NEETER DRIVE
SPIRAL BEVEL GEARBOXES

Section 4.1. - Bevel Gearboxes Range P

Compact 'Monobloc' Design
2-way, 3-way and 4-way
Solid Shaft and Hollow Shaft
Manual Disengage / Reversing Types
1:1, 2:1 and 3:1 gear ratios
Power Ratings: 0.1 ➔ 7.35 kW
Torque Ratings: 1.5 Nm ➔ 40 Nm

Section 4.2. - Bevel Gearboxes Range N

Ultra Compact Design
2-way, 3-way and 4-way
Solid Shaft and Hollow Shaft
Motor Adaptors
1:1, 2:1, 3.1 and 4:1 gear ratios
Power Ratings: 0.1 ➔ 226 kW
Torque Ratings: 15 Nm ➔ 3000Nm

4. bevel **gearboxes** (neeter drive)

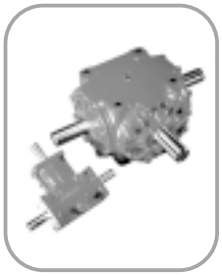
Section 4.3. - Bevel Gearboxes Range BA

Cubic shape with universal mounting on all sides
2-way, 3-way and 4-way
Solid Shaft and Hollow Shaft
Motor Adaptors
1:1, 2:1, 3:1, 4:1, 5:1 and 6:1 gear ratios
Torque Ratings: 10 Nm ➔ 9000 Nm

Section 4.4. - Bevel Gearboxes Range Power Gear

More than 100% more performance for construction sizes
Compact cubic design mounting holes on all sides
2-way, 3-way and 4-way
Solid Shaft and Hollow Shaft
Motor Adaptors
1:1, 2:1, 3:1, 4:1 and 5:1 gear ratios
Torque Ratings: 25 Nm ➔ 5200 Nm

Section Index



Picture Index

Cubic Actuators

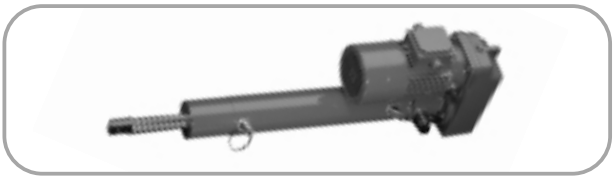
Metric Actuators

Metric Ball Screw Actuators

Stainless Steel Actuators

EMA Actuators

Ball Screw Rolaram Actuator



Roller Screw Rolaram Actuator

Special Actuators

Imperial Actuators

Imperial Ball Screw Actuators

Roller Screw and Special Actuators

Spiracon Roller Screw

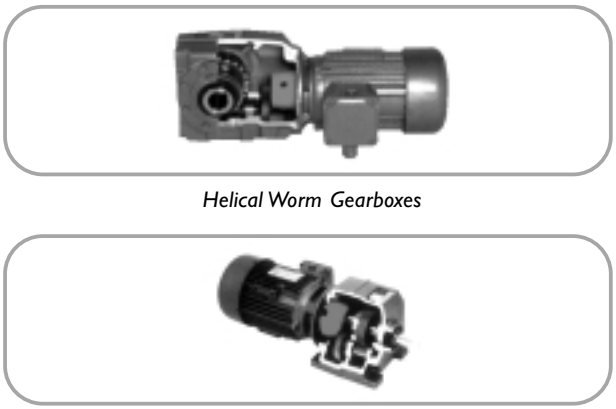
P-Range Bevel Gearboxes

N-Range Bevel Gearboxes

BA-Range Bevel Gearboxes

Electric Motors

Couplings and Drive Shafts



Helical Worm Gearboxes

In-Line Helical Gearboxes

Proximity and Contact Limit Switches

Rotary Limit Switches

Encoders

Position Indicators

Engineers Reference

Company Profile

Power Jacks is the largest and most experienced manufacturer of actuators and mechanical jacks in the UK. With our range of Power Jacks and Duff-Norton actuators you don't just get the product, you also get the knowledge and experience from a company that has, since 1883, manufactured quality industrial lifting, positioning and materials handling equipment.

On our extensive site in Fraserburgh, Aberdeenshire, we have a wide range of engineering facilities including CAD/CAM/CAE technology to aid engineering design and manufacture, an advanced production control system ensuring the optimum product flow through our comprehensive range of conventional and CNC machining facilities, which maximises efficiency and reduces delivery times. This is achieved with our 100+ highly trained employees, giving Power Jacks the capability to produce mechanical engineering of the highest standards.

Quality is a key part of Power Jacks working philosophy and built into the product from initial design conception, through production, to installation and after sales service.

There are over two million of our actuators successfully in operation world-wide. The Power Jacks Group are a global market leader in Linear Actuation Systems.

Power Jacks Ltd Extensive Site in Fraserburgh, Aberdeenshire

By specifying a Power Jacks product you are assured of quality, reliability, performance and value. In the United Kingdom there are a team of highly experienced sales engineers to assist customers with their actuation applications whether on site or by direct communications with the Fraserburgh factory. For overseas customers there is an extensive distributor network world-wide.

Power Jacks Standard Product Range Covers:-

Machine Screw Worm Gear Actuators (Screw Jacks)

Ball Screw Actuators (Screw Jacks)

Stainless Steel Actuators (Screw Jacks)

Micro-Miniature Actuators

TracMaster Electro-Mechanical Linear Actuators

EMA Electro-Mechanical Linear Actuators

Rolaram Electro-Mechanical Linear Actuators

Mechanical Jacks

Neeter Drive Bevel Gear Boxes

Reduction Gear Boxes

Power Transmissions

Accessories for Complete Actuator Systems

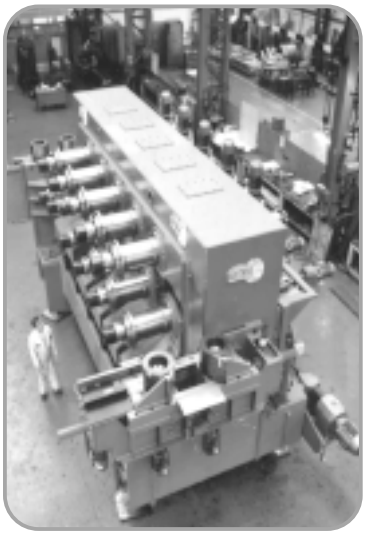
Actuator Motion Control Systems

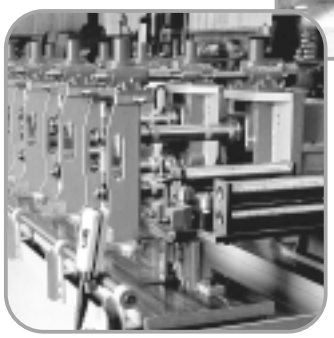
Track (Rail) Jacks

Hydraulic Jacks

Hydraulic Cylinders

Hydraulic Pumps and Tools





Both Metric and Imperial Products are available.

As well as these standard products Power Jacks has a dedicated engineering team for the design of "Special" products to suit all customer requirements.

These products can be provided as individual parts or single or multiple systems with full engineering consultancy available as part of the service.

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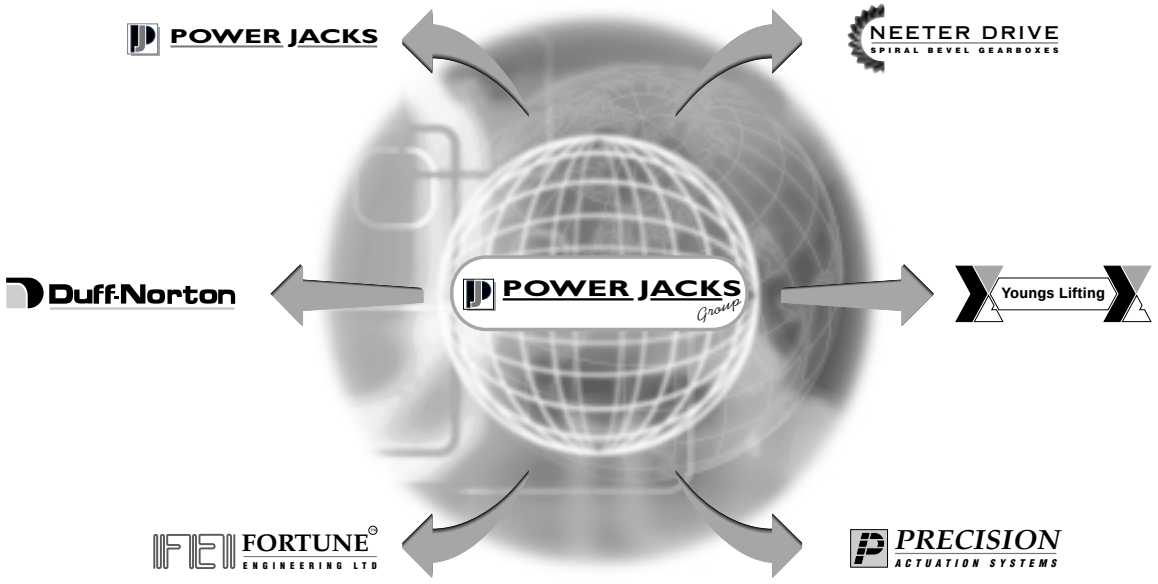
Internet: http://www.powerjacks.com

Company Profile

The Power Jacks Group is an engineering group focused on providing customers with the best solution for precision linear actuation, power transmission, mechanical jacking, hydraulic jacking and engineering service. The engineering history of the group dates from 1883 and the products and service are supplied to customers world-wide.

