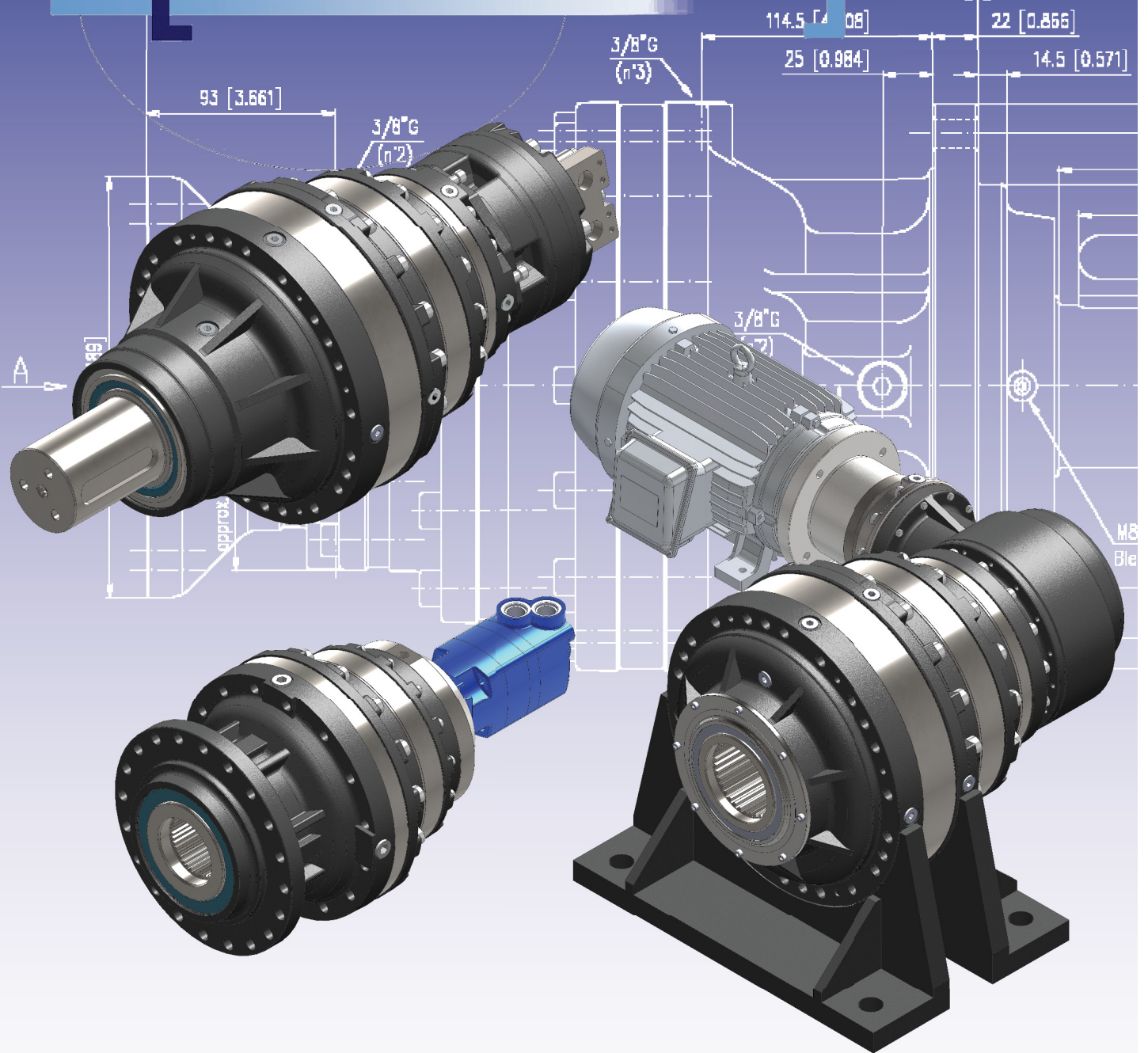


Plan-Star®



PSR  **REVOLUTION**
SERIES
PLANETARY GEARBOXES

Introduction

A INTRODUCTION

The catalog at hand presents the Plan-Star Revolution Series of Planetary Gears. This range has been developed by skilled technicians with tons of experience in planetary gear design and was meant to be an evolution to already existing products on the world market.

However, going deeper and deeper into design work, Plan-Star Engineering came out with such a revolutionary new style, so that what was meant to be an evolution literally became a revolution.

Plan-Star's Revolution Series provides features others can't offer. We start where others not even arrive!

Through the complete range there are small performance steps from one size to the next, allowing for easy selection of the best performing unit for any application. A Plan-Star is never too small and never too large, but just right to match the needs. In the end this comes up with savings for the customer: why buy more than actually needed?

Unification of many items helps to keep inventory down, combining best economy and short delivery time.

Although being totally new, the Revolution Series shares interface dimensions with older designs, thus allowing for easy replacement where interchangeability with older units is a must.

Specifications

The Plan-Star Revolution Series consists of a complete range of multi-purpose planetary gears, which can be operated by electric or hydraulic motors.

B1 BASIC DESIGN FEATURES:

- 33 sizes.
- output torque up to 250.000 Nm.
- transmissible power up to 500 kW.
- ratios going from 3 to over 3000:1 .
- modular structure.
- full planetary in-line and combined Gleason-planetary right-angle units available.
- 1 to 4 reduction stages, on request 5 stages.
- optional hydraulically operated multi-disc brake.
- flange-, foot- and shaft mounting versions, spindle output available.
- output shafts solid keyed or splined, hollow splined or for shrink disc mounting.
- vast range of accessories for the low speed shaft: drive flange, splined bush, slew pinion, splined rod, shrink disc, torque reaction arm.
- broad selection of input adapters: standard electric motors, IEC and NEMA, hydraulic motors of the major manufacturers, free high speed shafts.
- availability of hydraulic gear motors with and without integrated brake.

B2 FURTHER DESIGN FEATURES:

- compact design with best performance-to-dimensions and weight ratio.
- high efficiency, up to 98.5% per stage.
- all gearing heat treated with full addendum-, lead- and profile-modification in order to obtain best performance and efficiency as also smooth engagement for low-vibration, silent operation.
- close tolerances of all gear parts and floating planet carriers for even load sharing.
- planet carriers made of steel or high-tensile nodular iron.
- all roller bearing design for the planet gears for best efficiency and superior start-up torque. Performer Class planet bearings with increased life (up to 6 times if compared to former designs).
- gear case made of nodular iron.
- gear parts connected by means of spline profiles.
- heavy duty roller bearings on solid shaft and hollow shaft for shrink disc.
- high performance shafts made out of high tensile steel with larger diameters than industry standard.

Specifications

B3 SYMBOLS, TERMS AND UNITS

Symbol	Unit	Description
F_{A1}	[kN]	Axial Shaft Load, inwards (push)
$F_{A1}(\text{peak})$	[kN]	Maximum Admissible (Peak) Axial Shaft Load, inwards (push)
F_{A2}	[kN]	Axial Shaft Load, outwards (pull)
$F_{A2}(\text{peak})$	[kN]	Maximum Admissible (Peak) Axial Shaft Load, outwards (pull)
f_B	[--]	Life Factor, Bearings
f_G	[--]	Life Factor, Gears
F_R	[kN]	Applied Radial Shaft Load
$F_{R\text{adm}}$	[kN]	Admissible Radial Shaft Load
$F_{R\text{req}}$	[kN]	Adjusted Radial Shaft Load
f_t	[--]	Temperature Factor
f_v	[--]	Speed Factor
K_A	[--]	Application Factor
K_S	[--]	Shock Factor
η	[--]	Efficiency
n_1	[rpm]	Input Speed
$n_{1\text{max}}$	[rpm]	Maximum Input Speed
n_2	[rpm]	Output Speed
$n_{2\text{x h}}$	[--]	Service Life
P	[kW]	Mechanical Power
P_{cool}	[kW]	Cooling Power
P_{mech}	[kW]	Maximum Mechanical Power
P_{th}	[kW]	Thermal Power
$P_{\text{th cor}}$	[kW]	Corrected Thermal Power
T_2	[Nm]	Applied Output Torque
$T_{2\text{act}}$	[Nm]	Actual Torque Rating
$T_{2\text{nom}}$	[Nm]	Nominal Torque Rating
$T_{2\text{peak}}$	[Nm]	Peak Torque Rating
$T_{2\text{req}}$	[Nm]	Required Torque Rating
u	[--]	(Reduction) Ratio

B4 GENERAL TECHNICAL INFORMATION, TERMS, DEFINITIONS

1.0 Speed

1.1 Input Speed

 n_1 [rpm]

.. is the speed limit on the HSS (High Speed Shaft) for continuous operation. It is expressed in Revolutions Per Minute (rpm).

1.2 Maximum Input Speed

 $n_1 \text{ max}$ [rpm]

.. is the speed limit on the HSS for short time operation.

1.3 Output Speed

 n_2 [rpm]

.. is the speed on the LSS (Low Speed Shaft), expressed in rpm. The output speed derives from the input speed divided by the Reduction Ratio u .

2.0 Ratio (Reduction Ratio)

 u [--]

.. is obtained by dividing speed of HSS and LSS:

$$u = \frac{n_1}{n_2} \quad \text{formula 1}$$

3.0 Service Life

 $n_2 \times h$ [--]

.. is the product of output speed (n_2) and hours of service (h) excluding times when the unit is standing still. This value is directly proportional to the number of revolutions of the LSS.

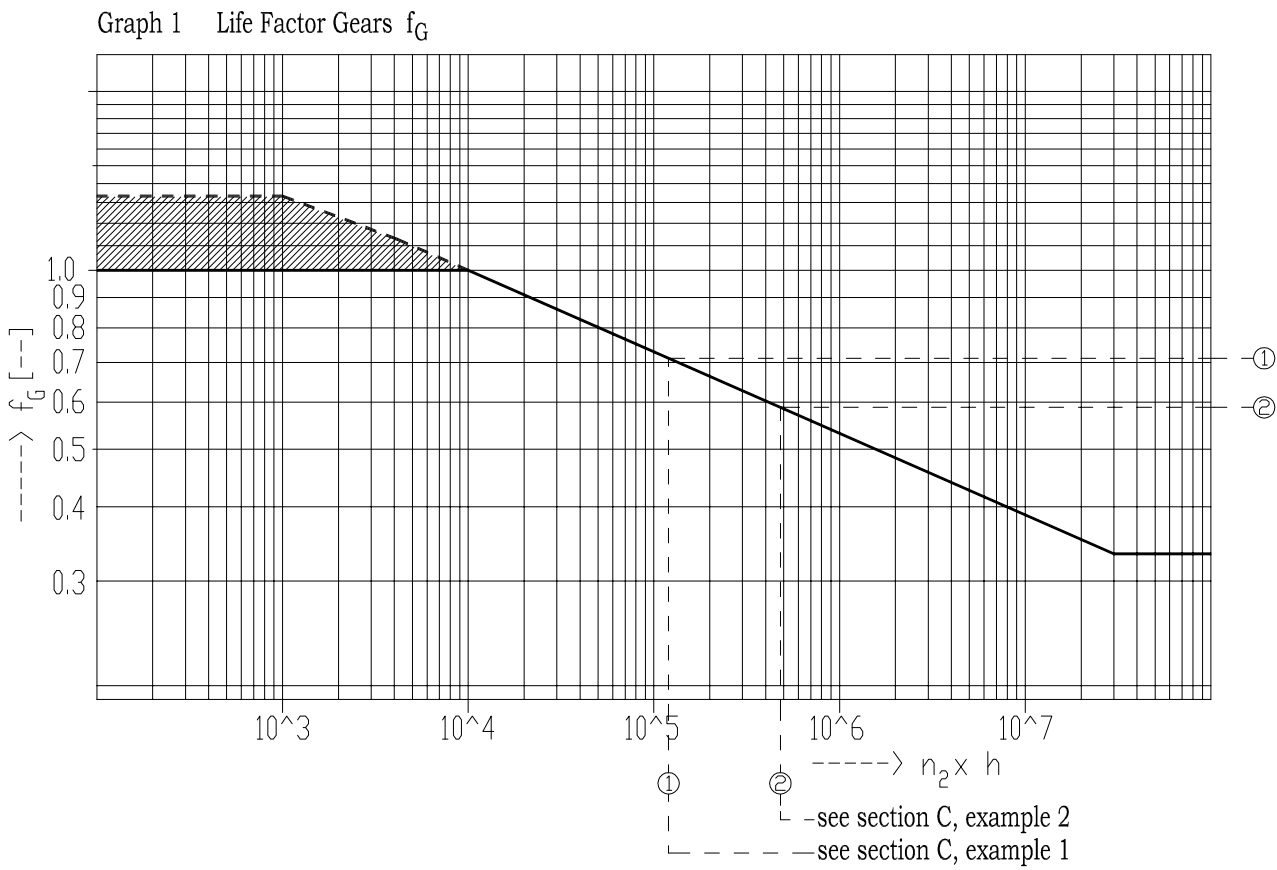
Specifications

4.0 Life Factor (Gears)

f_G [-]

.. is required for the determination of the transmissible torque for a service life different from the standard rated life.

Graph 1 shows the average life curve for all sizes and ratios.



5.0 Application Factor

K_A [-]

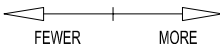
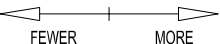
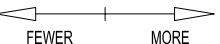
.. it considers the load variations typical for the driven machine and the driving member. These appear as shocks, oscillations and load peaks.

Table 1 supplies a choice of suitable values for most applications. Values smaller than $K_A = 1.3$ shall not be used unless there is enough experience with similar applications.

However, application factors may be very different from what they seem. In case of doubt, please contact Plan-Star Engineering for proper determination.

Specifications

Table 1 Application Factor K_A

TYPE OF LOADING	DRIVING MEMBER		
DRIVEN MACHINE	UNIFORM ELECTRIC AND HYDRAULIC MOTOR	LIGHT SHOCK MULTI-CYL. COMBUSTION ENGINE	MODERATE SHOCK SINGLE-CYL. COMBUSTION ENGINE
UNIFORM AGITATORS AND MIXERS FOR UNIFORM DENSITY, CONVEYERS, GENERATORS, SMALL WINCHES	1.0 - 1.3	1.3 - 1.7	1.7 - 2.0
MODERATE SHOCK CRANE SLEWING, TRAVEL AND HOIST, CALENDERS, CONCRETE MIXERS AND PUMPS, (PISTON) PUMPS	1.3 - 1.7	1.7 - 2.0	2.0 - 2.5
HEAVY SHOCK CRUSHING MACHINES, EXCAVATORS, FOUNDRY EQUIPM., MILLS, PRESSES, ROLLING MILLS, ROTARY BORING TOOLS	1.7 - 2.0	2.0 - 2.5	2.5 - 3.0
START/STOP FREQUENCY			

6.0 Torque

6.1 Nominal Torque Rating

 $T_2 \text{ nom} \text{ [Nm]}$

.. is a harmonized nominal value referring to preferred numbers R'40. The actual transmissible torque may vary depending on ratio, speed, application.

6.2 Actual Torque Rating

 $T_2 \text{ act} \text{ [Nm]}$

.. is the actual transmissible torque for (rated) standard conditions: $n_2 \times h = 10.000$, $K_A = 1$.

6.3 Peak Torque

 $T_2 \text{ peak} \text{ [Nm]}$

.. is the maximum torque the unit can withstand under highly intermittent or static operating conditions. It is considered to be a short time peak, e.g. at start-up.

6.4 Applied Torque

 $T_2 \text{ [Nm]}$

.. is the actually transmitted torque.

6.5 Required Torque Rating

 $T_2 \text{ req} \text{ [Nm]}$

.. is the adjusted torque value based on applied torque T_2 and required service life and operating conditions. This value is used for the selection of the unit.

$$T_2 \text{ req} = T_2 \times K_A \times \frac{1}{f_G} \quad \text{formula 2}$$

When selecting a gearbox the following condition must be fulfilled:

$$T_2 \text{ req} \leq T_2 \text{ act} \quad \text{formula 3}$$

Specifications

7.0 Mechanical Efficiency

$$\eta \text{ [--]}$$

.. is defined as the result of output power divided by input power.

$$\eta = P_2 / P_1 \quad \text{formula 4}$$

The efficiency of a gearbox is not a fixed value, but it depends on many factors. Especially the degree of utilization, but also speed, type of lubricant and temperature etc. are some of the main factors, which may reduce the particular high efficiency of a planetary gear stage from up to 98.5% to approximately 97% each reduction stage.

This last value is a good compromise for general application purposes. The following table shows the efficiency values thus obtained:

Table 2 Mechanical Efficiency η

NUMBER OF STAGES	1	2	3	4	5
EFFICIENCY η	0.97	0.94	0.91	0.89	0.86

8.0 Power

8.1 Mechanical Power

$$P \text{ [kW]}$$

.. results from transmitted torque and speed:

$$P = \frac{T \times n}{9550} = \frac{T_1 \times n_1}{9550} = \frac{T_2 \times n_2}{9550} \quad \text{formula 5}$$

With P in [kW] when T in [Nm] and n in [rpm]

8.2 Maximum Mechanical Power

$$P_{\text{mech}} \text{ [kW]}$$

.. is the maximum power transmissible for intermittent duty. The values shown in the performance data tables must not be exceeded.

Restrictions may apply for units having higher reduction ratio; make sure the torque resulting from transmitted power and speed not to exceed T_2 peak.

8.3 Thermal Power

$$P_{\text{th}} \text{ [kW]}$$

.. is the power limit for continuous operation. Exceeding this value will result in overheating the gearbox. In this case a suitable cooling system should be provided (e.g. fan, heat exchanger) or a larger gearbox having more thermal capacity may be selected.

Some factors influence the thermal power, such as ambient temperature, percentage of use, input speed, air circulation, direct sun exposure and paint color, general installation arrangement.

The values given in the performance data tables allow for a gearbox temperature of 90° C and are valid for the standard rated conditions: ambient temperature 20° C, continuous service (100%) and $n_1 = 1500$ rpm.

With the combined use of special seals and synthetic lubricant higher gearbox temperatures are admissible. Subsequently higher thermal ratings than the rated can be achieved. Contact Plan-Star Engineering for further information regarding this option. For application conditions different from the above, a corrected value of P_{th} can be obtained with the help of correction factors considering ambient temperature, type of duty, input speed.

Specifications

8.4 Temperature Factor

$$f_t \text{ [-]}$$

.. is used to adjust the table value of P_{th} for a choice of ambient temperatures and percentages of usage (based on the principle 1 hour continuous duty = 100% of usage).

Table 3 Temperature Factor f_t

TEMPERATURE FACTOR f_t							
AMBIENT TEMPERATURE [°C]		0°	10°	20°	30°	40°	50°
PERCENTAGE OF UTILIZATION AT EQUAL DISTRIBUTION OVER 1 HOUR	100%	1.29	1.14	1	0.86	0.71	0.57
	75%	1.48	1.32	1.15	0.99	0.82	0.66
	67%	1.57	1.40	1.22	1.05	0.87	0.70
	50%	1.82	1.62	1.41	1.21	1.01	0.81
	33%	2.24	1.99	1.74	1.49	1.24	0.99
	25%	2.57	2.29	2.00	1.71	1.43	1.14
	20%	2.87	2.56	2.24	1.92	1.60	1.28
	10%	3.00	3.00	3.00	2.71	2.26	1.81

8.5 Speed Factor

$$f_v \text{ [-]}$$

.. is used to adjust the table value of P_{th} for different input speeds than the rated value of 1500 rpm.

Table 4 Speed Factor f_v

SPEED FACTOR f_v									
INPUT SPEED n_1 [RPM]	500	750	1000	1250	1500	1750	2000	2500	3000
Horizontal mounting	2	1.75	1.5	1.25	1	0.88	0.75	0.62	0.5
Vertical mounting	1.9	1.68	1.41	1.18	0.95	0.82	0.71	0.56	0.43

8.6 Corrected Thermal Power

$$P_{th \text{ cor}} \text{ [kW]}$$

.. is the transmissible power without overheating for the actual operating conditions.

$$P_{th \text{ cor}} = P_{th} \times f_t \times f_v \quad \text{formula 6}$$

8.7 Cooling Power

$$P_{cool} \text{ [kW]}$$

.. is the amount of heat to be dissipated by means of an external cooling system if $P > P_{th \text{ cor}}$

$$P_{cool} = (1 - \eta) \times (P - P_{th \text{ cor}}) \text{ [kW]} \quad \text{formula 7}$$

Specifications

9.0 Shaft Loads

IMPORTANT NOTES:

- a Gearboxes having female splined shaft are designed to transmit torque only. The bearings of the output shaft cannot bear any radial nor axial shaft loads except very small forces deriving from the coupling to the driven machine.
- b Units with hollow shaft for shaft mounting (shrink disc mounting) do have heavy duty roller bearings on the output shaft. The bearing life exceeds the gear life, provided the minimum length of the torque arm is respected. For applications where external forces other than those deriving from torque reaction and gearbox weight (motor included) are applied, please contact Plan-Star Engineering for advice.
- c The bearing performance data given in the charts are valid for solid shafts (keyed, splined) as for the optional spindle output.
- d Combined (heavy) thrust and radial load may reduce bearing life. Please contact Plan-Star Engineering for accurate life calculation of your specific application.
- e Combination of high torque and heavy radial shaft load might require verification of the output shaft. If following condition is not fulfilled, contact Plan-Star Engineering for precise verification of your specific application:

$$\frac{F_R}{F_{R \text{ adm}}} \times \frac{T_2}{T_{2 \text{ nom}}} < 0.5 \quad \text{formula 8}$$

9.1 Radial Shaft Load

F_R [kN]

.. is the radial load actually applied to the output shaft at a known distance. The bearings' capacity change with variation of the distance between load and shaft shoulder.
The performance tables (bearing curves) show admissible loads at rated conditions in function of the load distance.

9.2 Admissible Radial Shaft Load

$F_{R \text{ adm}}$ [kN]

.. the values given in the performance data tables are the maximum output shaft and bearings can withstand. They are valid at rated conditions, $n_2 \times h = 10.000$ and shock factor $K_S = 1.0$.

For operating conditions different from the above, a corrected value of $F_{R \text{ adm}}$ can be obtained with the help of correction factors considering service life and shock loads.

9.3 Adjusted Radial Shaft Load

$F_{R \text{ req}}$ [kN]

.. is the necessary value based on applied radial load F_R , required service life and operating conditions. This value is used for the selection of the unit.

$$F_{R \text{ req}} = F_R \times K_S \times \frac{1}{f_B} \quad \text{formula 9}$$

When selecting a gearbox the following condition must be fulfilled:

$$F_{R \text{ req}} < F_{R \text{ adm}} \quad \text{formula 10}$$

Specifications

9.4 Shock Factor

K_S [-]

.. it considers the load variations typical for the driven machine. These appear as shocks, oscillations or peak loads. Table 5 supplies a choice of suitable values for most applications.

However, many times the radial shaft load is a function of the transmitted torque. Then, as a rule of thumb, set $K_S = K_A$.

Values smaller than $K_S = 1.3$ shall not be used unless exhaustive knowledge is provided as also enough experience with similar applications.

However, shock factors may be very different from what they seem. In case of doubt contact Plan-Star Engineering for proper determination.

Table 5 Shock Factor K_S

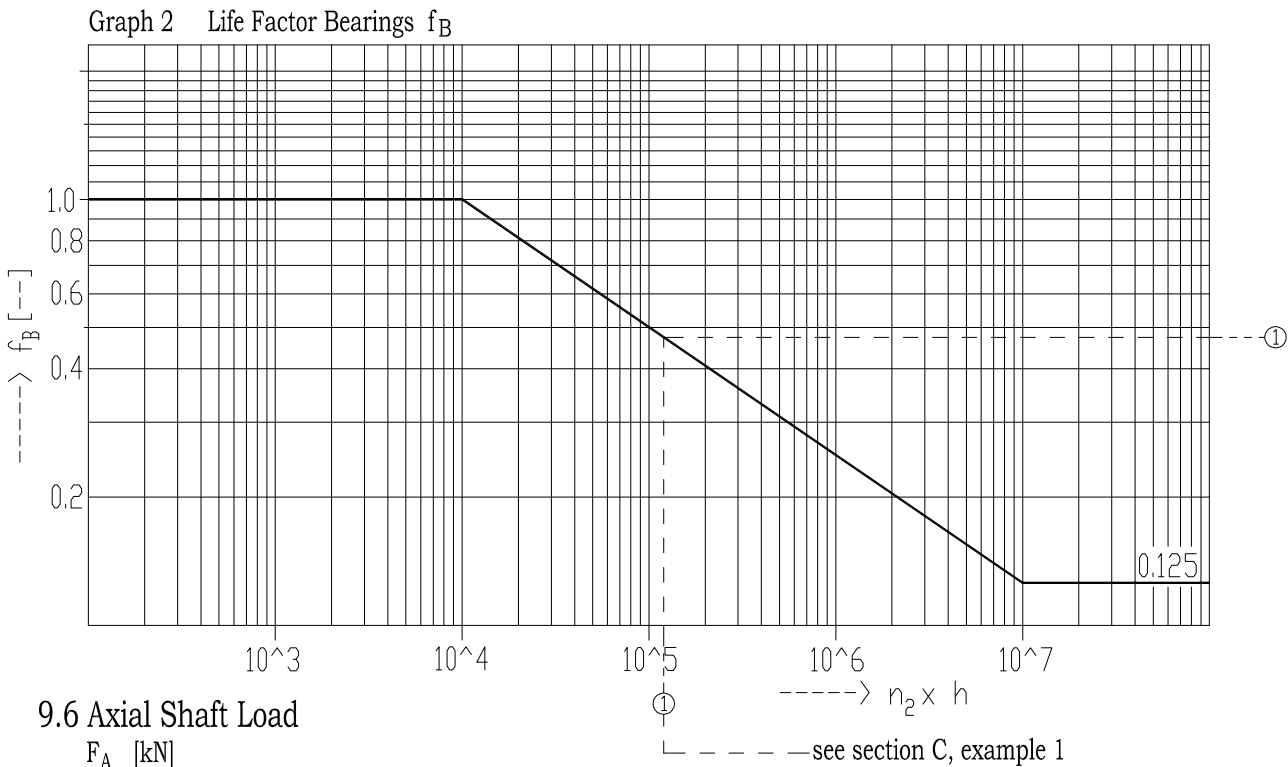
LOAD NATURE	UNIFORM	MODERATE SHOCK	HEAVY SHOCK
SHOCK FACTOR K_S	1.0	1.3 - 1.5	1.7 - 3.0

9.5 Life Factor Bearings

f_B [-]

.. is required for the determination of the admissible radial load for a service life different from the standard rated life.

Graph 2 shows the bearing life curve valid for all solid shafts.



9.6 Axial Shaft Load

F_A [kN]

.. is the axial load applied to the output shaft.

The values given are meant to be maximum peak values, which must not be exceeded.

Combined thrust and radial load might reduce bearing life. Please contact Plan-Star Engineering for accurate life calculation of your specific application.

Gear Selection

C SELECTION

C.1 Example 1: Concrete Pump driven by hydraulic motor

- Given Data:
- power input via hydraulic motor (radial piston crankshaft design)
 - pressure drop 175 bar
 - motor displacement 154 cm³
 - total motor efficiency 0.92 (92%)
 - input speed $n_1 = 150$ rpm
 - output speed $n_2 = 30$ rpm
 - power output via chain drive
 - sprocket eff. dia. = 127 mm (5")
 - sprocket mounted at 40 mm from shaft shoulder
 - duty cycle: continuous operation for 30 minutes up to 4 times a day
 - ambient temperature 40°C, horizontal mounting position
 - required life: 400 h/yr. for 10 years = 4000 hours
 - possible static (external) overload: 250% of nominal load

C.1.1 Ratio:
$$u = \frac{n_1}{n_2} = \frac{150}{30} = 5$$

C.1.2 Transmitted Torque:
$$T_1 = 175 \text{ bar} \times 154 \text{ cm}^3 \times 0.92 / 20\pi = 394.6 \text{ Nm}$$

$$T_2 = T_1 \times u = 394.6 \text{ Nm} \times 5 = 1973 \text{ Nm}$$

C.1.3 Application Factor: $K_A = 1.5$ (from table 1)

C.1.4 Radial Load on Output Shaft: $F_R = 1973 \text{ Nm} \times 2000 / 127 \text{ mm} = 31071 \text{ N} = 31 \text{ kN}$

C.1.5 Shock Factor: $K_S = 1.5$ (estimated, same as K_A)

C.1.6 Service Life: $n_2 \times h = 30 \times 4000 = 120000 = 1.2 \times 10^5$

C.1.7 Life Factor Gears: $f_G = 0.71$ (from graph 1 for $n_2 \times h = 1.2 \times 10^5$)

C.1.8 Life Factor Bearings: $f_B = 0.47$ (from graph 2 for $n_2 \times h = 1.2 \times 10^5$)

C.1.9 Required Torque Rating:
$$T_2 \text{ req} = T_2 \times K_A \times \frac{1}{f_G} = 1973 \times 1.5 \times \frac{1}{0.71} = 4168 \text{ Nm}$$

C.1.10 Adjusted Radial Shaft Load (at 40mm from shaft shoulder):
$$F_R \text{ req} = F_R \times K_S \times \frac{1}{f_B} = 31 \times 1.5 \times \frac{1}{0.47} = 99 \text{ kN}$$

C.1.11 Selected Gearbox: PS 42 - L1 - X16 - 5.1 - G12
 ratio 5.1 : 1 ; $T_{\text{nom}} = 4200 \text{ Nm}$, $T_{\text{act}} = 4300 \text{ Nm}$, $T_{\text{peak}} = 5500 \text{ Nm}$
 $F_{R\text{adm}} = 108 \text{ kN}$ (from bearing chart at 40mm load distance)
 $P_{\text{th}} = 7.5 \text{ kW}$, $P_{\text{max}} = 26 \text{ kW}$

C.1.12 Verification: $T_2 \text{ req} = 4168 < T_2 \text{ act} = 4300 \text{ Nm}$ OK

$T_2 \text{ peak} = 2.5 \times 1973 \text{ Nm} = 4933 \text{ Nm} < 5500 \text{ Nm}$ OK

$$P = \frac{T_1 \times n_1}{9550} = \frac{394.6 \times 150}{9550} = 6.2 \text{ kW} < P_{\text{max}} = 26 \text{ kW}$$
 OK

$P < P_{\text{th cor}} = 7.5 \text{ kW} \times 1.01 \times 2 = 15.15 \text{ kW}$ OK
 (with $f_t = 1.01$ from table 3, $f_v = 2$ from table 4)

Gear Selection

$$F_R \text{ req} = 99 \text{ kN} < F_R \text{ adm} = 108 \text{ kN}$$

OK

$$F_R \text{ peak} = 2.5 \times 31 \text{ kN} = 78 \text{ kN} < F_R \text{ adm} = 108 \text{ kN}$$

OK

$$\text{shaft (fatigue): } \frac{31 \text{ kN}}{108 \text{ kN}} \times \frac{1973 \text{ Nm}}{4200 \text{ Nm}} = 0.13 < 0.5$$

OK

C.2 Example 2: Conveyor Belt driven by electric motor, variable frequency drive

- Given Data:
- power input via electric motor (4 pole - IEC 160 B5)
 - installed power 11 kW
 - actually transmitted power 9.5 kW
 - motor peak factor = 1.6 (limited by VFD)
 - input speed $n_1 = 1430 \text{ rpm}$
 - output speed $n_2 = 4 \text{ rpm}$
 - power output via shrink disc, torque arm length = 1 m
 - duty cycle: continuous operation for 24 hours, 3 start-ups per day
 - ambient temperature 30°C , horizontal mounting position
 - required life: 6000 h/yr. for 20 years = 120000 hours

C.2.1 Ratio:

$$u = \frac{n_1}{n_2} = \frac{1430}{4} = 357.5$$

C.2.2 Transmitted Torque:

$$T_2 = \frac{P \times 9550}{n_2} = \frac{9.5 \times 9550}{4} = 22681 \text{ Nm}$$

C.2.3 Application Factor:

$$K_A = 1.2 \text{ (from table 1)}$$

C.2.4 Radial Load on Output Shaft: not applicable (due to adequate length of torque reaction arm)

C.2.5 Shock Factor:

not applicable (see above)

C.2.6 Service Life:

$$n_2 \times h = 4 \times 120000 = 480000 = 4.8 \times 10^5$$

C.2.7 Life Factor Gears:

$$f_G = 0.59 \text{ (from graph 1 for } n_2 \times h = 4.8 \times 10^5 \text{)}$$

C.2.8 Life Factor Bearings:

not applicable (see C.2.4)

C.2.9 Required Torque Rating:

$$T_2 \text{ req} = T_2 \times K_A \times \frac{1}{f_G} = 22681 \times 1.2 \times \frac{1}{0.59} = 46131 \text{ Nm}$$

C.2.10 Adjusted Radial Shaft Load: not applicable (see C.2.4)

C.2.11 Selected Gearbox:

PS 420 - L4 -P24 - 360 - E16

Ratio 360:1 ; $T_{\text{nom}} = 42000 \text{ Nm}$, $T_{\text{act}} = 51000 \text{ Nm}$, $T_{\text{peak}} = 58000 \text{ Nm}$ $P_{\text{th}} = 12 \text{ kW}$, $P_{\text{max}} = 30 \text{ kW}$

C.2.12 Verification:

$$T_2 \text{ req} = 46131 < T_2 \text{ act} = 51000 \text{ Nm}$$

OK

$$\text{Gearbox: } T_2 \text{ peak} = 1.6 \times \frac{11 \times 9550}{4} = 42020 \text{ Nm} < 58000 \text{ Nm}$$

OK

$$\text{Shrink Disc: } T_2 \text{ peak} = 42020 \text{ Nm} < 55000 \text{ Nm}$$

OK

$$P_{\text{peak}} = 11 \text{ kW} < P_{\text{max}} = 30 \text{ kW}$$

OK

$$P = 9.5 \text{ kW} < P_{\text{th cor}} = 12 \text{ kW} \times 0.86 \times 1 = 10.3 \text{ kW}$$

OK(with $f_t = 0.86$ from table 3, $f_v = 1$ from table 4)

Installation, Use and Maintenance

D INSTALLATION, USE AND MAINTENANCE

THE FOLLOWING GUIDELINE IS INTENDED TO GIVE JUST A ROUGH OVERVIEW OF THE MOST IMPORTANT RULES TO BE OBEYED.

D1 INSTALLATION:

The structure or frame, on which the gearbox is installed, must be sufficiently rigid in order to safely transmit torque and shaft loads.

The wall thickness of the bearing surface is very important and - as a rule of thumb - it should not be less than 1.5 to 2 times the fixing bolt diameter. The mating surfaces must be machined with the bearing surface to be perpendicular to the gear axis, the recommended tolerance for the bore is H8.

The mating surfaces must be free from oil and grease on both, the gear unit and the machine frame. Carefully degrease them with a suitable solvent making sure all safety regulations in regard are strictly followed.

The use of locking adhesives (e.g. Loctite) on the flange mating surfaces prevents from corrosion and may increase the coefficient of friction, keeping in mind that the removal of the unit may result more difficult.

Grease-like corrosion inhibitors are not admissible on the flange mounting surfaces as they reduce the transmissible torque to a minimum.

Gear units having female splined output shaft, which generally cannot bear any shaft loads, must be carefully aligned. Furthermore, very precise machining of the whole structure is necessary. Perfect perpendicularity between bearing surface and machine shaft, which must have own bearings, is a must. Misalignment of the shaft end due to bending is not admissible!

Always use all bolt holes on the mounting flange. Bolts should be of proven quality (the very best is the minimum you should pretend!) and should always have a marking showing manufacturer and grade. At least 8.8-grade bolts must be installed, and in case of inversions, shock loads and values of torque and/or shaft load close to the maximum admissible, 12.9-grade bolts are necessary.

Tighten the bolts by means of a torque wrench to approximately 80% of yield strength.

The following table shows recommended torque settings for the most commonly used bolt sizes:

Table 6 Recommended Bolt Torque Settings M_A

RECOMMENDED BOLT TORQUE SETTINGS M _A										
METRIC Thread Size				M10	M12	M14	M16	M18	M20	M30
Thread Pitch [mm]				1.5	1.75	2	2	2.5	2.5	3.5
T O R Q U E	[Nm]	Bolt Grade	8.8	49	86	135	210	295	410	1450
			10.9	69	120	190	295	415	580	2000
			12.9	83	145	230	355	500	690	2400
	[ft-lb]	Bolt Grade	8.8	36	64	100	155	220	300	1070
			10.9	51	89	140	220	305	430	1470
			12.9	61	107	170	260	370	510	1770

Installation, Use and Maintenance

Larger gear units (starting with size 300) have pre-installed dowels, which must be driven into the machine frame. See dimensional sheets for depth of dowel holes to be drilled (dimension "If"). These large units provide double pilots (spigots), which both must be used in case of gearboxes with solid shafts and shaft loads exceeding 50% of the admissible values.

When mounting and removing couplings to (from) input and output shafts use suitable devices (e.g. pullers, jack screws). DO NOT USE A HAMMER !

The general mounting arrangement must allow free access to fill, level and drain plugs. In case of vertical mounting, extension pipes and external oil tanks might be needed. Table "8" supplies some basic information regarding plug positions. However, being the table valid for all gear sizes and versions, some minor differences may occur.

Please ask Plan-Star Engineering for a certified outline drawing of your specific unit before designing your machine.

Breather plugs (vents) and shaft seals must not be painted. Adequate protection during the painting process must be provided in order to avoid solvents or paint to cause damage to the seals or the paint to clog the vent.

Rotating and/or moving parts of the gear units, such as input (HSS) and output (LSS) shafts, pinions, sprockets, belt and chain drives, couplings etc. must be adequately protected against accidental contact. The customer must provide suitable guards/shields in compliance with all applicable safety regulations in the land of origin and the land of destination of the machine, in which the Plan-Star units are incorporated. Plan-Star Inc. shall not be liable for whatever injuries and/or damages to persons or things caused by the lack of observance of the relevant regulations, rules and laws.

Vertical mounting positions with the LSS pointing upwards (V3, 12 o'clock) must be specified when ordering as on several gear sizes and versions grease lubed top bearings are installed.

D2 INITIAL OPERATION:

Make sure the gearbox is filled to the correct level with a suitable gear lubricant (see paragraph "Lubrication" for further details). Reference Values for the Oil Quantity can be found in Annex "B". The values given there, however, are intended as "standard values" and might change with the actual gearbox based on shaft version and ratio.

The first time a gear unit is started up, this should possibly happen at low speed and in no-load conditions. If during this first step no problems are recorded - as for example excessive noise or vibrations - the unit can be run at the nominal speeds and loads of the given application. During the second step check again for noise and vibrations.

In case of noise or vibrations check for correct alignment/installation and proper oil level.

After the trial run check for any oil leaks and again if oil level is correct. Make sure mounting bolts are tightened properly (see Table 6).

Installation, Use and Maintenance

D3 LUBRICATION:

As a standard, the gear unit is delivered without oil. Please make sure the gearbox is filled to the correct level with a suitable gear lubricant before start-up.

Table "8" supplies some basic information regarding mounting and plug positions. However, being the table valid for all gear sizes and versions, some minor differences may occur.

In case of vertical mounting (V1, V3, B51), extension pipes and external oil tanks might be needed.

Vertical mounting position with the LSS pointing upwards (V3) must be specified when ordering as on several gear sizes and versions grease lubed top bearings are installed.

Reference Values for the Oil Quantity can be found in Annex "B". The values given there, however, are intended as "standard values" and might change with the actual gearbox based on shaft version and ratio.

PAO (Poly-Alfa-Olefin) Synthetic Gear Oil (CASTROL Optigear Synthetic X320 or MOBIL Mobilgear SHC XMP 320) is always recommended. However, also other types of lubricants may be used, for example mineral oil, but then it must have EP-Additives (EP, Extreme Pressure) and provide a minimum FZG-Class of 12+. Further, for other lubricants than mentioned above the Viscosity Grade must be chosen based on Ambient Temperature while the named High Performance Lubricants can be used all year. In addition, High Performance Lubricants provide extended maintenance intervals, which in the long run end up with cost savings.

Lubrication with Glycol-based lubricants is admissible, but needs to be discussed beforehand as the compatibility with other lubricants/protectives used must be verified.