The Power Jacks Group Brings Together



Representation

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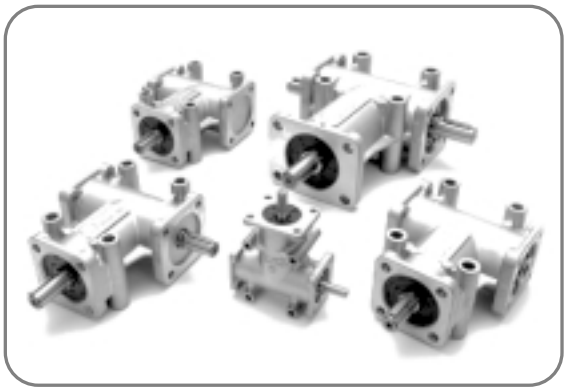
NEETER DRIVE
SPIRAL BEVEL GEARBOXES



4.1. Bevel Gearboxes - Neeter Drive - Range - P

4.1.1. Neeter Drive - Range - P - Design Overview

4.1.1.1. General Design Feature Housing

A compact "monobloc" design provides a visually attractive, quality finished, casing, produced from die-casting, in lightweight, aluminium alloy. Several alternative fixing options are provided each via 4 fixing holes, as well as, through 4 holes in integrally cast, small base-mounting bosses, on widely-spaced centres - for more stable mounting, to top or bottom thereby offering universal and exceptionally firm attachment facilities.

4.1.1.2. Bevel Gears

The GLEASON spiral bevel gears, of case-hardened alloy steel, provide an advancing, simultaneous mesh across several adjacent teeth, thereby ensuring smooth, evenly distributed, high load transmission, which is enhanced by, bi-directional, "running-in", in pairs.

4.1.1.3. Shafts

Shafts are of case-hardened and ground alloy-steel. Exceptions are: both, the smallest casting sizes, types 2000 & 2002 and types 2012 & 2028, where shafts are all of hardened and tempered, low alloy-steel. Bearings All shafts are carried by generously sized, high quality, deep groove, ball bearings of established make.

4.1.1.4. Design Speed and Life

Optimum performance, at continuous full rated power transmission, is based on an input-shaft design-speed of 1400 RPM. This provides an average, trouble-free, operating design-life of 10000 hours. However, where "ratio geared" units are used as speed "increasers", optimum performance, "input" design-speed is reduced to 500 RPM for the 1:3 ratios and, to 750 RPM for the 1:2 ratios. For all the types 4-way and 3-way independent shaft with a gear ratio different of 1:1, the input shaft is the shaft A (quickly), the shaft C (quickly) is the out shaft, the shafts B and D are slow.

4.1.1.5. Operating Temperature

Due to the compact "monobloc" design, operating case-temperature should be kept within the permissible limit of -18 °C to +80 °C (0°F to 170°F), to ensure trouble-free running.

4.1.1.6. Operating Noise

Close tolerance gear cutting and high accuracy assembly ensures extremely low operating noise levels, even at high running speeds.

4.1.1.7. Alignment Accuracy

Standard unit, final gear train assembly, angular clearances are held to within 15' - 30' of arc.

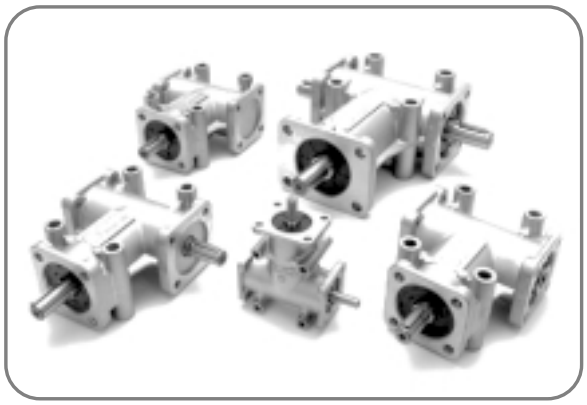
4.1.1.8. Lubrication

All units are supplied fully charged with oil. The 2000 series is lubricated with synthetic oil. The lubrication is a life one, they do not need replenishments or changes for the lifetime of the gear.

The above details are for series 2000 gearboxes. For 4000 gearbox details please consult Power Jacks.

For full catalogue with dimensions please consult Power Jacks.

4.1.2. Series P - 2000



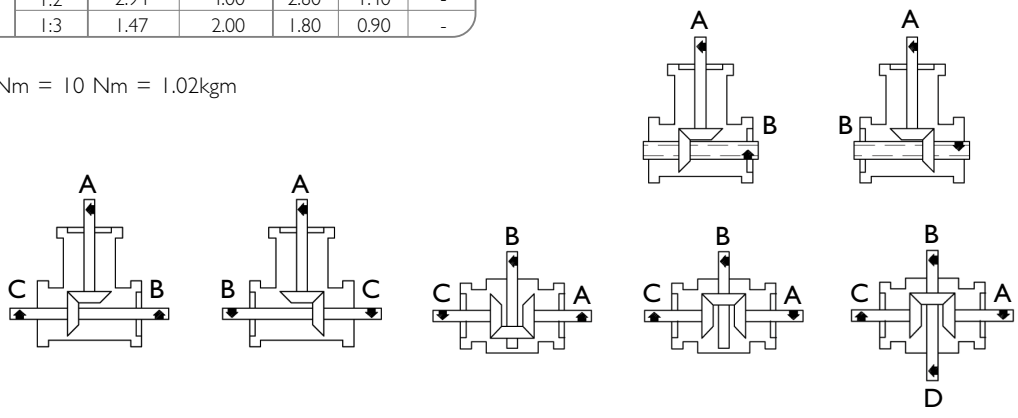
4-Hole flange mount, 2-way, 3-way and 4-way in solid and hollow shaft versions.

4.1.2.1. Gearbox Capacity Rating Performance Table

Type	Gear Ratio Option	Max input shaft "A" power at1400 rpm		Max output shaft torque in da Nm		
		kW	HP	B	C	D
2000	1:1	0.42	0.58	0.30	-	-
	1:2	0.10	0.14	0.15	-	-
2002	1:1	0.42	0.58	0.15	0.15	-
	1:2	0.10	0.14	0.08	0.08	-
2006	1:1	1.83	2.50	0.45	0.45	0.45
	1:2	0.50	0.68	0.25	0.25	0.25
	1:3	0.25	0.34	0.17	0.17	0.17
2007	1:1	1.83	2.50	0.90	0.45	-
	1:2	0.50	0.68	0.50	0.25	-
	1:3	0.25	0.34	0.35	0.17	-
2008	1:1	1.83	2.50	0.65	0.65	-
	1:2	0.50	0.68	0.35	0.35	-
	1:3	0.25	0.34	0.25	0.25	-
2011	1:1	1.83	2.50	1.30	-	-
	1:2	0.50	0.68	0.70	-	-
	1:3	0.25	0.34	0.50	-	-
2012	1:1	1.83	2.50	1.30	-	-
	1:2	0.50	0.68	0.70	-	-
	1:3	0.25	0.34	0.50	-	-
2025	1:1	7.35	10.00	3.50	1.80	-
	1:2	2.94	4.00	2.80	1.40	-
	1:3	1.47	2.00	1.80	0.90	-

Type	Gear Ratio Option	Max input shaft "A" power at 1400 rpm		Max output shaft torque in da Nm		
		kW	HP	B	C	D
2026	1:1	7.35	10.00	1.80	1.80	1.80
	1:2	2.94	4.00	1.40	1.40	1.40
	1:3	1.47	2.00	0.90	0.90	0.90
2027	1:1	7.35	10.00	1.66	1.66	1.66
2028	1:1	5.50	7.50	3.80	-	-
	1:2	1.83	2.50	2.50	-	-
	1:3	0.91	1.25	1.80	-	-
2030	1:1	5.50	7.50	3.80	-	-
	1:2	1.83	2.50	2.50	-	-
	1:3	0.91	1.25	1.80	-	-
2031	1:1	5.50	7.50	1.90	1.90	-
	1:2	1.83	2.50	1.25	1.25	-
	1:3	0.91	1.25	0.90	0.90	-
2032	1:1	7.35	10.00	5.00	-	-
	1:2	2.94	4.00	4.00	-	-
	1:3	1.47	2.00	2.80	-	-
2033	1:1	7.35	10.00	2.50	2.50	-
	1:2	2.94	4.00	2.00	2.00	-
	1:3	1.47	2.00	1.40	1.40	-

1 da Nm = 10 Nm = 1.02kgm



For full catalogue with dimensions please consult Power Jacks

4.1.3. Series P - 2000 - Manual Disengage/Reversing

4.1.3.1. Design Features

Generally comprising of the same basic design characteristics as the range of right angle gearboxes with the added facility, within the housing, for manual disconnection or "reversed rotation" re-engagement of the output drive shaft. This is effected by hand rotation of a control knob located on one side of the housing to provide 3 positive control positions. The control knob can engage with the power train of 3 straight bevel gears. "Central position": the drive output is fully disconnected allowing it to "idle" or "free-wheel". "Left position": engagement in one direction to provide forward output rotation. "Right position": engagement in the other direction to provide reverse output rotation.

Note: manual engagement & disengagement must ONLY be carried out when all shafts and, particularly, the output shafts are stationary (unless, both driving and driven inertias are small - and, even then, speeds should not exceed 200 RPM).

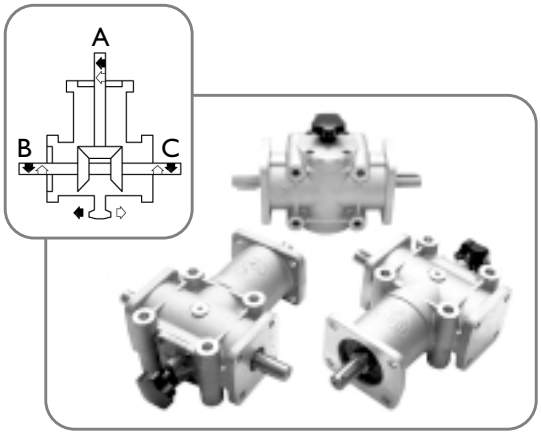
4.1.3.2. Gearbox Capacity Rating Performance Table

All Gear ratios = 1:1

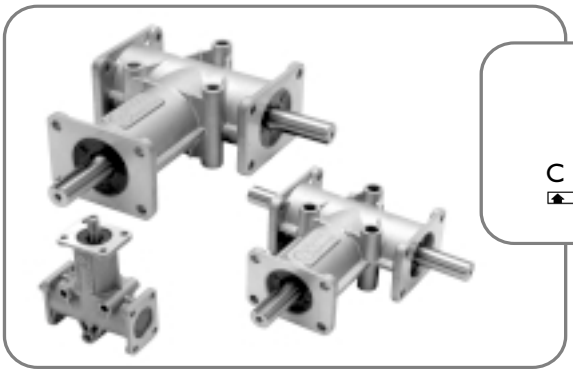
Type	Max input shaft "A" power at 1400 rpm	Max output shaft torque in da Nm		
	kW	B	C	D
2019	2.25	3	1.55	-
2020	2.25	3	1.55	-
2023	2.25	3	0.755	0.755

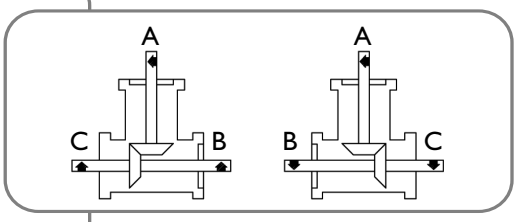
1 da Nm = 10 Nm = 1.02 kgm

For full catalogue with dimensions please consult Power Jacks.



4.1.4. Series P - 4000





3-Hole flange mount, 2-way and 3-way in solid shaft versions.

4.1.4.1. Gearbox Capacity Rating Performance Table

Type	Gear Ratio Option	Max input shaft "A" power at 1400 rpm		Max output shaft torque in da Nm	
		kW	HP	B	C
4000	1:1	0.37	0.50	0.24	-
	1:2	0.15	0.20	0.20	-
4002	1:1	0.37	0.50	0.12	0.12
	1:2	0.15	0.20	0.10	0.10
4008	1:1	1.30	1.75	0.44	0.44
	1:2	0.50	0.70	0.34	0.34
4011	1:1	1.30	1.75	0.88	-
	1:2	0.50	0.70	0.68	-

1 da Nm = 10 Nm = 1.02kgm

Type	Gear Ratio Option	Max input shaft "A" power at 1400 rpm		Max output shaft torque in da Nm	
		kW	HP	B	D
4030	1:1	4.00	5.50	2.72	-
	1:2	1.50	2.00	2.00	-
4031	1:1	4.00	5.50	1.36	1.36
	1:2	1.50	2.00	1.00	1.00
4032	1:1	6.50	8.80	4.40	-
	1:2	3.00	4.08	4.09	-
4033	1:1	6.50	8.80	2.20	2.20
	1:2	3.00	4.08	2.04	2.04

For full catalogue with dimensions please consult Power Jacks

Contents

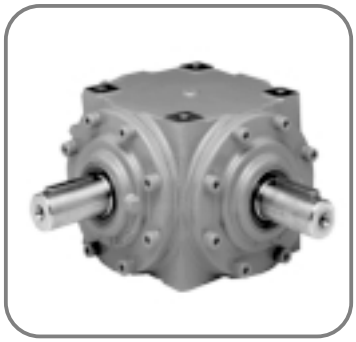
NEETER DRIVE
SPIRAL BEVEL GEARBOXES

4.1. Bevel Gearboxes - Neeter Drive - Range - N

4.2.1. Neeter Drive Spiral Bevel Gearbox Characteristics

Neeter Drive Series 35 - 40 Spiral Bevel Gearboxes

The NEETER DRIVE gearbox is an ultra compact unit and is available in 5 sizes and 5 gear ratios. The design employs a central bearing housing support on the 1:1 and 1.5:1 gear ratios, and a small extended bearing housing on the input side of the gearboxes with ratios 2:1 and above and hollow shaft output. It is a high torque rated unit with good thermal characteristics. It is available in solid shaft and hollow output shaft configurations and has the option of a motor mounting flange, for easy direct coupling of a standard electric motor.



NEETER DRIVE
SPIRAL BEVEL GEARBOXES

4.2.1.1. Spiral Bevel Gearbox Characteristics

Housing: S.G. Iron to BS27789:1985, Grade 420/12.

Gears: All gears are made from alloy steel and case hardened.

Bearings: Pinion (input) and gear shaft (output) are fitted with twin taper roller bearings to provide almost unchanged backlash over a long life.

Sealing: All units are fitted with spring energised single lipped oil seals and all flanges are sealed by O-rings.

Lubrication: Lubrication is dependent upon the operating conditions, oil for higher speeds and semi fluid grease for medium and low speeds.

Note: *All units are shipped dry from the factory and should be lubricated before use.*

Service Life: Life of gears including mountings 10000 hours

Efficiency: Reduction ratio bevel gear units are approximately 95% - 98% efficient. Please consult Neeter Drive regarding increasing ratios.

Overhung Loads: All units are rated for in-line connection. If a unit is to be fitted with a belt pulley, chain sprocket etc., radial forces must be considered. If in doubt please consult Neeter Drive.

Note: *Where operating conditions deviate from those described above please consult Neeter Drive.*

4.2.2. How to Select a Neeter Drive Unit

4.2.2.1. Selecting a Unit

When selecting a gearbox, there are a number of factors which can influence the final size of unit selected. The information contained in the selections gearbox characteristics (4.2.1.) and Technical data (4.2.3.) provide details of these factors for use in the selection process.

The following Selection Procedure provides a step-by-step guide to gearbox selection for those not fully familiar with the procedures. An example has been used in the selection procedure to assist in following through the procedure.

Example

A gearbox is required for an Input Speed of 1000 rpm, an Output Speed of 500 rpm, an Output Torque of 150Nm and one Output Shaft. The Drive is by electric motor through a clutch mechanism and the gearbox is on the main drive of a heavy duty stacking machine. The machine operates for 10 hours per day, starts 8 times per hour and operates for 35 minutes in every hour, the other 25 minutes being taken up in loading the machine. The ambient temperature of the premises is 20°C.

Specified Information

1.	Gearbox Input Speed (rpm)	**1.** 1000
2.	Gearbox Output Speed (rpm)	**2.** 500
3.	Gearbox Configuration (refer Section 4.2.5.)	**3.** 2 Way (2)
4.	Required Output Torque (Nm)	**4.** 150
5.	Operating Hours per Day (refer Section 4.2.3.)	**5.** 10
6.	Input Power Source (refer shock load table)	**6.** Electric Motor
7.	Gearbox Application (refer shock load table)	**7.** Stacking Machine
8.	Number of Starts per Hour (refer Section 4.2.3.3.)	**8.** 8
9.	Transmission Methods (refer transmission mechanism, Section 4.2.3.5.)	**9.** Clutch
10.	Duty Cycle per Hour (% Running time)	**10.** 35/60 = 58%
11.	Operating Ambient Temperature (refer Thermal Limit, Section 4.2.3.6.)	**11.** 20° C

4.2.2.2. Selection of Design Factors

Step 1 Shock Load Factor (f_1) — **Step 1** 1.50

Using the Specified Information in Points 5, 6 and 7 above, select the Shock Load Factor from the Table in Section 4.2.3.2

Step 2 Starting Frequency Factor (f_2) — **Step 2** 1.00

Using the Specified Information in Point 8 above, select the Starting Frequency Factor from the Table in Section 4.2.3.3

Step 3 Transmission Load Factor (f_3) — **Step 3** 1.00

Using the Specified Information in Point 9 above, select the Transmission Load Factor from the Table in Section 4.2.3.4.

Step 4 Thermal Limit - Duty Cycle - Factor (f_4) — **Step 4** 1.25

Using the Specified Information in Point 10 above, select the Thermal Limit - Duty Cycle - Factor from the Table in Section 4.2.3.6.1.

Step 5 Thermal Limit- Ambient Temperature - Factor (f_5) — **Step 5** 1.00

Using the Specified Information in Point 11 above, select the Thermal Limit - Ambient Temperature - Factor from the Table in Section 4.2.3.6.2.

4.2.2.3. Calculated Data

Step 6 **Calculate the Gear Ratio = Input Speed ÷ Output Speed**

Note: *If the gear ratio does not correspond to one of the STANDARD ratios contained in this technical manual, one of the speeds, normally the output speed, must be changed to bring the ratio to standard. Non-standard ratios can be supplied, if required, but such special selections must be referred to Neeter Drive.*

Step 6 1000/500 = 2
Therefore 2:1 Reduction

Step 7 **Calculate the Corrected Output Torque = Required Output Torque x f_1 x f_2 x f_3**

Note: *Where there is more than one output shaft, the Required Output Torque for the gearbox is the summation of the individual Output Torques from the output shafts.*

Step 7 150 x 1.25 x 1.00 x 1.00 = 187.5 Nm

Step 8 **Calculate the Corrected Output Power = Required Output Torque x Output Speed ÷ 9550**

Step 8 (187.5 x 500) ÷ 9550 = 9.82 kW

Step 9 **Calculate the Input Power = Output Power ÷ Efficiency**
(Gearbox efficiency is between 95% and 98% after initial running in)

Step 9 9.82 ÷ 0.98 = 10.02 kW

4.2.2.4. Gearbox Selection

Step 10 **From the GEARBOX RATINGS TABLE, select the gearbox with the closest adequate rated Power.**

Step 10 From the Selection Table in Section 4.2.4., for Input Power 10.02 kW, gear ratio 2:1, Output Torque 315 Nm and Input Speed 1000 rpm, select Series 39.