Table 7 Oil Viscosity Grade based on Ambient Temperature - Mineral Oils

Ambient Temp.	-10°C ... +10°C	0°C ... +30°C	+20°C ... +40°C	+30°C ... +50°C
	14°F ... +50°F	32°F ... +86°F	+68°F ... +104°F	+86°F ... +122°F
ISO VG	100	150	220	320
Agip	Blasia 100	Blasia 150	Blasia 220	Blasia 320
BP	Energol GR-XP 100	Energol GR-XP 150	Energol GR-XP 220	Energol GR-XP 320
Castrol	Alpha SP 100	Alpha SP 150	Alpha SP 220	Alpha SP 320
Chevron	Ultra Gear Lube 100	Ultra Gear Lube 150	Ultra Gear Lube 220	Ultra Gear Lube 320
Exxon-Esso	Spartan EP 100	Spartan EP 150	Spartan EP 220	Spartan EP 320
Mobil	Mobilgear 600 XP 100	Mobilgear 600 XP 150	Mobilgear 600 XP 220	Mobilgear 600 XP 320
Shell	Omala EP 100	Omala EP 150	Omala EP 220	Omala EP 320
Total-Elf	Reductelf SP 100	Reductelf SP 150	Reductelf SP 220	Reductelf SP 320

D4 MAINTENANCE:

The only actions to be taken are to check the oil level and to replace the lubricant. As a rule of thumb, level checking should be done every 3 to 6 months. Oil replacement should take place every 6 to 36 months, based on the type of lubricant used, the duty cycle and the ambient and oil temperature.

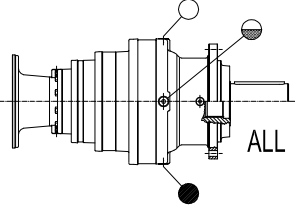
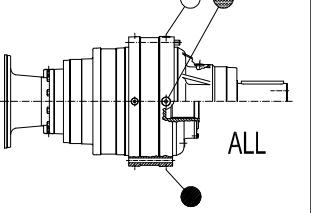
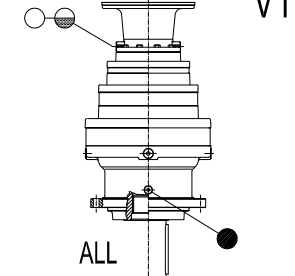
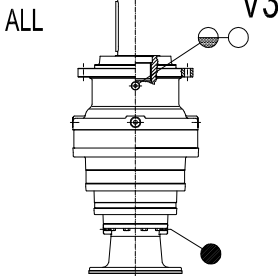
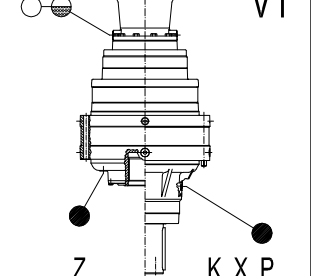
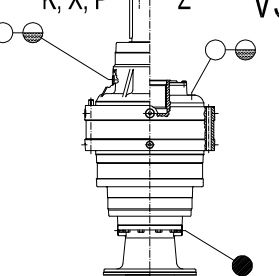
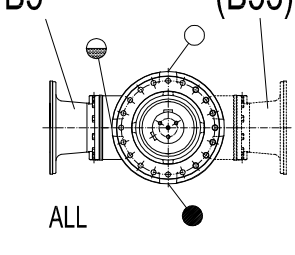
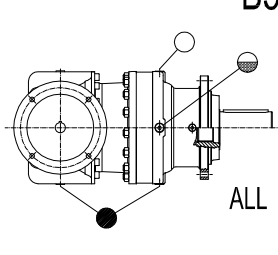
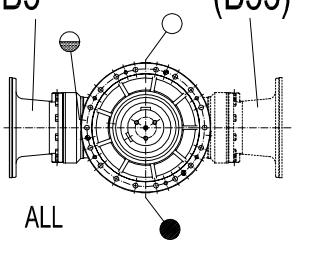
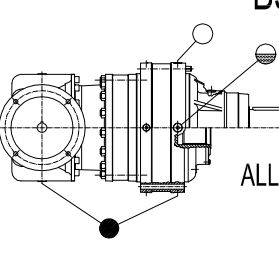
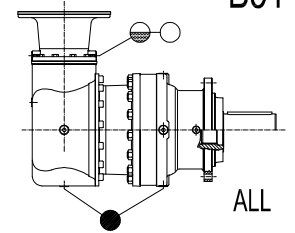
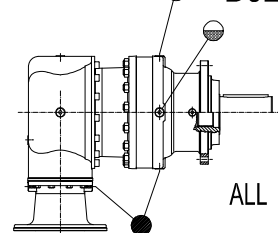
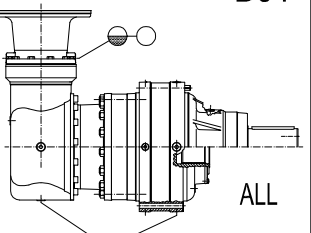
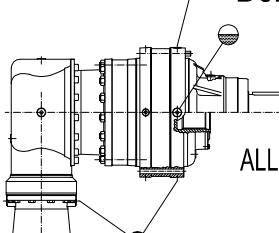
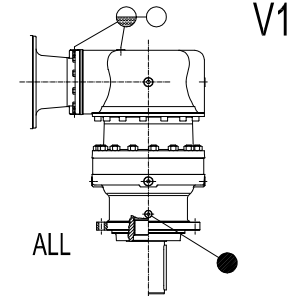
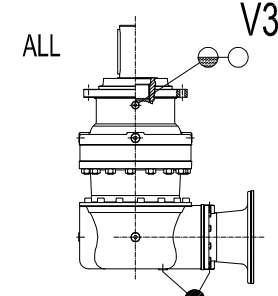
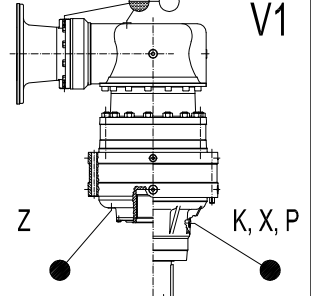
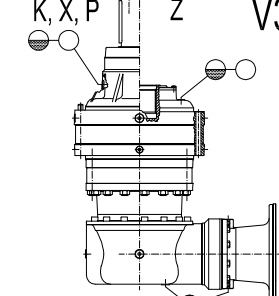
For High Performance Synthetic Lubricants the longer Service Intervals are valid while Standard Mineral Oils require the shorter intervals.

Oil replacement should be carried out with the oil still hot enough to flow freely. Wear Protective Apparel (gloves and goggles etc.) as the hot surfaces and the hot oil might lead to severe injury!

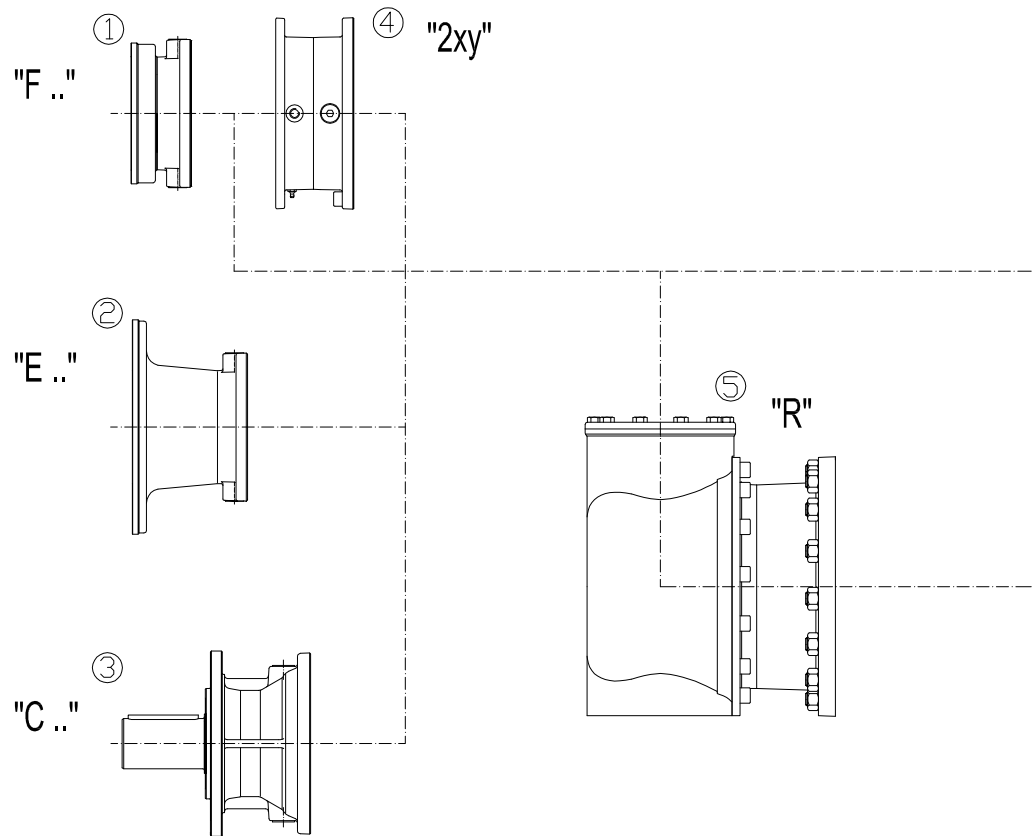
Please protect the Environment and respect all applicable laws, rules and regulations in your country.

Mounting and Plug Positions

Table 8 Mounting and Plug Positions

	B5 15 - 260 ○ VENT ◐ LEVEL ● DRAIN		B5 300 - 2500 ○ VENT ◐ LEVEL ● DRAIN
	V1 ALL  V3	 V1 Z K, X, P	 V3 K, X, P Z
 B5 (B53) ALL	 B5 ALL	 B5 (B53) ALL	 B5 ALL
 B51 ALL	 B52 ALL	 B51 ALL	 B52 ALL
 V1 ALL	 V3 ALL	 V1 Z K, X, P	 V3 K, X, P Z

Product Code



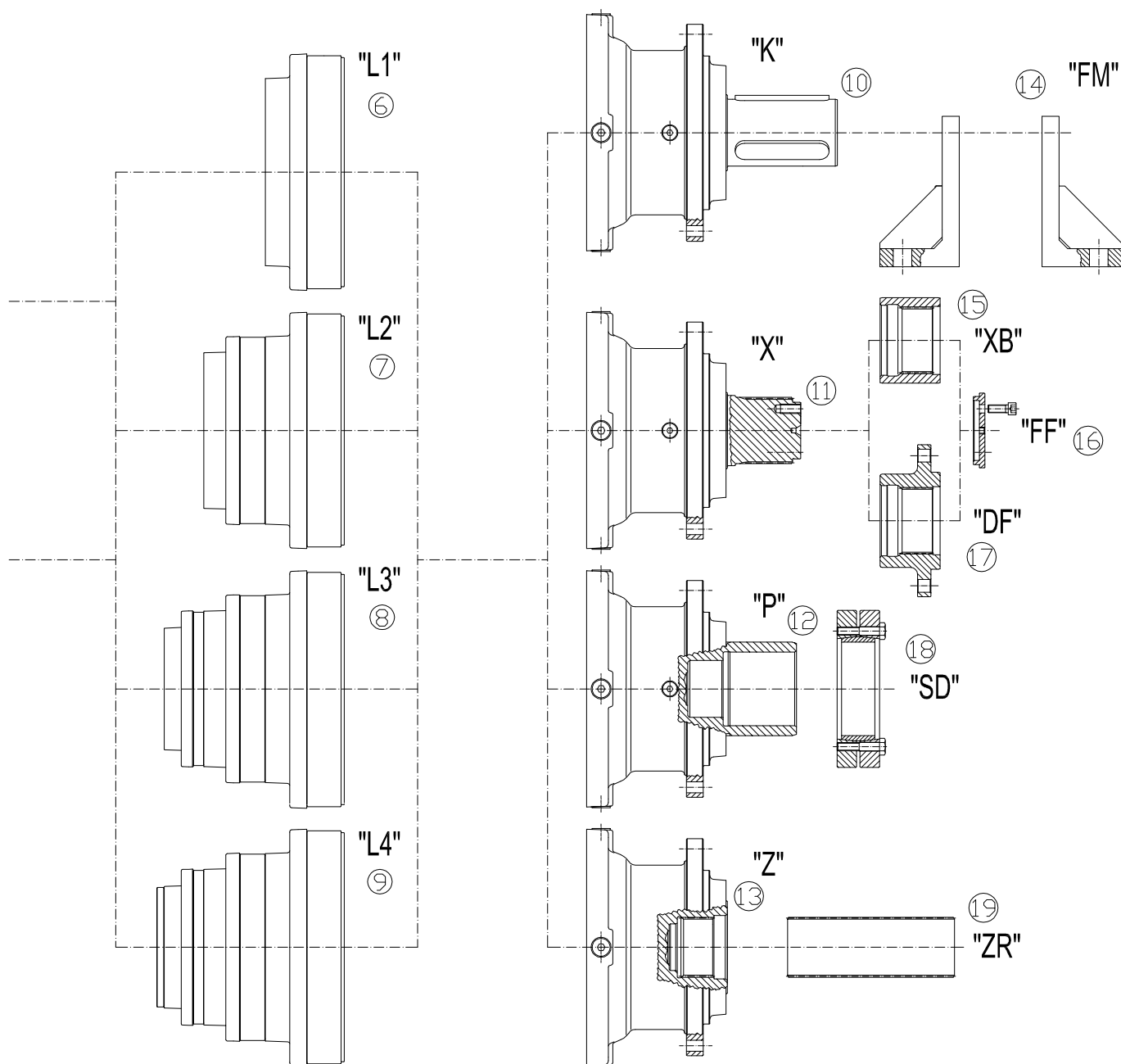
PSR 480 R4-K13-1200 - E 90 - FM

Foot Mount
Adapter for Electric Motor IEC 90
Nominal Ratio
Solid Keyed Output Shaft
4 Stage Right-Angle Planetary
Gear Size 480
Plan-Star Revolution Industrial Line

PSR 110 L2-X12 - 19 - B14 - 2AE - DF

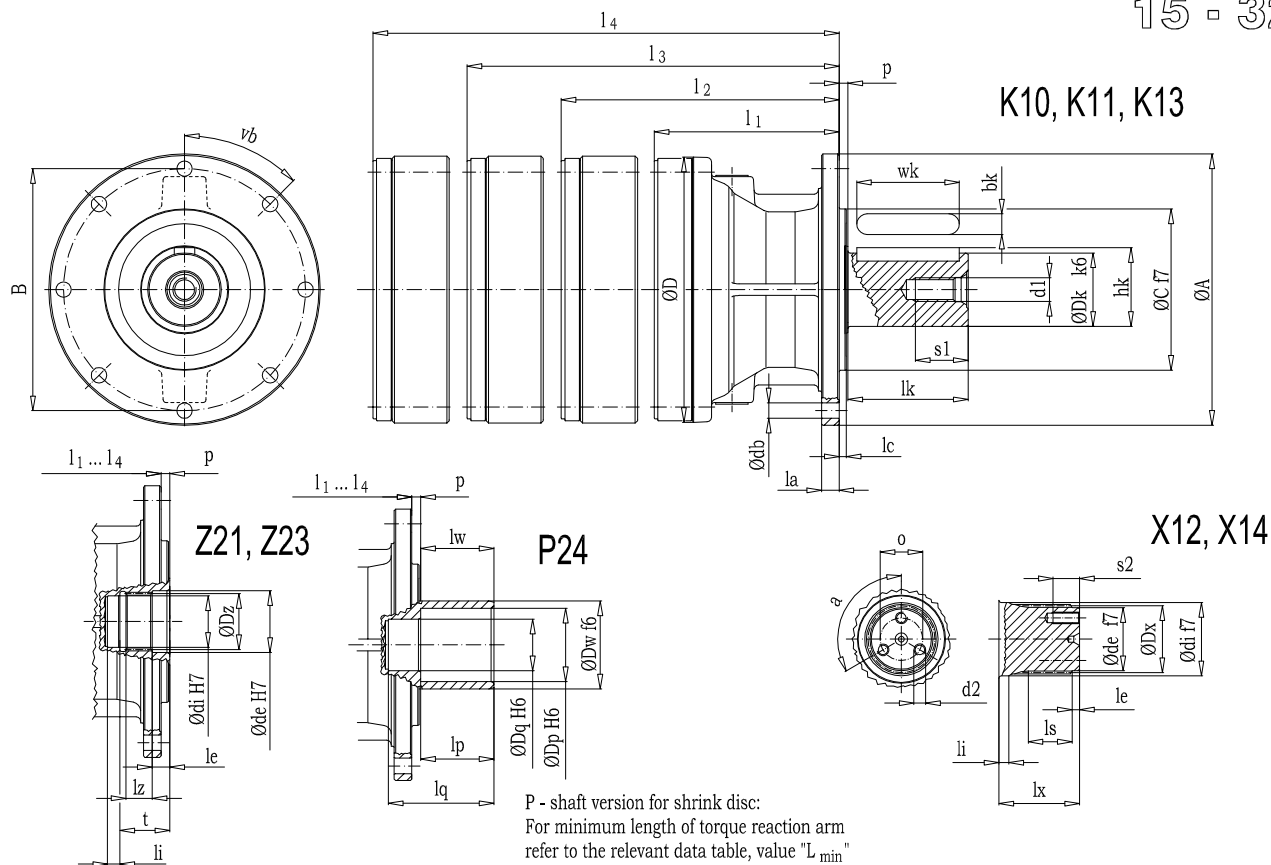
Drive Flange (incl. Fixing Plate) -
Multi-Disc Brake
Adapter for Hydraulic Motor SAE-B 12/24-14T
Nominal Ratio
Solid Splined Output Shaft
2 Stage In-Line Planetary
Gear Size 110
Plan-Star Revolution Industrial Line

Modular System



- 1 Motor Adapter for Hydraulic Motor
- 2 Motor Adapter for Electric Motor
- 3 High Speed Shaft
- 4 Multi-Disc Brake
- 5 Right-Angle Unit
- 6 One Planetary Stage
- 7 Two Planetary Stages
- 8 Three Planetary Stages
- 9 Four Planetary Stages

- 10 Solid Keyed Output Support
- 11 Solid Splined Output Support
- 12 Hollow Output Support for Shrink Disc
- 13 Hollow Splined Output Support
- 14 Foot Mount
- 15 Spline Bush
- 16 Fixing Flange (incl. bolts)
- 17 Drive Flange
- 18 Shrink Disc
- 19 Splined Billet



US Versions

X32, X34

K30, K33

Data and dimensions are not binding and may be modified without prior notice

Dimensions METRIC, solid shafts														Keyed										DIN Splined													
Model	A	la	B	db	vb	C	lc	D	p	l ₁	l ₂	l ₃	l ₄	Dk	lk	bk	hk	wk	d1	s1	code	Dx	lx	ls	de	le	di	li	d2	s2	a	o	code				
15	185	12	165	10.5	8x45°	110	5	185	6	113	163	213	263	38	58	10	41	50	M12	32	K 10	40x36	55	30	35	5	42	7	M6	13	3x120°	24	X 12				
18	185	12	165	10.5	8x45°	110	5	185	6	113	163	213	263	42	82	12	45	70	M16	36	K 11	40x36	55	30	35	5	42	7	M6	13	3x120°	24	X 12				
22	185	12	165	10.5	8x45°	110	5	185	6	113	163	213	263	50	82	14	53.5	70	M16	36	K 13	48x44	55	30	43	5	50	7	M8	18	3x120°	29	X 14				
28	185	12	165	10.5	8x45°	110	5	185	6	126	176	226	276	50	82	14	53.5	70	M16	36	K 13	48x44	55	30	43	5	50	7	M8	18	3x120°	29	X 14				
32	185	12	165	10.5	8x45°	110	5	185	6	126	176	226	276	50	82	14	53.5	70	M16	36	K 13	48x44	55	30	43	5	50	7	M8	18	3x120°	29	X 14				

Dimensions METRIC, hollow shafts														Hollow for Shrink Disc										Hollow Splined									
Model	A	la	B	db	vb	C	lc	D	p	l ₁	l ₂	l ₃	l ₄	Dp	lp	Dq	lq	Dw	lw	L min. of torque arm	code	Dz	lz	de	le	di	li	t	code				
15	185	12	165	10.5	8x45°	110	5	185	6	113	163	213	263	50	50	35	72	60	50	200	P 24	40x36	18	42	12	35	8.5	34	Z 21				
18	185	12	165	10.5	8x45°	110	5	185	6	113	163	213	263	50	50	35	72	60	50	200	P 24	40x36	18	42	12	35	8.5	34	Z 21				
22	185	12	165	10.5	8x45°	110	5	185	6	113	163	213	263	50	50	35	72	60	50	250	P 24	45x41	25	47	5	35	8.5	34	Z 23				
28	185	12	165	10.5	8x45°	110	5	185	6	126	176	226	276	50	50	35	72	60	50	250	P 24	45x41	25	47	5	35	8.5	34	Z 23				
32	185	12	165	10.5	8x45°	110	5	185	6	126	176	226	276	50	50	35	72	60	50	250	P 24	45x41	25	47	5	35	8.5	34	Z 23				

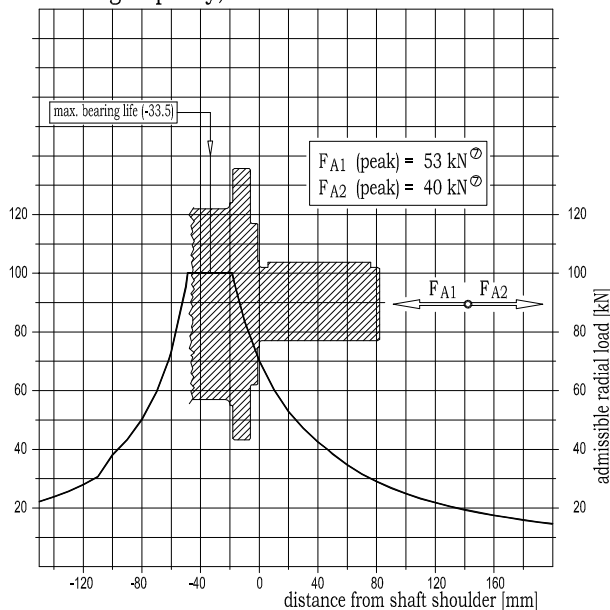
Dimensions US version, solid shafts														Cylindrical										ANSI Splined									
Model	Q	la	B	db	vb	C	lc	D	p	l ₁	l ₂	l ₃	l ₄	Dk	lk	bk	hk	wk	d1	s1	code	Dx	lx	ls	do	d2	s2	code					
15	150	15	162	15	4x90°	127	6.5	185	15	104	154	204	254	38.1 h6	61	9.525	42.4	57.15	1/2"-13	32	K 30	12/24-17T	61	40.5	37.6 h11	3/8"-16	22.5	X 32					
18	150	15	162	15	4x90°	127	6.5	185	15	104	154	204	254	38.1 h6	61	9.525	42.4	57.15	1/2"-13	32	K 30	12/24-17T	61	40.5	37.6 h11	3/8"-16	22.5	X 32					
22	150	15	162	15	4x90°	127	6.5	185	15	104	154	204	254	57.15 h7	96.5	12.7	62.9	88.9	3/4"-10	44.5	K 33	8/16-16T	76.5	52	53.975 h6	3/4"-10	44.5	X 34					
28	150	15	162	15	4x90°	127	6.5	185	15	117	167	217	267	57.15 h7	96.5	12.7	62.9	88.9	3/4"-10	44.5	K 33	8/16-16T	76.5	52	53.975 h6	3/4"-10	44.5	X 34					
32	150	15	162	15	4x90°	127	6.5	185	15	117	167	217	267	57.15 h7	96.5	12.7	62.9	88.9	3/4"-10	44.5	K 33	8/16-16T	76.5	52	53.975 h6	3/4"-10	44.5	X 34					

DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

Model	15	18	22	28	32
Torque Rating ^①	1500 Nm	1800 Nm	2200 Nm	2800 Nm	3200 Nm
L1	RATIO (ACT. RATING) 3.3 (B) 5.0 (B) 6.9 (C) 3.8 (A) 6.1 (B)	RATIO (ACT. RATING) 3.3 (B) 5.1 (B) 4.3 (A)	RATIO (ACT. RATING) 3.7 (A) 4.4 (A)	RATIO (ACT. RATING) 3.7 (A) 5.8 (C) 5.0 (B) 6.9 (D)	RATIO (ACT. RATING) 4.3 (A) 5.1 (B)
n ₁ nom./max.	3000/4000 rpm	3000/4000 rpm	3000/4000 rpm	3000/4000 rpm	3000/4000 rpm
P th. ^② /max.	8.5/25 kW	8.5/26.5 kW	8.5/28 kW	9/30 kW	9/33 kW
L2	NOM. RATIO ^③ (ACT. RATING) 11 (B) 22 (A) 42 (B) 12 (A) 26 (A) 48 (C) 14 (A) 30 (B) 16 (B) 35 (B) 19 (A) 38 (B)	NOM. RATIO ^③ (ACT. RATING) 11 (B) 22 (A) 12 (B) 26 (A) 14 (A) 30 (A) 16 (A) 35 (B) 19 (B)	NOM. RATIO ^③ (ACT. RATING) 12 (A) 26 (A) 14 (A) 30 (A) 16 (A) 30 (A) 19 (A) 22 (A)	NOM. RATIO ^③ (ACT. RATING) 12 (A) 26 (A) 48 (D) 14 (A) 30 (B) 16 (B) 35 (B) 19 (A) 40 (C) 22 (A) 42 (D)	NOM. RATIO ^③ (ACT. RATING) 14 (A) 30 (A) 16 (A) 35 (B) 19 (B) 22 (A) 26 (A)
n ₁ nom./max.	3000/4000 rpm	3000/4000 rpm	3000/4000 rpm	3000/4000 rpm	3000/4000 rpm
P th. ^② /max.	5/15 kW	5/15.5 kW	5/16 kW	5.5/17 kW	5.5/19 kW
L3	NOM. RATIO ^③ (ACT. RATING) 42 (A) 120 (A) 300 (B) 48 (A) 130 (A) 340 (C) 53 (A) 160 (A) 63 (A) 180 (A) 71 (A) 210 (B) 85 (A) 240 (B) 100 (A) 260 (B)	NOM. RATIO ^③ (ACT. RATING) 48 (A) 130 (A) 53 (A) 150 (A) 60 (A) 160 (A) 71 (A) 180 (A) 85 (A) 210 (A) 100 (A) 240 (B) 110 (A)	NOM. RATIO ^③ (ACT. RATING) 42 (A) 110 (A) 48 (A) 130 (A) 53 (A) 150 (A) 60 (A) 160 (A) 71 (A) 180 (A) 85 (A) 210 (A) 100 (A)	NOM. RATIO ^③ (ACT. RATING) 42 (A) 120 (A) 300 (D) 48 (A) 140 (A) 340 (D) 53 (A) 160 (A) 63 (A) 180 (A) 71 (A) 210 (B) 85 (A) 240 (B) 100 (A) 280 (C)	NOM. RATIO ^③ (ACT. RATING) 48 (A) 130 (A) 53 (A) 150 (A) 60 (A) 160 (A) 75 (A) 180 (A) 85 (A) 210 (A) 100 (A) 240 (B) 110 (A)
n ₁ nom./max.	3000/4000 rpm	3000/4000 rpm	3000/4000 rpm	3000/4000 rpm	3000/4000 rpm
P th. ^② /max.	4/7 kW	4/7.5 kW	4/8 kW	4.5/10 kW	4.5/11 kW
L4	NOM. RATIO ^③ (ACT. RATING) 200 (A) 500 (A) 1250 (A) 240 (A) 600 (A) 1500 (B) 260 (A) 670 (A) 1700 (B) 280 (A) 710 (A) 1800 (B) 320 (A) 800 (A) 2000 (B) 360 (A) 900 (A) 2300 (C) 400 (A) 1000 (A) 450 (A) 1100 (A)	NOM. RATIO ^③ (ACT. RATING) 220 (A) 750 (A) 280 (A) 950 (A) 320 (A) 1050 (A) 380 (A) 1100 (A) 420 (A) 1250 (A) 500 (A) 1400 (A) 560 (A) 1500 (B) 670 (A) 1700 (B)	NOM. RATIO ^③ (ACT. RATING) 240 (A) 750 (A) 280 (A) 900 (A) 320 (A) 1050 (A) 360 (A) 1100 (A) 420 (A) 1250 (A) 500 (A) 1400 (A) 560 (A) 670 (A)	NOM. RATIO ^③ (ACT. RATING) 200 (A) 500 (A) 1250 (A) 240 (A) 600 (A) 1500 (B) 260 (A) 670 (A) 1700 (B) 280 (A) 710 (A) 1900 (C) 320 (A) 800 (A) 2000 (D) 360 (A) 900 (A) 2300 (D) 400 (A) 1000 (A) 450 (A) 1100 (A)	NOM. RATIO ^③ (ACT. RATING) 240 (A) 750 (A) 280 (A) 800 (A) 320 (A) 900 (B) 380 (A) 1050 (A) 420 (A) 1250 (A) 500 (A) 1400 (A) 560 (A) 1700 (B) 670 (B)
n ₁ nom./max.	3000/4000 rpm	3000/4000 rpm	3000/4000 rpm	3000/4000 rpm	3000/4000 rpm
P th. ^② /max.	3.5/2 kW	3.5/2.3 kW	3.5/2.5 kW	3.7/3 kW	3.7/3.5 kW
Actual Torque [Nm] ^④	(A) 1700 (B) 1500 (C) 1300	(A) 2050 (B) 1800	(A) 2400	(A) 3200 (B) 2800 (C) 2600 (D) 2400	(A) 3700 (B) 3350
Peak Torque ^⑤	2000 Nm	2400 Nm	2800 Nm	3700 Nm	4100 Nm

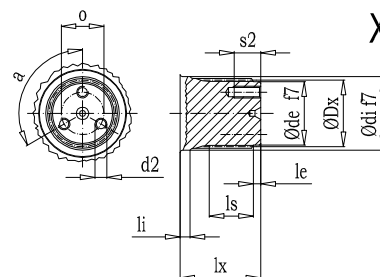
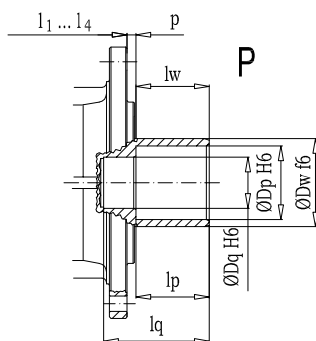
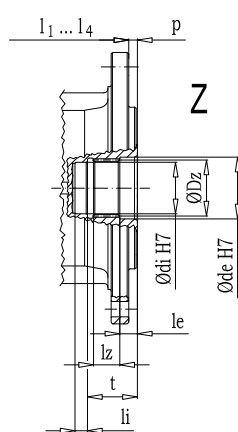
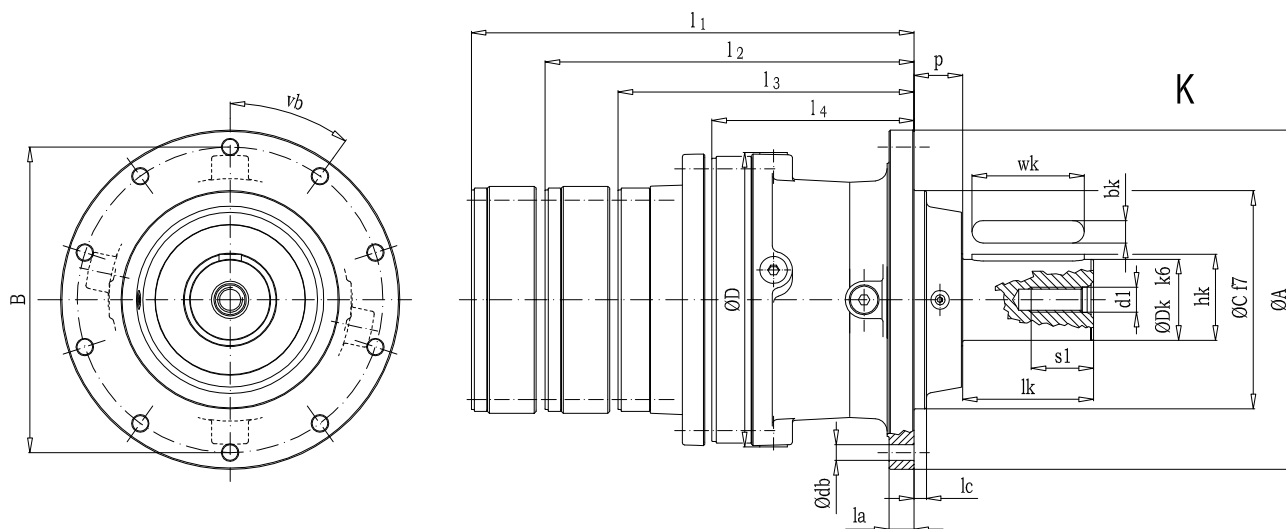
Data and dimensions are not binding and may be modified without prior notice

Bearing Capacity, solid shafts^{⑥⑦}



- ① Harmonized nominal value referring to Preferred Numbers R'40. Actual transmissible torque may vary depending on ratio, speed, application.
- ② Harmonized nominal value referring to Preferred Numbers R'40. For actual ratios see Annex C.
- ③ Thermal power limit. For actual figures based on speed, temperature and duty see Section B4, Specifications, Paragraph 8.
- ④ Mean value at rated conditions. For actual figures based on speed, service life and application/duty see Section B4, Specifications, Paragraph 6.
- ⑤ Restrictions may apply for hollow shaft for shrink disc, see Section G, Output Accessories. Customer to verify the mating shaft is capable of loads actually transmitted.
- ⑥ Mean values at rated conditions. For actual admissible loads based on speed, service life and application/duty see Section B4, Specifications, Paragraph 9.
- ⑦ Max. peak values, which must never be exceeded. Combined thrust and radial shaft loads might reduce bearing life. Please contact Plan-Star Engineering for accurate life calculation of your specific application.
- ⑧ Combination of high torque and heavy radial shaft load might require verification of the output shaft. If the following condition is not fulfilled, contact Plan-Star Engineering for accurate verification of your specific application:

$$\frac{\text{Radial Load (applied)}}{\text{Radial Load (admissible)}} \times \frac{\text{Torque (applied)}}{\text{Torque (nominal)}} < 0.5$$



P - shaft version for shrink disc:
For minimum length of torque reaction arm
refer to the relevant data table, value "L_{min}"

Data and dimensions are not binding and may be modified without prior notice

Dimensions METRIC, standard, solid shafts														Keyed										DIN Splined									
Model	A	la	B	db	vb	C	lc	D	p	l ₁	l ₂	l ₃	l ₄	Dk	lk	bk	hk	wk	d1	s1	code	Dx	lx	ls	de	le	di	li	d2	s2	a	o	code
36	220	18	195	12.5	10x36°	150	14	242	15	140	194	244	294	60	105	18	64	90	M20	50	K 11	58x53	68	38	50	8	60	7	M10	20	3x120°	32	X 12
42	220	18	195	12.5	10x36°	150	14	242	15	140	194	244	294	60	105	18	64	90	M20	50	K 11	58x53	68	38	50	8	60	7	M10	20	3x120°	32	X 12
50	220	18	195	12.5	10x36°	150	14	242	15	140	194	244	294	65	105	18	69	90	M20	50	K 13	58x53	68	38	50	8	60	7	M10	20	3x120°	32	X 12
60	220	18	195	12.5	10x36°	150	14	242	15	155	222	272	322	65	105	18	69	90	M20	50	K 13	58x53	68	38	50	8	60	7	M10	20	3x120°	32	X 12
67	220	18	195	12.5	10x36°	150	14	242	15	155	222	272	322	65	105	18	69	90	M20	50	K 13	58x53	68	38	50	8	60	7	M10	20	3x120°	32	X 12

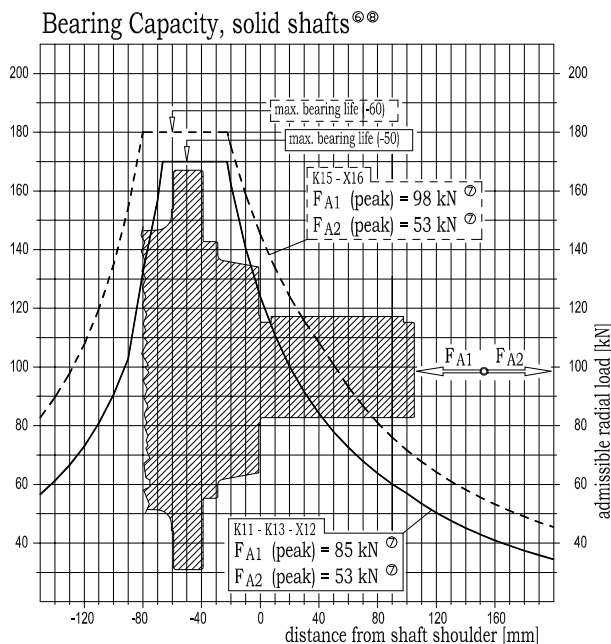
Dimensions METRIC, reinforced, solid shafts														Keyed										DIN Splined									
Model	A	la	B	db	vb	C	lc	D	p	l ₁	l ₂	l ₃	l ₄	Dk	lk	bk	hk	wk	d1	s1	code	Dx	lx	ls	de	le	di	li	d2	s2	a	o	code
36	272	20	245	12.5	10x36°	175	10	242	39	148.5	198.5	248.5	298.5	65	105	18	69	90	M20	50	K 15	58x53	80	50	50	8	60	7	M10	20	3x120°	32	X 16
42	272	20	245	12.5	10x36°	175	10	242	39	148.5	198.5	248.5	298.5	65	105	18	69	90	M20	50	K 15	58x53	80	50	50	8	60	7	M10	20	3x120°	32	X 16
50	272	20	245	12.5	10x36°	175	10	242	39	148.5	198.5	248.5	298.5	65	105	18	69	90	M20	50	K 15	58x53	80	50	50	8	60	7	M10	20	3x120°	32	X 16
60	272	20	245	12.5	10x36°	175	10	242	39	163.5	230.5	280.5	330.5	65	105	18	69	90	M20	50	K 15	58x53	80	50	50	8	60	7	M10	20	3x120°	32	X 16
67	272	20	245	12.5	10x36°	175	10	242	39	163.5	230.5	280.5	330.5	65	105	18	69	90	M20	50	K 15	58x53	80	50	50	8	60	7	M10	20	3x120°	32	X 16

Dimensions METRIC, hollow shafts														Hollow for Shrink Disc										Hollow Splined									
Model	A	la	B	db	vb	C	lc	D	p	l ₁	l ₂	l ₃	l ₄	Dp	lp	Dq	lq	Dw	lw	code	L min. of torque arm	Dz	lz	de	le	di	li	t	code				
36	220	18	195	12.5	10x36°	150	14	242	15	140	194	244	294	75	70	50	100	90	50	P 24	250	58x53	24	60	15	50	10	44	Z 21				
42	220	18	195	12.5	10x36°	150	14	242	15	140	194	244	294	75	70	50	100	90	50	P 24	250	58x53	24	60	15	50	10	44	Z 21				
50	220	18	195	12.5	10x36°	150	14	242	15	140	194	244	294	75	70	50	100	90	50	P 24	300	58x53	24	60	15	50	10	44	Z 21				
60	220	18	195	12.5	10x36°	150	14	242	15	155	222	272	322	75	70	50	100	90	50	P 24	300	58x53	24	60	15	50	10	44	Z 21				
67	220	18	195	12.5	10x36°	150	14	242	15	155	222	272	322	75	70	50	100	90	50	P 24	300	58x53	24	60	15	50	10	44	Z 21				

DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

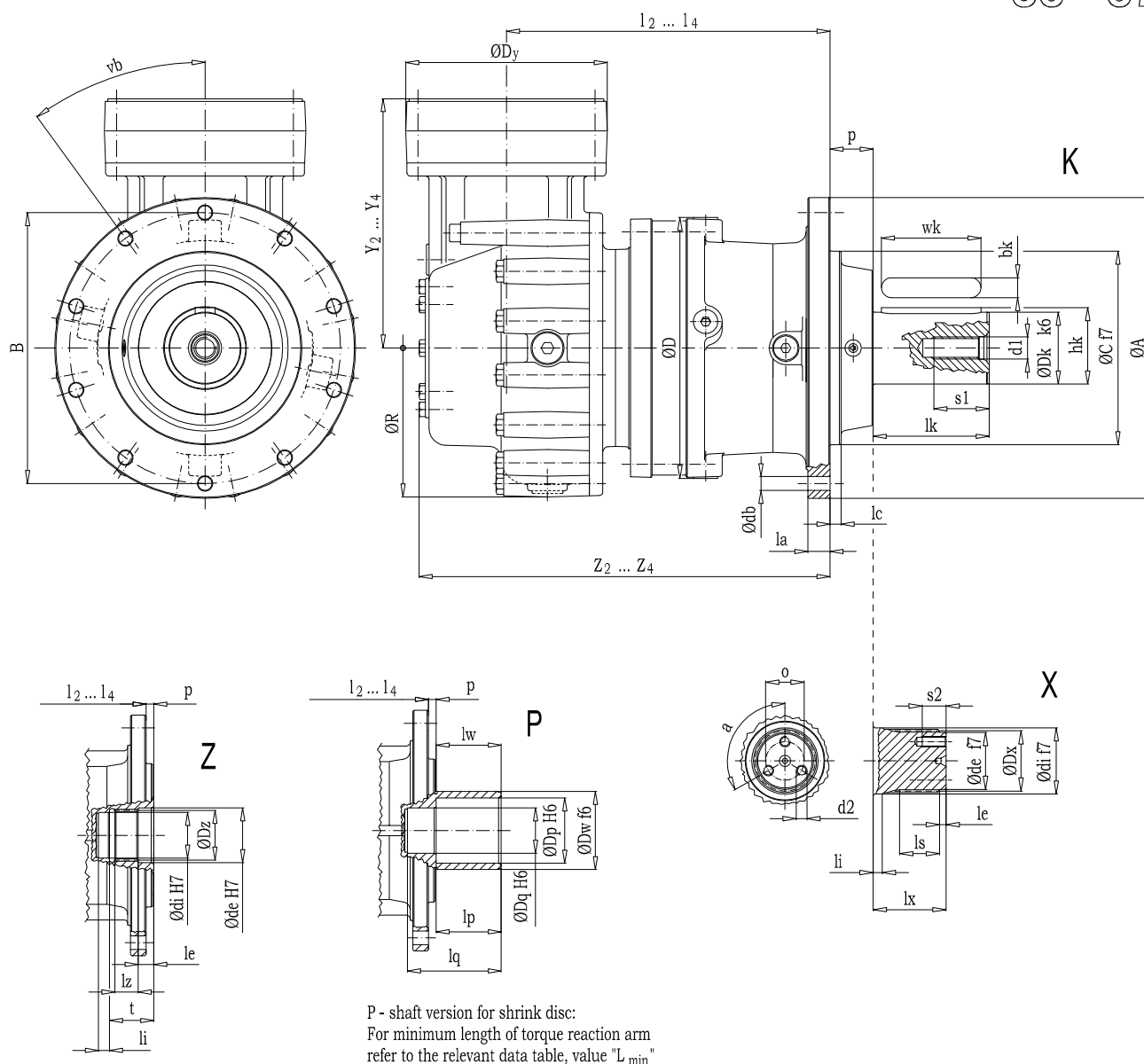
Model	36	42	50	60	67
Torque Rating ^①	3600 Nm	4200 Nm	5000 Nm	6000 Nm	6700 Nm
L1	RATIO (ACT. RATING) 3.3 (B) 5.0 (B) 6.9 (C) 3.8 (A) 6.1 (B)	RATIO (ACT. RATING) 3.3 (B) 5.1 (B) 4.3 (A)	RATIO (ACT. RATING) 3.7 (A) 4.4 (A)	RATIO (ACT. RATING) 3.7 (A) 5.8 (C) 5.0 (B) 6.9 (D)	RATIO (ACT. RATING) 4.3 (A) 5.1 (B)
n ₁ nom./max.	2800/3800 rpm	2800/3800 rpm	2800/3800 rpm	2800/3800 rpm	2800/3800 rpm
P th. ^② /max.	13/60 kW	13/63 kW	13/67 kW	15/90 kW	15/100 kW
L2	NOM. RATIO ^③ (ACT. RATING) 11 (B) 22 (A) 42 (B) 12 (A) 26 (A) 48 (C) 14 (A) 30 (B) 16 (B) 35 (B) 19 (A) 38 (B)	NOM. RATIO ^③ (ACT. RATING) 11 (B) 22 (A) 12 (B) 26 (A) 14 (A) 30 (A) 16 (A) 35 (B) 19 (B)	NOM. RATIO ^③ (ACT. RATING) 12 (A) 26 (A) 14 (A) 16 (A) 19 (A) 22 (A)	NOM. RATIO ^③ (ACT. RATING) 14 (A) 34 (C) 19 (A) 36 (B) 22 (A) 40 (C) 26 (A) 48 (D) 30 (B)	NOM. RATIO ^③ (ACT. RATING) 16 (A) 36 (B) 19 (B) 22 (A) 25 (A) 30 (A)
n ₁ nom./max.	3000/4000 rpm	3000/4000 rpm	3000/4000 rpm	3000/4000 rpm	3000/4000 rpm
P th. ^② /max.	7.5/25 kW	7.5/26 kW	7.5/27 kW	8/30 kW	8/33 kW
L3	NOM. RATIO ^③ (ACT. RATING) 42 (A) 120 (A) 300 (B) 48 (A) 130 (A) 340 (C) 53 (A) 160 (A) 63 (A) 180 (A) 71 (A) 210 (B) 85 (A) 240 (B) 100 (A) 260 (B)	NOM. RATIO ^③ (ACT. RATING) 48 (A) 130 (A) 53 (A) 150 (A) 60 (A) 160 (A) 71 (A) 180 (A) 85 (A) 210 (A) 100 (A) 240 (B) 110 (A)	NOM. RATIO ^③ (ACT. RATING) 42 (A) 110 (A) 48 (A) 120 (A) 53 (A) 130 (A) 60 (A) 150 (A) 71 (A) 160 (A) 85 (A) 180 (A) 100 (A)	NOM. RATIO ^③ (ACT. RATING) 48 (A) 130 (A) 300 (C) 53 (A) 150 (A) 340 (D) 63 (A) 160 (A) 71 (A) 180 (A) 80 (A) 210 (B) 95 (A) 240 (B) 110 (A) 280 (C)	NOM. RATIO ^③ (ACT. RATING) 53 (A) 150 (A) 60 (A) 170 (A) 71 (B) 180 (A) 80 (A) 210 (A) 95 (A) 240 (B) 110 (A) 130 (A)
n ₁ nom./max.	3000/4000 rpm	3000/4000 rpm	3000/4000 rpm	3000/4000 rpm	3000/4000 rpm
P th. ^② /max.	5.5/15 kW	5.5/16 kW	5.5/17 kW	6/25 kW	6/28 kW
L4	NOM. RATIO ^③ (ACT. RATING) 200 (A) 500 (A) 1250 (A) 240 (A) 600 (A) 1500 (B) 260 (A) 670 (A) 1700 (B) 280 (A) 710 (A) 1800 (B) 320 (A) 800 (A) 2000 (B) 360 (A) 900 (A) 2300 (C) 400 (A) 1000 (A) 450 (A) 1100 (A)	NOM. RATIO ^③ (ACT. RATING) 220 (A) 750 (A) 280 (A) 950 (A) 320 (A) 1050 (A) 380 (A) 1100 (A) 420 (A) 1250 (A) 500 (A) 1400 (A) 560 (A) 1500 (B) 670 (A) 1700 (B)	NOM. RATIO ^③ (ACT. RATING) 200 (A) 600 (A) 240 (A) 670 (A) 280 (A) 750 (A) 360 (A) 800 (A) 420 (A) 900 (A) 480 (A) 1100 (A) 500 (A) 1300 (A) 560 (A)	NOM. RATIO ^③ (ACT. RATING) 200 (A) 560 (A) 1400 (B) 240 (A) 600 (A) 1500 (B) 260 (A) 670 (A) 1700 (B) 300 (A) 750 (A) 1900 (C) 360 (A) 800 (A) 2000 (D) 420 (A) 900 (A) 2300 (D) 480 (A) 1050 (A) 530 (A) 1250 (A)	NOM. RATIO ^③ (ACT. RATING) 220 (A) 630 (A) 280 (A) 670 (A) 300 (A) 750 (A) 360 (A) 900 (A) 380 (A) 1050 (A) 420 (A) 1200 (A) 480 (A) 1400 (A) 560 (A) 1700 (B)
n ₁ nom./max.	3000/4000 rpm	3000/4000 rpm	3000/4000 rpm	3000/4000 rpm	3000/4000 rpm
P th. ^② /max.	4.5/5 kW	4.5/5.5 kW	4.5/6 kW	5/8 kW	5/9 kW
Actual Torque [Nm] ^④ Rating	(A) 4100 (B) 3600 (C) 3150	(A) 4900 (B) 4300	(A) 5700	(A) 7000 (B) 6200 (C) 5500 (D) 5100	(A) 8250 (B) 7200
Peak Torque ^⑤	4500 Nm	5500 Nm	6700 Nm	8000 Nm	9000 Nm

Data and dimensions are not binding and may be modified without prior notice



- ① Harmonized nominal value referring to Preferred Numbers R'40. Actual transmissible torque may vary depending on ratio, speed, application.
- ② Harmonized nominal value referring to Preferred Numbers R'40. For actual ratios see Annex C.
- ③ Thermal power limit. For actual figures based on speed, temperature and duty see Section B4, Specifications, Paragraph 8.
- ④ Mean value at rated conditions. For actual figures based on speed, service life and application/duty see Section B4, Specifications, Paragraph 6.
- ⑤ Restrictions may apply for hollow shaft for shrink disc, see Section G, Output Accessories. Customer to verify the mating shaft is capable of loads actually transmitted.
- ⑥ Mean values at rated conditions. For actual admissible loads based on speed, service life and application/duty see Section B4, Specifications, Paragraph 9.
- ⑦ Max. peak values, which must never be exceeded. Combined thrust and radial shaft loads might reduce bearing life. Please contact Plan-Star Engineering for accurate life calculation of your specific application.
- ⑧ Combination of high torque and heavy radial shaft load might require verification of the output shaft. If the following condition is not fulfilled, contact Plan-Star Engineering for accurate verification of your specific application:

$$\frac{\text{Radial Load (applied)}}{\text{Radial Load (admissible)}} \times \frac{\text{Torque (applied)}}{\text{Torque (nominal)}} < 0.5$$



Data and dimensions are not binding and may be modified without prior notice

Dimensions METRIC, standard, solid shafts																											Keyed										DIN Splined									
Model	A	la	B	db	vb	C	lc	D	p	l ₂	l ₃	l ₄	Y ₂	Y ₃	Y ₄	Dy	Z ₂	Z ₃	Z ₄	R	Dk	lk	bk	hk	wk	d1	s1	code	Dx	lx	ls	de	le	di	li	d2	s2	a	o	code						
36	220	18	195	12.5	10x36°	150	14	242	15	269	269	269	226	276	326	185	348	348	348	274	60	105	18	64	90	M20	50	K 11	58x53	68	38	50	8	60	7	M10	20	3x120°	32	X 12						
42	220	18	195	12.5	10x36°	150	14	242	15	269	269	269	226	276	326	185	348	348	348	274	60	105	18	64	90	M20	50	K 11	58x53	68	38	50	8	60	7	M10	20	3x120°	32	X 12						
50	220	18	195	12.5	10x36°	150	14	242	15	269	269	269	226	276	326	185	348	348	348	274	65	105	18	69	90	M20	50	K 13	58x53	68	38	50	8	60	7	M10	20	3x120°	32	X 12						
60	220	18	195	12.5	10x36°	150	14	242	15	284	284	284	226	276	326	185	363	363	363	274	65	105	18	69	90	M20	50	K 13	58x53	68	38	50	8	60	7	M10	20	3x120°	32	X 12						
67	220	18	195	12.5	10x36°	150	14	242	15	284	284	284	226	276	326	185	363	363	363	274	65	105	18	69	90	M20	50	K 13	58x53	68	38	50	8	60	7	M10	20	3x120°	32	X 12						

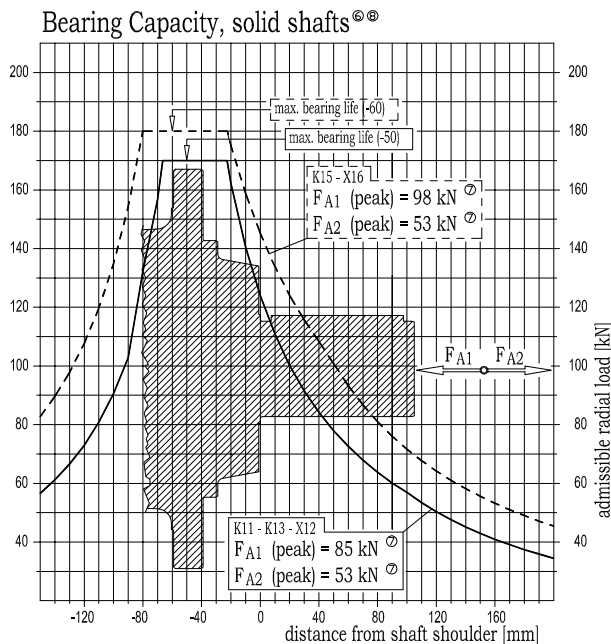
Dimensions METRIC, reinforced, solid shafts																					Keyed										DIN Splined									
Model	A	la	B	db	vb	C	lc	D	p	l ₂	l ₃	l ₄	Y ₂	Y ₃	Y ₄	Dy	Z ₂	Z ₃	Z ₄	R	Dk	lk	bk	hk	wk	d1	s1	code	Dx	lx	ls	de	le	di	li	d2	s2	a	o	code
36	272	20	245	12.5	10x36°	175	10	242	39	278	278	278	226	276	326	185	357	357	357	270	65	105	18	69	90	M20	50	K 15	58x53	80	50	50	8	60	7	M10	20	3x120°	32	X 16
42	272	20	245	12.5	10x36°	175	10	242	39	278	278	278	226	276	326	185	357	357	357	270	65	105	18	69	90	M20	50	K 15	58x53	80	50	50	8	60	7	M10	20	3x120°	32	X 16
50	272	20	245	12.5	10x36°	175	10	242	39	278	278	278	226	276	326	185	357	357	357	270	65	105	18	69	90	M20	50	K 15	58x53	80	50	50	8	60	7	M10	20	3x120°	32	X 16
60	272	20	245	12.5	10x36°	175	10	242	39	293	293	293	226	276	326	185	372	372	372	270	65	105	18	69	90	M20	50	K 15	58x53	80	50	50	8	60	7	M10	20	3x120°	32	X 16
67	272	20	245	12.5	10x36°	175	10	242	39	293	293	293	226	276	326	185	372	372	372	270	65	105	18	69	90	M20	50	K 15	58x53	80	50	50	8	60	7	M10	20	3x120°	32	X 16

Dimensions METRIC, hollow shafts																	Hollow for Shrink Disc										Hollow Splined									
Model	A	la	B	db	vb	C	lc	D	p	l ₂	l ₃	l ₄	Y ₂	Y ₃	Y ₄	Dy	Z ₂	Z ₃	Z ₄	R	Dp	lp	Dq	lq	Dw	lw	code	L min. of torque arm	Dz	lz	de	le	di	li	t	code
36	220	18	195	12.5	10x36°	150	14	242	15	269	269	269	226	276	326	185	348	348	348	270	75	70	50	100	90	50	P 24	250	58x53	24	60	15	50	10	44	Z 21
42	220	18	195	12.5	10x36°	150	14	242	15	269	269	269	226	276	326	185	348	348	348	270	75	70	50	100	90	50	P 24	250	58x53	24	60	15	50	10	44	Z 21
50	220	18	195	12.5	10x36°	150	14	242	15	269	269	269	226	276	326	185	348	348	348	270	75	70	50	100	90	50	P 24	300	58x53	24	60	15	50	10	44	Z 21
60	220	18	195	12.5	10x36°	150	14	242	15	284	284	284	226	276	326	185	363	363	363	270	75	70	50	100	90	50	P 24	300	58x53	24	60	15	50	10	44	Z 21
67	220	18	195	12.5	10x36°	150	14	242	15	284	284	284	226	276	326	185	363	363	363	270	75	70	50	100	90	50	P 24	300	58x53	24	60	15	50	10	44	Z 21

DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

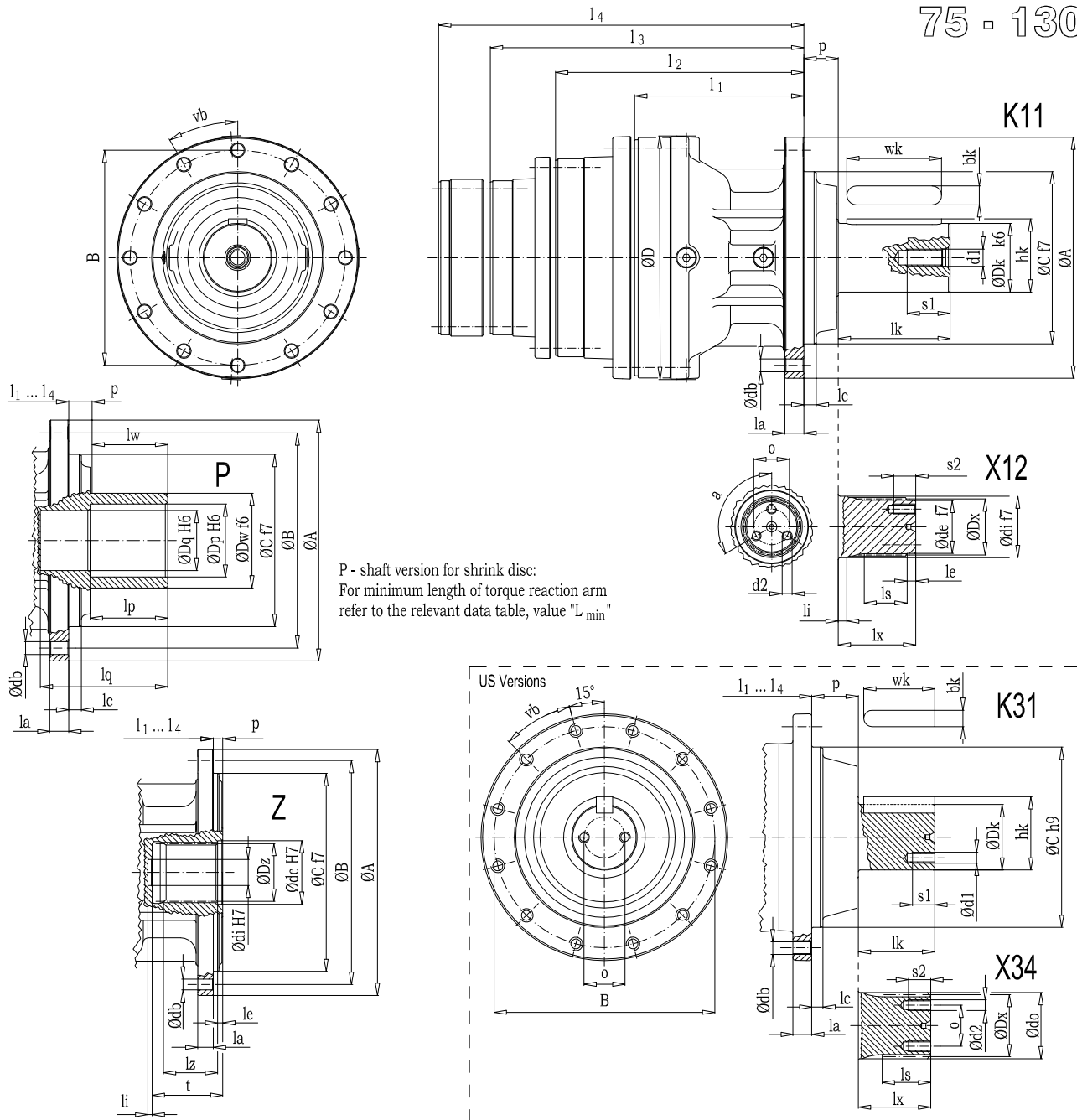
Model	36		42		50		60		67	
Torque Rating ^①	3600 Nm		4200 Nm		5000 Nm		6000 Nm		6700 Nm	
R2	NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)	
	10 (B)	21 (C)	10 (B)	25 (B)	12 (A)		12 (A)	28 (C)	13 (A)	
	12 (A)	25 (B)	13 (A)		14 (A)		16 (B)	34 (D)	16 (B)	
	16 (B)	30 (B)	16 (B)		18 (A)		18 (A)		21 (A)	
	18 (A)	34 (C)	21 (A)		21 (A)		25 (B)		25 (B)	
n ₁ nom./max.	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm
P th. ^③ /max.	15 kW	25 kW	15 kW	26 kW	15 kW	27 kW	16 kW	30 kW	16 kW	33 kW
R3	NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)	
	34 (B)	90 (A)	34 (B)	80 (A)	38 (A)	95 (A)	38 (A)	110 (A)	45 (A)	105 (A)
	38 (A)	100 (B)	38 (B)	85 (A)	45 (A)	105 (A)	42 (A)	125 (A)	50 (A)	130 (A)
	45 (A)	110 (A)	45 (A)	95 (A)	50 (A)	125 (A)	53 (B)	150 (B)	53 (B)	150 (A)
	53 (B)	125 (A)	50 (A)	105 (A)	60 (A)	150 (A)	60 (A)	170 (B)	67 (A)	170 (B)
	60 (A)	150 (B)	53 (B)	130 (A)	67 (A)		67 (A)	200 (C)	71 (A)	
	67 (A)	170 (B)	60 (B)	150 (A)	71 (A)		71 (A)	240 (D)	80 (A)	
	71 (A)	210 (B)	67 (A)	170 (B)	80 (A)		80 (A)		85 (A)	
	80 (A)	240 (C)	71 (A)		85 (A)		90 (A)		95 (A)	
n ₁ nom./max.	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm
P th. ^③ /max.	11 kW	15 kW	11 kW	16 kW	11 kW	17 kW	12 kW	25 kW	12 kW	28 kW
R4	NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)	
	140 (A)	630 (A)	170 (A)	630 (A)	160 (A)	530 (A)	140 (A)	670 (A)	170 (A)	750 (A)
	160 (A)	670 (A)	190 (A)	750 (A)	190 (A)	560 (A)	160 (A)	750 (A)	190 (A)	800 (A)
	180 (B)	750 (A)	220 (A)	800 (A)	220 (A)	630 (A)	200 (A)	850 (A)	220 (A)	900 (A)
	200 (A)	850 (A)	250 (A)	900 (A)	250 (A)	670 (A)	220 (A)	950 (B)	260 (A)	950 (B)
	220 (A)	900 (B)	260 (A)	1000 (A)	300 (A)	750 (A)	250 (A)	1050 (B)	300 (A)	1050 (B)
	260 (A)	1050 (B)	300 (A)	1200 (B)	340 (A)	800 (A)	300 (A)	1200 (B)	340 (A)	1200 (B)
	300 (A)	1250 (B)	340 (A)		360 (A)	850 (A)	340 (A)	1400 (C)	400 (A)	
	340 (A)	1400 (B)	360 (A)		400 (A)	900 (A)	400 (A)	1600 (D)	420 (A)	
	400 (A)	1600 (C)	400 (A)		420 (A)	1000 (A)	450 (A)		480 (A)	
	450 (A)		480 (A)		450 (A)		500 (A)		530 (A)	
	500 (A)		530 (A)		480 (A)		560 (A)		560 (A)	
	560 (A)		560 (A)		500 (A)		630 (A)		630 (A)	
n ₁ nom./max.	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm
P th. ^③ /max.	5 kW	5 kW	5.5 kW	5.5 kW	6 kW	6 kW	7.5 kW	8 kW	7.5 kW	9 kW
Actual Torque [Nm] ^④	(A) 4100 (B) 3600 (C) 3150		(A) 4900 (B) 4300		(A) 5700		(A) 7000 (B) 6200 (C) 5500 (D) 5100		(A) 8250 (B) 7200	
Peak Torque ^⑤	4500 Nm		5500 Nm		6700 Nm		8000 Nm		9000 Nm	

Data and dimensions are not binding and may be modified without prior notice



- ① Harmonized nominal value referring to Preferred Numbers R'40. Actual transmissible torque may vary depending on ratio, speed, application.
- ② Harmonized nominal value referring to Preferred Numbers R'40. For actual ratios see Annex C.
- ③ Thermal power limit. For actual figures based on speed, temperature and duty see Section B4, Specifications, Paragraph 8.
- ④ Mean value at rated conditions. For actual figures based on speed, service life and application/duty see Section B4, Specifications, Paragraph 6.
- ⑤ Restrictions may apply for hollow shaft for shrink disc, see Section G, Output Accessories. Customer to verify the mating shaft is capable of loads actually transmitted.
- ⑥ Mean values at rated conditions. For actual admissible loads based on speed, service life and application/duty see Section B4, Specifications, Paragraph 9.
- ⑦ Max. peak values, which must never be exceeded. Combined thrust and radial shaft loads might reduce bearing life. Please contact Plan-Star Engineering for accurate life calculation of your specific application.
- ⑧ Combination of high torque and heavy radial shaft load might require verification of the output shaft. If the following condition is not fulfilled, contact Plan-Star Engineering for accurate verification of your specific application:

$$\frac{\text{Radial Load (applied)}}{\text{Radial Load (admissible)}} \times \frac{\text{Torque (applied)}}{\text{Torque (nominal)}} < 0.5$$



P - shaft version for shrink disc:
For minimum length of torque reaction arm
refer to the relevant data table, value "L_{min}"

Data and dimensions are not binding and may be modified without prior notice

Dimensions METRIC, solid shafts														Keyed								DIN Splined											
Model	A	la	B	db	vb	C	lc	D	p	l ₁	l ₂	l ₃	l ₄	Dk	lk	bk	hk	wk	d1	s1	code	Dx	lx	ls	de	le	di	li	d2	s2	a	o	code
75	280	22	250	15	12x30°	200	14.5	285	40	181.5	250.5	304.5	354.5	80	130	22	85	110	M20	50	K 11	70x64	90	50	62	10	72	10	M10	20	3x120°	40	X 12
85	280	22	250	15	12x30°	200	14.5	285	40	181.5	250.5	304.5	354.5	80	130	22	85	110	M20	50	K 11	70x64	90	50	62	10	72	10	M10	20	3x120°	40	X 12
100	280	22	250	15	12x30°	200	14.5	285	40	181.5	250.5	304.5	354.5	80	130	22	85	110	M20	50	K 11	70x64	90	50	62	10	72	10	M10	20	3x120°	40	X 12
110	280	22	250	15	12x30°	200	14.5	285	40	196.5	265.5	319.5	369.5	80	130	22	85	110	M20	50	K 11	70x64	90	50	62	10	72	10	M10	20	3x120°	40	X 12
130	280	22	250	15	12x30°	200	14.5	285	40	196.5	280.5	334.5	384.5	80	130	22	85	110	M20	50	K 11	70x64	90	50	62	10	72	10	M10	20	3x120°	40	X 12

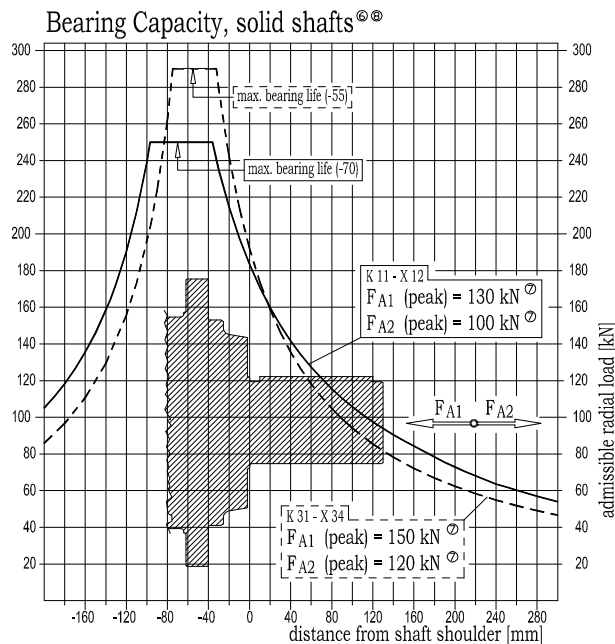
Dimensions METRIC, hollow shafts							Hollow for Shrink Disc															Hollow Splined														
Model	A	D	l ₁	l ₂	l ₃	l ₄	la	B	db	vb	C	lc	p	D _p	lp	D _q	l _q	D _w	lw	L _{min}	code	la	B	db	vb	C	lc	p	D _z	l _z	de	le	di	li	t	code
75	280	285	181.5	250.5	304.5	354.5	22	250	15	12x30°	200	14.5	27	85	90	70	148	110	88	300	P 24	18	260	12.5	10x36°	230	7	11	70x64	65	74	6	30	5	82	Z 21
85	280	285	181.5	250.5	304.5	354.5	22	250	15	12x30°	200	14.5	27	85	90	70	148	110	88	300	P 24	18	260	12.5	10x36°	230	7	11	70x64	65	74	6	30	5	82	Z 21
100	280	285	181.5	250.5	304.5	354.5	22	250	15	12x30°	200	14.5	27	85	90	70	148	110	88	400	P 24	18	260	12.5	10x36°	230	7	11	70x64	65	74	6	30	5	82	Z 21
110	280	285	196.5	265.5	319.5	369.5	22	250	15	12x30°	200	14.5	27	85	90	70	148	110	88	400	P 24	18	260	12.5	10x36°	230	7	11	70x64	65	74	6	30	5	82	Z 21
130	280	285	196.5	280.5	334.5	384.5	22	250	15	12x30°	200	14.5	27	85	90	70	148	110	88	400	P 24	18	260	12.5	10x36°	230	7	11	70x64	65	74	6	30	5	82	Z 21

Dimensions US version, solid shafts														Cylindrical											ANSI Splined										
Model	A	la	B	db	vb	C	lc	D	p	l ₁	l ₂	l ₃	l ₄	Dk	lk	bk	hk	wk	d1	s1	a	o	code	Dx	lx	ls	do	d2	s2	a	o	code			
75	287	22	256.5	5/8"-11	12x30°	209.55	13	285	54.5	130.5	199.5	253.5	303.5	76.2	h7	88.9	19.05	85.1	82.5	1/2" - 20	25	2x180°	47.6	K 31	8/16-23T	84.3	56.5	75.7	h12	1/2" - 20	25	2x180°	47.6	X 34	
85	287	22	256.5	5/8"-11	12x30°	209.55	13	285	54.5	130.5	199.5	253.5	303.5	76.2	h7	88.9	19.05	85.1	82.5	1/2" - 20	25	2x180°	47.6	K 31	8/16-23T	84.3	56.5	75.7	h12	1/2" - 20	25	2x180°	47.6	X 34	
100	287	22	256.5	5/8"-11	12x30°	209.55	13	285	54.5	130.5	199.5	253.5	303.5	76.2	h7	88.9	19.05	85.1	82.5	1/2" - 20	25	2x180°	47.6	K 31	8/16-23T	84.3	56.5	75.7	h12	1/2" - 20	25	2x180°	47.6	X 34	
110	287	22	256.5	5/8"-11	12x30°	209.55	13	285	54.5	145.5	214.5	268.5	318.5	76.2	h7	88.9	19.05	85.1	82.5	1/2" - 20	25	2x180°	47.6	K 31	8/16-23T	84.3	56.5	75.7	h12	1/2" - 20	25	2x180°	47.6	X 34	
130	287	22	256.5	5/8"-11	12x30°	209.55	13	285	54.5	145.5	229.5	283.5	333.5	76.2	h7	88.9	19.05	85.1	82.5	1/2" - 20	25	2x180°	47.6	K 31	8/16-23T	84.3	56.5	75.7	h12	1/2" - 20	25	2x180°	47.6	X 34	

DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

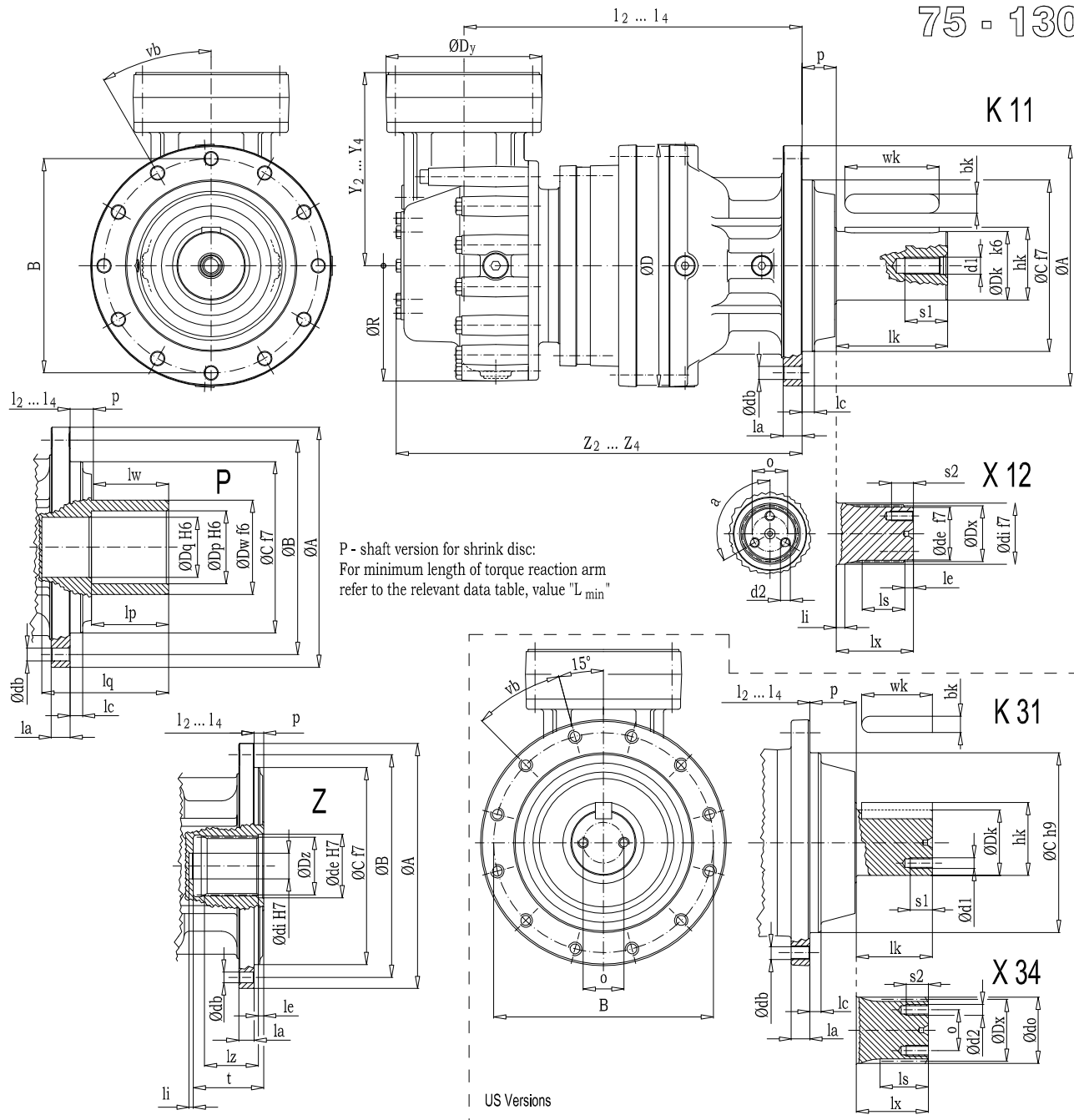
Model	75		85		100		110		130	
Torque Rating ^①	7500 Nm		8500 Nm		10000 Nm		11000 Nm		13000 Nm	
L1	RATIO (ACT. RATING) 3.3 (B) 5.0 (B) 6.9 (C) 3.8 (A) 6.1 (B)		RATIO (ACT. RATING) 3.3 (B) 5.1 (B) 4.3 (A)		RATIO (ACT. RATING) 3.7 (A) 4.4 (A)		RATIO (ACT. RATING) 3.7 (A) 5.8 (C) 5.0 (B) 6.9 (D)		RATIO (ACT. RATING) 4.3 (A) 5.1 (B)	
n ₁ nom./max.	2800 rpm	3800 rpm	2500 rpm	3500 rpm	2500 rpm	3500 rpm	2000 rpm	3000 rpm	2000 rpm	3000 rpm
P th./ P mech.	22 kW	120 kW	22 kW	125 kW	22 kW	132 kW	24 kW	145 kW	24 kW	158 kW
L2	NOM. RATIO ^② (ACT. RATING) 11 (B) 22 (A) 42 (B) 12 (A) 26 (A) 48 (C) 14 (A) 30 (B) 16 (B) 35 (B) 19 (A) 38 (B)		NOM. RATIO ^② (ACT. RATING) 11 (B) 22 (A) 12 (B) 26 (A) 14 (A) 30 (A) 16 (A) 35 (B) 19 (B)		NOM. RATIO ^② (ACT. RATING) 12 (A) 26 (A) 14 (A) 30 (A) 16 (A) 19 (A) 22 (A)		NOM. RATIO ^② (ACT. RATING) 12 (A) 30 (B) 16 (A) 36 (C) 19 (A) 42 (D) 22 (B) 26 (B)		NOM. RATIO ^② (ACT. RATING) 16 (A) 35 (B) 19 (B) 22 (A) 25 (A) 30 (A)	
n ₁ nom./max.	2800 rpm	3800 rpm	2800 rpm	3800 rpm	2800 rpm	3800 rpm	2800 rpm	3800 rpm	2800 rpm	3800 rpm
P th./ P mech.	13.5 kW	54 kW	13.5 kW	57 kW	13.5 kW	60 kW	15 kW	66 kW	15 kW	72 kW
L3	NOM. RATIO ^② (ACT. RATING) 42 (A) 120 (A) 260 (B) 48 (A) 130 (A) 300 (B) 53 (A) 140 (A) 340 (C) 63 (A) 160 (A) 71 (A) 180 (A) 85 (A) 210 (B) 100 (A) 240 (B)		NOM. RATIO ^② (ACT. RATING) 48 (A) 110 (A) 53 (A) 130 (A) 60 (A) 150 (A) 71 (A) 160 (A) 80 (A) 180 (A) 90 (A) 210 (A) 100 (A) 240 (B)		NOM. RATIO ^② (ACT. RATING) 42 (A) 110 (A) 48 (A) 130 (A) 53 (A) 140 (A) 60 (A) 150 (A) 71 (A) 160 (A) 80 (A) 180 (A) 95 (A) 210 (A)		NOM. RATIO ^② (ACT. RATING) 42 (A) 110 (A) 48 (A) 130 (A) 53 (A) 150 (B) 60 (A) 180 (B) 71 (A) 210 (B) 80 (A) 250 (C) 95 (A) 300 (D)		NOM. RATIO ^② (ACT. RATING) 53 (A) 150 (A) 60 (A) 170 (A) 71 (B) 180 (A) 80 (A) 210 (A) 95 (A) 240 (B) 110 (A) 130 (A)	
n ₁ nom./max.	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm
P th./ P mech.	9.5 kW	22 kW	9.5 kW	23.5 kW	9.5 kW	25 kW	10.5 kW	28 kW	10.5 kW	31 kW
L4	NOM. RATIO ^② (ACT. RATING) 200 (A) 500 (A) 1250 (A) 240 (A) 600 (A) 1500 (B) 260 (A) 670 (A) 1700 (B) 280 (A) 710 (A) 1800 (B) 320 (A) 800 (A) 2000 (B) 360 (A) 900 (A) 2300 (C) 400 (A) 1000 (A) 450 (A) 1100 (A)		NOM. RATIO ^② (ACT. RATING) 220 (A) 750 (A) 1700 (B) 280 (A) 850 (A) 320 (A) 950 (A) 380 (A) 1050 (A) 420 (A) 1100 (A) 500 (A) 1250 (A) 560 (A) 1400 (A) 670 (A) 1500 (B)		NOM. RATIO ^② (ACT. RATING) 220 (A) 670 (A) 260 (A) 710 (A) 300 (A) 800 (A) 360 (A) 900 (A) 420 (A) 1050 (A) 480 (A) 1250 (A) 560 (A) 1400 (A) 600 (A)		NOM. RATIO ^② (ACT. RATING) 180 (A) 600 (A) 1500 (B) 220 (A) 670 (A) 1700 (C) 260 (A) 710 (A) 2000 (D) 300 (A) 800 (A) 360 (A) 900 (A) 420 (A) 1050 (B) 480 (A) 1200 (B) 560 (A) 1300 (B)		NOM. RATIO ^② (ACT. RATING) 220 (A) 670 (A) 1400 (A) 260 (B) 750 (A) 1500 (B) 300 (A) 850 (A) 1700 (B) 360 (A) 900 (A) 420 (A) 950 (A) 480 (A) 1050 (A) 560 (A) 1200 (A) 600 (A) 1300 (A)	
n ₁ nom./max.	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm
P th./ P mech.	7.5 kW	11 kW	7.5 kW	11.5 kW	7.5 kW	12 kW	8.5 kW	13.5 kW	8.5 kW	15 kW
Actual Torque [Nm] ^④	(A) 8700 (B) 7800 (C) 6600		(A) 10400 (B) 9400		(A) 12000		(A) 13000 (B) 11700 (C) 10800 (D) 9900		(A) 15000 (B) 13000	
Peak Torque ^⑤	10500 Nm		12000 Nm		13500 Nm		15000 Nm		16000 Nm	

Data and dimensions are not binding and may be modified without prior notice



- ① Harmonized nominal value referring to Preferred Numbers R'40. Actual transmissible torque may vary depending on ratio, speed, application.
- ② Harmonized nominal value referring to Preferred Numbers R'40. For actual ratios see Annex C.
- ③ Thermal power limit. For actual figures based on speed, temperature and duty see Section B4, Specifications, Paragraph 8.
- ④ Mean value at rated conditions. For actual figures based on speed, service life and application/duty see Section B4, Specifications, Paragraph 6.
- ⑤ Restrictions may apply for hollow shaft for shrink disc, see Section G, Output Accessories. Customer to verify the mating shaft is capable of loads actually transmitted.
- ⑥ Mean values at rated conditions. For actual admissible loads based on speed, service life and application/duty see Section B4, Specifications, Paragraph 9.
- ⑦ Max. peak values, which must never be exceeded. Combined thrust and radial shaft loads might reduce bearing life. Please contact Plan-Star Engineering for accurate life calculation of your specific application.
- ⑧ Combination of high torque and heavy radial shaft load might require verification of the output shaft. If the following condition is not fulfilled, contact Plan-Star Engineering for accurate verification of your specific application:

$$\frac{\text{Radial Load (applied)}}{\text{Radial Load (admissible)}} \times \frac{\text{Torque (applied)}}{\text{Torque (nominal)}} < 0.5$$



Data and dimensions are not binding and may be modified without prior notice.