Step 11 **When selecting a gearbox, the Thermal Capacity of the gearbox chosen must be considered. For the Limiting Thermal Capacity, expressed as a Power Rating, refer to Section 4.2.3.6.3. For the selected gearbox, calculate the Thermal Capacity = Limiting Thermal Capacity x f_4 x f_5.**

The Calculated Input Power must not exceed this Calculated Thermal Capacity. A larger gearbox must be selected if the Calculated Input Power is higher and a check run on the other parameters

Step 11 From the table in Section 4.2.3.6.3, Limiting Thermal Capacity for Series 39 is 49kW.

Calculate the gearbox,
Thermal Capacity = 49 x 1.25 x 1.00 = 73.5 kW

The Input Power is within this limit.
Selected gearbox is ok.

Step 12 **As a final check on the capacity of the chosen gearbox, the effect of the connected drive systems must be considered. The section headed Permissible Shaft Loading describes the calculation to be undertaken where the transmission mechanism can give rise to radial and/or axial forces on the gear shafts. This occurs, particularly, where chain and belt drives are employed.**

Step 12 Power transmission is by clutch. From the Transmission Load Factor table (refer Section 4.2.3.5), there are no additional loads to be considered and the selection of gearbox is acceptable.

4.2.3. Neeter Drive Technical Data

4.2.3.1. Capacity and Torque

Refers to the rated capacity and rated torque on the basis of the following nominal values:

- Shock-free operation
- Operating time per day = 8 hours
- Max. 20 starts per hour (torque x 1.5 permissible)
- Duty cycle 100%
- Life of gears including mountings 10000 hours
- When selecting gearboxes please take thermal capacity into consideration.
- Ambient temperature approx. 20° C (-10° to +50°C capacity into consideration permissible)

4.2.3.2. Shock Load Factor (f_1)

Shock Load Category		
I	II	III
Conveyor Belts	Heavy Duty Lifts	Punching Machine
Generators	Hoists	Shears
Ventilators	Mixers	Forging Presses
Light Textile Machinery	Cranes	Vibrators
Rotating Machine Tools	Heavy Duty Textile Machinery	Rolling Mills
	Woodworking Machinery	Extremely Heavy Lifts
	Paper Machinery	Heavy Duty Roller Conveyors

Shock Load Category	Input Power Source								
	Electric Motor			Piston Machine Hydro Motor			Single Cylinder Piston Machine		
	Operating Time per Day (hrs)			Operating Time per Day (hrs)			Operating Time per Day (hrs)		
	≤2	10	>10	≤2	10	>10	≤2	10	>10
I	0.9	1.00	1.25	1.00	1.25	1.50	1.25	1.50	1.75
II	1.00	1.25	1.50	1.25	1.50	1.75	1.50	1.75	2.00
III	1.50	1.50	1.75	1.75	2.00	2.25	2.00	2.25	2.50

4.2.3.3. Starting Frequency Factor (f_2)

up to	20 starts per hour	f_2 = 1.0
up to	60 starts per hour	f_2 = 1.1
up to	200 starts per hour	f_2 = 1.3
up to	600 starts per hour	f_2 = 1.5
more than	600 starts per hour	(on request)

4.2.3.4. Transmission Load Factor (f_3)

The total load on the drive shafts and their bearing is the result of:

a. The loads arising from the gear teeth

b. The axial and radial loads arising from the transmission mechanisms attached to the drive shafts. It is this load which must be considered when selection the gearbox and shaft sizes.

Depending upon the type of transmission mechanism used in connecting the gear shafts to the driving and driven loads, axial and / or radial loads can be applied to the gearbox shafts and their bearings. These loads can arise from:

either ***preload,*** due for example, to tension loading in belts
or ***dynamic forces,*** due for example, to out-of-balance in the transmission element or shock load, due for example, to snatching in a chain drive.

The following table gives the factors which should be used to correct the Output Torque when sizing the gearbox.

4.2.3.5. Transmission Load Factor (f_3)

Transmission Mechanism	Transmission Load Factor (f_3)	
	Preload	Dynamic
Clutches	-	1.00
Gears of all Types	-	1.00 → 1.25
Chains	1.00 → 1.25	1.25 → 1.50
Flat Belts	2.00 → 250	1.00 → 1.25
V-Belts, Toothed Belts	1.50 → 2.00	1.00 → 1.25

4.2.3.6. Thermal Limits

Due to the compact design of this range of spiral bevel gear units the ratings are controlled by the thermal capacity at some speeds. A maximum case temperature of 80°C is specified and temperatures in excess of this figure normally indicate either incorrect oil levels or too much power being handled by the unit. If this temperature is exceeded Neeter Drive should be consulted.

4.2.3.6.1. Thermal Limit - Duty Cycle - Factor (f_4)

Duty cycle per hour is the percentage of the time per hour during which the gearbox will be on-load.

Duty Cycle per Hour (%)	100	80	60	40	20
Thermal Limit Factor, f_4	1.00	1.25	1.50	1.75	2.00

4.2.3.6.2. Thermal Limit - Ambient Temperature - Factor (f_5)

Ambient Temperature °C	10	20	30	40	50
Thermal Limit Factor, f_5	1.20	1.00	0.87	0.75	0.62

4.2.3.6.3. Limiting Thermal Capacity

The capacity of some gears is limited by the maximum permissible temperature of the oil bath. The charts below show the limiting thermal capacities, which can be transferred without cooling at an ambient temperature of 20°C and duty cycle of 100% per hour.

Series	35	37	38	39	40
Power (kW)	3.3	9.0	20.5	49	90

WARNING: **The case temperature must not exceed 80°C, (see thermal limits).**

Neeter Drive should be consulted if a gear unit is to be installed with a shaft positioned vertically.

4.2.3.7. Interpreting Power Charts

Speeds other than those shown may be calculated easily by interpolating between next lower and next higher speeds shown. The ratings are based upon a 10000 hour life datum, (8-10) hours per day operation, uniform power source, free from recurrent shock loads) and must be adjusted by service factor from the factor tables if different.

4.2.3.8. Approximate Gear Box Weight

Weight (kg)	2 Way 1:1 & 1.5:1 Ratio	3 Way 1:1 & 1.5:1 Ratio	2 Way 2:1 & Above	3 Way 2:1 & Above
Series 35	4.5	4.75	6.5	6.75
Series 37	10.5	11	12	12.5
Series 38	20	20.5	23	23.5
Series 39	38	46.5	45	53
Series 40	112	116	126.5	131

4.2.3.9. Permissible Shaft Loading

After selecting the gearbox for the required duty it is necessary to check that the axial and radial loading arising from the transmission mechanism is acceptable for the gear shaft diameters on the selected gearbox (gear shaft diameters are given on the Dimensions page for the chosen design).

The bearing configuration on the shafting, the shaft diameter and the shaft speed determine the permissible external loading which can be carried by the shaft without bearing or shaft failure. The graph showing permissible radial forces on shafts has been drawn for a typical Output Shaft. In this arrangement the bearing centres are mounted at either end of the through shaft and there is a significant span which allows higher radial loads to be accepted, see sketch below. For typical Input Shafts and Output Shafts, which are overhung from the gearbox face, the bearing centres are closer together and the radial load carrying capacity is reduced, see sketch below.

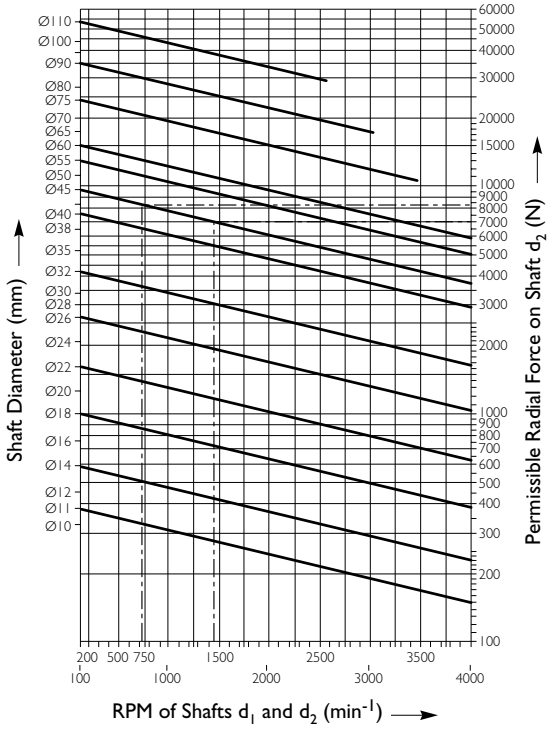
To calculate the Permissible Loading on the gearbox shafts, use the gearbox output and input speeds and diameters respectively.

1. Read off the Permissible radial Force for the nearest diameter shafts from the graph below.
2. Use the Correction Factors, below, to calculate the Permissible Radial and Axial Loads for each of the gearbox shafts.

4.2.3.10. Correction Factors

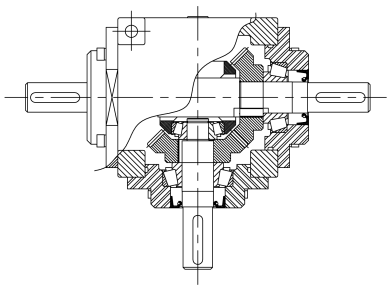
	Output Shaft (Bearings on through shaft)	Input Shaft (Bearings on overhung shaft)	Output Shaft (Bearings on overhung shaft)	Gearboxes with Centrebearing
Permissible Radical Forces	1.00	0.66	0.66	0.40
Permissible Axial Forces	0.50	0.50	0.50	0.50

The calculated loads should be checked against the radial and axial loads provided by the manufacturer of the transmission mechanism. If the loading created by the transmission mechanism exceeds the permissible level, a gearbox with a larger diameter shaft is required. At this point Neeter Drive should be consulted as it is often possible to fit a special shaft arrangement into a standard gearbox.

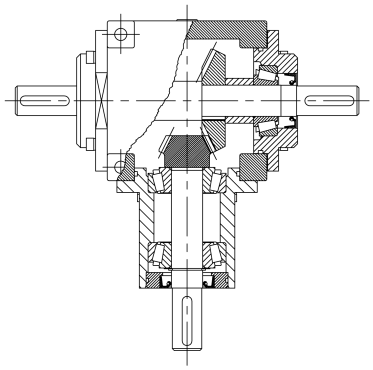


Permissible Shaft Loading Curves

Permissible Shaft Loading Curves



Ratios 1:1 & 1.5:1



Ratios 2:1 & above

Example Series 39, ratio 2:1

Shaft diameter = 48 mm, nearest tabulated diameter = 45 mm

$Ød_1$ = 45 (48) permissible transverse force 7000 N x 0.66 = 4620 N
permissible axial force 4620 N x 0.50 = 2310 N

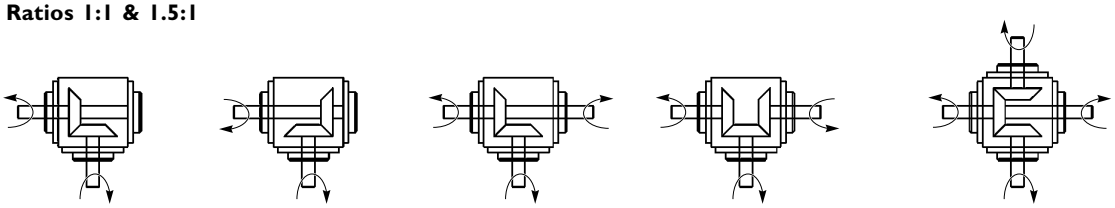
$Ød_2$ = 45 (48) permissible transverse force 8400 N x 1.00 = 8400 N
permissible axial force 8400 N x 0.50 = 4200 N

Gear Unit	Ratio	Power Ratings at given Input Speeds (rev min^{-1})																					
		10		50		100		250		500		750		1000		1500		2000		2500		3000	
		kW	Nm	kW	Nm	kW	Nm	kW	Nm	kW	Nm	kW	Nm	kW	Nm	kW	Nm	kW	Nm	kW	Nm	kW	Nm
Series 35	1:1	0.1	94	0.4	75	0.8	75	1.7	64	3.1	58	4.3	54	5.4	51	7.4	46	8.9	42	8.9	33	10.4	32
	1.5:1	0.04	56	0.2	56	0.4	56	0.7	39	1.4	39	2.1	39	2.6	37	3.7	35	4.7	33	4.7	26	5.6	26
	2:1	0.03	56	0.12	45	0.2	37	0.5	37	0.9	34	1.2	30	1.6	30	2.2	27	2.9	27	2.9	22	3.6	22
	3:1	0.01	28	0.03	17	0.06	17	0.15	17	0.31	17	0.45	17	0.6	17	0.9	17	1.2	17	1.3	15	1.6	15
Series 37	1:1	0.2	187	1.0	187	2.0	187	4.3	161	7.7	144	10.8	135	13.6	127	18.5	115	22.6	106	26.3	98	30.6	95
	1.5:1	0.1	140	0.5	140	0.8	112	1.9	107	3.5	98	5.0	94	6.4	90	9.0	84	11.5	81	14.3	80	17.0	80
	2:1	0.1	187	0.3	112	0.6	112	1.3	97	2..5	94	3.5	87	4.5	84	6.4	80	8.1	76	10.1	76	12.0	75
	3:1	0.03	84	0.11	62	0.2	56	0.5	56	0.8	45	1.2	45	1.5	42	2.1	39	2.8	39	3.5	39	4.2	39
	4:1	0.01	37	0.06	45	0.1	37	0.2	30	0.4	30	0.6	30	0.8	30	1.2	30	1.5	28	1.9	28	2.25	28
Series 38	1:1	0.5	468	2.5	468	5.0	468	11.7	438	21.2	397	29.9	373	38	356	52.6	328	65.1	305	76.6	287	-	-
	1.5:1	0.2	281	0.9	253	1.6	225	3.4	191	6.1	171	8.7	163	11.1	156	15.5	145	19.4	136	23.6	133	27.6	129
	2:1	0.3	562	0.6	225	1.2	225	2.6	195	4.8	180	6.9	172	9.0	168	12.8	160	16.6	155	20.6	154	24.6	153
	3:1	0.1	281	0.3	168	0.5	140	1.2	135	2.2	124	3.1	116	4.0	112	5.7	107	7.5	105	9.4	106	11.2	105
	4:1	0.03	112	0.13	97	0.23	86	0.7	105	0.9	67	1.3	65	1.7	64	2.4	60	3.2	60	4.0	60	4.8	60
Series 39	1:1	1.0	936	5.0	936	9.8	917	22.2	831	38.6	723	52.0	649	62.9	589	77.2	482	-	-	-	-	-	-
	1.5:1	0.34	477	1.7	477	3.4	477	9.0	505	18.9	531	29.2	547	39.9	560	61.5	576	83.2	584	105	590	-	-
	2:1	0.5	936	2.0	749	3.6	674	7.9	591	14.5	543	20.7	517	26.6	498	38.0	474	49.5	463	62.8	470	76.3	476
	3:1	0.2	562	0.8	449	1.4	393	3.2	359	5.9	331	8.4	314	10.9	306	15.6	292	20.5	288	25.4	285	30.3	284
	4:1	0.1	374	0.4	299	0.7	262	1.74	261	2.9	217	4.2	210	5.4	202	7.7	192	10.2	191	12.7	190	15.3	191
Series 40	1:1	3.3	3088	16.2	3032	31.8	2976	74.3	2781	126	2358	166	2071	194	1816	-	-	-	-	-	-	-	-
	1.5:1	1.9	2667	8.9	2499	16.3	2288	36.4	2044	65.6	1842	90.8	1700	112	1572	145	1357	-	-	-	-	-	-
	2:1	1.5	2808	6.8	2546	12.5	2340	28	2096	52.0	1947	74.8	1867	96.7	1810	139	1735	181	1694	226	1692	-	-
	3:1	0.7	1965	2.6	1460	4.5	1263	10.3	1157	19.2	1078	27.8	1041	36.1	1014	52.0	973	68.3	959	85.2	957	102	955
	4:1	0.4	1497	1.5	1123	2.8	1048	6.9	1033	11.7	876	16.9	844	21.9	820	31.6	789	42.1	788	52.5	786	62.8	784

Ratings within the bordered area – check thermal limit!

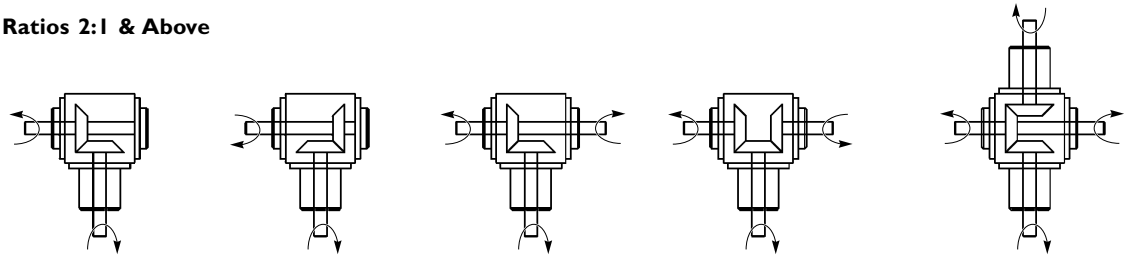
4.2.5. Configuration/Rotation Diagrams for Neeter Drive Gearboxes

Ratios 1:1 & 1.5:1



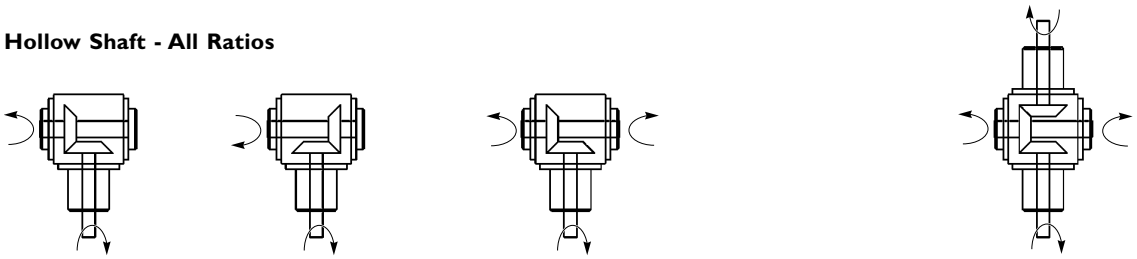
2 (2 Way) *5 (2 Way Reverse)* *3 (3 Way)* *4 (3 Way Reverse)* *7 (4 Way)*