Dimensions METRIC, solid shafts																					Keyed										DIN Splined									
Media	A	Ja	B	db	vb	C	lc	d	p	l ₂	l ₃	l ₄	Y ₂	Y ₃	Y ₄	D ₂	Z ₃	Z ₄	R	Dk	lk	bk	hk	wk	d1	s1	code	Dx	lx	ls	de	le	di	li	d2	s2	a	o	code	
75	280	22	250	15	12x30°	200	14,5	285	40	317	380	380	226	226	276	185	396	459	459	274	80	130	22	85	110	M20	50	K 11	70x64	90	50	62	10	72	10	M10	20	3x120°	40	X 12
85	280	22	250	15	12x30°	200	14,5	285	40	317	380	380	226	226	276	185	396	459	459	274	80	130	22	85	110	M20	50	K 11	70x64	90	50	62	10	72	10	M10	20	3x120°	40	X 12
100	280	22	250	15	12x30°	200	14,5	285	40	317	380	380	226	226	276	185	396	459	459	274	80	130	22	85	110	M20	50	K 11	70x64	90	50	62	10	72	10	M10	20	3x120°	40	X 12
110	280	22	250	15	12x30°	200	14,5	285	40	332	395	395	226	226	276	185	411	489	474	274	80	130	22	85	110	M20	50	K 11	70x64	90	50	62	10	72	10	M10	20	3x120°	40	X 12
130	280	22	250	15	12x30°	200	14,5	285	40	332	410	410	226	226	276	185	411	489	489	274	80	130	22	85	110	M20	50	K 11	70x64	90	50	62	10	72	10	M10	20	3x120°	40	X 12

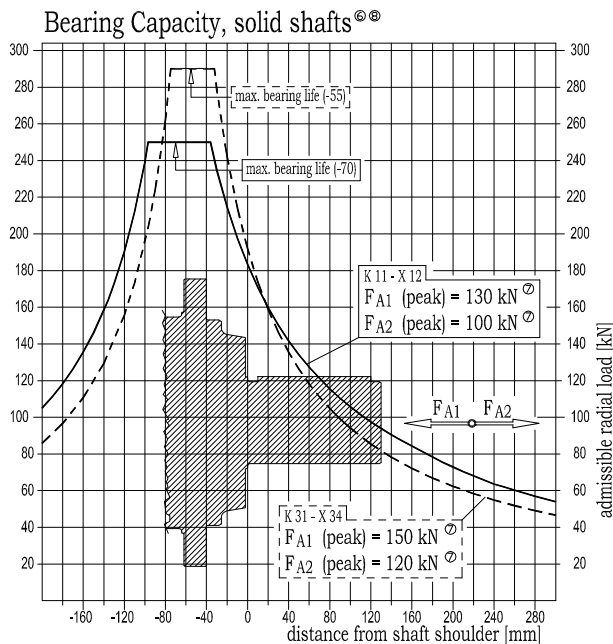
Dimensions METRIC, hollow shafts														Hollow for Shrink Disc														Hollow Splined															
mod	A	D	l ₂	l ₃	l ₄	Y ₂	Y ₃	Y ₄	D _y	Z ₂	Z ₃	Z ₄	R	la	B	db	vb	C	lc	p	Dp	lp	Dq	lq	Dw	lw	L _{min}	code	la	B	db	vb	C	lc	p	Dz	lz	de	le	di	li	t	code
75	280	285	317	380	380	226	226	276	185	396	459	459	274	22	250	15	12x30*	200	14.5	27	85	90	70	148	110	88	300	P 24	18	260	12.5	10x36*	230	7	11	70x64	65	74	6	30	5	82	Z 21
85	280	285	317	380	380	226	226	276	185	396	459	459	274	22	250	15	12x30*	200	14.5	27	85	90	70	148	110	88	300	P 24	18	260	12.5	10x36*	230	7	11	70x64	65	74	6	30	5	82	Z 21
100	280	285	317	380	380	226	226	276	185	396	459	459	274	22	250	15	12x30*	200	14.5	27	85	90	70	148	110	88	400	P 24	18	260	12.5	10x36*	230	7	11	70x64	65	74	6	30	5	82	Z 21
110	280	285	332	395	395	226	226	276	185	411	474	474	274	22	250	15	12x30*	200	14.5	27	85	90	70	148	110	88	400	P 24	18	260	12.5	10x36*	230	7	11	70x64	65	74	6	30	5	82	Z 21
130	280	285	332	410	410	226	226	276	185	411	489	489	274	22	250	15	12x30*	200	14.5	27	85	90	70	148	110	88	400	P 24	18	260	12.5	10x36*	230	7	11	70x64	65	74	6	30	5	82	Z 21

Dimensions US version, solid shafts																	Keyed										ANSI Splined										
Media	A	la	B	db	vb	C	lc	D	p	l ₂	l ₃	l ₄	Y ₂	Y ₃	Y ₄	Dy	Z ₂	Z ₃	Z ₄	R	Dk	lk	bk	hk	hk	code	Dx	lx	ls	do	d3	s3	a	o	code		
75	287	22	256.5	5/8"-11	12x30"	209.55	13	285	54.5	317	380	380	226	226	276	185	396	459	459	274	76.2	h7	88.9	19.05	85.1	82.5	K 31	8/16-23	84.3	56.5	75.7	h12	1/2"-20	25	2x180"	47.6	X 34
85	287	22	256.5	5/8"-11	12x30"	209.55	13	285	54.5	317	380	380	226	226	276	185	396	459	459	274	76.2	h7	88.9	19.05	85.1	82.5	K 31	8/16-23	84.3	56.5	75.7	h12	1/2"-20	25	2x180"	47.6	X 34
100	287	22	256.5	5/8"-11	12x30"	209.55	13	285	54.5	317	380	380	226	226	276	185	396	459	459	274	76.2	h7	88.9	19.05	85.1	82.5	K 31	8/16-23	84.3	56.5	75.7	h12	1/2"-20	25	2x180"	47.6	X 34
110	287	22	256.5	5/8"-11	12x30"	209.55	13	285	54.5	332	395	395	226	226	276	185	411	479	484	274	76.2	h7	88.9	19.05	85.1	82.5	K 31	8/16-23	84.3	56.5	75.7	h12	1/2"-20	25	2x180"	47.6	X 34
130	287	22	256.5	5/8"-11	12x30"	209.55	13	285	54.5	332	410	410	226	226	276	185	411	489	489	274	76.2	h7	88.9	19.05	85.1	82.5	K 31	8/16-23	84.3	56.5	75.7	h12	1/2"-20	25	2x180"	47.6	X 34

DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

Model	75		85		100		110		130	
Torque Rating ^①	7500 Nm		8500 Nm		10000 Nm		11000 Nm		13000 Nm	
R2	NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)	
	10 (B) 21 (C)		10 (B) 25 (B)		12 (A) 14 (A)		12 (A) 28 (C)		13 (A) 16 (B)	
	12 (A) 25 (B)		13 (A) 16 (B)		18 (A) 21 (A)		16 (B) 34 (D)		21 (A) 25 (B)	
	16 (B) 30 (B)		21 (A)				18 (A) 25 (B)			
	18 (A) 34 (C)									
n ₁ nom./max.	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm
P th. ^③ /max.	20 kW	54 kW	20 kW	57 kW	20 kW	60 kW	22.5 kW	66 kW	22.5 kW	72 kW
R3	NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)	
	34 (B) 90 (A)		34 (B) 80 (A)		38 (A) 95 (A)		38 (A) 150 (B)		50 (A)	
	38 (A) 100 (B)		38 (B) 85 (A)		45 (A) 105 (A)		50 (A) 170 (C)		67 (A)	
	45 (A) 110 (A)		45 (A) 95 (A)		50 (A) 125 (A)		60 (A) 210 (D)		80 (A)	
	53 (B) 125 (A)		50 (A) 105 (A)		60 (A) 150 (A)		71 (A)		95 (A)	
R4	NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)	
	140 (A) 630 (A)		170 (A) 630 (A)		160 (A) 530 (A)		130 (A) 450 (A)		170 (A) 750 (A)	
	160 (A) 670 (A)		190 (A) 750 (A)		190 (A) 560 (A)		140 (A) 500 (A)		190 (A) 850 (A)	
	180 (B) 750 (A)		220 (A) 800 (A)		220 (A) 630 (A)		170 (A) 560 (A)		220 (A) 900 (A)	
	200 (A) 850 (A)		250 (A) 900 (A)		250 (A) 670 (A)		190 (A) 630 (A)		260 (A) 1000 (A)	
R4	NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)	
	220 (A) 900 (B)		260 (A) 1000 (A)		300 (A) 750 (A)		200 (A) 670 (A)		300 (A) 1200 (B)	
	260 (A) 1050 (B)		300 (A) 1200 (B)		340 (A) 800 (A)		220 (A) 750 (A)		340 (A)	
	300 (A) 1250 (B)		340 (A)		360 (A) 850 (A)		240 (A) 850 (B)		400 (A)	
	340 (A) 1400 (B)		360 (A)		400 (A) 900 (A)		260 (A) 900 (B)		450 (A)	
R4	NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)	
	400 (A) 1600 (C)		400 (A)		420 (A) 1000 (A)		300 (A) 1050 (B)		500 (A)	
	450 (A)		480 (A)		450 (A)		340 (A) 1200 (C)		560 (A)	
	500 (A)		530 (A)		480 (A)		380 (A) 1400 (D)		630 (A)	
	560 (A)		560 (A)		500 (A)		420 (A)		670 (A)	
n ₁ nom./max.	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm
P th. ^③ /max.	11 kW	11 kW	11 kW	11.5 kW	11 kW	12 kW	12.5 kW	13.5 kW	12.5 kW	15 kW
Actual Torque [Nm] ^④	(A) 8700 (B) 7800 (C) 6600		(A) 10400 (B) 9400		(A) 12000		(A) 13000 (B) 11700 (C) 10800 (D) 9900		(A) 15000 (B) 13000	
Peak Torque ^⑤	10500 Nm		12000 Nm		13500 Nm		15000 Nm		16000 Nm	

Data and dimensions are not binding and may be modified without prior notice

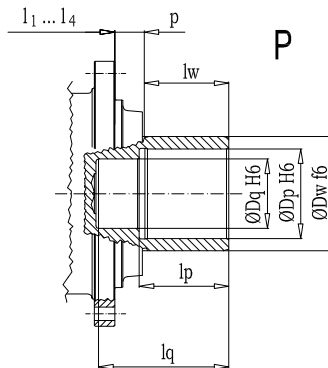
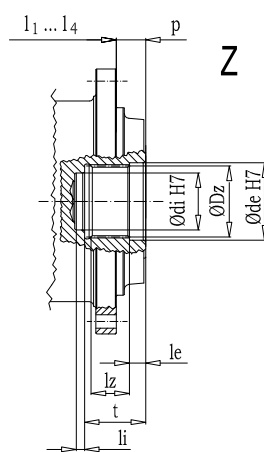
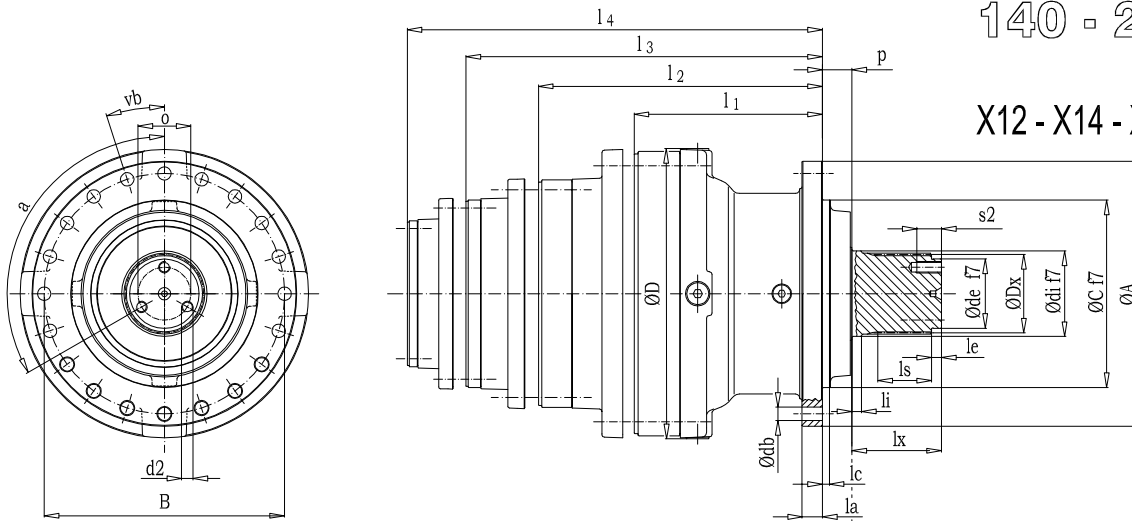


- ① Harmonized nominal value referring to Preferred Numbers R'40. Actual transmissible torque may vary depending on ratio, speed, application.
- ② Harmonized nominal value referring to Preferred Numbers R'40. For actual ratios see Annex C.
- ③ Thermal power limit. For actual figures based on speed, temperature and duty see Section B4, Specifications, Paragraph 8.
- ④ Mean value at rated conditions. For actual figures based on speed, service life and application/duty see Section B4, Specifications, Paragraph 6.
- ⑤ Restrictions may apply for hollow shaft for shrink disc, see Section G, Output Accessories. Customer to verify the mating shaft is capable of loads actually transmitted.
- ⑥ Mean values at rated conditions. For actual admissible loads based on speed, service life and application/duty see Section B4, Specifications, Paragraph 9.
- ⑦ Max. peak values, which must never be exceeded. Combined thrust and radial shaft loads might reduce bearing life. Please contact Plan-Star Engineering for accurate life calculation of your specific application.
- ⑧ Combination of high torque and heavy radial shaft load might require verification of the output shaft. If the following condition is not fulfilled, contact Plan-Star Engineering for accurate verification of your specific application:

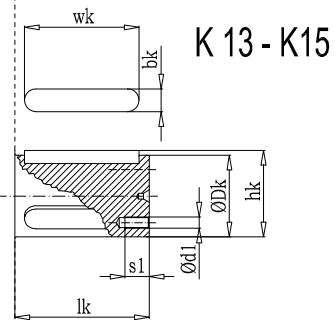
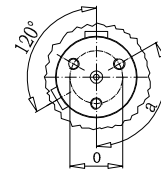
$$\frac{\text{Radial Load (applied)}}{\text{Radial Load (admissible)}} \times \frac{\text{Torque (applied)}}{\text{Torque (nominal)}} < 0.5$$

140 - 260

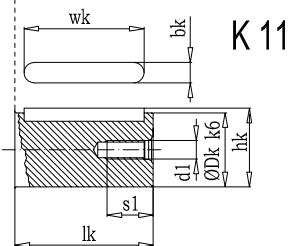
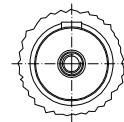
X12 - X14 - X16



P - shaft version for shrink disc:
For minimum length of torque reaction arm
refer to the relevant data table, value "L min"



K 13 - K15



K 11

Data and dimensions are not binding and may be modified without prior notice

Dimensions, solid shafts														Keyed										DIN Splined									
Model	A	la	B	db	vb	C	lc	D	p	l ₁	l ₂	l ₃	l ₄	Dk	lk	bk	hk	wk	d1	s1	code	Dx	lx	ls	di	li	de	le	d2	s2	a	o	code
140	325	25	295	16.5	20x18°	230	10	360	36	206	291	345	395	90	170	25	95	150	M20	50	K 11	80x74	90	50	85	10	70	10	M12	25	3x120°	45	X 12
170	325	25	295	16.5	20x18°	230	10	360	36	206	291	345	395	90	170	25	95	150	M20	50	K 11	80x74	90	50	85	10	70	10	M12	25	3x120°	45	X 12
200	325	25	295	16.5	20x18°	230	10	360	36	206	290	359	413	100	165	28	106	140	M14 (3)	30	K 13	100x94	110	66	105	12	85	12	M14	30	3x120°	65	X 14
220	325	25	295	16.5	20x18°	230	10	360	36	226	310	379	433	100	165	28	106	140	M14 (3)	30	K 13	100x94	110	66	105	12	85	12	M14	30	3x120°	65	X 14
260	325	25	295	16.5	20x18°	230	10	360	36	226	325	394	448	100	165	28	106	140	M14 (3)	30	K 13	100x94	110	66	105	12	85	12	M14	30	3x120°	65	X 14

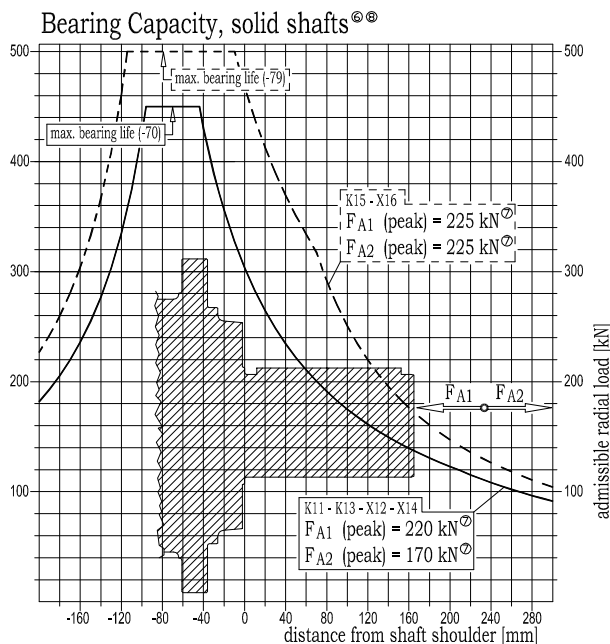
Dimensions, reinforced, solid shafts														Keyed										DIN Splined									
Model	A	la	B	db	vb	C	lc	D	p	l ₁	l ₂	l ₃	l ₄	Dk	lk	bk	hk	wk	d1	s1	code	Dx	lx	ls	di	li	de	le	d2	s2	a	o	code
140	325	25	295	16.5	20x18°	250	20	360	57	206	291	345	395	100	165	28	106	140	M14 (3)	30	K15	100x94	110	66	105	12	85	12	M14	30	3x120°	65	X16
170	325	25	295	16.5	20x18°	250	20	360	57	206	291	345	395	100	165	28	106	140	M14 (3)	30	K15	100x94	110	66	105	12	85	12	M14	30	3x120°	65	X16
200	325	25	295	16.5	20x18°	250	20	360	57	206	290	359	413	100	165	28	106	140	M14 (3)	30	K15	100x94	110	66	105	12	85	12	M14	30	3x120°	65	X16
220	325	25	295	16.5	20x18°	250	20	360	57	226	310	379	433	100	165	28	106	140	M14 (3)	30	K15	100x94	110	66	105	12	85	12	M14	30	3x120°	65	X16
260	325	25	295	16.5	20x18°	250	20	360	57	226	325	394	448	100	165	28	106	140	M14 (3)	30	K15	100x94	110	66	105	12	85	12	M14	30	3x120°	65	X16

Dimensions, hollow shafts														Hollow for Shrink Disc										Hollow Splined							
model	A	la	B	db	vb	C	lc	D	p	l ₁	l ₂	l ₃	l ₄	Dp	lp	Dq	lq	Dw	lw	code	L min. of torque arm	Dz	lz	de	le	di	li	t	code		
140	325	25	295	16.5	20x18°	230	10	360	36	206	291	345	395	110	110	85	160	140	104	P 24	400	80x74	47	85	20	70	10	75	Z 21		
170	325	25	295	16.5	20x18°	230	10	360	36	206	291	345	395	110	110	85	160	140	104	P 24	400	80x74	47	85	20	70	10	75	Z 21		
200	325	25	295	16.5	20x18°	230	10	360	36	206	290	359	413	110	110	85	160	140	104	P 24	500	90x84	48	95	20	70	10	75	Z 23		
220	325	25	295	16.5	20x18°	230	10	360	36	226	310	379	433	110	110	85	160	140	104	P 24	500	90x84	48	95	20	70	10	75	Z 23		
260	325	25	295	16.5	20x18°	230	10	360	36	226	325	394	448	110	110	85	160	140	104	P 24	500	90x84	48	95	20	70	10	75	Z 23		

DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

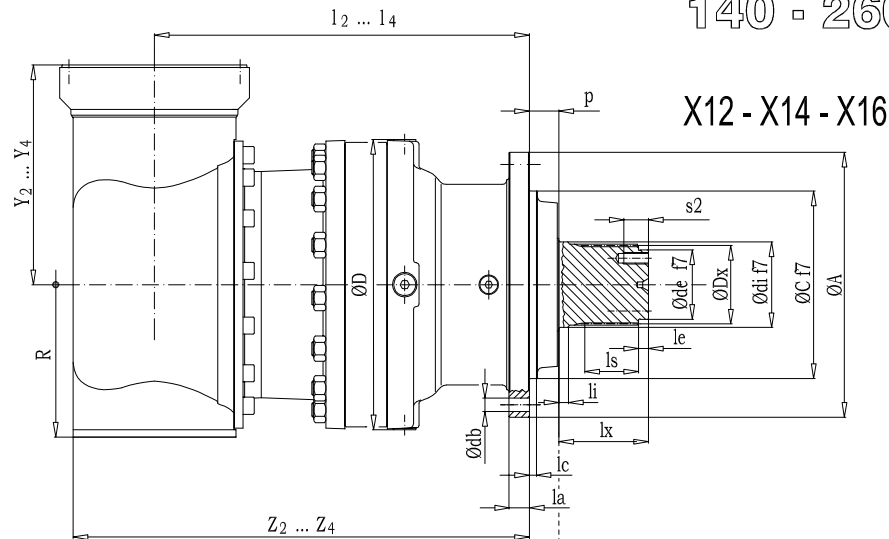
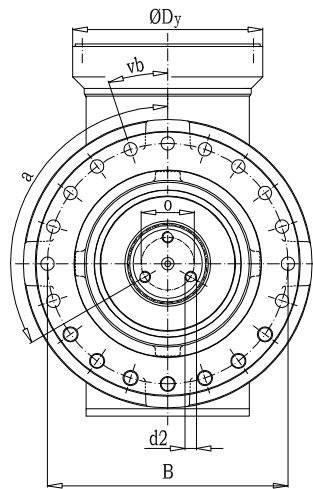
Model	140		170		200		220		260	
Torque Rating ^①	14000 Nm		17000 Nm		20000 Nm		22000 Nm		26000 Nm	
L1	RATIO (ACT. RATING) 3.3 (B)* 5.0 (B) 6.9 (C) 3.8 (A) 6.1 (B) * on request		RATIO (ACT. RATING) 3.3 (B)* 5.1 (B) 4.3 (A) * on request		RATIO (ACT. RATING) 3.7 (A) 4.4 (A)		RATIO (ACT. RATING) 3.7 (A) 5.8 (C) 5.0 (B) 6.9 (D)		RATIO (ACT. RATING) 4.3 (A) 5.1 (B)	
n ₁ nom./max.	2000 rpm	3000 rpm	2000 rpm	3000 rpm	2000 rpm	3000 rpm	1800 rpm	2500 rpm	1800 rpm	2500 rpm
P th ^② / P mech.	30 kW	200 kW	30 kW	210 kW	30 kW	220 kW	37 kW	240 kW	37 kW	265 kW
L2	NOM. RATIO ^③ (ACT. RATING) 12 (B)* 30 (B) 14 (A) 36 (B) 19 (A) 42 (B) 22 (A) 48 (C) 26 (A) * on request		NOM. RATIO ^③ (ACT. RATING) 12 (B)* 30 (A) 16 (A) 35 (B) 19 (B) 22 (A) 25 (A) * on request		NOM. RATIO ^③ (ACT. RATING) 12 (A) 26 (A) 14 (A) 30 (A) 16 (A) 19 (A) 22 (A)		NOM. RATIO ^③ (ACT. RATING) 12 (A) 26 (A) 48 (D) 14 (A) 30 (B) 16 (B) 35 (B) 19 (A) 40 (C) 22 (A) 42 (D)		NOM. RATIO ^③ (ACT. RATING) 16 (A) 35 (B) 19 (B) 22 (A) 25 (A) 30 (A)	
n ₁ nom./max.	2800 rpm	3800 rpm	2800 rpm	3800 rpm	2800 rpm	3800 rpm	2800 rpm	3800 rpm	2000 rpm	3000 rpm
P th ^② / P mech.	18.5 kW	90 kW	18.5 kW	95 kW	18.5 kW	100 kW	22 kW	132 kW	22 kW	150 kW
L3	NOM. RATIO ^③ (ACT. RATING) 48 (A) 130 (A) 260 (B) 53 (A) 150 (A) 300 (B) 63 (A) 160 (A) 340 (C) 71 (A) 180 (A) 80 (A) 200 (B) 95 (A) 220 (B) 110 (A) 240 (B)		NOM. RATIO ^③ (ACT. RATING) 53 (A) 110 (A) 60 (A) 130 (A) 71 (B) 150 (A) 75 (A) 170 (A) 85 (A) 180 (A) 95 (A) 210 (A) 100 (A) 240 (B)		NOM. RATIO ^③ (ACT. RATING) 42 (A) 110 (A) 48 (A) 130 (A) 53 (A) 140 (A) 60 (A) 150 (A) 71 (A) 160 (A) 80 (A) 180 (A) 95 (A) 210 (A)		NOM. RATIO ^③ (ACT. RATING) 42 (A) 120 (A) 300 (D) 48 (A) 140 (A) 340 (D) 53 (A) 160 (A) 63 (A) 180 (A) 71 (A) 210 (B) 85 (A) 240 (B) 100 (A) 280 (C)		NOM. RATIO ^③ (ACT. RATING) 53 (A) 150 (A) 60 (A) 170 (A) 71 (B) 180 (A) 80 (A) 210 (A) 95 (A) 240 (B) 110 (A) 130 (A)	
n ₁ nom./max.	3000 rpm	4000 rpm	3000 rpm	4000 rpm	2800 rpm	3800 rpm	2800 rpm	3800 rpm	2800 rpm	3800 rpm
P th ^② / P mech.	11.5 kW	30 kW	11.5 kW	32 kW	11.5 kW	35 kW	15 kW	60 kW	15 kW	65 kW
L4	NOM. RATIO ^③ (ACT. RATING) 200 (A) 560 (A) 1100 (A) 240 (A) 600 (A) 1250 (A) 260 (A) 670 (A) 1400 (B) 300 (A) 710 (A) 1500 (B) 320 (A) 750 (A) 1700 (B) 360 (A) 800 (A) 1800 (B) 420 (A) 900 (A) 2000 (B) 480 (A) 1050 (A) 2300 (C)		NOM. RATIO ^③ (ACT. RATING) 220 (A) 710 (A) 1400 (A) 260 (B) 750 (A) 1500 (B) 300 (A) 800 (A) 1700 (B) 360 (A) 900 (A) 420 (A) 950 (A) 480 (A) 1050 (A) 560 (A) 1200 (A) 630 (A) 1300 (A)		NOM. RATIO ^③ (ACT. RATING) 220 (A) 670 (A) 260 (A) 710 (A) 300 (A) 800 (A) 360 (A) 900 (A) 420 (A) 1050 (A) 480 (A) 1250 (A) 560 (A) 1400 (A) 600 (A)		NOM. RATIO ^③ (ACT. RATING) 200 (A) 500 (A) 1250 (A) 240 (A) 600 (A) 1500 (B) 260 (A) 670 (A) 1700 (B) 280 (A) 710 (A) 1900 (C) 320 (A) 800 (A) 2000 (D) 360 (A) 900 (A) 2300 (D) 400 (A) 1000 (A) 450 (A) 1100 (A)		NOM. RATIO ^③ (ACT. RATING) 220 (A) 670 (A) 1400 (A) 260 (B) 750 (A) 1500 (B) 300 (A) 850 (A) 1700 (B) 360 (A) 900 (A) 420 (A) 950 (A) 480 (A) 1050 (A) 560 (A) 1200 (A) 600 (A) 1300 (A)	
n ₁ nom./max.	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm
P th ^② / P mech.	9 kW	22 kW	9 kW	23 kW	9 kW	24 kW	10 kW	25 kW	10 kW	26.5 kW
Actual Torque [Nm] ^④ Rating	(A) 18000 (B) 15000 (C) 13000		(A) 20500 (B) 18000		(A) 24000		(A) 29000 (B) 23000 (C) 21000 (D) 19000		(A) 32000 (B) 29000	
Peak Torque ^⑤	22000 Nm		26000 Nm		30000 Nm		33000 Nm		35000 Nm	

Data and dimensions are not binding and may be modified without prior notice



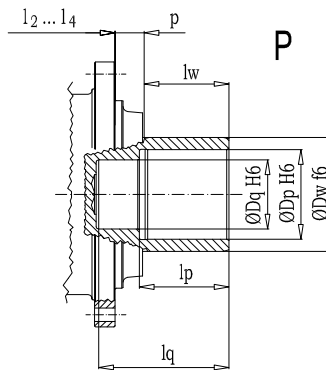
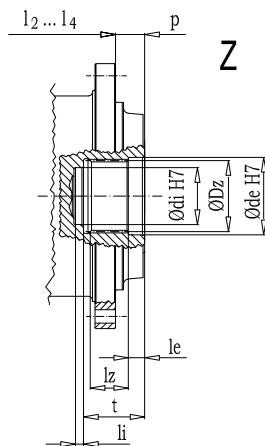
- ① Harmonized nominal value referring to Preferred Numbers R'40. Actual transmissible torque may vary depending on ratio, speed, application.
- ② Harmonized nominal value referring to Preferred Numbers R'40. For actual ratios see Annex C.
- ③ Thermal power limit. For actual figures based on speed, temperature and duty see Section B4, Specifications, Paragraph 8.
- ④ Mean value at rated conditions. For actual figures based on speed, service life and application/duty see Section B4, Specifications, Paragraph 6.
- ⑤ Restrictions may apply for hollow shaft for shrink disc, see Section G, Output Accessories. Customer to verify the mating shaft is capable of loads actually transmitted.
- ⑥ Mean values at rated conditions. For actual admissible loads based on speed, service life and application/duty see Section B4, Specifications, Paragraph 9.
- ⑦ Max. peak values, which must never be exceeded. Combined thrust and radial shaft loads might reduce bearing life. Please contact Plan-Star Engineering for accurate life calculation of your specific application.
- ⑧ Combination of high torque and heavy radial shaft load might require verification of the output shaft. If the following condition is not fulfilled, contact Plan-Star Engineering for accurate verification of your specific application:

$$\frac{\text{Radial Load (applied)}}{\text{Radial Load (admissible)}} \times \frac{\text{Torque (applied)}}{\text{Torque (nominal)}} < 0.5$$

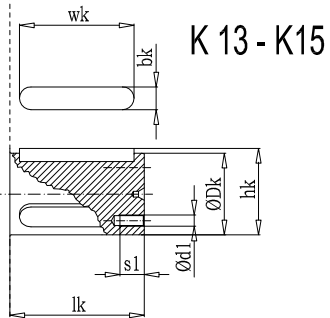
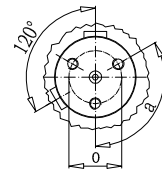


X12 - X14 - X16

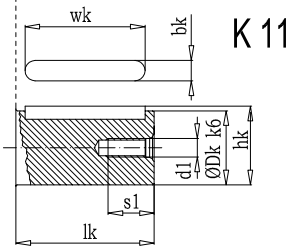
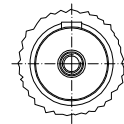
Dimensions, Gearcase				
Model	version	Dy	R	
140	R2, R3, R4	185	137	
170	R2, R3, R4	185	137	
200	R2	242	187	
	R3, R4	185	137	
220	R2	242	187	
	R3, R4	185	137	
260	R2	242	187	
	R3, R4	185	137	



P - shaft version for shrink disc:
For minimum length of torque reaction arm
refer to the relevant data table, value "L_{min}"



K 13 - K15



K 11

Data and dimensions are not binding and may be modified without prior notice

Dimensions, standard, solid shafts																			Keyed										DIN Splined									
Model	A	la	B	db	vb	C	lc	D	p	l ₂	l ₃	l ₄	Y ₂	Y ₃	Y ₄	Z ₂	Z ₃	Z ₄	Dk	lk	bk	hk	wk	d1	s1	code	Dx	lx	ls	de	le	di	li	d2	s2	a	o	code
140	325	25	295	16,5	20x18°	230	10	360	36	343	420	420	226	226	276	422	499	499	90	170	25	95	150	M20	50	K 11	80x74	90	50	70	10	85	10	M12	25	3x120°	45	X 12
170	325	25	295	16,5	20x18°	230	10	360	36	343	420	420	226	226	276	422	499	499	90	170	25	95	150	M20	50	K 11	80x74	90	50	70	10	85	10	M12	25	3x120°	45	X 12
200	325	25	295	16,5	20x18°	230	10	360	36	440	425	488	270	226	226	543	504	567	100	165	28	106	140	M14 (3)	30	K 13	100x94	110	66	85	12	105	12	M14	30	3x120°	65	X 14
220	325	25	295	16,5	20x18°	230	10	360	36	460	445	508	270	226	226	563	524	587	100	165	28	106	140	M14 (3)	30	K 13	100x94	110	66	85	12	105	12	M14	30	3x120°	65	X 14
260	325	25	295	16,5	20x18°	230	10	360	36	460	460	523	270	226	226	563	539	602	100	165	28	106	140	M14 (3)	30	K 13	100x94	110	66	85	12	105	12	M14	30	3x120°	65	X 14

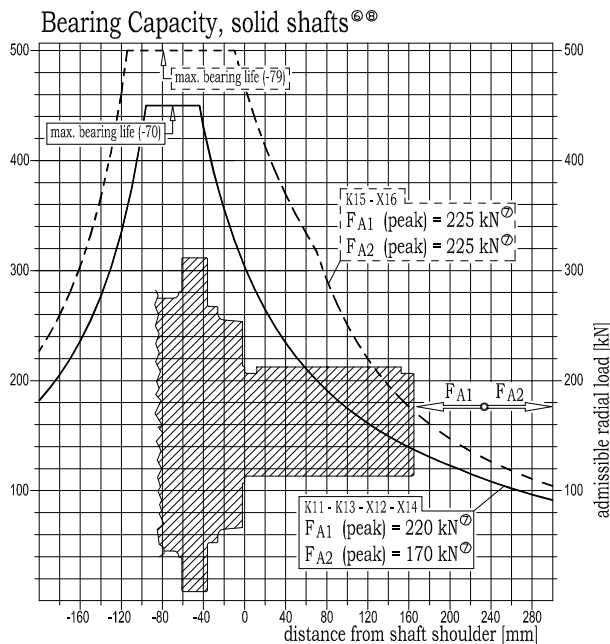
Dimensions, reinforced, solid shafts																			Keyed										DIN Splined											
Model	A	la	B	db	vb	C	lc	D	p	l ₂	l ₃	l ₄	Y ₂	Y ₃	Y ₄	Z ₂	Z ₃	Z ₄	Dk	lk	bk	hk	wk	d1	s1	code	Dx	lx	ls	de	le	di	li	d2	s2	a	o	code		
140	325	25	295	16,5	20x18°	250	20	360	57	343	420	420	226	226	276	422	499	499	100	165	28	106	140	M14 (3)	30	K 15	100x94	110	66	85	12	105	12	M14	30	3x120°	65	X 16		
170	325	25	295	16,5	20x18°	250	20	360	57	343	420	420	226	226	276	422	499	499	100	165	28	106	140	M14 (3)	30	K 15	100x94	110	66	85	12	105	12	M14	30	3x120°	65	X 16		
200	325	25	295	16,5	20x18°	250	20	360	57	440	425	488	270	226	226	543	504	567	100	165	28	106	140	M14 (3)	30	K 15	100x94	110	66	85	12	105	12	M14	30	3x120°	65	X 16		
220	325	25	295	16,5	20x18°	250	20	360	57	460	445	508	270	226	226	563	524	587	100	165	28	106	140	M14 (3)	30	K 15	100x94	110	66	85	12	105	12	M14	30	3x120°	65	X 16		
260	325	25	295	16,5	20x18°	250	20	360	57	460	460	523	270	226	226	563	539	602	100	165	28	106	140	M14 (3)	30	K 15	100x94	110	66	85	12	105	12	M14	30	3x120°	65	X 16		

Dimensions, hollow shafts																				Hollow for Shrink Disc													Hollow Splined						
Model	A	la	B	db	vb	C	lc	D	p	l ₂	l ₃	l ₄	Y ₂	Y ₃	Y ₄	Z ₂	Z ₃	Z ₄	Dp	lp	Dq	lq	Dw	lw	code	L min. of torque arm	Dz	lz	de	le	di	li	t	code					
140	325	25	295	16,5	20x18°	230	10	360	36	343	420	420	226	226	276	422	499	499	110	110	85	160	140	104	P 24	400	80x74	47	85	20	70	10	75	Z 21					
170	325	25	295	16,5	20x18°	230	10	360	36	343	420	420	226	226	276	422	499	499	110	110	85	160	140	104	P 24	400	80x74	47	85	20	70	10	75	Z 21					
200	325	25	295	16,5	20x18°	230	10	360	36	440	425	488	270	226	226	543	504	567	110	110	85	160	140	104	P 24	500	90x84	48	95	20	70	10	75	Z 23					
220	325	25	295	16,5	20x18°	230	10	360	36	460	445	508	270	226	226	563	524	587	110	110	85	160	140	104	P 24	500	90x84	48	95	20	70	10	75	Z 23					
260	325	25	295	16,5	20x18°	230	10	360	36	460	460	523	270	226	226	563	539	602	110	110	85	160	140	104	P 24	500	90x84	48	95	20	70	10	75	Z 23					

DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

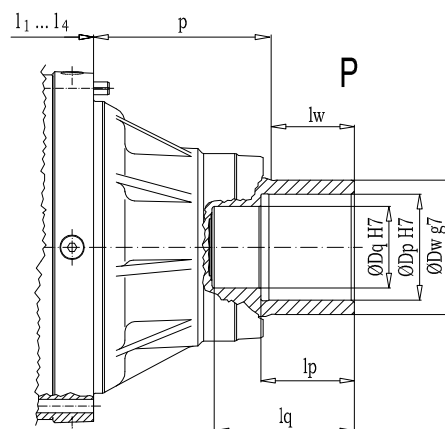
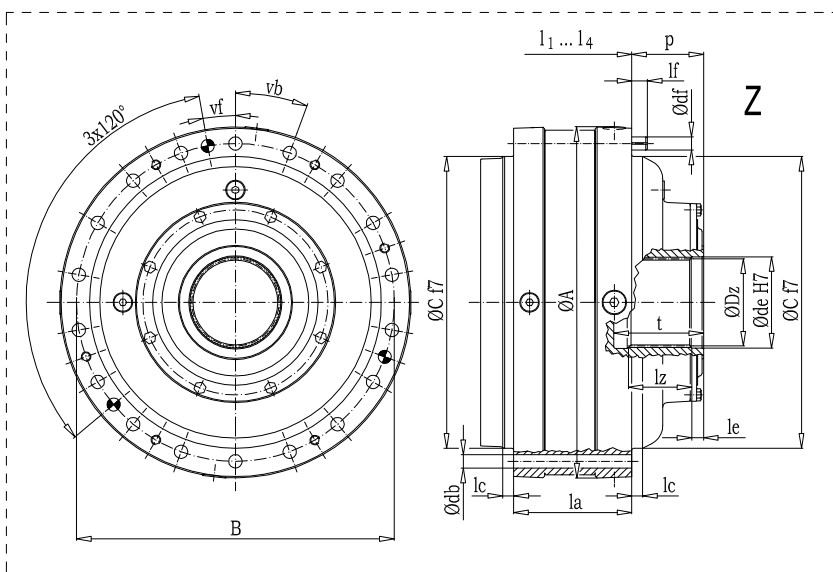
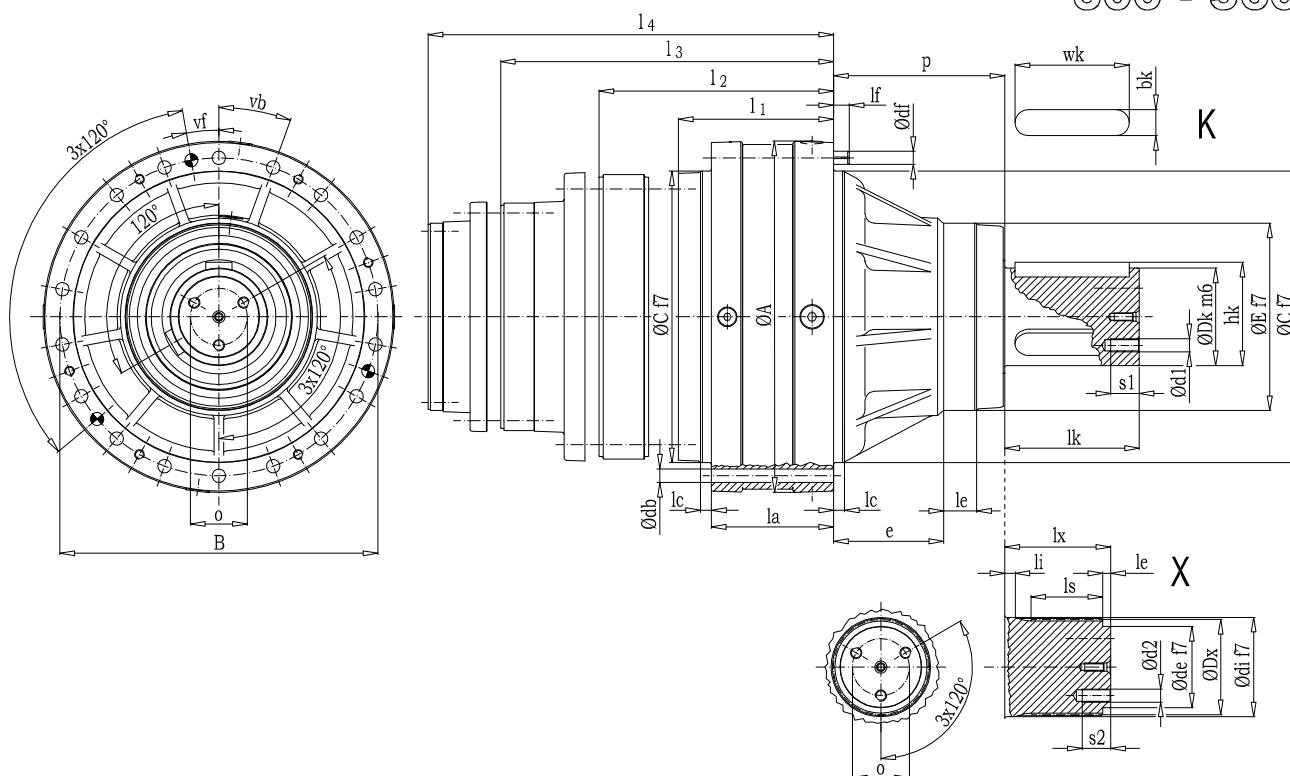
Model	140		170		200		220		260	
Torque Rating ^①	14000 Nm		17000 Nm		20000 Nm		22000 Nm		26000 Nm	
R2	NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)	
	10 (B)* 25 (B)		10 (B)* 25 (B)		12 (A) 14 (A)		12 (A) 28 (C)		13 (A) 16 (B)	
	12 (A) 30 (B)		13 (A) 16 (B)		18 (A) 21 (A)		16 (B) 34 (D)		21 (A) 25 (B)	
	16 (B) 34 (C)		21 (A)				18 (A) 25 (B)			
	18 (A) * on request		* on request							
n ₁ nom./max.	3000 rpm	4000 rpm	3000 rpm	4000 rpm	2250 rpm	3000 rpm	2250 rpm	3000 rpm	2250 rpm	3000 rpm
P th. ^③ /max.	24 kW	90 kW	24 kW	95 kW	37 kW	100 kW	42 kW	132 kW	42 kW	150 kW
R3	NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)	
	38 (B)* 125 (A)		38 (B)* 170 (B)		38 (A) 95 (A)		38 (A) 150 (B)		50 (A)	
	45 (A) 140 (B)		50 (A)		45 (A) 105 (A)		45 (A) 170 (B)		67 (A)	
	53 (B)* 150 (B)		67 (A)		50 (A) 125 (A)		60 (A) 200 (C)		80 (A)	
	60 (A) 170 (B)		80 (A)		60 (A) 150 (A)		71 (A) 240 (D)		95 (A)	
R4	NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)	
	140 (A) 710 (A)		170 (A) 850 (A)		160 (A) 530 (A)		140 (A) 560 (A)		170 (A) 750 (A)	
	160 (A) 750 (A)		190 (A) 900 (A)		190 (A) 560 (A)		160 (A) 630 (A)		190 (A) 850 (A)	
	200 (A) 850 (A)		220 (A) 1000 (A)		220 (A) 630 (A)		200 (A) 710 (A)		220 (A) 900 (A)	
	220 (A) 900 (B)		250 (A) 1200 (B)		250 (A) 670 (A)		220 (A) 800 (A)		260 (A) 1000 (A)	
R5	NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)	
	250 (A) 1000 (B)		300 (A)		300 (A) 750 (A)		240 (A) 900 (A)		300 (A) 1200 (B)	
	300 (A) 1050 (B)		340 (A)		340 (A) 800 (A)		260 (A) 1050 (B)		340 (A)	
	340 (A) 1250 (B)		400 (A)		360 (A) 850 (A)		300 (A) 1200 (B)		400 (A)	
	400 (A) 1400 (B)		450 (A)		400 (A) 900 (A)		340 (A) 1400 (C)		450 (A)	
R6	NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)	
	450 (A) 1600 (C)		480 (A)		420 (A) 1000 (A)		380 (A) 1600 (D)		500 (A)	
	500 (A)		530 (A)		450 (A)		420 (A)		560 (A)	
	560 (A)		630 (A)		480 (A)		450 (A)		630 (A)	
	630 (A)		750 (A)		500 (A)		500 (A)		670 (A)	
n ₁ nom./max.	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm
P th. ^③ /max.	11.5 kW	22 kW	11.5 kW	23 kW	11.5 kW	24 kW	13 kW	25 kW	13 kW	26.5 kW
Actual Torque [Nm] ^④	(A) 18000 (B) 15000 (C) 13000		(A) 20500 (B) 18000		(A) 24000		(A) 29000 (B) 23000 (C) 21000 (D) 19000		(A) 32000 (B) 29000	
Peak Torque ^⑤	22000 Nm		26000 Nm		30000 Nm		33000 Nm		35000 Nm	

Data and dimensions are not binding and may be modified without prior notice



- ① Harmonized nominal value referring to Preferred Numbers R'40. Actual transmissible torque may vary depending on ratio, speed, application.
- ② Harmonized nominal value referring to Preferred Numbers R'40. For actual ratios see Annex C.
- ③ Thermal power limit. For actual figures based on speed, temperature and duty see Section B4, Specifications, Paragraph 8.
- ④ Mean value at rated conditions. For actual figures based on speed, service life and application/duty see Section B4, Specifications, Paragraph 6.
- ⑤ Restrictions may apply for hollow shaft for shrink disc, see Section G, Output Accessories. Customer to verify the mating shaft is capable of loads actually transmitted.
- ⑥ Mean values at rated conditions. For actual admissible loads based on speed, service life and application/duty see Section B4, Specifications, Paragraph 9.
- ⑦ Max. peak values, which must never be exceeded. Combined thrust and radial shaft loads might reduce bearing life. Please contact Plan-Star Engineering for accurate life calculation of your specific application.
- ⑧ Combination of high torque and heavy radial shaft load might require verification of the output shaft. If the following condition is not fulfilled, contact Plan-Star Engineering for accurate verification of your specific application:

$$\frac{\text{Radial Load (applied)}}{\text{Radial Load (admissible)}} \times \frac{\text{Torque (applied)}}{\text{Torque (nominal)}} < 0.5$$



P - shaft version for shrink disc:
For minimum length of torque reaction arm
refer to the relevant data table, value "L_{min}"

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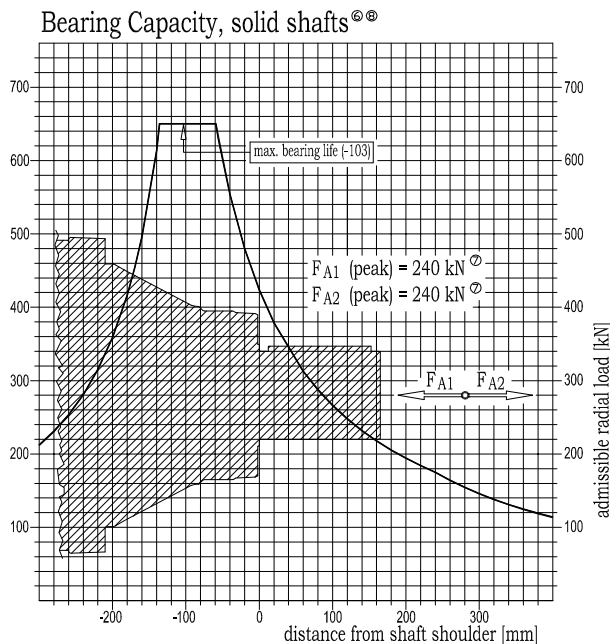
Dimensions, solid shafts															Keyed										DIN Spined													
Model	A	la	B	db	vb	C	lc	E	le	e	df	lf	vf	p	l ₁	l ₂	l ₃	l ₄	Dk	lk	bk	hk	wk	d1	s1	o	code	Dx	lx	ls	di	li	de	le	d2	s2	o	code
300	432	122	390	16.5	18x20°	358	13.5	230	40	135	16	19	10°	210	154.5	196	265	319	100	165	28	106	140	M14	30	65	K 11	100x94	110	66	105	12	85	12	M14	30	65	X 12
360	432	125	390	16.5	18x20°	358	13.5	230	40	135	16	19	10°	210	165.5	197	267	321	100	165	28	106	140	M14	30	65	K 11	100x94	110	66	105	12	85	12	M14	30	65	X 12
420	432	125	390	16.5	18x20°	358	13.5	230	40	135	16	19	10°	210	165.5	197	282	336	120	165	32	127	140	M16	35	70	K 13	120x3	130	88	122	15	100	10	M16	35	70	X 14
480	432	150	390	16.5	18x20°	358	13.5	230	40	135	16	19	10°	210	190.5	222	307	361	120	165	32	127	140	M16	35	70	K 13	120x3	130	88	122	15	100	10	M16	35	70	X 14
560	432	150	390	16.5	18x20°	358	13.5	230	40	135	16	19	10°	210	190.5	242	326	395	120	165	32	127	140	M16	35	70	K 13	120x3	130	88	122	15	100	10	M16	35	70	X 14

Dimensions, hollow shafts															Hollow for Shrink Disc										Hollow Spined													
Model	A	B	db	vb	C	lc	df	lf	vf	la	E	le	e	p	l ₁	l ₂	l ₃	l ₄	Dp	lp	Dq	lq	Dw	lw	code	L _{min}	la	p	l ₁	l ₂	l ₃	l ₄	Dz	lz	de	le	t	code
300	432	390	16.5	18x20°	358	13.5	16	19	10°	122	230	40	135	220	154.5	196	265	319	130	115	100	175	165	100	P 24	800	117	88	149.5	191	260	314	100x94	78	102	15	110	Z 21
360	432	390	16.5	18x20°	358	13.5	16	19	10°	125	230	40	135	220	165.5	197	267	321	130	115	100	175	165	100	P 24	800	120	88	160.5	192	262	316	100x94	78	102	15	110	Z 21
420	432	390	16.5	18x20°	358	13.5	16	19	10°	125	230	40	135	220	165.5	197	282	336	130	115	100	175	165	100	P 24	800	120	88	160.5	192	277	331	100x94	78	102	15	110	Z 21
480	432	390	16.5	18x20°	358	13.5	16	19	10°	150	230	40	135	220	190.5	222	307	361	130	115	100	175	165	100	P 24	800	145	88	185.5	217	302	356	110x3	78	112	15	110	Z 23
560	432	390	16.5	18x20°	358	13.5	16	19	10°	150	230	40	135	220	190.5	242	326	395	130	115	100	175	165	100	P 24	800	145	88	185.5	237	321	390	110x3	78	112	15	110	Z 23

DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

Model	300		360		420		480		560	
Torque Rating ^①	30000 Nm		36000 Nm		42000 Nm		48000 Nm		56000 Nm	
L1	RATIO (ACT. RATING) 3.7 (A) 6.1 (B) 5.0 (B) 6.9 (C)		RATIO (ACT. RATING) 4.3 (A) 5.1 (B)		RATIO (ACT. RATING) 3.7 (A) 4.4 (A)		RATIO (ACT. RATING) 3.7 (A) 5.8 (C) 5.0 (B) 6.9 (D)		RATIO (ACT. RATING) 4.3 (A) 5.1 (B)	
n ₁ nom./max.	1800 rpm	2500 rpm	1800 rpm	2500 rpm	1800 rpm	2500 rpm	1500 rpm	2000 rpm	1500 rpm	2000 rpm
P th. ^② / P mech.	40 kW	280 kW	40 kW	290 kW	40 kW	300 kW	45 kW	330 kW	45 kW	360 kW
L2	NOM. RATIO ^③ (ACT. RATING) 14 (A) 36 (B) 19 (A) 42 (B) 22 (A) 48 (C) 26 (A) 30 (B)		NOM. RATIO ^③ (ACT. RATING) 14 (A)* 30 (A) 16 (A) 35 (B) 19 (B) 22 (A) 26 (A) * on request		NOM. RATIO ^③ (ACT. RATING) 12 (A)* 26 (A) 14 (A) 30 (A) 16 (A) 19 (A) 22 (A) * on request		NOM. RATIO ^③ (ACT. RATING) 12 (A)* 30 (B) 16 (A) 36 (C) 19 (A) 42 (D) 22 (A) 26 (B) * on request		NOM. RATIO ^③ (ACT. RATING) 16 (A) 35 (B) 19 (B) 22 (A) 25 (A) 30 (A)	
n ₁ nom./max.	2000 rpm	3000 rpm	2000 rpm	3000 rpm	2000 rpm	3000 rpm	2000 rpm	3000 rpm	1800 rpm	2500 rpm
P th. ^② / P mech.	25 kW	150 kW	25 kW	160 kW	25 kW	170 kW	30 kW	200 kW	30 kW	220 kW
L3	NOM. RATIO ^③ (ACT. RATING) 48 (A) 130 (A) 260 (B) 53 (A) 150 (A) 300 (B) 63 (A) 160 (A) 340 (C) 71 (A) 180 (A) 80 (A) 200 (B) 95 (A) 220 (B) 110 (A) 240 (B)		NOM. RATIO ^③ (ACT. RATING) 53 (A) 150 (A) 63 (B) 160 (A) 71 (A) 180 (A) 80 (A) 210 (B) 95 (A) 110 (A) 130 (A)		NOM. RATIO ^③ (ACT. RATING) 53 (A) 130 (A) 60 (A) 150 (A) 71 (A) 160 (A) 80 (A) 180 (A) 85 (A) 210 (A) 95 (A) 110 (A)		NOM. RATIO ^③ (ACT. RATING) 60 (A) 160 (A) 71 (A) 180 (B) 80 (A) 210 (B) 85 (A) 250 (C) 95 (A) 300 (D) 110 (A) 130 (A)		NOM. RATIO ^③ (ACT. RATING) 53 (A) 150 (A) 60 (A) 170 (A) 71 (B) 180 (A) 80 (A) 210 (A) 95 (A) 240 (B) 110 (A) 130 (A)	
n ₁ nom./max.	2800 rpm	3800 rpm	2800 rpm	3800 rpm	2800 rpm	3800 rpm	2800 rpm	3800 rpm	2800 rpm	3800 rpm
P th. ^② / P mech.	16 kW	70 kW	16 kW	75 kW	16 kW	80 kW	18.5 kW	90 kW	18.5 kW	100 kW
L4	NOM. RATIO ^③ (ACT. RATING) 200 (A) 560 (A) 1100 (A) 240 (A) 600 (A) 1250 (A) 260 (A) 670 (A) 1400 (B) 300 (A) 710 (A) 1500 (B) 320 (A) 750 (A) 1700 (B) 360 (A) 800 (A) 1800 (B) 420 (A) 900 (A) 2000 (B) 480 (A) 1050 (A) 2300 (C)		NOM. RATIO ^③ (ACT. RATING) 200 (A) 560 (A) 1500 (B) 240 (A) 670 (A) 260 (A) 750 (A) 300 (A) 800 (B) 360 (A) 900 (A) 380 (A) 1050 (A) 420 (A) 1200 (B) 480 (A) 1300 (A)		NOM. RATIO ^③ (ACT. RATING) 220 (A) 600 (A) 260 (A) 670 (A) 300 (A) 750 (A) 320 (A) 800 (A) 360 (A) 900 (A) 420 (A) 1050 (A) 480 (A) 1250 (A) 560 (A) 1400 (A)		NOM. RATIO ^③ (ACT. RATING) 200 (A) 500 (A) 900 (A) 220 (A) 530 (A) 1000 (A) 260 (A) 560 (A) 1100 (A) 300 (A) 600 (A) 1200 (B) 320 (A) 670 (A) 1300 (B) 360 (A) 710 (A) 1500 (B) 420 (A) 750 (A) 1700 (C) 480 (A) 800 (A) 2000 (D)		NOM. RATIO ^③ (ACT. RATING) 220 (A) 670 (A) 1400 (A) 260 (B) 750 (A) 1500 (B) 300 (A) 850 (A) 1700 (B) 360 (A) 900 (A) 420 (A) 950 (A) 480 (A) 1050 (A) 560 (A) 1200 (A) 600 (A) 1300 (A)	
n ₁ nom./max.	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	2800 rpm	3800 rpm
P th. ^② / P mech.	12 kW	28 kW	12 kW	29 kW	12 kW	30 kW	14 kW	31 kW	14 kW	33 kW
Actual Torque [Nm] ^④	(A) 37000 (B) 33000 (C) 28000		(A) 44000 (B) 39000		(A) 51000		(A) 56000 (B) 51000 (C) 47000 (D) 42500		(A) 65000 (B) 58000	
Peak Torque ^⑤	45000 Nm		52000 Nm		58000 Nm		65000 Nm		75000 Nm	

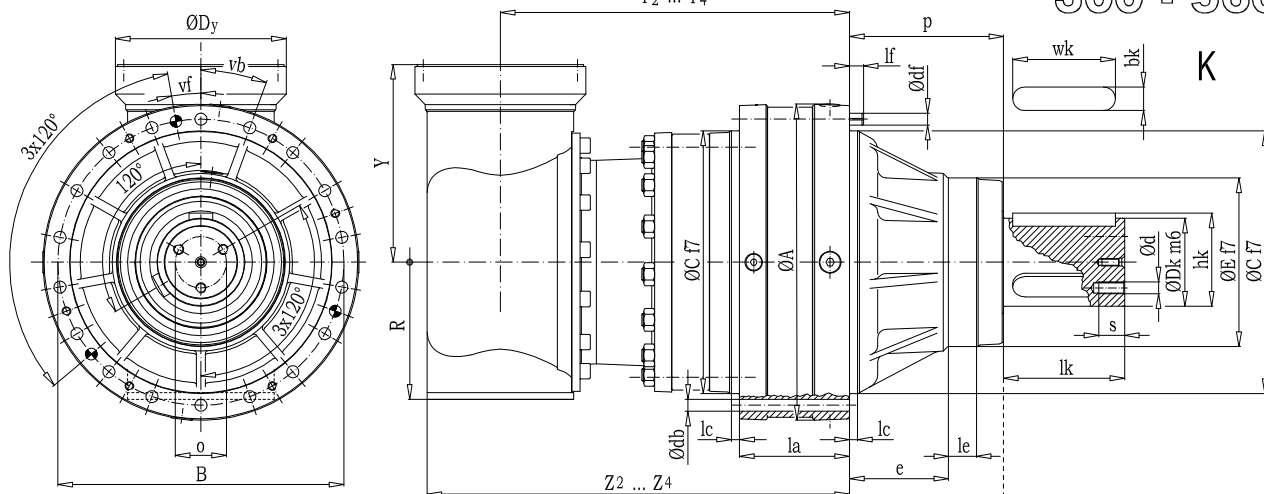
Data and dimensions are not binding and may be modified without prior notice



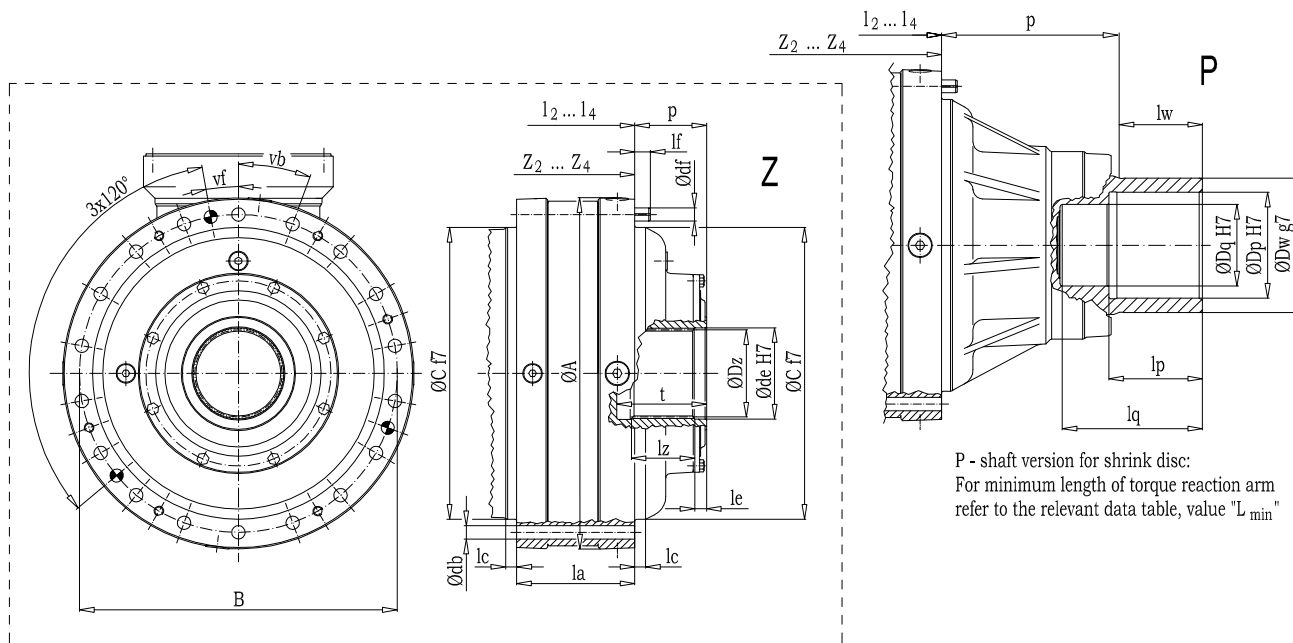
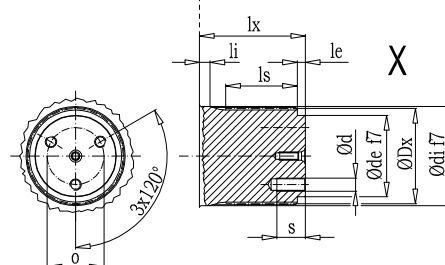
- ① Harmonized nominal value referring to Preferred Numbers R'40. Actual transmissible torque may vary depending on ratio, speed, application.
- ② Harmonized nominal value referring to Preferred Numbers R'40. For actual ratios see Annex C.
- ③ Thermal power limit. For actual figures based on speed, temperature and duty see Section B4, Specifications, Paragraph 8.
- ④ Mean value at rated conditions. For actual figures based on speed, service life and application/duty see Section B4, Specifications, Paragraph 6.
- ⑤ Restrictions may apply for hollow shaft for shrink disc, see Section G, Output Accessories. Customer to verify the mating shaft is capable of loads actually transmitted.
- ⑥ Mean values at rated conditions. For actual admissible loads based on speed, service life and application/duty see Section B4, Specifications, Paragraph 9.
- ⑦ Max. peak values, which must never be exceeded. Combined thrust and radial shaft loads might reduce bearing life. Please contact Plan-Star Engineering for accurate life calculation of your specific application.
- ⑧ Combination of high torque and heavy radial shaft load might require verification of the output shaft. If the following condition is not fulfilled, contact Plan-Star Engineering for accurate verification of your specific application:

$$\frac{\text{Radial Load (applied)}}{\text{Radial Load (admissible)}} \times \frac{\text{Torque (applied)}}{\text{Torque (nominal)}} < 0.5$$

300 - 560



Dimensions, Gearcase					
Model	version	Dy	R	Y	
300	R2	242	187	270	
	R3, R4	185	137	226	
360	R2	242	187	270	
	R3, R4	185	137	226	
420	R2	242	187	270	
	R3, R4	185	137	226	
480	R2	242	187	270	
	R3, R4	185	137	226	
560	R2, R3	242	187	270	
	R4	185	137	226	



Data and dimensions are not binding and may be modified without prior notice

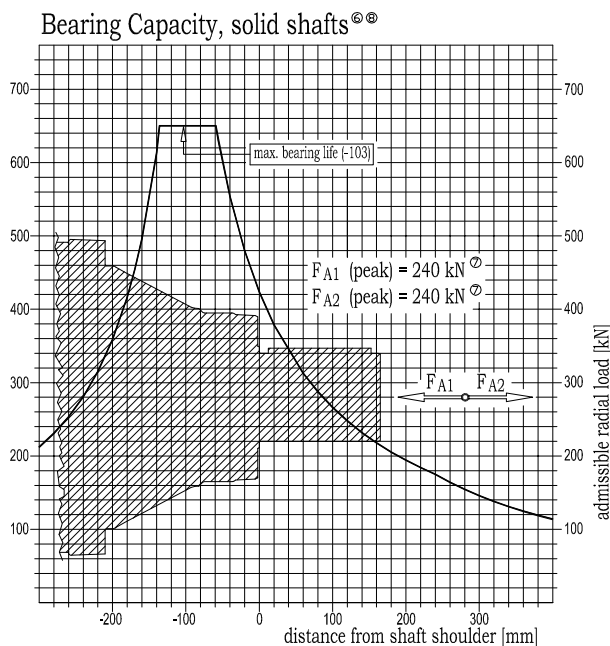
Dimensions, solid shafts																							Keyed										DIN Splined									
Model	A	la	B	db	vb	C	lc	E	le	e	df	lf	vf	p	l ₂	l ₃	l ₄	Z ₂	Z ₃	Z ₄	d	s	o	Dk	lk	bk	hk	wk	code	Dx	lx	ls	di	le	code							
300	432	122	390	16.5	18x20°	358	13.5	230	40	135	16	19	10°	210	331	331	394	434	410	473	M14	30	65	100	165	28	106	140	K 11	100x94	110	66	105	12	85	12	X 12					
360	432	125	390	16.5	18x20°	358	13.5	230	40	135	16	19	10°	210	331	334	396	434	413	475	M14	30	65	100	165	28	106	140	K 11	100x94	110	66	105	12	85	12	X 12					
420	432	125	390	16.5	18x20°	358	13.5	230	40	135	16	19	10°	210	331	334	411	434	413	490	M16	35	70	120	165	32	127	140	K 13	120x3	130	88	122	15	100	10	X 14					
480	432	150	390	16.5	18x20°	358	13.5	230	40	135	16	19	10°	210	356	359	436	459	438	515	M16	35	70	120	165	32	127	140	K 13	120x3	130	88	122	15	100	10	X 14					
560	432	150	390	16.5	18x20°	358	13.5	230	40	135	16	19	10°	210	356	476	461	459	579	540	M16	35	70	120	165	32	127	140	K 13	120x3	130	88	122	15	100	10	X 14					

Dimensions, hollow shafts										Hollow for Shrink Disc																Hollow Splined																
Model	A	B	db	vb	C	lc	df	lf	vf	la	E	le	e	p	l ₂	l ₃	l ₄	Z ₂	Z ₃	Z ₄	Dp	lp	Dq	lq	Dw	lw	code	L _{min}	la	p	l ₂	l ₃	l ₄	Z ₂	Z ₃	Z ₄	Dz	lz	de	le	t	code
300	432	390	16.5	18x20°	358	13.5	16	19	10°	122	230	40	135	220	326	326	389	429	405	468	130	115	100	175	165	100	P 24	800	117	88	326	326	389	429	405	468	100x94	78	102	15	110	Z 21
360	432	390	16.5	18x20°	358	13.5	16	19	10°	125	230	40	135	220	326	329	391	429	408	470	130	115	100	175	165	100	P 24	800	120	88	326	329	391	429	408	470	100x94	78	102	15	110	Z 21
420	432	390	16.5	18x20°	358	13.5	16	19	10°	125	230	40	135	220	326	329	406	429	408	485	130	115	100	175	165	100	P 24	800	120	88	326	329	406	429	408	485	100x94	78	102	15	110	Z 21
480	432	390	16.5	18x20°	358	13.5	16	19	10°	150	230	40	135	220	351	354	431	454	433	510	130	115	100	175	165	100	P 24	800	145	88	351	354	431	454	433	510	110x3	78	112	15	110	Z 23
560	432	390	16.5	18x20°	358	13.5	16	19	10°	150	230	40	135	220	351	471	455	454	574	535	130	115	100	175	165	100	P 24	800	145	88	351	471	456	454	574	535	110x3	78	112	15	110	Z 23

DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

Model	300		360		420		480		560	
Torque Rating ^①	30000 Nm		36000 Nm		42000 Nm		48000 Nm		56000 Nm	
R2	NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)	
	12 (A) 25 (B)		13 (A)		12 (A)		16 (B)		16 (B)	
	16 (B) 30 (B)		16 (B)		14 (A)		25 (B)			
	18 (A) 34 (C)		21 (A)		18 (A)		28 (C)			
	21 (C)		25 (B)		21 (A)		34 (D)			
n ₁ nom./max.	2250 rpm	3000 rpm	2250 rpm	3000 rpm	2250 rpm	3000 rpm	2250 rpm	3000 rpm	2250 rpm	3000 rpm
P th. ^③ /max.	37 kW	150 kW	37 kW	160 kW	37 kW	170 kW	45 kW	200 kW	45 kW	220 kW
R3	NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)	
	42 (A) 140 (B)		50 (A)		42 (A) 110 (A)		50 (A) 170 (C)		50 (A)	
	60 (A) 150 (B)		67 (A)		50 (A) 125 (A)		60 (A) 210 (D)		67 (A)	
	67 (A) 170 (B)		80 (A)		60 (A) 150 (A)		71 (A)		80 (A)	
	71 (B) 210 (B)		95 (A)		67 (A)		80 (A)		95 (A)	
R4	NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)	
	140 (A) 560 (A)		170 (A) 710 (A)		160 (A) 710 (A)		190 (A) 1050 (B)		170 (A) 670 (A)	
	160 (A) 630 (A)		200 (B) 800 (A)		190 (A) 800 (A)		220 (A) 1200 (C)		190 (A) 710 (B)	
	200 (A) 710 (A)		220 (A) 900 (A)		220 (A) 900 (A)		260 (A) 1400 (D)		220 (A) 750 (A)	
	220 (A) 800 (A)		250 (A) 1050 (B)		260 (A) 1000 (A)		300 (A)		250 (A) 850 (A)	
R4	NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)	
	250 (A) 900 (A)		280 (A)		300 (A)		340 (A)		300 (A) 900 (A)	
	260 (A) 1000 (B)		320 (A)		340 (A)		360 (A)		340 (A) 1000 (A)	
	300 (A) 1050 (B)		360 (A)		360 (A)		400 (A)		360 (A) 1050 (B)	
	340 (A) 1200 (B)		400 (A)		400 (A)		450 (A)		420 (A) 1200 (B)	
R4	NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)		NOM. RATIO ^② (ACT. RATING)	
	360 (A) 1250 (B)		450 (A)		450 (A)		500 (A)		480 (A)	
	400 (A) 1400 (B)		500 (A)		500 (A)		560 (A)		530 (A)	
	450 (A) 1600 (C)		560 (A)		560 (A)		670 (A)		560 (A)	
	500 (A)		630 (A)		630 (A)		800 (A)		630 (A)	
n ₁ nom./max.	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm
P th. ^③ /max.	15 kW	28 kW	15 kW	29 kW	15 kW	30 kW	17 kW	31 kW	17 kW	33 kW
Actual Torque [Nm] ^④	(A) 37000 (B) 33000 (C) 28000		(A) 44000 (B) 39000		(A) 51000		(A) 56000 (B) 51000 (C) 47000 (D) 42500		(A) 65000 (B) 58000	
Peak Torque ^⑤	45000 Nm		52000 Nm		58000 Nm		65000 Nm		75000 Nm	

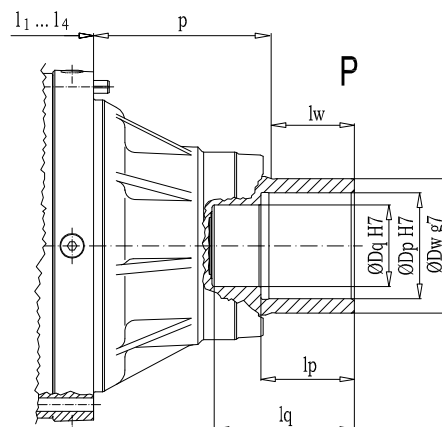
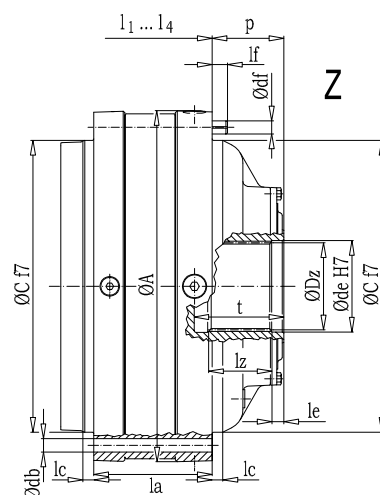
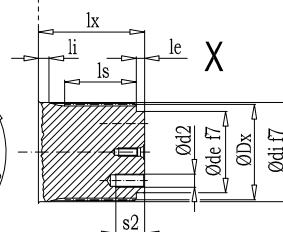
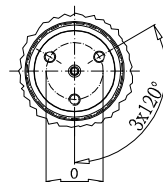
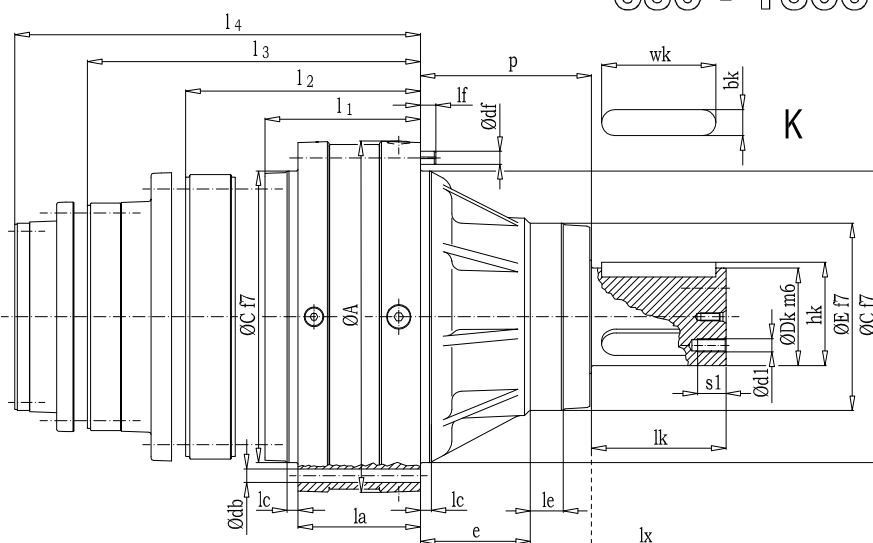
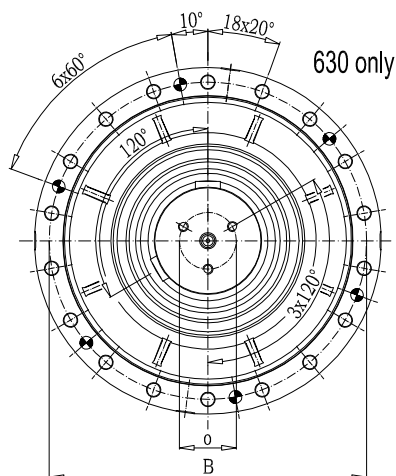
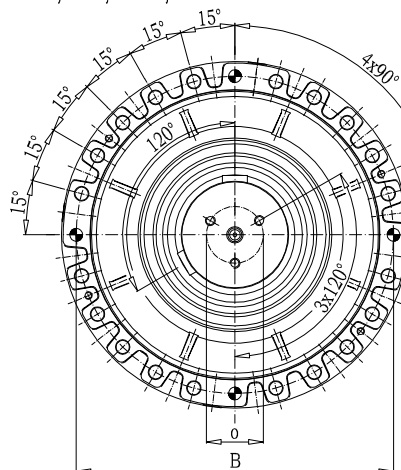
Data and dimensions are not binding and may be modified without prior notice



- ① Harmonized nominal value referring to Preferred Numbers R'40. Actual transmissible torque may vary depending on ratio, speed, application.
- ② Harmonized nominal value referring to Preferred Numbers R'40. For actual ratios see Annex C.
- ③ Thermal power limit. For actual figures based on speed, temperature and duty see Section B4, Specifications, Paragraph 8.
- ④ Mean value at rated conditions. For actual figures based on speed, service life and application/duty see Section B4, Specifications, Paragraph 6.
- ⑤ Restrictions may apply for hollow shaft for shrink disc, see Section G, Output Accessories. Customer to verify the mating shaft is capable of loads actually transmitted.
- ⑥ Mean values at rated conditions. For actual admissible loads based on speed, service life and application/duty see Section B4, Specifications, Paragraph 9.
- ⑦ Max. peak values, which must never be exceeded. Combined thrust and radial shaft loads might reduce bearing life. Please contact Plan-Star Engineering for accurate life calculation of your specific application.
- ⑧ Combination of high torque and heavy radial shaft load might require verification of the output shaft. If the following condition is not fulfilled, contact Plan-Star Engineering for accurate verification of your specific application:

$$\frac{\text{Radial Load (applied)}}{\text{Radial Load (admissible)}} \times \frac{\text{Torque (applied)}}{\text{Torque (nominal)}} < 0.5$$

750, 900, 1100, 1300



P - shaft version for shrink disc:
For minimum length of torque reaction arm
refer to the relevant data table, value " L_{min} "

Data and dimensions are not binding and may be modified without prior notice

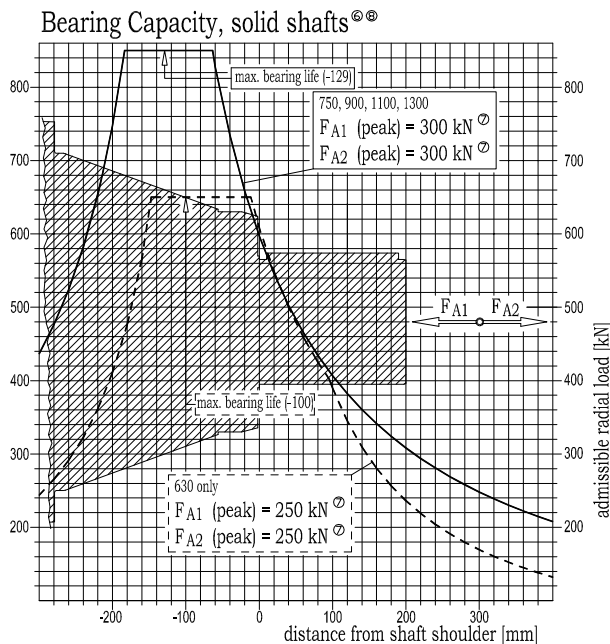
Dimensions, solid shafts																Keyed										DIN Splined										
Media	A	la	B	db	C	lc	E	le	e	df	lf	p	l ₁	l ₂	l ₃	l ₄	DK	lk	bk	hk	wk	d1	s1	o	code	Dx	lx	ls	di	li	de	le	d2	s2	o	code
630	460	152	415	19	385	13	260	38	152	16	20	227	190.5	242	326	395	130	170	32	137	160	M16	35	70	K 11	130x3	130	88	132	15	110	10	M16	35	70	X 12
750	550	154	503	21	460	13.5	300	30	224	20	25	279	216	320.5	362	431	150	200	36	158	180	M16	35	70	K 11	150x5	150	107	151	15	125	12	M16	35	70	X 12
900	550	154	503	21	460	13.5	300	30	224	20	25	279	216	320.5	362	431	150	200	36	158	180	M16	35	70	K 11	150x5	150	107	151	15	125	12	M16	35	70	X 12
1100	550	154	503	21	460	13.5	300	30	224	20	25	279	246	386.5	418	488	170	200	40	179	180	M16	35	90	K 13	170x5	150	127	151	15	145	12	M16	35	90	X 14
1300	550	154	503	21	460	13.5	300	30	224	20	25	279	246	386.5	418	488	170	200	40	179	180	M16	35	90	K 13	170x5	170	120	171	15	145	12	M16	35	90	X 14

Dimensions, hollow shafts								Hollow for Shrink Disc														Hollow Splined														
media	A	B	db	C	ic	df	If	la	E	le	e	p	l ₁	l ₂	l ₃	l ₄	Dp	lp	Dq	lq	Dw	lw	code	L _{min}	la	p	l ₁	l ₂	l ₃	l ₄	Dz	lz	de	le	t	code
630	460	415	19	385	13	16	20	152	260	38	152	237	190.5	242	326	395	140	145	130	202	185	125	P 22	900	152	81	190.5	242	326	395	130x3	70	132	30	110	Z 21
750	550	503	21	460	13.5	20	25	154	300	30	224	287	216	320.5	362	431	160	160	130	227	200	140	P 22	1100	154	98	216	320.5	362	431	150x5	90	152	20	120	Z 21
900	550	503	21	460	13.5	20	25	154	300	30	224	287	216	320.5	362	431	160	160	130	227	200	140	P 22	1100	154	98	216	320.5	362	431	150x5	90	152	20	120	Z 21
1100	550	503	21	460	13.5	20	25	184	300	30	224	287	246	386.5	418	488	170	170	130	247	220	150	P 24	1100	184	98	246	386.5	418	488	160x5	93	162	20	120	Z 23
1300	550	503	21	460	13.5	20	25	184	300	30	224	287	246	386.5	418	488	170	170	130	247	220	150	P 24	1100	184	98	246	386.5	418	488	160x5	93	162	20	120	Z 23

DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

Model	630		750		900		1100		1300	
Torque Rating ^①	63000 Nm		75000 Nm		90000 Nm		110000 Nm		130000 Nm	
L1	RATIO (ACT. RATING) 4.5 (A)		RATIO (ACT. RATING) 3.4 (B) 5.3 (B) 4.1 (A)		RATIO (ACT. RATING) 3.4 (B) 5.3 (B) 4.1 (A)		RATIO (ACT. RATING) 3.4 (B) 5.3 (B) 4.1 (A)		RATIO (ACT. RATING) 3.4 (B) 5.3 (B) 4.1 (A)	
n ₁ nom./max.	1200 rpm	1700 rpm	900 rpm	1200 rpm	850 rpm	1200 rpm	800 rpm	1000 rpm	750 rpm	1000 rpm
P th./ P mech.	50 kW	370 kW	64 kW	390 kW	70 kW	440 kW	80 kW	515 kW	88 kW	620 kW
L2	NOM. RATIO ^② (ACT. RATING) 17 (A) 22 (A) 26 (A) 32 (A)		NOM. RATIO ^② (ACT. RATING) 13 (B) 28 (A) 15 (A) 32 (B) 17 (B) 36 (B) 21 (A) 25 (A)		NOM. RATIO ^② (ACT. RATING) 13 (B) 28 (A) 15 (A) 32 (B) 17 (B) 36 (B) 21 (A) 25 (A)		NOM. RATIO ^② (ACT. RATING) 13 (B) 28 (A) 15 (A) 30 (B) 17 (B) 36 (B) 21 (A) 24 (A)		NOM. RATIO ^② (ACT. RATING) 13 (B) 28 (A) 15 (A) 30 (B) 17 (B) 36 (B) 21 (A) 24 (A)	
n ₁ nom./max.	1800 rpm	2500 rpm	1800 rpm	2500 rpm	1800 rpm	2500 rpm	1500 rpm	2000 rpm	1500 rpm	2000 rpm
P th./ P mech.	33 kW	230 kW	44 kW	280 kW	48 kW	290 kW	55 kW	330 kW	60 kW	360 kW
L3	NOM. RATIO ^② (ACT. RATING) 56 (A) 140 (A) 63 (A) 160 (A) 75 (A) 180 (A) 85 (A) 190 (A) 100 (A) 220 (A) 120 (A) 130 (A)		NOM. RATIO ^② (ACT. RATING) 48 (B) 130 (A) 56 (A) 140 (A) 63 (B) 160 (A) 80 (A) 170 (A) 95 (A) 200 (A) 105 (A) 220 (B) 120 (A) 250 (B)		NOM. RATIO ^② (ACT. RATING) 48 (B) 130 (A) 56 (A) 140 (A) 63 (B) 160 (A) 80 (A) 170 (A) 95 (A) 200 (A) 105 (A) 220 (B) 120 (A) 250 (B)		NOM. RATIO ^② (ACT. RATING) 42 (B)* 120 (A) 48 (B) 140 (A) 56 (A) 170 (A) 67 (B) 200 (A) 80 (A) 220 (B) 90 (A) 250 (B) 105 (A) * on request		NOM. RATIO ^② (ACT. RATING) 42 (B)* 120 (A) 48 (B) 140 (A) 56 (A) 170 (A) 67 (B) 200 (A) 80 (A) 220 (B) 90 (A) 250 (B) 105 (A) * on request	
n ₁ nom./max.	2800 rpm	3800 rpm	2000 rpm	3000 rpm	2000 rpm	3000 rpm	2000 rpm	3000 rpm	2000 rpm	3000 rpm
P th./ P mech.	20 kW	110 kW	28 kW	150 kW	32 kW	160 kW	35 kW	200 kW	39 kW	220 kW
L4	NOM. RATIO ^② (ACT. RATING) 240 (A) 710 (A) 280 (A) 800 (A) 320 (A) 900 (A) 360 (A) 1000 (A) 420 (A) 1100 (A) 480 (A) 1250 (A) 530 (A) 1500 (A) 600 (A)		NOM. RATIO ^② (ACT. RATING) 220 (A) 600 (A) 1200 (A) 260 (A) 670 (A) 1400 (A) 300 (A) 710 (A) 1500 (B) 340 (A) 800 (A) 1700 (B) 400 (A) 850 (A) 450 (A) 900 (A) 480 (A) 1000 (A) 530 (A) 1100 (A)		NOM. RATIO ^② (ACT. RATING) 220 (A) 600 (A) 1200 (A) 260 (A) 670 (A) 1400 (A) 300 (A) 710 (A) 1500 (B) 340 (A) 800 (A) 1700 (B) 400 (A) 850 (A) 450 (A) 900 (A) 480 (A) 1000 (A) 530 (A) 1100 (A)		NOM. RATIO ^② (ACT. RATING) 220 (A) 600 (A) 1200 (A) 260 (A) 670 (A) 1400 (A) 300 (A) 710 (A) 1500 (B) 340 (A) 800 (A) 1700 (B) 400 (A) 850 (A) 450 (A) 900 (A) 480 (A) 1000 (A) 530 (A) 1100 (A)		NOM. RATIO ^② (ACT. RATING) 250 (A) 670 (A) 1300 (B) 300 (A) 710 (A) 1500 (B) 340 (A) 800 (A) 400 (A) 850 (A) 450 (A) 900 (A) 480 (A) 1000 (A) 530 (A) 1050 (A) 600 (A) 1200 (A)	
n ₁ nom./max.	2800 rpm	3800 rpm	2800 rpm	3800 rpm	2800 rpm	3800 rpm	2800 rpm	3800 rpm	2800 rpm	3800 rpm
P th./ P mech.	16 kW	37 kW	22 kW	63 kW	24 kW	70 kW	27 kW	90 kW	30 kW	100 kW
Actual Torque [Nm] ^④	(A) 73000		(A) 94000 (B) 79000		(A) 110000 (B) 95000		(A) 133000 (B) 112000		(A) 160000 (B) 135000	
Peak Torque ^⑤	100000 Nm		140000 Nm		160000 Nm		190000 Nm		215000 Nm	

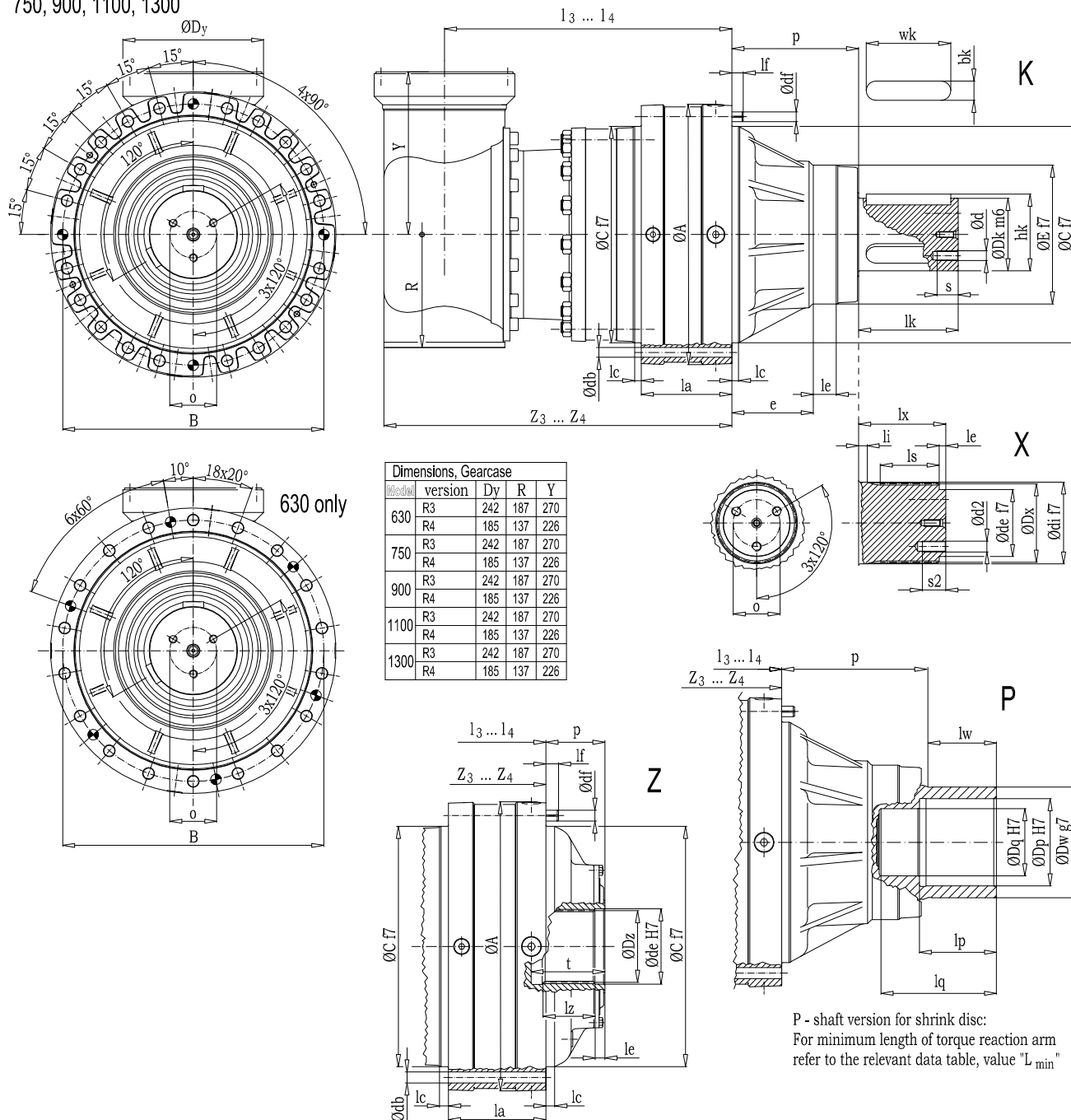
Data and dimensions are not binding and may be modified without prior notice



- ① Harmonized nominal value referring to Preferred Numbers R'40. Actual transmissible torque may vary depending on ratio, speed, application.
- ② Harmonized nominal value referring to Preferred Numbers R'40. For actual ratios see Annex C.
- ③ Thermal power limit. For actual figures based on speed, temperature and duty see Section B4, Specifications, Paragraph 8.
- ④ Mean value at rated conditions. For actual figures based on speed, service life and application/duty see Section B4, Specifications, Paragraph 6.
- ⑤ Restrictions may apply for hollow shaft for shrink disc, see Section G, Output Accessories. Customer to verify the mating shaft is capable of loads actually transmitted.
- ⑥ Mean values at rated conditions. For actual admissible loads based on speed, service life and application/duty see Section B4, Specifications, Paragraph 9.
- ⑦ Max. peak values, which must never be exceeded. Combined thrust and radial shaft loads might reduce bearing life. Please contact Plan-Star Engineering for accurate life calculation of your specific application.
- ⑧ Combination of high torque and heavy radial shaft load might require verification of the output shaft. If the following condition is not fulfilled, contact Plan-Star Engineering for accurate verification of your specific application:

$$\frac{\text{Radial Load (applied)}}{\text{Radial Load (admissible)}} \times \frac{\text{Torque (applied)}}{\text{Torque (nominal)}} < 0.5$$

750, 900, 1100, 1300



Data and dimensions are not binding and may be modified without prior notice

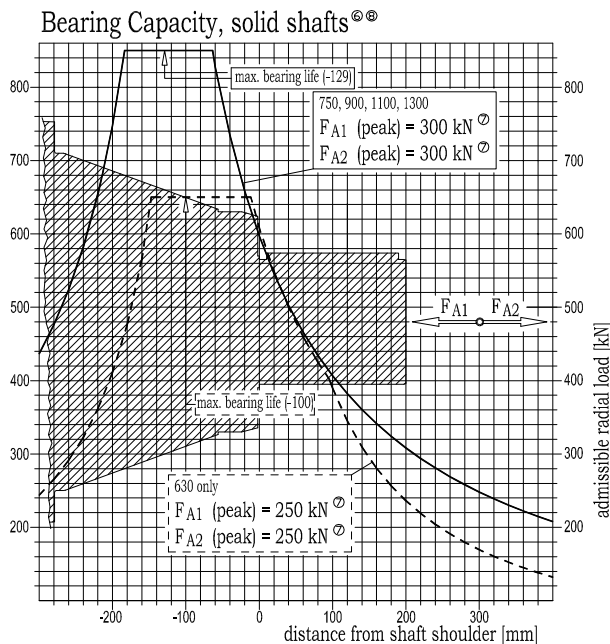
Dimensions, solid shafts																	Keyed										DIN Spined									
code	A	Ja	B	db	C	lc	E	le	e	df	lf	p	l ₃	l ₄	Z ₃	Z ₄	Dk	lk	bk	hk	wk	d1	s1	o	code	Dx	lx	ls	di	li	de	le	d2	s2	o	code
630	460	152	415	19	385	13	260	38	152	16	20	227	471	455	574	535	130	170	32	137	160	M16	35	70	K 11	130x3	130	88	132	15	110	10	M16	35	70	X 12
750	550	154	503	21	460	13.5	300	38	224	20	25	279	497	497	600	576	150	200	36	158	180	M16	35	70	K 11	150x5	150	107	151	15	125	12	M16	35	70	X 12
900	550	154	503	21	460	13.5	300	38	224	20	25	279	497	497	600	576	150	200	36	158	180	M16	35	70	K 11	150x5	150	107	151	15	125	12	M16	35	70	X 12
1100	550	154	503	21	460	13.5	300	38	224	20	25	279	552	555	655	634	170	200	40	179	180	M16	35	90	K 13	170x5	170	120	171	15	145	12	M16	35	90	X 14
1300	550	154	503	21	460	13.5	300	38	224	20	25	279	552	555	655	634	170	200	40	179	180	M16	35	90	K 13	170x5	170	120	171	15	145	12	M16	35	90	X 14

Dimensions, hollow shafts								Hollow for Shrink Disc																	Hollow Splined																
Mod	A	B	db	C	lc	df	lf	la	E	le	e	p	l ₃	l ₄	Z ₃	Z ₄	Dp	lp	Dq	lq	Dw	lw	code	L _{min}	la	p	l ₃	Z ₃	Z ₄	Dz	lz	l ₂	l ₃	t	code						
630	460	415	19	385	13	16	20	152	260	38	152	237	471	455	574	535	140	145	130	202	185	125	P 22	900	152	81	471	455	574	535	130x3	70	132	30	110	Z 21					
750	550	503	21	460	13.5	20	25	154	300	30	224	287	497	497	600	576	160	160	130	227	200	140	P 22	1100	154	98	497	497	600	576	150x5	90	152	20	120	Z 21					
900	550	503	21	460	13.5	20	25	154	300	30	224	287	497	497	600	576	160	160	130	227	200	140	P 22	1100	154	98	497	497	600	576	150x5	90	152	20	120	Z 21					
1100	550	503	21	460	13.5	20	25	184	300	30	224	287	552	555	655	634	170	170	130	247	220	150	P 24	1100	184	98	552	555	655	634	160x5	93	162	20	120	Z 23					
1300	550	503	21	460	13.5	20	25	184	300	30	224	287	552	555	655	634	170	170	130	247	220	150	P 24	1100	184	98	552	555	655	634	160x5	93	162	20	120	Z 23					

DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

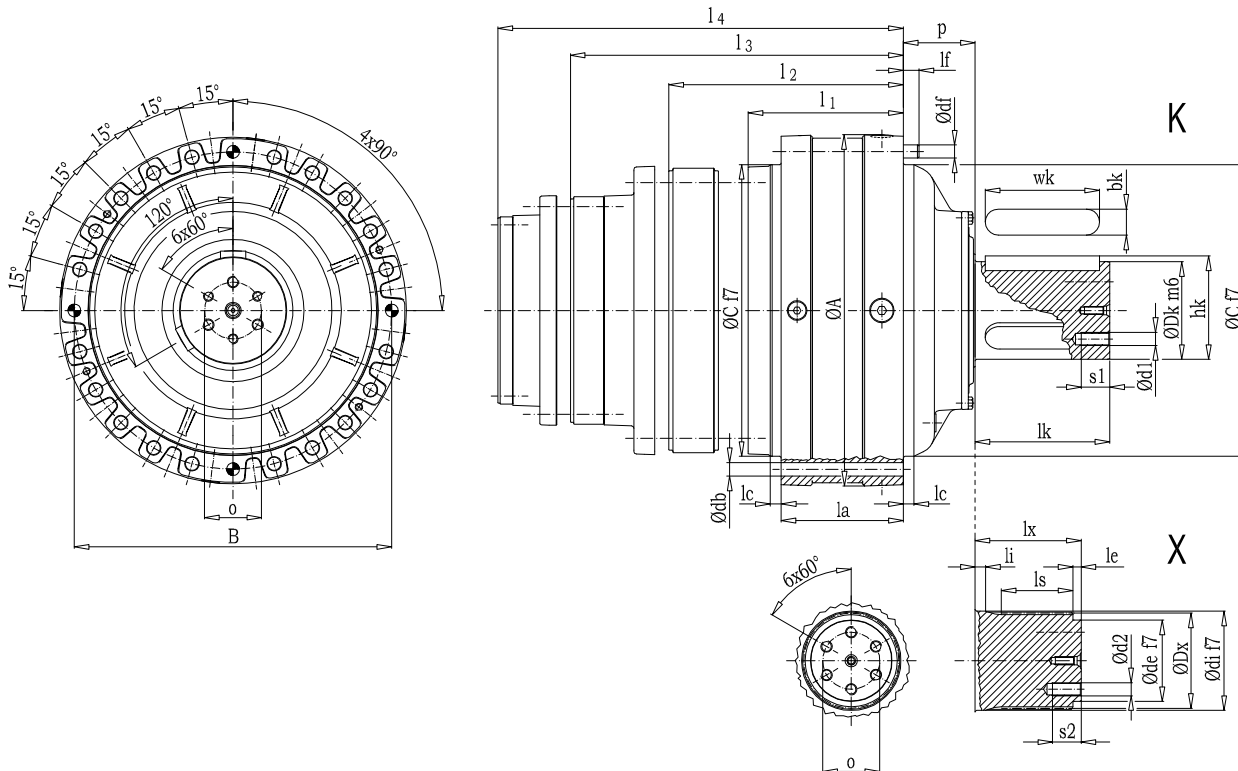
Model	630		750		900		1100		1300	
Torque Rating ^①	63000 Nm		75000 Nm		90000 Nm		110000 Nm		130000 Nm	
R3	NOM. RATIO ^② (ACT. RATING) 53 (A) 71 (A) 80 (A) 95 (A) 110 (A) 130 (A) 150 (A)		NOM. RATIO ^② (ACT. RATING) 40 (B) 100 (A) 45 (A) 110 (B) 53 (B) 120 (A) 60 (B) 140 (A) 63 (A) 160 (B) 75 (A) 180 (B) 80 (B) 90 (A)		NOM. RATIO ^② (ACT. RATING) 40 (B) 100 (A) 45 (A) 110 (B) 53 (B) 120 (A) 60 (B) 140 (A) 63 (A) 160 (B) 75 (A) 180 (B) 80 (B) 90 (A)		NOM. RATIO ^② (ACT. RATING) 40 (B) 100 (A) 45 (A) 110 (B) 53 (B) 120 (A) 60 (B) 140 (A) 63 (A) 150 (B) 75 (A) 180 (B) 80 (B) 90 (A)		NOM. RATIO ^② (ACT. RATING) 53 (B) 140 (A) 60 (B) 150 (B) 63 (A) 180 (B) 75 (A) 80 (B) 90 (A) 95 (B) 120 (A)	
n ₁ nom./max.	2250 rpm	3000 rpm	2250 rpm	3000 rpm	2250 rpm	3000 rpm	2250 rpm	3000 rpm	2250 rpm	3000 rpm
P th. ^③ /max.	28 kW	110 kW	37 kW	150 kW	41 kW	160 kW	45 kW	200 kW	50 kW	220 kW
R4	NOM. RATIO ^② (ACT. RATING) 170 (A) 1050 (A) 200 (A) 240 (A) 280 (A) 320 (A) 360 (A) 420 (A) 480 (A) 560 (A) 630 (A) 750 (A) 900 (A)		NOM. RATIO ^② (ACT. RATING) 150 (B) 630 (A) 180 (A) 710 (A) 200 (B) 750 (B) 240 (A) 850 (A) 280 (A) 950 (A) 320 (A) 1100 (B) 360 (A) 1200 (B) 400 (A) 450 (A) 500 (A) 530 (A) 600 (A)		NOM. RATIO ^② (ACT. RATING) 150 (B) 630 (A) 180 (A) 710 (A) 200 (B) 750 (B) 240 (A) 850 (A) 280 (A) 950 (A) 320 (A) 1100 (B) 360 (A) 1200 (B) 400 (A) 450 (A) 500 (A) 530 (A) 600 (A)		NOM. RATIO ^② (ACT. RATING) 180 (A) 710 (A) 200 (B) 750 (B) 240 (A) 850 (A) 280 (A) 950 (A) 320 (A) 1100 (B) 360 (A) 1200 (B) 400 (A) 450 (A) 500 (A) 530 (A) 600 (A) 630 (A)		NOM. RATIO ^② (ACT. RATING) 180 (A) 710 (A) 200 (B) 750 (B) 240 (A) 850 (A) 280 (A) 950 (A) 320 (A) 1100 (B) 360 (A) 1200 (B) 400 (A) 450 (A) 500 (A) 530 (A) 600 (A) 630 (A)	
n ₁ nom./max.	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm	3000 rpm	4000 rpm
P th. ^③ /max.	17 kW	37 kW	24 kW	63 kW	26.5 kW	70 kW	30 kW	90 kW	33 kW	100 kW
Actual Torque [Nm] ^④	(A) 73000		(A) 89000 (B) 75000		(A) 110000 (B) 92000		(A) 133000 (B) 112000		(A) 160000 (B) 135000	
Peak Torque ^⑤	100000 Nm		140000 Nm		160000 Nm		190000 Nm		215000 Nm	

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- ⑧ Combination of high torque and heavy radial shaft load might require verification of the output shaft. If the following condition is not fulfilled, contact Plan-Star Engineering for accurate verification of your specific application:

$$\frac{\text{Radial Load (applied)}}{\text{Radial Load (admissible)}} \times \frac{\text{Torque (applied)}}{\text{Torque (nominal)}} < 0.5$$



P - shaft version for shrink disc:
For minimum length of torque reaction arm
refer to the relevant data table, value "L_{min}"

Data and dimensions are not binding and may be modified without prior notice

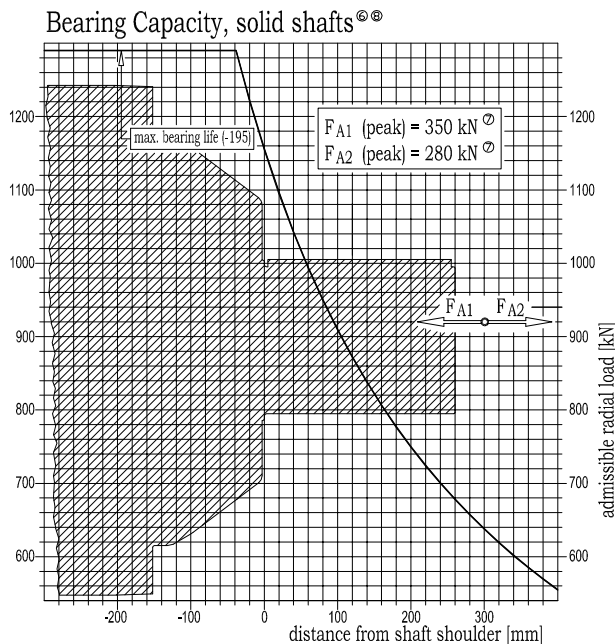
Dimensions, solid shafts														Keyed										DIN Splined									
Model	A	la	B	db	C	lc	df	lf	p	l ₁	l ₂	l ₃	l ₄	Dk	lk	bk	hk	wk	d1	s1	o	code	Dx	lx	ls	di	li	de	le	d2	s2	o	code
1700	700	195	635	32	560	20	25	35	152	266	407.5	459	543	200	260	45	210	250	M16	36	140	K 11	200x5	200	130	200	30	170	20	M16	36	140	X 12
2100	700	220	635	32	560	20	25	35	152	315.5	484	588.5	615	200	260	45	210	250	M16	36	140	K 11	200x5	200	130	200	30	170	20	M16	36	140	X 12
2500	700	220	635	32	560	20	25	35	152	315.5	484	588.5	615	220	300	50	231	280	M16	36	160	K 13	220x5	220	150	220	30	190	20	M16	36	160	X 14

Dimensions, hollow shafts														Hollow for Shrink Disc										Hollow Splined									
Model	A	B	db	C	lc	df	lf	la	p	l ₁	l ₂	l ₃	l ₄	Dp	lp	Dq	lq	Dw	lw	code	L _{min}	la	p	l ₁	l ₂	l ₃	l ₄	Dz	lz	de	le	t	code
1700	700	635	32	560	20	25	35	195	153	266	407.5	459	543	200	210	170	305	260	180	P 22	1500	195	152	266	407.5	459	543	200x5	115	210	17	140	Z 21
2100	700	635	32	560	20	25	35	220	153	315.5	484	588.5	615	200	210	170	305	260	180	P 22	1500	220	152	315.5	484	588.5	615	200x5	115	210	17	140	Z 21
2500	700	635	32	560	20	25	35	220	153	315.5	484	588.5	615	200	210	170	305	260	180	P 22	1500	220	152	315.5	484	588.5	615	210x5	115	220	17	140	Z 23

DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

Model	1700		2100		2500	
Torque Rating ^①	170000 Nm		210000 Nm		250000 Nm	
L1	RATIO (ACT. RATING) 3.5 (B)* 5.3 (B) 4.2 (A) * on request		RATIO (ACT. RATING) 3.5 (B)* 5.3 (B) 4.2 (A) * on request		RATIO (ACT. RATING) 3.5 (B)* 5.3 (B) 4.2 (A) * on request	
n ₁ nom./max.	750 rpm	1000 rpm	750 rpm	1000 rpm	750 rpm	1000 rpm
P th.®/ P mech.	100 kW	750 kW	110 kW	850 kW	110 kW	900 kW
L2	NOM. RATIO ^② (ACT. RATING) 13 (B)* 21 (A) 15 (B)* 24 (B) 18 (A) 28 (B) * on request		NOM. RATIO ^② (ACT. RATING) 12 (B)* 18 (B) 14 (A) 22 (A) 17 (A) 28 (B)		NOM. RATIO ^② (ACT. RATING) 12 (B)* 18 (B) 14 (A) 22 (A) 17 (A) 28 (B)	
n ₁ nom./max.	1500 rpm	2000 rpm	900 rpm	1200 rpm	900 rpm	1200 rpm
P th.®/ P mech.	63 kW	360 kW	70 kW	390 kW	70 kW	440 kW
L3	NOM. RATIO ^② (ACT. RATING) 56 (B)* 120 (A) 67 (A) 140 (B) 80 (A) 150 (A) 90 (A) 160 (B) 105 (A) 190 (B) * on request		NOM. RATIO ^② (ACT. RATING) 45 (B)* 110 (A) 53 (A) 120 (A) 63 (A) 130 (A) 71 (A) 150 (A) 80 (A) 170 (B) 90 (A) 190 (B) 100 (A) * on request		NOM. RATIO ^② (ACT. RATING) 45 (B)* 110 (A) 53 (A) 120 (A) 63 (A) 130 (A) 71 (A) 150 (A) 80 (A) 170 (B) 90 (A) 190 (B) 100 (A) * on request	
n ₁ nom./max.	1800 rpm	2500 rpm	1800 rpm	2500 rpm	1800 rpm	2500 rpm
P th.®/ P mech.	45 kW	240 kW	50 kW	280 kW	50 kW	280 kW
L4	NOM. RATIO ^② (ACT. RATING) 220 (A) 530 (A) 1000 (A) 260 (A) 560 (A) 1100 (B) 300 (A) 630 (A) 1300 (B) 340 (A) 710 (A) 400 (A) 750 (A) 450 (A) 850 (A) 480 (A) 900 (A)		NOM. RATIO ^② (ACT. RATING) 180 (A) 400 (A) 850 (B) 200 (A) 450 (A) 950 (A) 210 (A) 500 (A) 1050 (A) 240 (A) 560 (A) 1200 (B) 280 (A) 630 (A) 1300 (B) 320 (A) 710 (A) 360 (A) 800 (A)		NOM. RATIO ^② (ACT. RATING) 180 (A) 400 (A) 850 (B) 200 (A) 450 (A) 950 (A) 210 (A) 500 (A) 1050 (A) 240 (A) 560 (A) 1200 (B) 280 (A) 630 (A) 1300 (B) 320 (A) 710 (A) 360 (A) 800 (A)	
n ₁ nom./max.	2800 rpm	3800 rpm	2800 rpm	3800 rpm	2800 rpm	3800 rpm
P th.®/ P mech.	33 kW	120 kW	37 kW	120 kW	37 kW	120 kW
Actual Torque [Nm] ^④	(A) 215000 (B) 175000		(A) 260000 (B) 220000		(A) 310000 (B) 260000	
Peak Torque ^⑤	300000 Nm		350000 Nm		400000 Nm	

Data and dimensions are not binding and may be modified without prior notice



- ① Harmonized nominal value referring to Preferred Numbers R'40. Actual transmissible torque may vary depending on ratio, speed, application.
- ② Harmonized nominal value referring to Preferred Numbers R'40. For actual ratios see Annex C.
- ③ Thermal power limit. For actual figures based on speed, temperature and duty see Section B4, Specifications, Paragraph 8.
- ④ Mean value at rated conditions. For actual figures based on speed, service life and application/duty see Section B4, Specifications, Paragraph 6.
- ⑤ Restrictions may apply for hollow shaft for shrink disc, see Section G, Output Accessories. Customer to verify the mating shaft is capable of loads actually transmitted.
- ⑥ Mean values at rated conditions. For actual admissible loads based on speed, service life and application/duty see Section B4, Specifications, Paragraph 9.
- ⑦ Max. peak values, which must never be exceeded. Combined thrust and radial shaft loads might reduce bearing life. Please contact Plan-Star Engineering for accurate life calculation of your specific application.
- ⑧ Combination of high torque and heavy radial shaft load might require verification of the output shaft. If the following condition is not fulfilled, contact Plan-Star Engineering for accurate verification of your specific application:

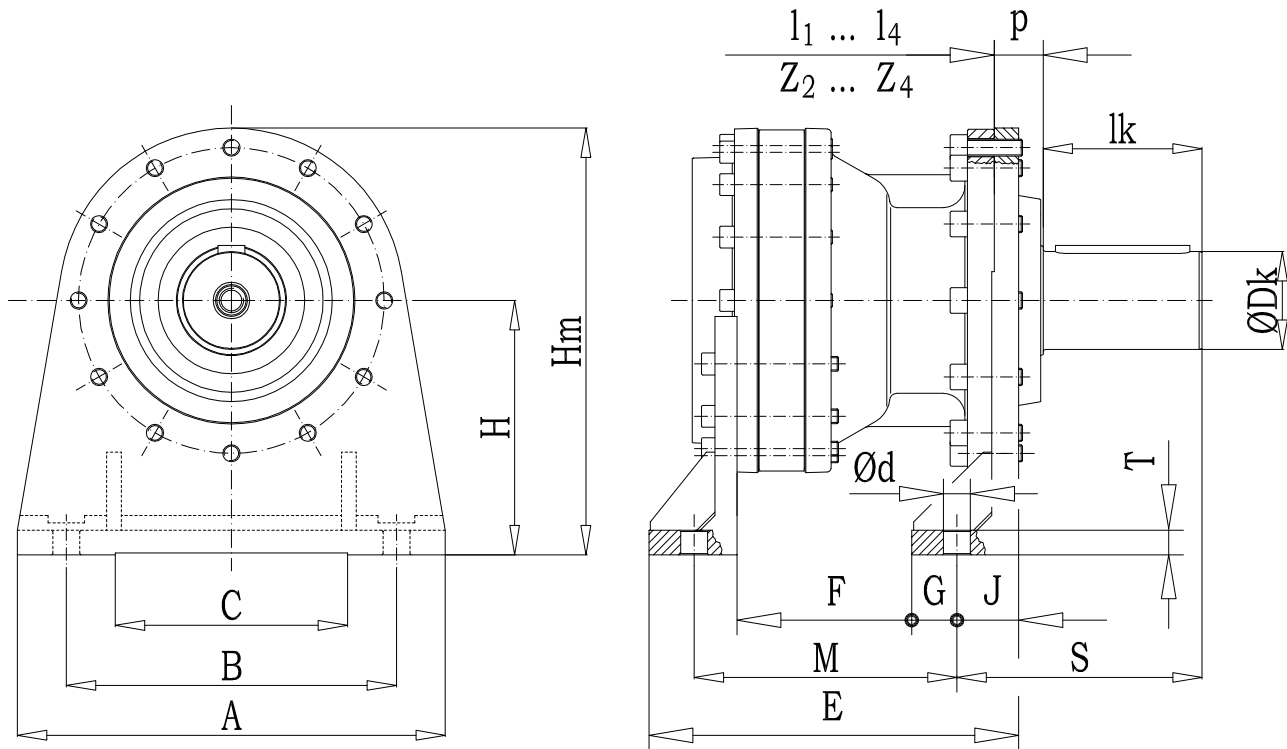
$$\frac{\text{Radial Load (applied)}}{\text{Radial Load (admissible)}} \times \frac{\text{Torque (applied)}}{\text{Torque (nominal)}} < 0.5$$

IMPORTANT NOTES:

The foot mounts for gearboxes from model PSR 36 to model PSR 260 come factory-fitted. They can't be installed afterwards.

For gearboxes from model PSR 300 to PSR 2500 the foot mounts can be installed even after commissioning.

Standard orientation for the input end on right-angle gearboxes is B51 or "12 o'clock". Different orientations must be stated when ordering, e.g. B53 (3 o'clock), B52 (6 o'clock) and B5 (9 o'clock). Indication of orientation is valid for the output end view. See also section D, Mounting Positions.



Dimensions and Technical Data not shown can be found in the relevant tables for the flange mounted gears.