Ratios 2:1 & Above

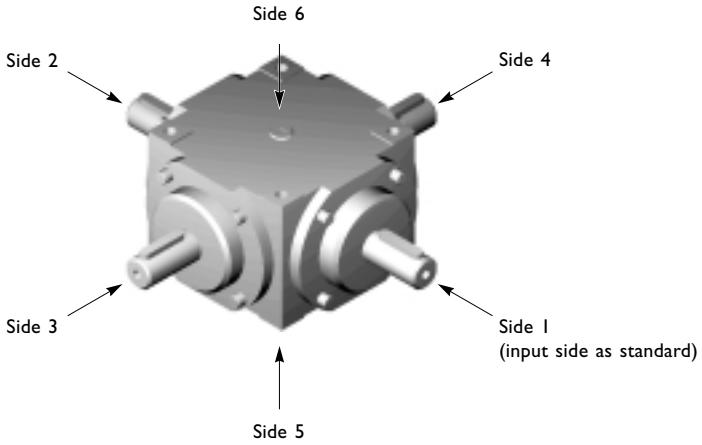


2 (2 Way) *5 (2 Way Reverse)* *3 (3 Way)* *4 (3 Way Reverse)* *7 (4 Way)*

Hollow Shaft - All Ratios

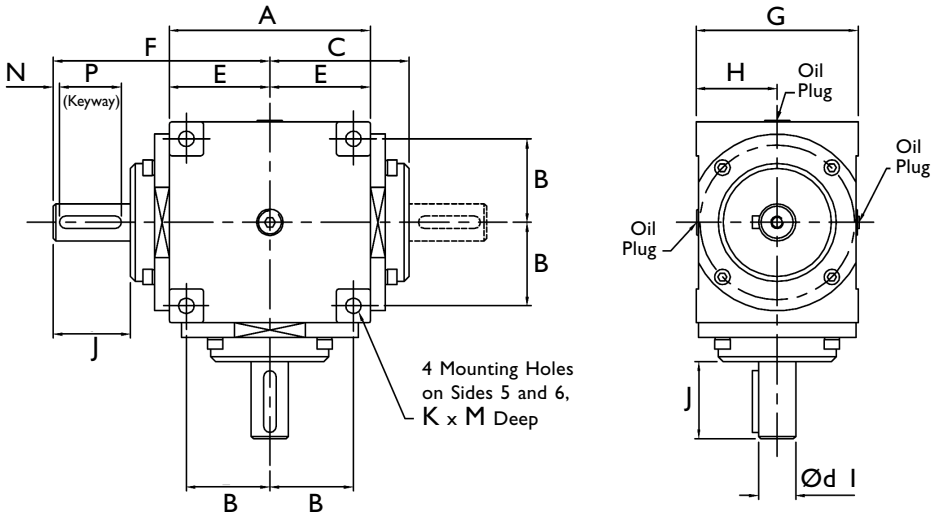


K (2 Way) *L (2 Way Reverse)* *O (3 Way)* *J (4 Way)*

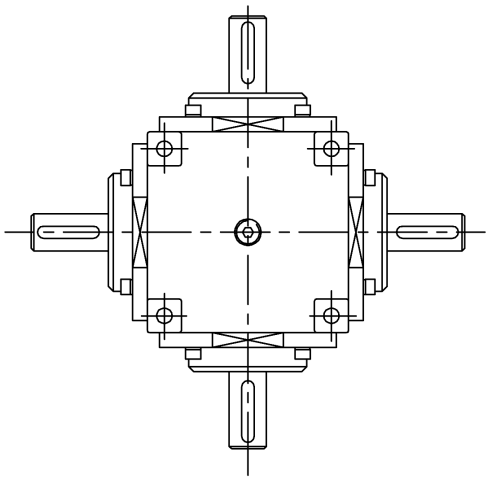


4.2.6. Neeter Drive Gearbox Dimensions

4.2.6.1. Gear Unit Dimensions - Ratios 1:1 and 1.5:1 Solid Shafts



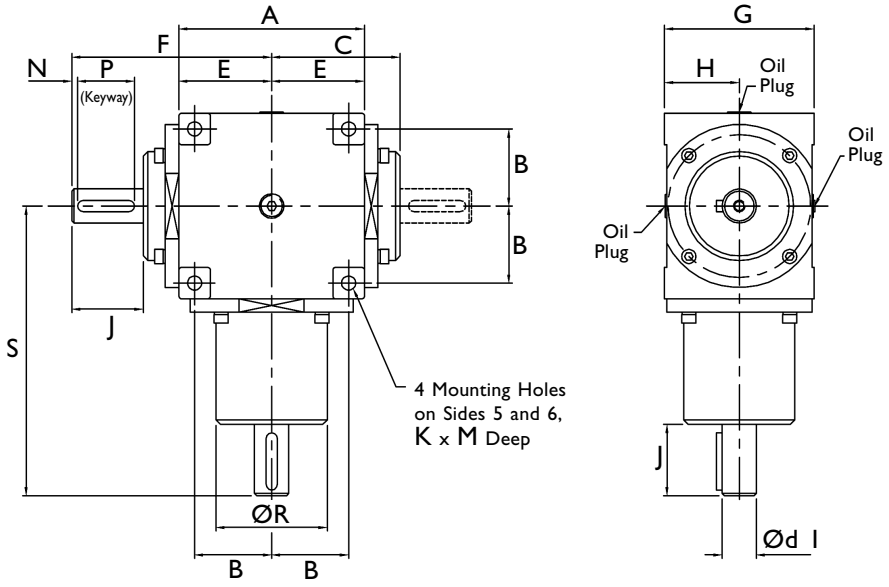
Tapped Hole in End of Each Solid Drive Shaft - Detail 'V'



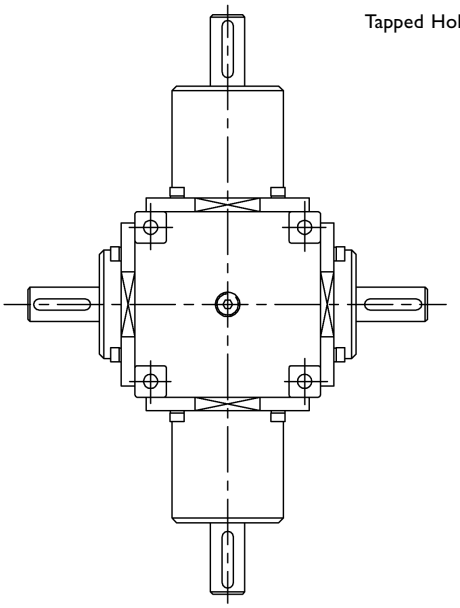
Series	A	B	C	Ød 1 (js6)	E	F	G	H	J	K	M	N	P key to BS4235 Part 1:1972	V
35	90	36.5	64	19	45	105	92	46	41	M8	12	2	6 x 6 x 36	M6 x 16 mm Deep
37	130	54	90	24	65	140	105	52.5	50	M10	20	4	8 x 7 x 40	M8 x 25 mm Deep
38	156	57	104	32	78	165	143	71.5	61	M10	20	5	10 x 8 x 50	M10 x 25 mm Deep
39	198	76	134	48	99	210	190.5	95.25	76	M12	25	2.5	14 x 9 x 70	M12 x 30 mm Deep
40	280	114	165	60	140	267	292	146	102	M16	30	5	18 x 11 x 90	M16 x 38 mm Deep

Note: *1. All dimensions in mm unless otherwise stated.*
2. Dimensions subject to change without notice

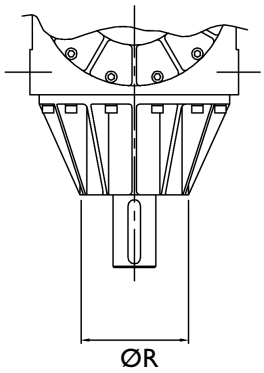
4.2.6.2. Gear Unit Dimensions - Ratios 2:1 and Above Solid Shafts



Tapped Hole in End of Each Solid Drive Shaft - Detail 'V'



Series 40

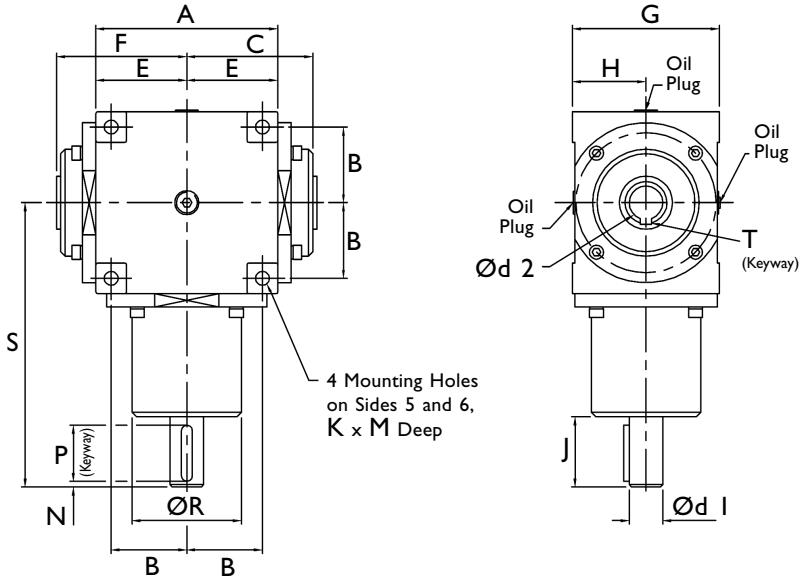


Series	A	B	C	Ød 1 (js6)	E	F	G	H	J	K	M	N	P key to BS4235 Part 1:1972	ØR	S	V
35	90	36.5	64	19	45	105	92	46	41	M8	12	2	6 x 6 x 36	61	143	M6 x 16 mm Deep
37	130	54	90	24	65	140	105	52.5	50	M10	20	4	8 x 7 x 40	78	203	M8 x 25 mm Deep
38	156	57	104	32	78	165	143	71.5	61	M10	20	5	10 x 8 x 50	92	222	M10 x 25 mm Deep
39	198	76	134	48	99	210	190.5	95.25	76	M12	25	2.5	14 x 9 x 70	118	299	M12 x 30 mm Deep
40	280	114	165	60	140	267	292	146	102	M16	30	5	18 x 11 x 90	152**	388	M16 x 38 mm Deep

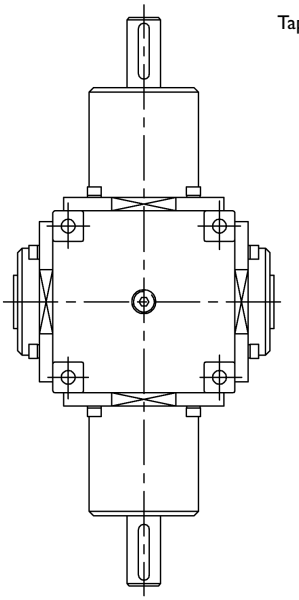
** *See Series 40 extended input housing detail*

Note: *1. All dimensions in mm unless otherwise stated.*
2. Dimensions subject to change without notice

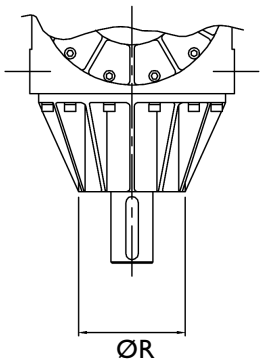
4.2.6.3. Gear Unit Dimensions - All Ratios Hollow Output Shafts



Tapped Hole in End of Each Solid Drive Shaft - Detail 'V'



Series 40

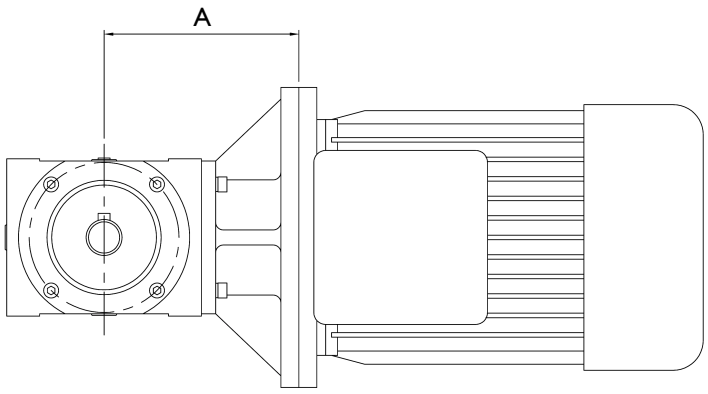


Series	A	B	C	Ød 1 (js6)	Ød 2 H7	E	F	G	H	J	K	M	N	P key to BS4235 Part 1:1972	ØR	S	T key to BS4235 Part 1:1972	V
35	90	36	64	19	19	45	67	92	46	41	M8	12	6	6 x 6 x 36	61	143	6 x 6 x 134	M6 x 16 mm Deep
37	130	54	90	24	24	65	93	105	52.5	50	M10	20	8	8 x 7 x 40	78	203	8 x 7 x 186	M8 x 25 mm Deep
38	156	57	104	32	32	78	107	143	71.5	61	M10	20	10	10 x 8 x 50	92	222	10 x 8 x 214	M10 x 25 mm Deep
39	198	76	134	48	48	99	137	190.5	95.25	76	M12	25	14	14 x 9 x 70	118	299	14 x 9 x 274	M12 x 30 mm Deep
40	280	114	165	60	60	140	168	293	146	102	M16	30	18	18 x 11 x 90	152**	388	18 x 11 x 336	M16 x 38 mm Deep

** *See Series 40 extended input housing detail*

Note: *1. All dimensions in mm unless otherwise stated.*
2. Dimensions subject to change without notice

4.2.6.4. Gear Unit Dimensions - Motor Mounting Flanges



Motor Frame	Gear Unit Series	Ratio	Dimension 'A'	Fear Unit Prefix
D71	35	All	115	A
D80	35	All	115	B
D90	37	All	130	C
D100	37	1:1 and 1.5:1	130	D
D100	37	2:1	140	D
D112	37	1:1 and 1.5:1	130	D
D112	37	2:1	140	D
D112	38	All	190	D
D132	38	All	190	E
D132	39	All	220	E
D160	38	1:1, 1.5:1 and 2:1	190	F
D160	38	3:1 and 4:1	210	F
D160	39	1:1, 1.5:1 and 2:1	220	F
D160	39	3:1 and 4:1	240	F
D180	39	1:1, 1.5:1 and 2:1	220	G
D180	39	3:1 and 4:1	240	G
D180	40	All	280	G
D200	40	All	280	H
D225 : 2 Pole	40	All	280	J
D225 : 4 - 8 Pole	40	All	310	K
D250 : 2 Pole	40	All	310	L

Notes: *1. All other gearbox dimensions are as detailed in Sections 4.2.6.1, 4.2.6.2 and 4.2.6.3*
2. All Flange dimensions conform to standard IEC electric motor details
3. NEMA flanges available on request.

Should you require a unit outside of, or a deviation from our standard product, Neeter Drive's design team is always available to assist in producing a unit to meet your specific requirements. Do not hesitate to contact us with your application details.

Note: *1. All dimensions in mm unless otherwise stated.*
2. Dimensions subject to change without notice.

4.2.7. Special Configuration and Special Features Available from Neeter Drive

This catalogue has been designed to cover the standard range of Neeter Drive products. Neeter Drive can offer a number of special features, which supplement or extend these ranges.

Neeter Drive is also able to offer gearboxes specifically designed to meet customers' needs allowing the units to easily and neatly interface with the end product, saving assembly time and cost.

The following gives some idea of the range of features, which are available, Neeter Drive will be pleased to discuss customers' special requirements and provide advice on the selection of the correct gearbox and special features.

4.2.7.1. Reversible and Disengageable Units

Available on all units with a 1:1 ratio. This feature allows the output shaft rotation to be interrupted or its rotation to be reversed. The gear unit must be at rest during the operation of this feature.

4.2.7.2. Features that have been incorporated into Neeter Drive Units

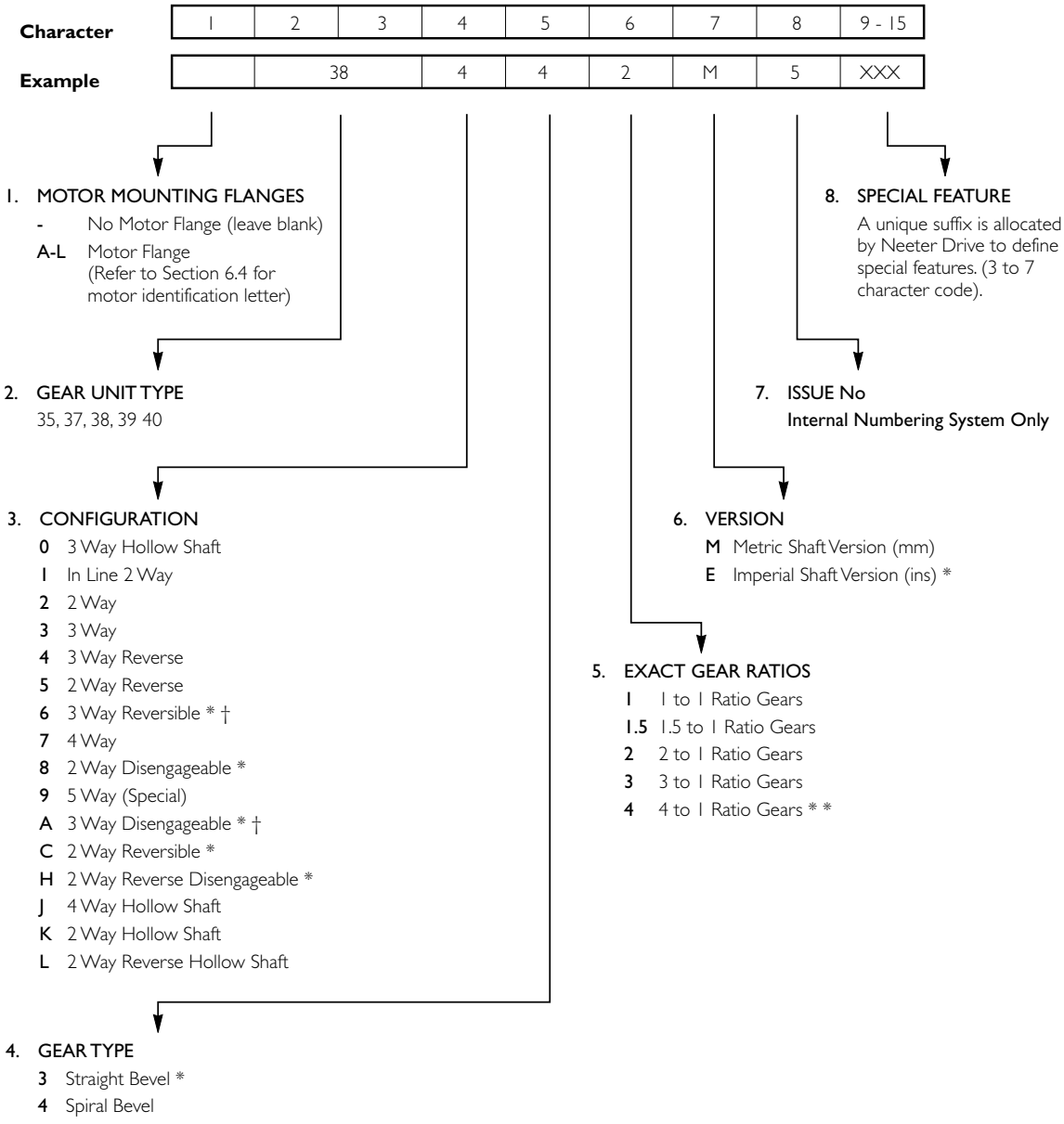
Stainless Steel	Units manufactured with stainless steel case, covers and shafts, supplied for nuclear environment and the food process industry.
Submersible	Remote underwater valve controllers, units manufactured using customer specified materials for shafts, oil seals and o-rings. As well as redesigning the covers to take the oil seals and interfacing, we supplied a facility for the customer to fix a "pressure balloon" to and pressure compensate the unit.
Military	Gearbox housings manufactured from aluminium, special shaft design and mounting flanges. These units have been used on military vehicles & artillery. Neeter Drive gearboxes have been used in many military vehicles and similar applications over many years.
Humanitarian	Special "high Power" units designed to work on land minesweepers, which have been used extensively throughout the world on this vehicle.
Conveyor Lines	Units designed for a well known off road car, to drive the conveyor system to move the "car bodies" around during assembly.
Pharmaceutical	Specially sealed units, complete with special shafts and mounting interfaces for the unit to be integrated in to a pharmaceutical mixer.
Automotive	Special hollow shaft unit for automotive component manufacture.