Data and dimensions are not binding and may be modified without prior notice

Dimensions, Foot Mounts 'FM'																			
Type	A	B	C	Dk	lk	E	F	G	d	H	Hm	J	M	p	S	T	m[kg]	m[lbs]	used on gearbox model
FM 36	310	254	—	60	105	223	70	36	18	160	270	21	126 - 143	15	86	16	15	33	36 - K11, X12
FM 42	310	254	—	60	105	223	70	36	18	160	270	21	126 - 143	15	86	16	15	33	42 - K11, X12
FM 50	310	254	—	65	105	223	70	36	18	160	270	21	126 - 143	15	86	16	15	33	50 - K12, X12
FM 60	310	254	—	65	105	238	85	36	18	160	270	21	141 - 158	15	86	16	15	33	60 - K13, X12
FM 67	310	254	—	65	105	238	85	36	18	160	270	21	141 - 158	15	86	16	15	33	67 - K13, X12
FM 75	350	270	190	80	130	233,5	74	37	22	208	350	50,5	148	40	200,5	20	25	55	75 - K11, X12
FM 85	350	270	190	80	130	233,5	74	37	22	208	350	50,5	148	40	200,5	20	25	55	85 - K11, X12
FM 100	350	270	190	80	130	233,5	74	37	22	208	350	50,5	148	40	200,5	20	25	55	100 - K11, X12
FM 110	350	270	190	80	130	248,5	74	37	22	208	350	50,5	148	40	200,5	20	25	55	110 - K11, X12
FM 130	350	270	190	80	130	248,5	74	37	22	208	350	50,5	148	40	200,5	20	25	55	130 - K11, X12
FM 140	445	356	265	90	170	330	160	32	25	225	405	53	245	36	236	22	38	84	140 - K11, X12
FM 170	445	356	265	90	170	330	160	32	25	225	405	53	245	36	236	22	38	84	170 - K11, X12
FM 200	445	356	265	100	165	330	160	32	25	225	405	53	245	36	231	22	38	84	200 - K13, X14
FM 220	445	356	265	100	165	350	180	32	25	225	405	53	265	36	231	22	38	84	220 - K13, X14
FM 260	445	356	265	100	165	350	180	32	25	225	405	53	265	36	231	22	38	84	260 - K13, X14

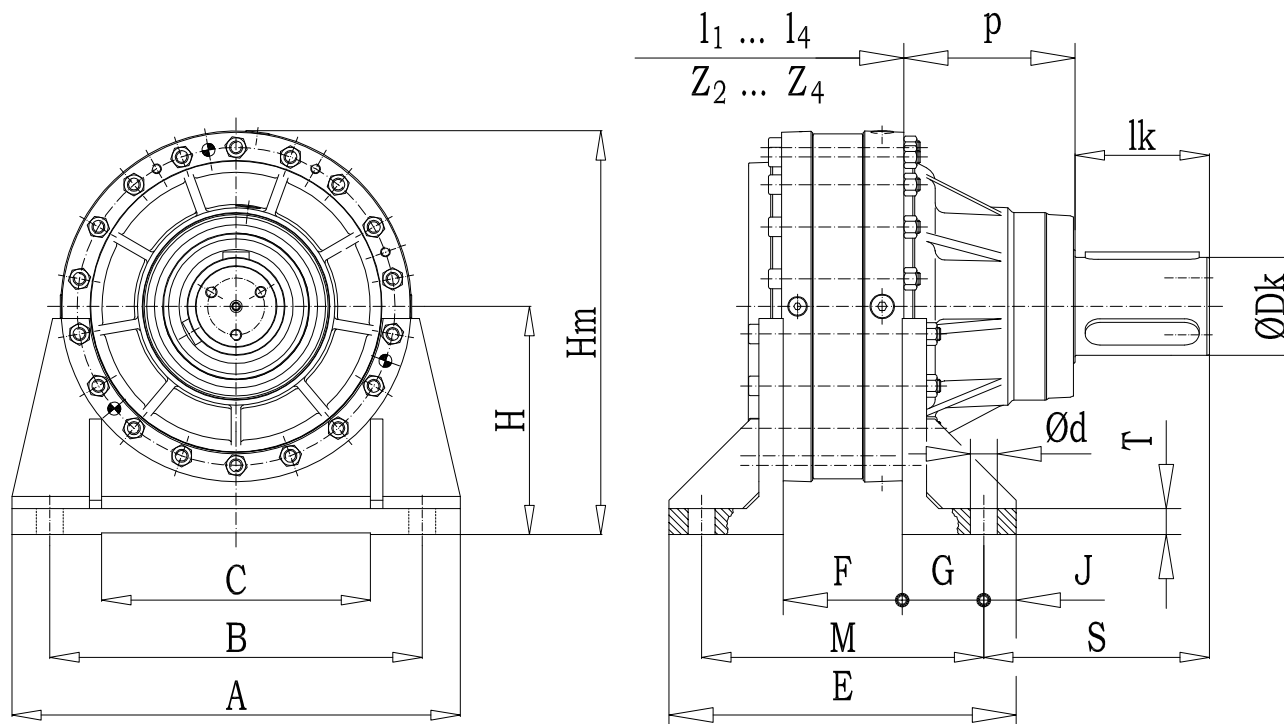
DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

Foot Mount Type FM (FL) 300 - 2500

IMPORTANT NOTES:

The foot mounts for gearboxes from model PSR 36 to model PSR 260 come factory-fitted. They can't be installed afterwards.

For gearboxes from model PSR 300 to PSR 2500 the foot mounts can be installed even after commissioning. Standard orientation for the input end on right-angle gearboxes is B51 or "12 o'clock". Different orientations must be stated when ordering, e.g. B53 (3 o'clock), B52 (6 o'clock) and B5 (9 o'clock). Indication of orientation is valid for the output end view. See also section D, Mounting Positions.



Dimensions and Technical Data not shown can be found in the relevant tables for the flange mounted gears.

Data and dimensions are not binding and may be modified without prior notice

Dimensions, Foot Mounts 'FM' and 'FL'

Type	A	B	C	Dk	lk	E	F	G	d	H	Hm	J	M	p	S	T	m[kg]	m[lbs]	used on gearbox model
FM 300	550	457	330	100	165	398	118	100	33	280	500	40	318	210	277	32	78	172	300 - K11, X12
FL 300	550	457	330	100	165	448	118	100	33	280	500	40	334 - 378	210	277	32	81	179	300 - K11, X12
FM 360	550	457	330	100	165	401	121	100	33	280	500	40	321	210	277	32	78	172	360 - K11, X12
FL 360	550	457	330	100	165	451	121	100	33	280	500	40	337 - 381	210	277	32	81	179	360 - K11, X12
FM 420	550	457	330	120	165	401	121	100	33	280	500	40	321	210	277	32	78	172	420 - K13, X14
FL 420	550	457	330	120	165	451	121	100	33	280	500	40	337 - 381	210	277	32	81	179	420 - K13, X14
FM 480	550	457	330	120	165	426	146	100	33	280	500	40	346	210	277	32	78	172	480 - K13, X14
FL 480	550	457	330	120	165	476	146	100	33	280	500	40	362 - 406	210	277	32	81	179	480 - K13, X14
FM 560	550	457	330	120	165	426	146	100	33	280	500	40	346	210	277	32	78	172	560 - K13, X14
FL 560	550	457	330	120	165	476	146	100	33	280	500	40	362 - 406	210	277	32	81	179	560 - K13, X14
FM 630	550	457	330	130	170	460	146	117	33	280	515	40	380	227	277	32	83	183	630 - K11, X12
FL 750	620	508	380	150	200	497	149	112.5	39	315	590	61.5	374	279	369	32	100	220	750 - K11, X12
FM 750	620	508	380	150	200	497	149	112.5	39	315	590	61.5	374 - 409	279	369	32	100	220	750 - K11, X12
FM 900	620	508	380	150	200	497	149	112.5	39	315	590	61.5	374	279	369	32	100	220	900 - K11, X12
FL 900	620	508	380	150	200	497	149	112.5	39	315	590	61.5	374 - 409	279	369	32	100	220	900 - K11, X12
FM 1100	620	508	380	170	200	527	179	112.5	39	315	590	61.5	404	279	369	32	100	220	1100 - K13, X14
FL 1100	620	508	380	170	200	527	179	112.5	39	315	590	61.5	404 - 439	279	369	32	100	220	1100 - K13, X14
FM 1300	620	508	380	170	200	527	179	112.5	39	315	590	61.5	404	279	369	32	100	220	1300 - K13, X14
FL 1300	620	508	380	170	200	527	179	112.5	39	315	590	61.5	404 - 439	279	369	32	100	220	1300 - K13, X14
FM 1700	850	700	550	200	260	585	189	128	45	415	765	70	445	152	287	45	270	595	1700 - K11, X12
FM 2100	850	700	550	200	260	610	214	128	45	415	765	70	470	152	287	45	270	595	2100 - K11, X12
FM 2500	850	700	550	220	300	610	214	128	45	415	765	70	470	152	287	45	270	595	2500 - K13, X14

DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

High Speed (Input) Shafts

These High Speed Shafts (HSS) are available in several sizes and versions. The smaller of them, C4N and C4R, are suitable for the transmission of smaller powers only. The larger types, from C60 to C13, allow for the transmission of high power, for example by means of multiple belt drives.

Models C60 to C13 provide the possibility to install a cover or guard, while C4N and C4R do not have this feature.

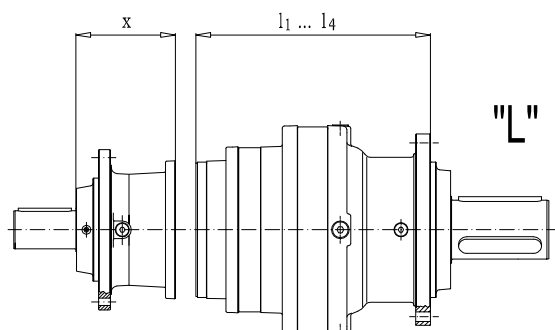
See table below for availability, for dimensions and technical data refer to page 'F 02'.

Availability, High Speed Shafts

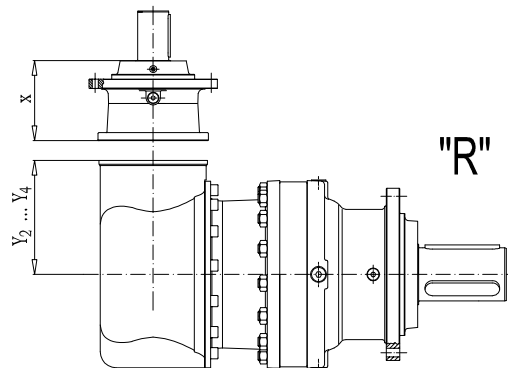
Data and dimensions are not binding and may be modified without prior notice

Gearbox Model																
Size	In-Line												Size	Right-Angle		
15	15 L1-L4															
18	18 L1-L4															
22	22 L1-L4															
28	28 L1-L4															
32	32 L1-L4															
36	36 L2-L4	36 L1												36	36 R2-R4	
42	42 L2-L4	42 L1												42	42 R2-R4	
50	50 L2-L4	50 L1												50	50 R2-R4	
60	60 L2-L4	60 L1												60	60 R2-R4	
67	67 L2-L4	67 L1												67	67 R2-R4	
75	75 L3-L4	75 L2	75 L1											75	75 R2-R4	
85	85 L3-L4	85 L2	85 L1											85	85 R2-R4	
100	100 L3-L4	100 L2	100 L1											100	100 R2-R4	
110	110 L3-L4	110 L2	110 L1											110	110 R2-R4	
130	130 L3-L4	130 L2	130 L1											130	130 R2-R4	
140	140 L3-L4	140 L2		140 L1										140	140 R2-R4	
170	170 L3-L4	170 L2		170 L1										170	170 R2-R4	
200	200 L4	200 L3	200 L2		200 L1									200	200 R3-R4	200 R2
220	220 L4	220 L3	220 L2		220 L1									220	220 R3-R4	220 R2
260	260 L4	260 L3	260 L2		260 L1									260	260 R3-R4	260 R2
300	300 L4	300 L3	300 L2			300 L1								300	300 R3-R4	300 R2
360	360 L4	360 L3		360 L2			360 L1							360	360 R3-R4	360 R2
420	420 L4	420 L3			420 L2		420 L1							420	420 R3-R4	420 R2
480	480 L4	480 L3			480 L2		480 L1							480	480 R3-R4	480 R2
560		560 L4	560 L3		560 L2		560 L1							560	560 R4	560 R2-R3
630		560 L4	630 L3		630 L2		630 L1							630	630 R4	630 R3
750		750 L4	750 L3			750 L2			750 L1					750	750 R4	750 R3
900		900 L4	900 L3			900 L2			900 L1					900	900 R4	900 R3
1100		1100 L4		1100 L3				1100 L2	1100 L1					1100	1100 R4	1100 R3
1300		1300 L4		1300 L3				1300 L2	1300 L1					1300	1300 R4	1300 R3
1700			1700 L4		1700 L3		1700 L2			1700 L1						
2100			2100 L4			2100 L3			2100 L2		2100 L1					
2500			2500 L4			2500 L3			2500 L2		2500 L1					
Type	Distance 'x' [mm]												approx. mass [kg] approx. mass [lbs]			
C4N	107	9.3 20.5	111	10.8 23.8												
C4R	107	9.5 20.9	111	11.0 24.3												
C60			165	23.7 52.3	190	27.6 60.8	191	27.6 60.8								
C65				22.5 49.6	222.5	31.6 69.7	223.5	35.7 78.7	255	44.2 97.4	197.5	40.3 88.8				
C80																
C90									213.5	89.0 192.1	213.5	89.0 192.1				
C10																
C13											238.5	100.0 220.5	262	117.5 259.0	279	141.8 312.6
														254.5	135.4 298.4	
		</														

Mounting Scheme, In-Line Gears

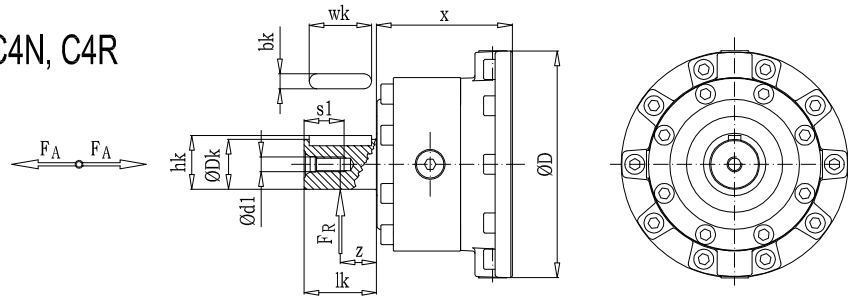


Mounting Scheme, Right-Angle Gears

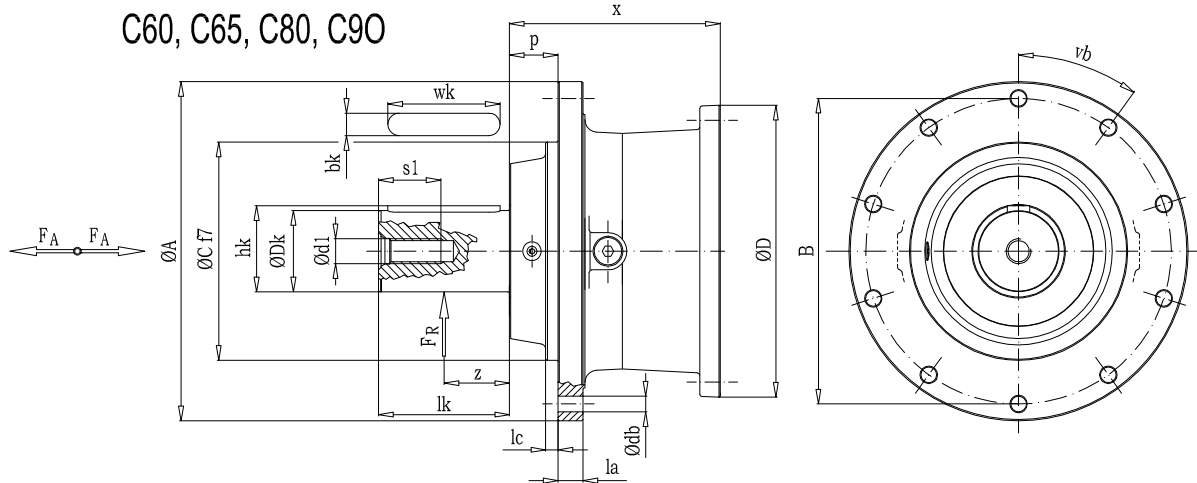


High Speed (Input) Shafts

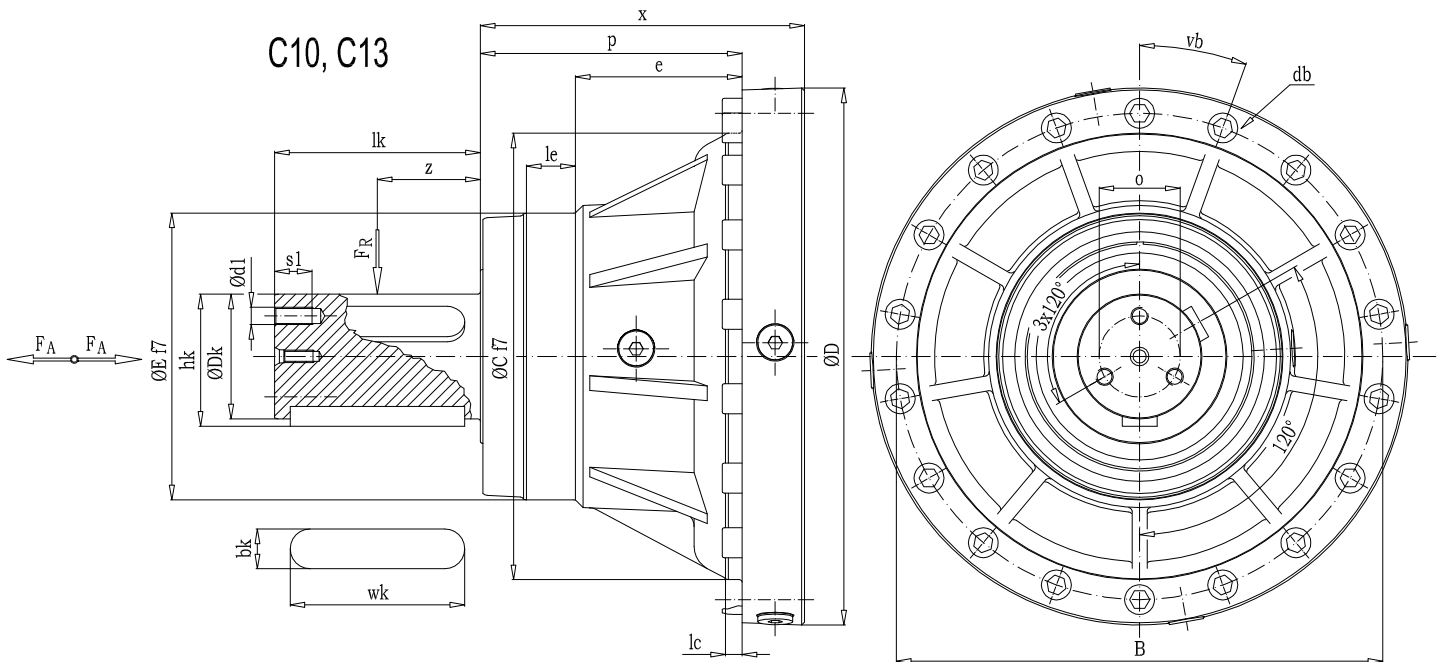
C4N, C4R



C60, C65, C80, C90



C10, C13



Data and dimensions are not binding and may be modified without prior notice

Data and dimensions are not binding and may be modified without prior notice																							Admissible Shaft Loads [kN] (based on location of load and bearing life)																					
Dimensions																							F _R shaft shoulder												F _R middle of shaft				F _R end of shaft					
Type	A	la	B	db	vb	C	lc	D	E	le	e	p	Dk	lk	b _k	hk	wk	d ₁	s ₁	o	z	F _A ①	10 ⁵	10 ⁶	10 ⁷	10 ⁸	10 ⁵	10 ⁶	10 ⁷	10 ⁸	10 ⁵	10 ⁶	10 ⁷	10 ⁸	10 ⁵	10 ⁶	10 ⁷	10 ⁸	n _r x h	Type				
C4N	—	—	—	—	—	—	—	185	—	—	—	—	40 k6	58	12	43	50	M12	32	—	29	2	15.5	7.2	3.3	1.6	10.8	5.1	2.3	1.1	6.9	3.2	1.5	0.7					C4N					
C4R	—	—	—	—	—	—	—	185	—	—	—	—	40 k6	58	12	43	50	M12	32	—	29	2	32.6	16.3	8.2	4.1	16.3	7.6	3.5	1.6	10.3	4.8	2.2	1.0					C4R					
C60	220	18	195	12.5	10x36°	150	14	242	—	—	—	15	60 k6	105	18	64	90	M20	50	—	52.5	7	62.1	31.1	15.6	7.8	38.3	19.2	9.6	4.8	27.7	13.9	7.0	3.5					C60					
C65	272	20	245	12.5	10x36°	175	10	242	—	—	—	39	65 k6	105	18	69	90	M20	50	—	52.5	7	72.8	36.5	18.3	9.2	50.3	25.2	12.6	6.3	38.4	19.3	9.7	4.8					C65					
C80	280	22	250	15	12x30°	200	14.5	285	—	—	—	40	80 k6	130	22	85	110	M20	50	—	65	10	92.0	56.0	23.0	11.5	62.0	31.0	15.5	7.8	47.0	23.5	11.8	5.9					C80					
C90	325	25	295	16.5	20x18°	230	10	360	—	—	—	36	90 k6	170	25	95	150	M20	50	—	85	15	152	76.0	38.0	19.0	94.0	47.0	23.5	11.8	68.0	34.0	17.0	8.5					C90					
C10	—	—	390	M16	18x20°	358	13.5	432	230	40	135	210	100 m6	165	28	106	140	M14	30	65	82.5	20	212	106	53.0	27.0	142	71.0	36.0	18.0	107	54.0	27.0	14.0					C10					
C13	—	—	415	M18	18x20°	385	13	460	260	38	152	227	130 m6	170	32	137	160	M16	35	70	85	25	305	153	76.0	38.0	216	108	54.0	27.0	134	67.0	34.0	17.0					C13					

DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

① Max. values, which must not be exceeded. Combined thrust and radial shaft loads might reduce bearing life. Contact Plan-Star Engineering for precise life calculation.

Input Adapters

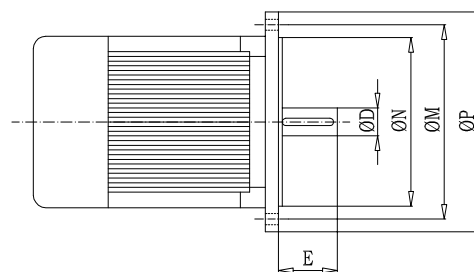
IMPORTANT NOTES:

- The combinations given in the tables show the most common combinations of gearboxes and electric motors. These are based on typical applications and average reduction ratios.
- Further combinations, e.g. for uncommon applications or for very low or high ratios, are available on request.
- As there is a wide range of power, torque and speed for electric motors, the listed gear and motor combinations are intended to be just a quick reference, therefore some restrictions may apply.
- The selected unit must be verified according to catalog section C.

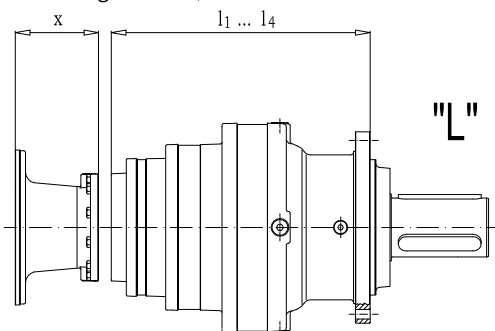
Basic IEC Dimensions, B5-Type Flange [mm]

IEC frame size	ØP	ØN	ØM	ØD	E	Flange Code
63	140	95	115	11	23	E63
71	160	110	130	14	30	E71
80	200	130	165	19	40	E80
90	200	130	165	24	50	E90
100	250	180	215	28	60	E10
112	250	180	215	28	60	E10
132	300	230	265	38	80	E13
160	350	250	300	42	110	E16
180	350	250	300	48	110	E18
200	400	300	350	55	110	E20
225	450	350	400	60	140	E22
250	550	450	450	65	140	E25
280	550	450	450	75	140	E28
315	660	550	550	80	170	E31

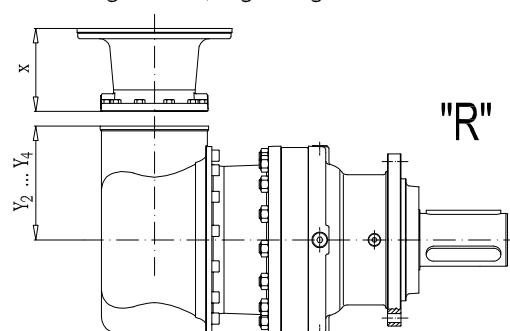
IEC



Mounting Scheme, In-Line Gears



Mounting Scheme, Right-Angle Gears



[illegible][illegible][illegible][illegible]

Part 1 of 10
 Part 2 of 10
 Part 3 of 10
 Part 4 of 10
 Part 5 of 10
 Part 6 of 10
 Part 7 of 10
 Part 8 of 10
 Part 9 of 10
 Part 10 of 10

DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

Input Adapters

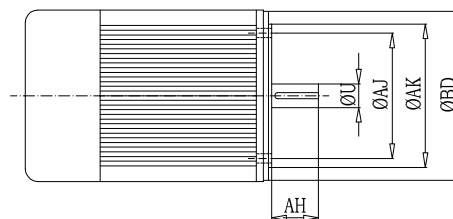
IMPORTANT NOTES:

- The combinations given in the tables show the most common combinations of gearboxes and electric motors. These are based on typical applications and average reduction ratios.
- Further combinations, e.g. for uncommon applications or for very low or high ratios, are available on request.
- As there is a wide range of power, torque and speed for electric motors, the listed gear and motor combinations are intended to be just a quick reference, therefore some restrictions may apply.
- The selected unit must be verified according to catalog section C.

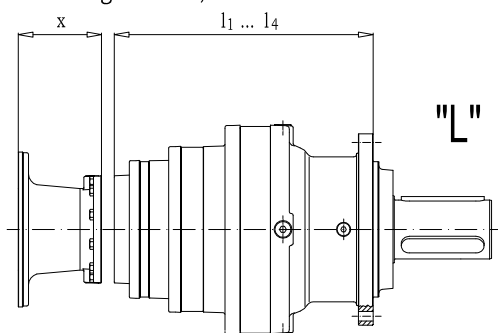
Basic NEMA Dimensions, C-Face Flange [in]

NEMA frame size	ØBD	ØAK	ØAJ	ØU	AH	Flange Code
42 C	4.9	3.0	3.750	0.375	1.31	---
48 C	5.0	3.0	3.750	0.500	1.69	---
56 C	6.5	4.5	5.875	0.625	2.06	N56
143 - 145 TC	6.5	4.5	5.875	0.875	2.13	N14
182 - 184 TC	8.9	8.5	7.250	1.125	2.63	N18
213 - 215 TC	9.0	8.5	7.250	1.375	3.13	N21
254 - 256 TC	9.6	8.5	7.250	1.625	3.75	N25
284 - 286 TC	11.0	10.5	9.0	1.875	4.38	N28
324 - 326 TC	13.4	12.5	11.0	2.125	5.00	N32
364 - 365 TC	14.0	12.5	11.0	2.375	5.63	N36
404 - 405 TC	15.5	12.5	11.0	2.875	7.00	N40
444 - 445 TC	18.0	16.0	14.0	3.375	8.25	N44

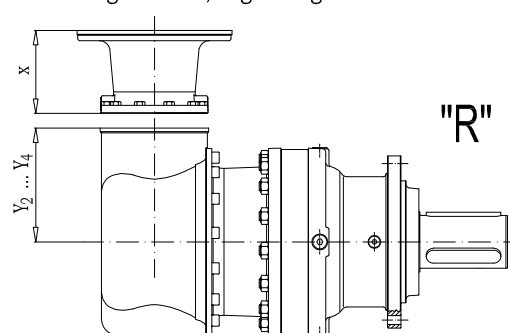
NEMA



Mounting Scheme, In-Line Gears



Mounting Scheme, Right-Angle Gears

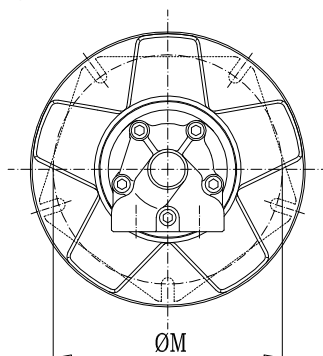
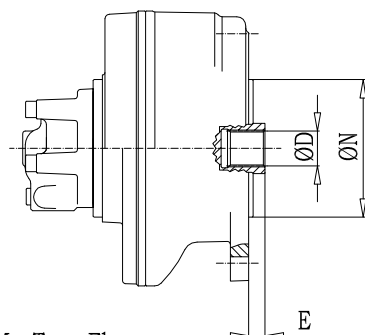


DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

Input Adapters

IMPORTANT NOTES:

- a The combinations given in the tables show the most common combinations of gearboxes and hydraulic motors. These are based on typical applications and average performance requirements.
- b Further input adapters, e.g. for uncommon brands of hydraulic motors, are available on request.
- c As there is a wide range of power, torque and speed for hydraulic motors, the listed combinations are intended to be just a quick reference, therefore some restrictions may apply.
- d The selected unit must be verified according to catalog section C.

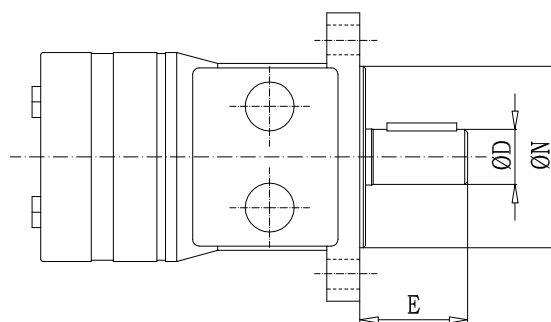
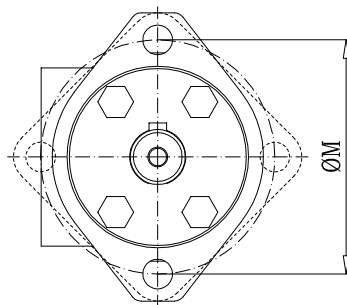


SAI

Basic Dimensions, SAI GM - Type Flange

SAI frame size	ØN [mm]	ØM [mm]	E [mm]	ØD										Thickness "x"		Approx. Mass	
				35x2x16	40x3x12	55x3x17	80x3x25							Input Type	x	[kg]	[lbs]
GM 05, FS15-A1	125	160	23	F15										1	33	2.5	5.5
GM 1	175	210	8	F21										2	28	3.0	6.6
FS15-A2, FS30-A1				F31										3	55	5.8	12.8
GM 2	150	250	18		F32									3	33.5	5.7	12.6
FS30-A2, FS50-A1					F42									4	62	11.1	24.5
GM 3	265	310	18			F43								4	38	9.3	20.5
GM 4	265	310	14			F44								4	38	9.5	20.9
						F54								5B	5.5	3.5	7.7
GM 5A	265	310	14			F54								5B	5.5	3.5	7.7
GM 6	381	420	20				F56							5B	46.5	25.1	55.3
L 7 B	381	420	20				F66							6	50	35.5	78.3

Data and dimensions are not binding and may be modified without prior notice

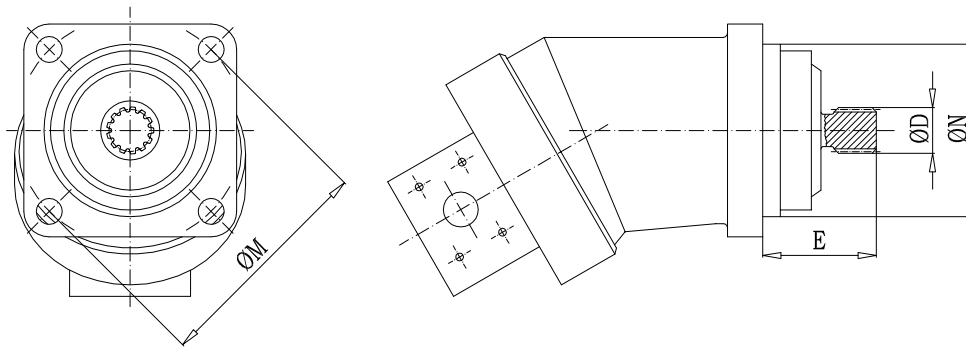


SAE

Basic Dimensions, SAE - Type Flange

SAE frame size	ØN	ØM	E max	ØD											Thickness "x"		Approx. Mass	
	[in.]	[in.]	[mm]	Ø0.875"	16/32-13T	Ø25mm	Ø1"	1"-6B	Ø1.25"	Ø32mm	12/24-14T	16/32-21T	16/32-23T	8/16-13T	Input Type	x	[kg]	[lbs]
A - 2/4 bolt	3.25	4.188	68		A13	A25	A10	A6B	A12	A32	A14				1	104	5.4	11.9
															2	108	7.0	15.4
B - 2/4 bolt	4.00	5.750	75	B78	B13	B25	B10	B6B			B14				1	111	6.7	14.8
															2	115	8.3	18.3
C - 2 bolt	5.00	7.125	73								C14	C21	C23		1	109	8.1	17.9
															2	113	9.7	21.4
D - 2/4 bolt	6.00	9.000	73											D13	1	109	15.5	34.2
															2	113	17.1	37.7

Data and dimensions are not binding and may be modified without prior notice



Basic Dimensions, ISO - Type Flange

ISO frame size	ØN	ØM	E max	ØD										Thickness "x"		Approx. Mass	
	[mm]	[mm]	[mm]	Ø25	m1.25 z18	30x2x14	35x2x16	40x2x18	45x2x21	50x2x24				Input Type	x	[kg]	[lbs]
4 - 100	80	100	54	25A										1	88	6.4	14.1
4 - 125	100	125	60			14B								1	94	8.0	17.6
4 - 160	125	160	72			14C	16C							1	106	10.3	22.7
														2	110	11.9	26.2
4 - 180	140	180	77					18D						1	111	11.2	24.7
														2	115	12.8	28.2
4 - 200	160	200	90						21E					1	124	14.9	32.8
														2	128	16.5	36.4
4 - 224	180	224	95							24F				1	129	17.3	38.1
														2	133	18.9	41.7
4 - 250	200	250	95							24G				2	133	24.8	54.7
4 - 280	224	280	108							24H				2	146	28.6	63.1

Data and dimensions are not binding and may be modified without prior notice

Table 11: Input Flange Type

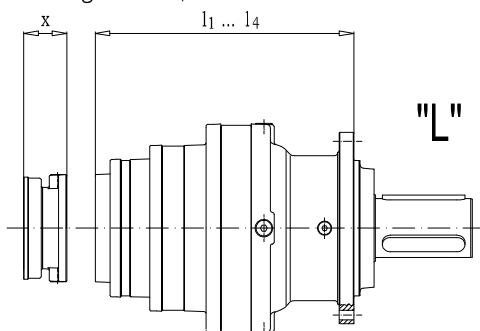
Size, n°stages	15				18				22				28				32				36				42				50				60				67				75			
Type	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
L	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	2	1	1	1	2	1	1	1	2	1	1	1	2	1	1	1	3	2	1	1
R																	1	1	1		1	1	1		1	1	1		1	1	1		1	1	1		1	1	1		1	1	1	

Size, n°stages	85				100				110				130				140				170				200				220				260				300				360			
Type	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
L	3	2	1	1	3	2	1	1	3	2	1	1	3	2	1	1	4	2	1	1	4	2	1	1	4	3	2	1	4	3	2	1	4	3	2	1	5A	3	2	1	5B	4	2	1
R		1	1	1		1	1	1		1	1	1		1	1	1		1	1	1		1	1	1		2	1	1		2	1	1		2	1	1		2	1	1		2	1	1

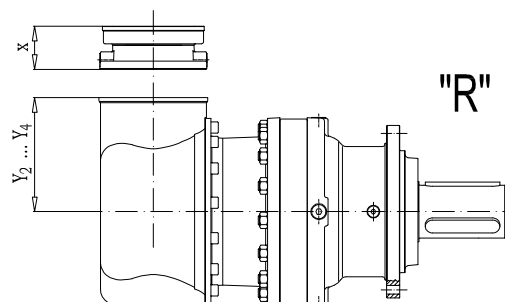
Size, n°stages	420				480				560				630				750				900				1100				1300				1700				2100				2500					
Type	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4		
L	5B	4	2	1	5B	4	2	1	5B	4	3	2	5B	4	3	2	6	5A	3	2	6	5A	3	2	6	5B	4	2	6	5B	4	2	7A	5B	4	3	7B	6	5A	3	7B	6	5A	3		
R		2	1	1		2	1	1		2	2	1		2	2	1		2	1			2	1			2	1			2	1				1				2				2			

Data and dimensions are not binding and may be modified without prior notice

Mounting Scheme, In-Line Gears



Mounting Scheme, Right-Angle Gears



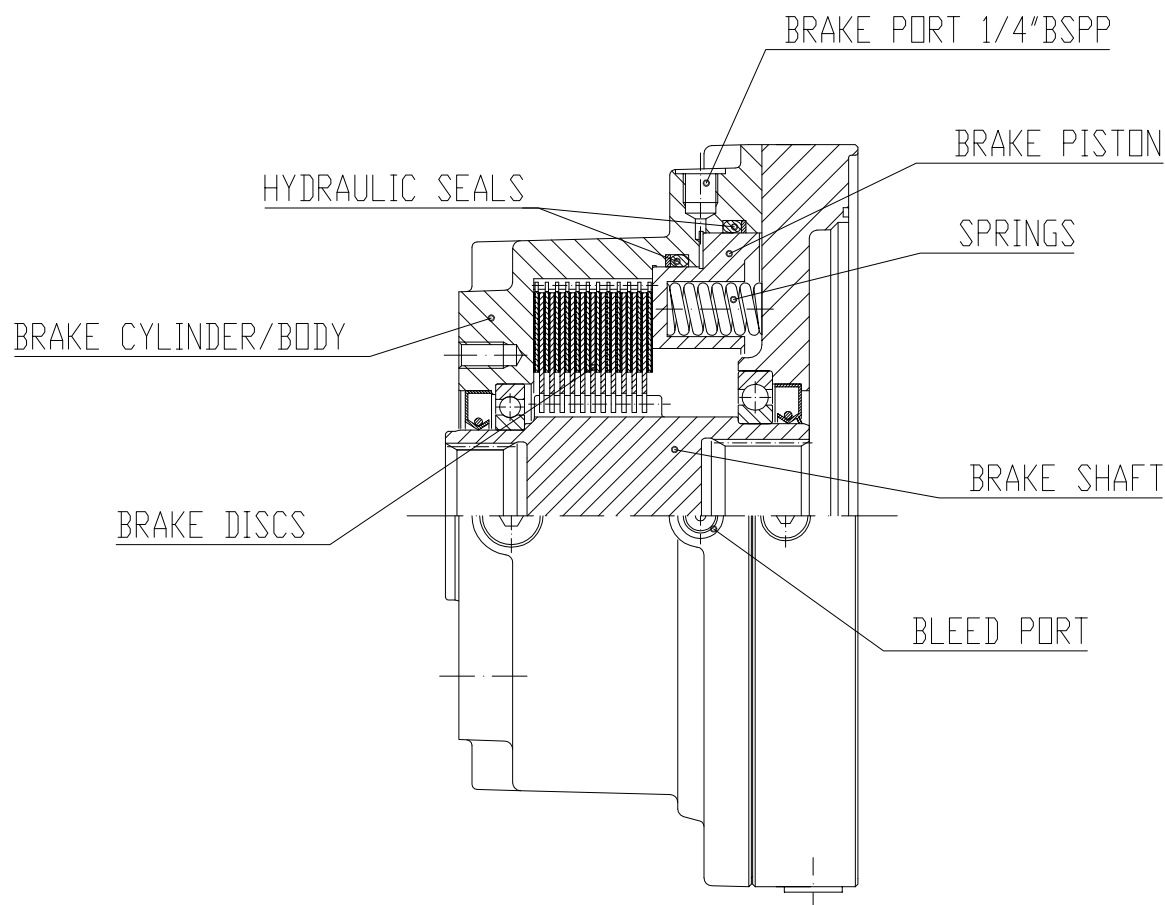
GENERAL FEATURES:

Our Multi-Disc Brakes are hydraulically operated and provide fail-safe characteristics. This means they are normally closed and will release when the necessary hydraulic pressure is applied to the brake port.

They are intended for static braking purposes, for example as a parking or holding brake. However, in the event of emergency also dynamic braking capabilities are given. In this case the brake torque is reduced to approx. 70% of the static value shown in Table 9.

Dynamic braking reduces the life of the brake lining and might also lead to overheating.

In case of frequent dynamic brake cycles please contact Plan-Star Engineering for proper evaluation of your specific case or application.



LUBRICATION:

The multi-disc brakes form a compact unit with the gearbox and thus they need very little mounting space.

Their lubrication is of the independent type, but there are also solutions with common lubrication. However, some mounting positions might require lubrication of the common type.

Generally mineral hydraulic oil ISO VG 32 is recommended.

In case of common lubrication of gearbox and brake with synthetic gear oils (e.g. CASTROL Optigear Synthetic X320 and MOBIL Mobilgear SHC XMP 320 or similar) a reduction of the brake torque of up to 15% must be taken into account.

The oil quantities given in the table are valid for horizontal mounting arrangement of the brake (mounting position B5 for In-Line Reducers and mounting positions B5, B53, V1 and V3 for Right-Angle Reducers.

Vertical mounting of the brake (V1 and V2 on In-Line and B51 and B52 on Right-Angle Units) require approximately doubled oil quantities.

SELECTION:

The correct selection of the brake is depending not only on the required brake torque and the release pressure. It is further of crucial importance to make sure that the static brake torque multiplied with the gearbox ratio will not exceed the admissible peak torque of the gearbox (see relevant gear ratio in Annex "C"). Also the efficiency has a certain influence as it increases the brake capacity, see Section B4, Table 2.

The resulting brake torque can be calculated as follows:

$$T_{2Br} = T_{St} \times u \times \frac{1}{\eta} \quad \text{formula 11}$$

When selecting a brake-gearbox combination the following condition must be fulfilled:

$$T_{2Br} \leq T_{2peak} \quad \text{formula 12}$$

Table 12, Static Brake Torque T_{St}

Type	Static Torque ^①		Release Press.		Max. Pressure ^②		Oil Volume ^③		Release Vol. ^④		Type	Static Torque ^①		Release Press.		Max. Pressure ^②		Oil Volume ^③		Release Vol. ^④	
	[Nm]	[ft-lb]	[bar]	[psi]	[bar]	[psi]	[ccm]	[cu.in]	[ccm]	[cu.in]		[Nm]	[ft-lb]	[bar]	[psi]	[bar]	[psi]	[ccm]	[cu.in]	[ccm]	[cu.in]
1 AC	799	589	23.5	340	125	1800	50	3.1	15	0.9	4 AA	10000	7380	33	480	125	1800	400	24.4	54	3.3
1 AE	559	412	16.5	240	125	1800	50	3.1	15	0.9	4 AB	9000	6640	30	435	125	1800	400	24.4	54	3.3
1 AF	374	276	11	160	125	1800	50	3.1	15	0.9	4 AC	8400	6200	27.5	400	125	1800	400	24.4	54	3.3
1 AH	267	197	8	115	125	1800	50	3.1	15	0.9	4 AD	7800	5750	25.5	370	125	1800	400	24.4	54	3.3
1 AK	187	138	5.5	80	125	1800	50	3.1	15	0.9	4 AE	6700	4940	22	320	125	1800	400	24.4	54	3.3
1 CA	745	550	33	480	125	1800	50	3.1	15	0.9	4 AF	5600	4130	18.5	270	125	1800	400	24.4	54	3.3
1 CC	532	392	23.5	340	125	1800	50	3.1	15	0.9	4 AG	5000	3690	16.5	240	125	1800	400	24.4	54	3.3
1 CE	373	275	16.5	240	125	1800	50	3.1	15	0.9	4 AH	4500	3320	14.5	210	125	1800	400	24.4	54	3.3
1 CF	250	184	11	160	125	1800	50	3.1	15	0.9	4 AJ	3300	2430	11	160	125	1800	400	24.4	54	3.3
1 CH	178	131	8	115	125	1800	50	3.1	15	0.9	4 CA	7500	5530	33	480	125	1800	400	24.4	54	3.3
1 CK	125	92	5.5	80	125	1800	50	3.1	15	0.9	4 CC	6300	4650	27.5	400	125	1800	400	24.4	54	3.3
1 EA	373	275	33	480	125	1800	50	3.1	15	0.9	4 CD	5900	4350	25.5	370	125	1800	400	24.4	54	3.3
1 EC	266	196	23.5	340	125	1800	50	3.1	15	0.9	4 CF	4200	3100	18.5	270	125	1800	400	24.4	54	3.3
1 EE	186	137	16.5	240	125	1800	50	3.1	15	0.9	4 CG	3800	2800	16.5	240	125	1800	400	24.4	54	3.3
1 EF	125	92	11	160	125	1800	50	3.1	15	0.9	4 EG	2800	2060	18.5	270	125	1800	400	24.4	54	3.3
1 EH	89	66	8	115	125	1800	50	3.1	15	0.9											
1 EK	62	46	5.5	80	125	1800	50	3.1	15	0.9											
Type	Static Torque ^①		Release Press.		Max. Pressure ^②		Oil Volume ^③		Release Vol. ^④		Type	Static Torque ^①		Release Press.		Max. Pressure ^②		Oil Volume ^③		Release Vol. ^④	
	[Nm]	[ft-lb]	[bar]	[psi]	[bar]	[psi]	[ccm]	[cu.in]	[ccm]	[cu.in]		[Nm]	[ft-lb]	[bar]	[psi]	[bar]	[psi]	[ccm]	[cu.in]	[ccm]	[cu.in]
2 AA	1118	825	33	480	125	1800	50	3.1	15	0.9	5 AA	10000	7380	33	480	125	1800	400	24.4	54	3.3
2 AC	799	589	23.5	340	125	1800	50	3.1	15	0.9	5 AB	9000	6640	30	435	125	1800	400	24.4	54	3.3
2 AE	559	412	16.5	240	125	1800	50	3.1	15	0.9	5 AC	8400	6200	27.5	400	125	1800	400	24.4	54	3.3
2 AF	374	276	11	160	125	1800	50	3.1	15	0.9	5 AD	7800	5750	25.5	370	125	1800	400	24.4	54	3.3
2 AH	267	197	8	115	125	1800	50	3.1	15	0.9	5 AE	6700	4940	22	320	125	1800	400	24.4	54	3.3
2 AK	187	138	5.5	80	125	1800	50	3.1	15	0.9	5 AF	5600	4130	18.5	270	125	1800	400	24.4	54	3.3
2 CA	745	550	33	480	125	1800	50	3.1	15	0.9	5 AG	5000	3690	16.5	240	125	1800	400	24.4	54	3.3
2 CC	532	392	23.5	340	125	1800	50	3.1	15	0.9	5 AH	4500	3320	14.5	210	125	1800	400	24.4	54	3.3
2 CE	373	275	16.5	240	125	1800	50	3.1	15	0.9	5 AJ	3300	2430	11	160	125	1800	400	24.4	54	3.3
2 CF	250	184	11	160	125	1800	50	3.1	15	0.9	5 CA	7500	5530	33	480	125	1800	400	24.4	54	3.3
2 CH	178	131	8	115	125	1800	50	3.1	15	0.9	5 CC	6300	4650	27.5	400	125	1800	400	24.4	54	3.3
2 CK	125	92	5.5	80	125	1800	50	3.1	15	0.9	5 CD	5900	4350	25.5	370	125	1800	400	24.4	54	3.3
2 EA	373	275	33	480	125	1800	50	3.1	15	0.9	5 CF	4200	3100	18.5	270	125	1800	400	24.4	54	3.3
2 EC	266	196	23.5	340	125	1800	50	3.1	15	0.9	5 CG	3800	2800	16.5	240	125	1800	400	24.4	54	3.3
2 EE	186	137	16.5	240	125	1800	50	3.1	15	0.9	5 EF	2800	2060	18.5	270	125	1800	400	24.4	54	3.3
2 EF	125	92	11	160	125	1800	50	3.1	15	0.9	5 EG	2500	1840	16.5	240	125	1800	400	24.4	54	3.3
2 EH	89	66	8	115	125	1800	50	3.1	15	0.9											
2 EK	62	46	5.5	80	125	1800	50	3.1	15	0.9											
Type	Static Torque ^①		Release Press.		Max. Pressure ^②		Oil Volume ^③		Release Vol. ^④		Type	Static Torque ^①		Release Press.		Max. Pressure ^②		Oil Volume ^③		Release Vol. ^④	
	[Nm]	[ft-lb]	[bar]	[psi]	[bar]	[psi]	[ccm]	[cu.in]	[ccm]	[cu.in]		[Nm]	[ft-lb]	[bar]	[psi]	[bar]	[psi]	[ccm]	[cu.in]	[ccm]	[cu.in]
3 AA	3830	2825	29.5	430	125	1800	220	13.4	21	1.3											
3 AB	3070	2265	23.5	340	125	1800	220	13.4	21	1.3											
3 AC	2880	2125	22	320	125	1800	220	13.4	21	1.3											
3 AD	2300	1695	17.5	255	125	1800	220	13.4	21	1.3											
3 AE	1920	1415	14.5	210	125	1800	220	13.4	21	1.3											
3 AF	1530	1130	12	175	125	1800	220	13.4	21	1.3											
3 AG	960	710	7.5	110	125	1800	220	13.4	21	1.3											
3 DC	1920	1415	22	320	125	1800	220	13.4	21	1.3											
3 DD	1530	1130	17.5	255	125	1800	220	13.4	21	1.3											
3 DE	1280	945	14.5	210	125	1800	220	13.4	21	1.3											
3 DF	1020	750	12	175	125	1800	220	13.4	21	1.3											
3 GC	960	710	22	320	125	1800	220	13.4	21	1.3											
3 GD	770	570	17.5	255	125	1800	220	13.4	21	1.3											
3 GE	640	470	14.5	210	125	1800	220	13.4	21	1.3											
3 GF	510	375	12	175	125	1800	220	13.4	21	1.3											
3 GG	320	235	7.5	110	125	1800	220	13.4	21	1.3											

① ±10%, new brake discs, mineral oil ISO VG32, no back pressure.

② Max. pressure 250 bar / 3600 psi available on request.

③ Approximate quantity of lubrication oil, horizontal mounting.

④ Maximum oil volume needed to fully release the brake.

Availability, Multi-Disc Brakes

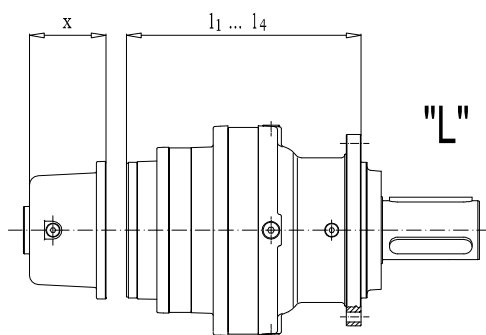
Data and dimensions are not binding and may be modified without prior notice

Gearbox Model										
Gearbox Size		In-Line						Size	Right-Angle	
	15	15 L1-L4								
	18	18 L1-L4								
	22	22 L1-L4								
	28	28 L1-L4								
	32	32 L1-L4								
	36	36 L2-L4	36 L1							
	42	42 L2-L4	42 L1							
	50	50 L2-L4	50 L1							
	60	60 L2-L4	60 L1							
	67	67 L2-L4	67 L1							
	75	75 L3-L4	75 L2	75 L1						
	85	85 L3-L4	85 L2	85 L1						
	100	100 L3-L4	100 L2	100 L1						
	110	110 L3-L4	110 L2	110 L1						
	130	130 L3-L4	130 L2	130 L1						
	140	140 L3-L4	140 L2		140 L1					
	170	170 L3-L4	170 L2		170 L1					
	200	200 L4	200 L3	200 L2	200 L1					
	220	220 L4	220 L3	220 L2	220 L1					
	260	260 L4	260 L3	260 L2	260 L1					
	300	300 L4	300 L3	300 L2		300 L1				
	360	360 L4	360 L3		360 L2		360 L1			
	420	420 L4	420 L3		420 L2		420 L1			
	480	480 L4	480 L3		480 L2		480 L1			
	560		560 L4	560 L3	560 L2		560 L1			
	630		630 L4	630 L3	630 L2		630 L1			
	750		750 L4	750 L3		750 L2				
	900		900 L4	900 L3		900 L2				
	1100		1100 L4		1100 L3		1100 L2			
	1300		1300 L4		1300 L3		1300 L2			
	1700			1700 L4	1700 L3		1700 L2			
	2100			2100 L4		2100 L3				
	2500			2500 L4		2500 L3				
Type	Distance 'x' [mm]						approx. mass [kg] approx. mass [lbs]			
1 ..	Standard, Other Motors	85.5	17.3 38.1							
	GM-05 Direct Mount "F15"	112.5	17.3 38.1							
	GM-01 Direct Mount "F11"	85.5	17.3 38.1							
2 ..	Standard, Other Motors		85	17.3 38.1						
	GM-01 Direct Mount "F21"		93	17.3 38.1						
	GM-02 Direct Mount "F22"		116	21.7 47.8						
3 ..	Standard, Other Motors				148	35 77				
	GM-01 Direct Mount "F31"				171	40 88				
	GM-02 Direct Mount "F32"				171	42 93				
4 ..	GM-04 Direct Mount "F54"					194	76 168			
5 ..	GM-04 Direct Mount "F54"					136.5	62 137	125.5	60 132	
	GM-06 Direct Mount "F56"					147.5	71 157	136.5	69 150	

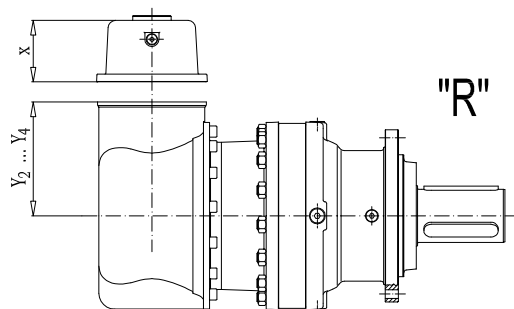
Size	Right-Angle	
36	36 R2-R4	
42	42 R2-R4	
50	50 R2-R4	
60	60 R2-R4	
67	67 R2-R4	
75	75 R2-R4	
85	85 R2-R4	
100	100 R2-R4	
110	110 R2-R4	
130	130 R2-R4	
140	140 R2-R4	
170	170 R2-R4	
200	200 R3-R4	200 R2
220	220 R3-R4	220 R2
260	260 R3-R4	260 R2
300	300 R3-R4	300 R2
360	360 R3-R4	360 R2
420	420 R3-R4	420 R2
480	480 R3-R4	480 R2
560	560 R4	560 R2-R3
630	630 R4	630 R3
750	750 R4	750 R3
900	900 R4	900 R3
1100	1100 R4	1100 R3
1300	1300 R4	1300 R3

Type	Distance 'x' [mm]		approx. mass [kg] approx. mass [lbs]
1 ..	Standard, Other Motors	85.5	17.3 38.1
	GM-05 Direct Mount "F15"	112.5	17.3 38.1
	GM-01 Direct Mount "F11"	85.5	17.3 38.1
3 ..	Standard, Other Motors		148
	GM-01 Direct Mount "F31"		171
	GM-02 Direct Mount "F32"		171

Mounting Scheme, In-Line Gears

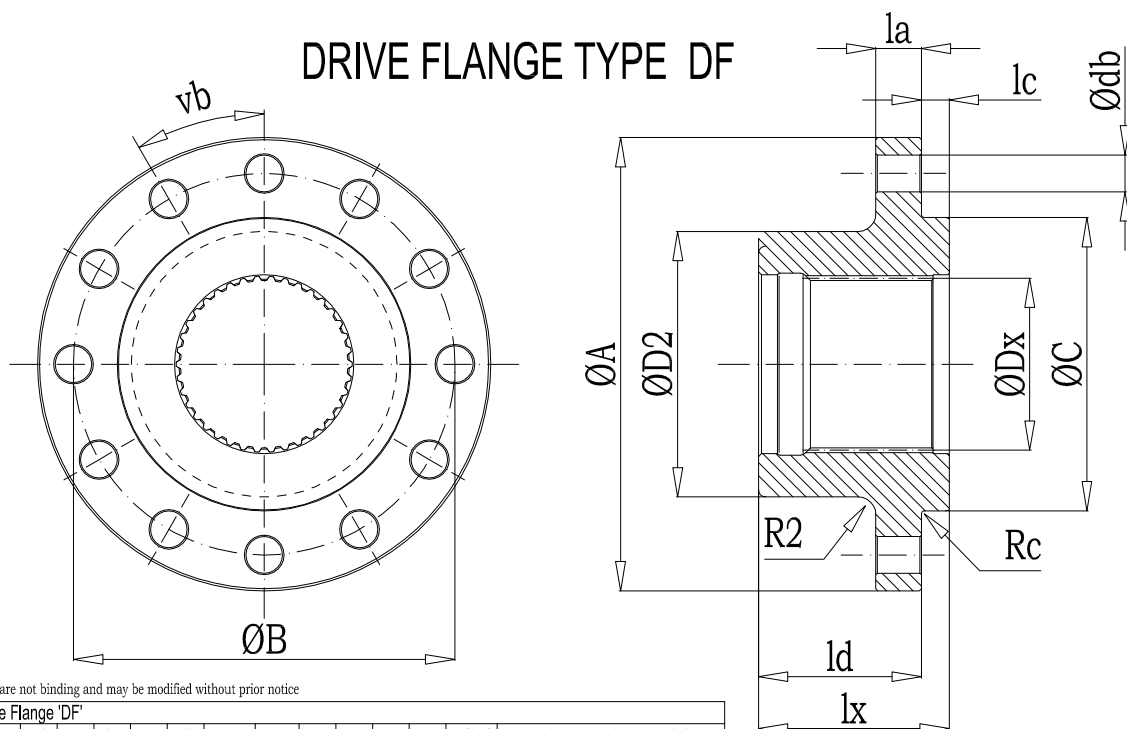


Mounting Scheme, Right-Angle Gears



Accessories

DRIVE FLANGE TYPE DF



Data and dimensions are not binding and may be modified without prior notice

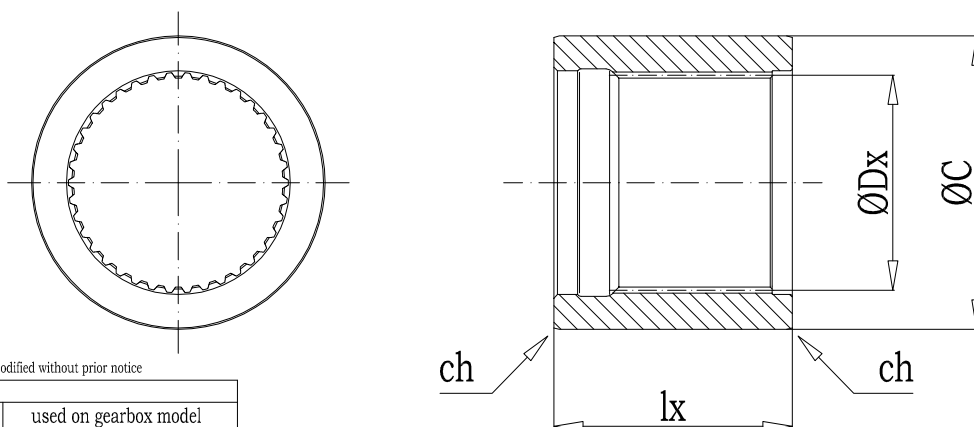
Dimensions, Drive Flange 'DF'															used on gearbox model
Type	Dx	lx	ld	A	la	B	db	vb	C	lc	Rc	D2	R2	m[kg]	
DF 40	40x36	55	47	147	12	125	10.5	6x60°	60 f7	8	1	70	6	2.2	15, 18 - X12
DF 48	48x44	55	47	147	12	125	10.5	12x30°	60 f7	8	1	70	6	2.0	22, 28, 32 - X14
DF 58	58x53	68	58	166	14	145	12.5	12x30°	95 f7	10	1	88	8	3.5	36, 42, 50, 60, 67 - X12
DF 5R	58x53	80	70	166	14	145	12.5	12x30°	95 f7	10	1	88	8	3.9	36, 42, 50, 60, 67 - X16
DF 70	70x64	90	76	208	20	175	19	12x30°	125 f7	14	1.5	120	10	8.5	75, 85, 100, 110, 130 - X12
DF 80	80x74	90	76	208	20	175	19	12x30°	125 f7	14	1.5	120	10	7.6	140, 170 - X12
DF 10	100x94	110	90	254	24	212	21	12x30°	170 f7	20	2	145	11	14.1	200, 220, 260 - X14 300, 360 - X12
DF 12	120x3	130	111	309	31	260	25	12x30°	200 f7	19	2	181	12	26.4	420, 480, 560 - X14
DF 13	130x3	130	111	309	31	260	25	12x30°	200 f7	19	2	181	12	24.2	630 - X12
DF 15	150x5	150	131	384	31	320	32	12x30°	220 f7	19	3	220	16	41.6	750, 900 - X12
DF 17	170x5	170	151	404	36	340	32	16x22.5°	240 f7	19	3	240	16	51.1	1100, 1300 - X14
DF 20	200x5	200	160	512	50	440	38	18x20°	300 f7	40	4	300	20	108.4	1700, 2100 - X12
DF 22	220x5	220	160	542	50	470	38	20x18°	320 f7	60	4	320	20	125.5	2500 - X14

DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

Material:
Alloy Steel 42CrMo4 +QT
(4140 Quenched and Tempered)

Custom versions available

SPLINE BUSH TYPE XB



Data and dimensions are not binding and may be modified without prior notice

Dimensions, Splined Bushing 'XB'						used on gearbox model
Type	Dx	lx	C	ch	m[kg]	
XB 40	40x36	55	60 f7	2x15°	0.7	15, 18 - X12
XB 48	48x44	55	68 f7	2x15°	0.8	22, 28, 32 - X14
XB 58	58x53	68	78 f7	2x15°	1.2	36, 42, 50, 60, 67 - X12
XB 5R	58x53	80	78 f7	2x15°	1.4	36, 42, 50, 60, 67 - X16
XB 70	70x64	90	95 f7	3x15°	2.3	75, 85, 100, 110, 130 - X12
XB 80	80x74	90	108 f7	3x15°	2.9	140, 170 - X12
XB 10	100x94	110	136 f7	3x15°	5.7	200, 220, 260 - X14 300, 360 - X12
XB 12	120x3	130	160 f7	3x15°	9.1	420, 480, 560 - X14
XB 13	130x3	130	195 f7	3x15°	16.4	630 - X12
XB 15	150x5	150	200 f7	3x15°	17.1	750, 900 - X12
XB 17	170x5	170	220 f7	3x15°	21.4	1100, 1300 - X14
XB 20	200x5	200	280 f7	4x15°	48.5	1700, 2100 - X12
XB 22	220x5	220	290 f7	4x15°	50	2500 - X14

DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

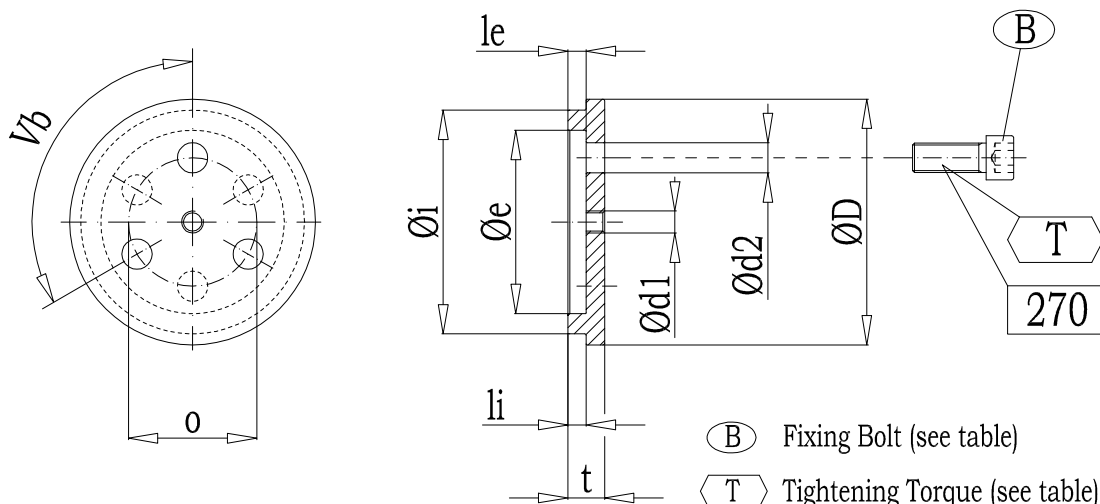
Material:
Weldable Steel St 52 (E 355, Gr.65)

Carbonitriding necessary to achieve
full performance of spline profile

Custom versions available

Accessories

FIXING FLANGE TYPE FF



Ⓑ Fixing Bolt (see table)

 T Tightening Torque (see table)

270 Use Locking Agent, 270 or equivalent

Data and dimensions are not binding and may be modified without prior notice

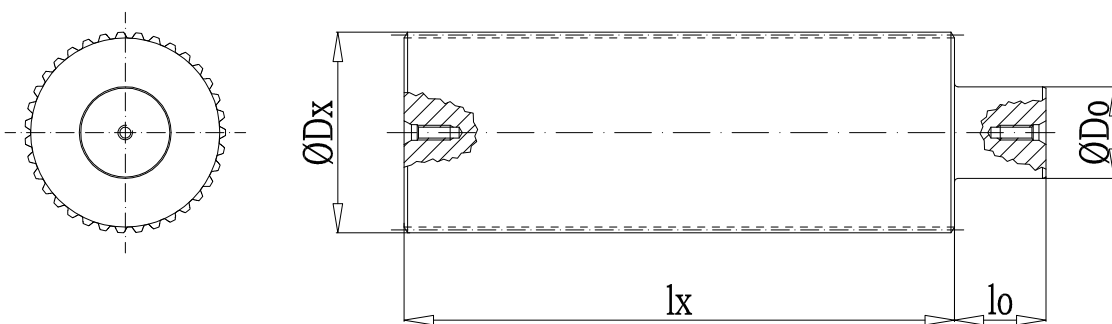
Dimensions, Fixing Flange FF																
Type	D	d1	d2	Vb	e	le	i	li	o	t	B	DIN 912	T[Nm]	T[lb-ft]	m[kg]	used on gearbox model
FF 40	49	M6	6.5	3x120°	35 K7	5	42/7	5	24	9	M6x16-12.9	14	10	0.07	15, 18 - X12	
FF 48	58	M8	8.5	3x120°	43 K7	5	50/7	5	29	10	M8x20-12.9	35	26	0.12	22, 28, 32 - X14	
FF 58	69	M8	10.5	3x120°	50 K7	7.5	60/7	7.5	32	13	M10x25-12.9	69	51	0.20	36, 42, 50, 60, 67 - X12, X16	
FF 70	79	M10	10.5	3x120°	62 K7	9	72/7	9	40	17	M10x25-12.9	69	51	0.36	75, 85, 100, 110, 130 - X12	
FF 80	92	M10	12.5	3x120°	70 K7	9	82/7	9	45	17	M12x30-12.9	120	89	0.49	140, 170 - X12	
FF 10	114	M10	14.5	3x120°	85 K7	11	105/7	11	65	21	M14x35-12.9	190	140	1.01	200, 220, 260 - X14	300, 360 - X12
FF 12	134	M12	16.5	3x120°	100 K7	10	122/7	10	70	20	M16x40-12.9	295	218	1.35	420, 480, 560 - X14	
FF 13	144	M12	16.5	3x120°	110 K7	10	132/7	10	70	20	M16x40-12.9	295	218	1.53	630 - X12	
FF 15	164	M12	16.5	3x120°	125 K7	12	151/7	12	70	22	M16x40-12.9	295	218	2.13	750, 900 - X12	
FF 17	184	M12	16.5	3x120°	145 K7	11.5	171/7	11.5	90	23.5	M16x40-12.9	295	218	2.13	1100, 1300 - X14	
FF 20	226	M16	16.5	6x60°	170 K7	19	202/7	19	140	44	M16x60-12.9	295	218	9.0	1700, 2100 - X12	
FF 22	246	M16	16.5	6x60°	190 K7	19	222/7	19	160	44	M16x60-12.9	295	218	10.6	2500 - X14	

DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

Material:
Steel C40 (1040)

Custom versions available

SPLINE ROD TYPE ZR



Data and dimensions are not binding and may be modified without prior notice

Dimensions, Splined Rod 'ZR'						
Type	Dx	lx	Do	lo	m[kg]	used on gearbox model
ZR 40	40x36	230	—	—	2	15, 18 - Z21
ZR 45	45x41	230	—	—	2.6	22, 28, 32 - Z23
ZR 58	58x53	230	—	—	4.3	36, 42, 50, 60, 67 - Z21
ZR 70	70x64	250	30 h9	30	7	75, 85, 100, 110, 130 - Z21
ZR 80	80x74	250	30 h9	30	9.2	140, 170 - Z21
ZR 90	90x74	250	30 h9	30	11.7	200, 220, 260 - Z23
ZR 10	100x94	300	50 h9	50	18	300, 360, 420 - Z21
ZR 11	110x93	300	50 h9	50	21.7	480, 560 - Z23
ZR 13	130x93	300	50 h9	50	30.2	630 - Z21
ZR 15	150x95	300	50 h9	50	39.1	750, 900 - Z21
ZR 16	160x95	300	50 h9	50	44.6	1100, 1300 - Z23
ZR 20	200x95	400	70 h9	70	95	1700, 2100 - Z21
ZR 21	210x95	400	70 h9	70	105	2500 - Z23

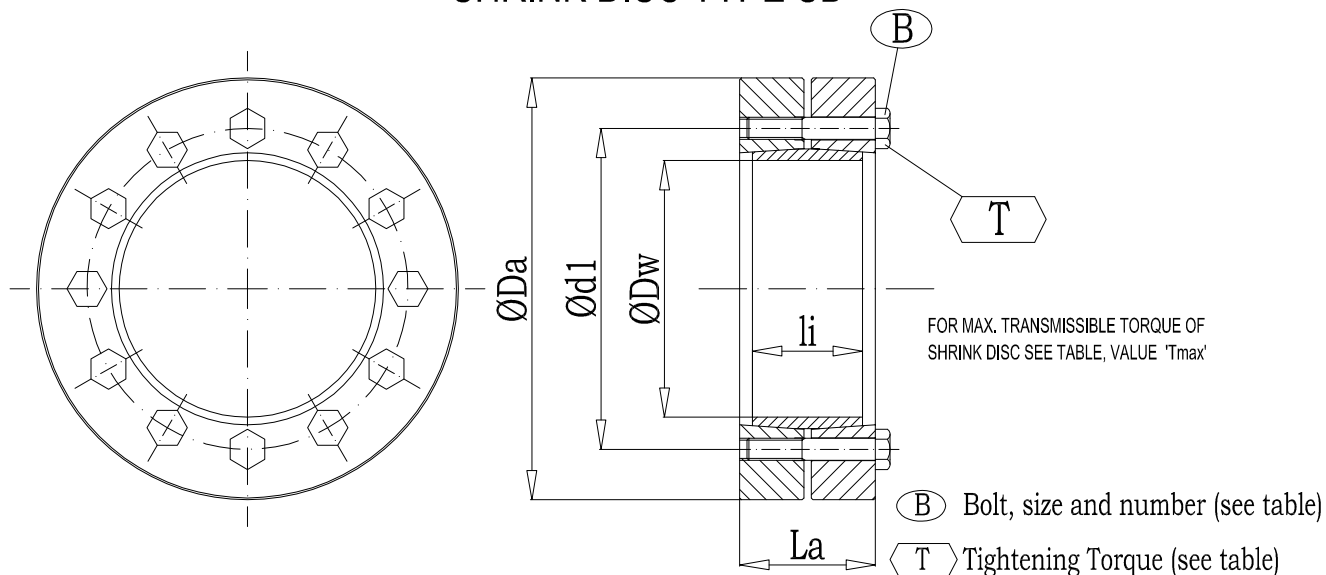
DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

Material:
Alloy Steel 42CrMo4 +QT
(4140 Quenched and Tempered)

Custom versions available

Accessories

SHRINK DISC TYPE SD



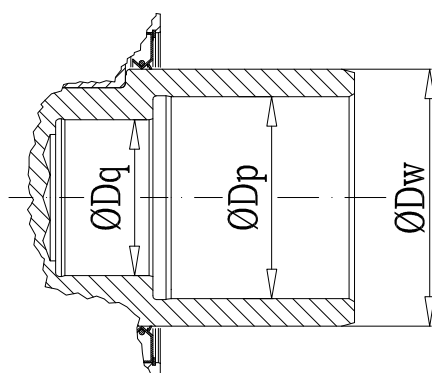
Data and dimensions are not binding and may be modified without prior notice

Dimensions, Shrink Disc 'SD'												
Type	Dw	Da	d1	li	La	B	T[Nm]	T[lb-ft]	m[kg]	Tmax[Nm]	Tmax[lb-ft]	Gearbox Model
SD 60	60	110	86	23	31	8 x M6	12	9	1.3	2300	1700	15, 18, 22, 28, 32 - P24
SD 90	90	155	114	30	39	10 x M8	30	22	3.3	7250	5350	36, 42, 50, 60, 67 - P24
SD 110	110	185	136	39	50	9 x M10	59	44	5.9	10800	7950	75, 85, 100, 110, 130 - P24
SD 125	125	215	160	55	65	10 x M12	100	74	11	20000	14750	140, 170, 200, 220, 260 - P20
SD 125	125	215	160	55	65	10 x M12	100	74	11	22500	16600	140, 170, 200, 220, 260 - P22
SD 140	140	230	175	60	74	12 x M12	100	74	13	29500	21750	140, 170, 200, 220, 260 - P24
SD 165	165	290	210	72	88	10 x M16	250	185	26	55000	40550	300, 360, 420, 480, 560 - P24
SD 185	185	330	236	92	112	14 x M16	250	185	47	78000	57550	630 - P22
SD 200	200	350	246	92	112	15 x M16	250	185	50	108000	79650	750, 900 - P22
SD 220	220	370	270	114	134	20 x M16	250	185	65	147000	108400	1100, 1300 - P24
SD 260	260	430	321	136	160	18 x M20	490	360	100	240000	177000	1700, 2100, 2500 - P22

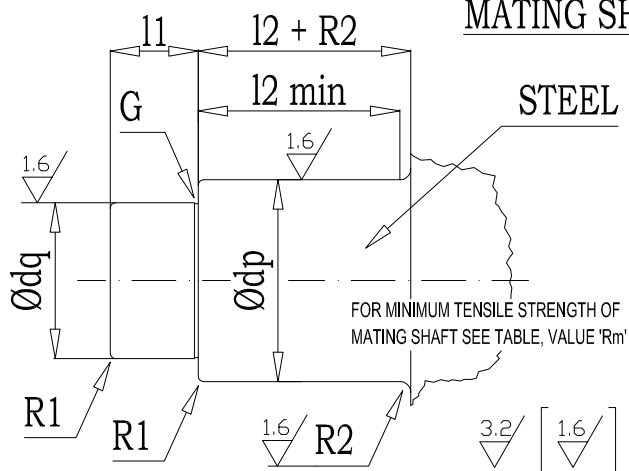
DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

RECOMMENDED DIMENSIONS OF MATING SHAFT

GEARBOX SHAFT



MATING SHAFT

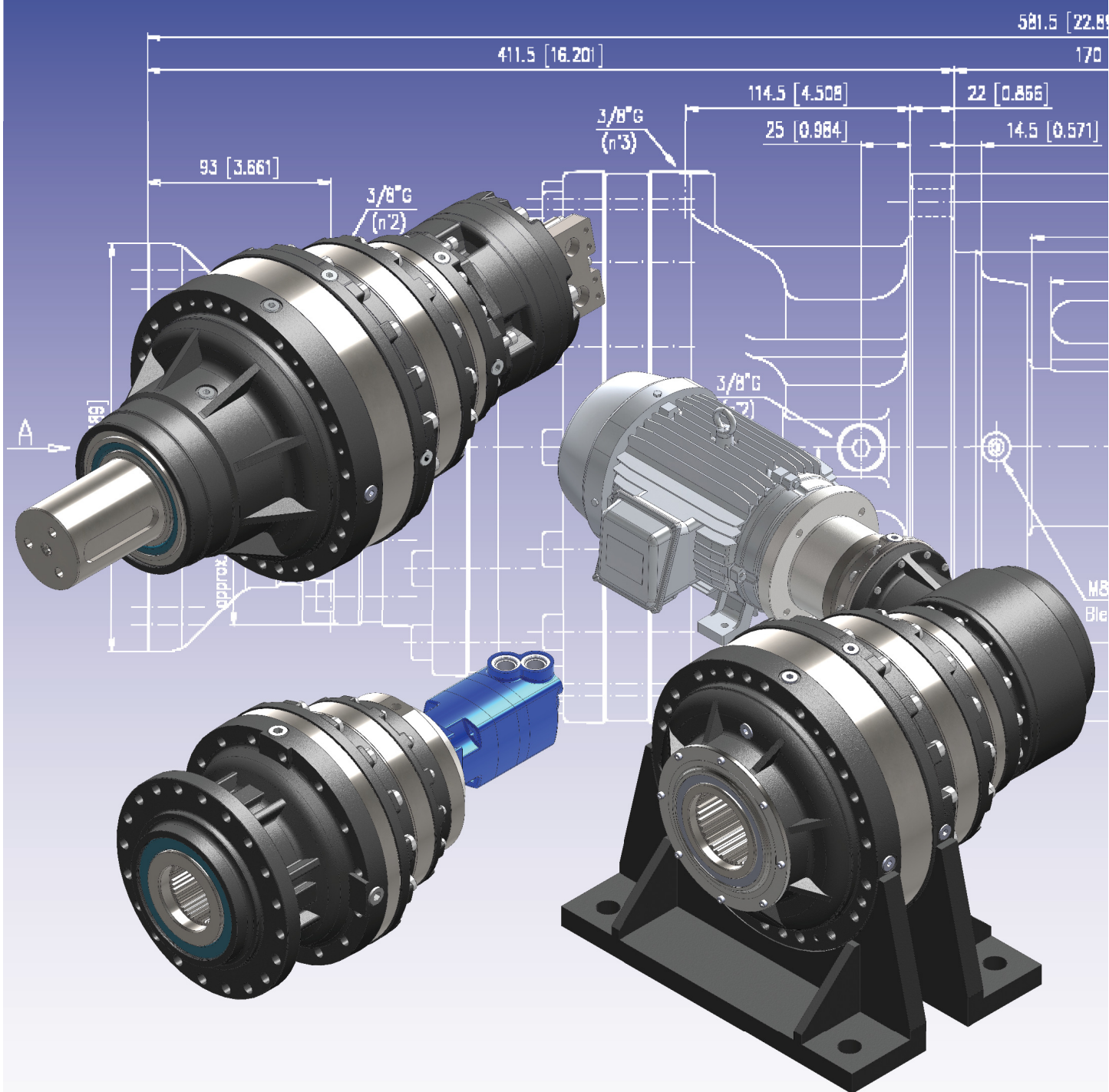


Data and dimensions are not binding and may be modified without prior notice

Recommended Dimensions of Mating Shaft								
Type	dq	l1	R1	dp	l2 min	R2 min	G (DIN509)	Rm (of mating shaft)
SD 60	35 g6	21	2	50 h6	50	3	F1.0x0.2	600 MPa min.
SD 90	50 g6	25	3	75 g6	70	4	F1.0x0.2	600 MPa min.
SD 110	70 g6	52	4	85 g6	90	5	F1.6x0.3	600 MPa min.
SD 125	80 g6	38	4	95 g6	100	5	F1.6x0.3	700 MPa min.
SD 125	85 g6	38	4	100 g6	100	5	F2.5x0.4	700 MPa min.
SD 140	85 g6	48	5	110 g6	110	6	F2.5x0.4	700 MPa min.
SD 165	100 g6	57	5	130 g6	115	6	F2.5x0.4	750 MPa min.
SD 185	110 g6	57	5	140 g6	145	6	F2.5x0.4	750 MPa min.
SD 200	130 g6	62	5	160 g6	160	8	F4.0x0.5	750 MPa min.
SD 220	130 g6	72	5	170 g6	170	8	F4.0x0.5	800 MPa min.
SD 260	170 g6	95	5	200 g6	210	8	F4.0x0.5	800 MPa min.

DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED

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