Many other customers have had requirements met by having minor alterations, including longer shafts, shorter shafts, spigots on covers, special input/output flanges, special coatings on shafts or special materials, the details options are endless. If you feel that you may require special features please contact Neeter Drive.

4.2.8. Neeter Drive Range - N Product Code

Each Neeter Drive Gear Unit is allocated a Part Number which defines the unit specification. For identification purposes this number is stamped on each unit.

The following chart outlines the Part Numbering System. It should be noted that as Neeter Drive's range of units has developed over the years, certain features are not applicable to the current range.



* *Non Standard feature*

** *Not available on Series 35*

† *Reverse/Reversible Configuration*
The reverse configuration is the way in which the output shaft rotates (refer Section 4.2.5)
The Reversible unit has a hand wheel on the unit so the output shaft direction of rotation (refer Section 4.2.5) can be changed when stationary.

4.2.9. Neeter Drive Range - N Lubrication and Maintenance Instructions

4.2.9.1 Installation

1. Gear units are shipped dry.
2. Check your gear unit for damage during shipment.
3. Take care when fitting couplings, a blow on a shaft end can cause gear overmeshing.
4. Shaft alignment is critical, check on installation.

4.2.9.2. Oil Levels

The information given below assumes that the gear unit is positioned with all shafts in a horizontal plane.

For input speeds up to 1500 RPM the oil level in the gear unit should be maintained just below the centreline of the shafts. A sight glass or level plug is provided for level indication.

A change of oil level may be required for speeds of 1500 RPM or above, and Neeter Drive should be consulted.

For input speeds of 250 rpm or below grease lubrication should be used.

Important *Neeter Drive should also be advised when a gear unit is installed with a shaft positioned vertically.*

4.2.9.3. Case Temperature

Bevel units will operate with a maximum case temperature of 80°C. If this temperature is exceeded Neeter Drive should be consulted.

4.2.9.4. Maintenance Instructions

A new gear unit should be drained after 100 hours and cleaned using a light flushing oil. After this the gear unit oil should be changed every six months or 2500 operating hours. Where severe operating conditions are encountered more frequent oil changes are advised. The gear unit should be warm when an oil change is undertaken. Check oil levels regularly.

Warning: *The case temperature must not exceed 80°C (See case temperature)*

4.2.9.5. Oil Specification

Ambient Temperature	Gear Oil	
Below +5°C	ISO 150	Mobilgear 629 or equivalent
+5°C to +40°C	ISO 220	Mobilgear 630 or equivalent
Above 40°C	ISO 320	Mobilgear 632 or equivalent

Fill quantities (Average)

Series No	35	37	38	39	40
Litres	0.14	0.29	0.75	1.71	3.27
Pints	0.24	0.50	1.32	3.00	5.75

4.2.9.6. Grease Nipples/Grease Filled Units

Use EP1 Grease e.g. Mobilux EP1 or equivalent

4.2.9.7. Spares

When ordering spares always specify the part number and serial number stamped on the gear unit.

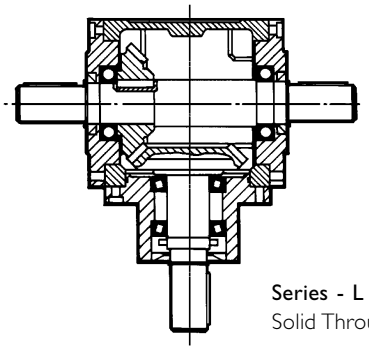
Contents

NEETER DRIVE
SPIRAL BEVEL GEARBOXES

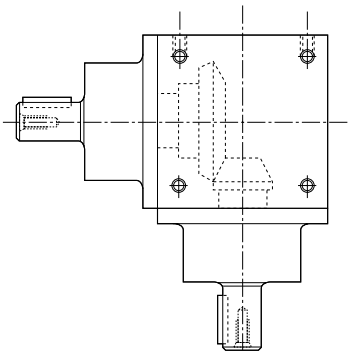
4.3. BA - Series Cubic Spiral Bevel Gearboxes

4.3.1. BA Gearbox Features

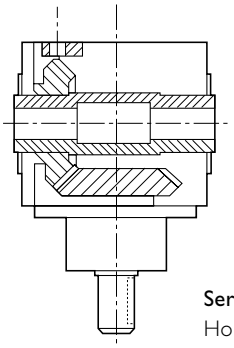
- Robust cast iron construction.
- Cuboid body shape - good symmetry.
- Universal mounting on all sides.
- 10 gearbox sizes.
- 6 standard ratios from 1:1 to 6:1.
- Special ratios available on request.
- Torque range 10 Nm to 9000 Nm.
- High quality bearings giving long life.
- **Input Shaft Bearings** - are supported by high quality ball bearings up to size 2, and taper roller bearings up to sizes 23 to 6.
- **Output Shaft Bearings** - are supported by deep groove ball bearings to withstand high radial loads and give long life.
- **Gearbox Housing** - produced in quality grey cast iron ensuring strength and stability.
- **Alloy steel gears** - hardened and lapped in pairs then set in the gearbox to give the optimum setting for quiet efficient running.



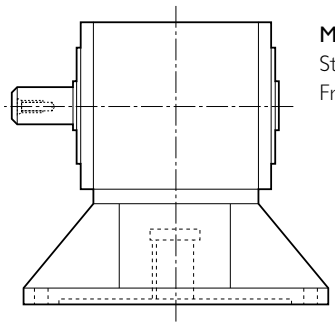
Series - L
Solid Through Shaft



Series - K
Solid Shaft Independent Bearings for each Shaft.



Series - H
Hollow Shaft



Motor Flanges
Standard IEC Motor Frames (B5 and B14).

Neeter Drives range of Cubic spiral bevel gear boxes are produced in a modular design with many standard models covering a wide performance range. The modular design allows multi-shaft and power take off drives. Standard units have two or three shafts although more are available on special request, consult Neeter Drives. All the gearboxes can be driven by either input or output shafts to increase or decrease in speed and all the gearboxes can be supplied with flanges to suit direct mounting of standard IEC frame motors.

4.3.2. BA Gearbox Mounting

The spiral bevel gearboxes are supplied with tapped mounting holes in all faces however the following must be considered.

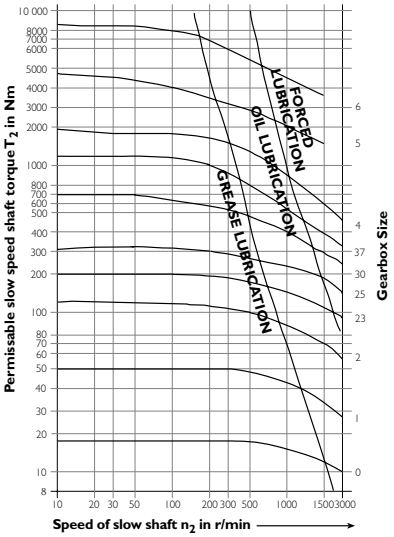
1. **Grease Lubrication** - No breather or sightglass required. The gearbox can be mounted in any orientation.
2. **Oil Lubrication** - Breather, sightglass and drain plug required. The gearbox can be mounted in any orientation but the side of the gearbox facing downwards "side-under" and the side in which the sightglass and breather are required must be stated when ordering. Note breathers and sightglasses cannot be fitted on the same face as the shaft.

4.3.3. Performance of BA Spiral Bevel Gear Boxes

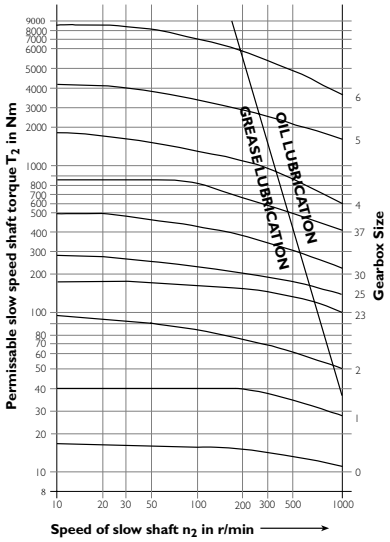
4.3.3.1. Torque/Speed Graphs

Selection Graphs by Output Torque

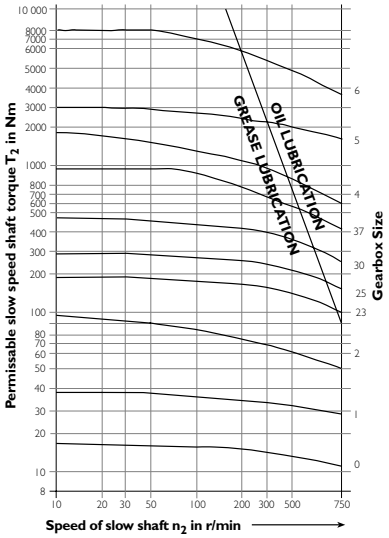
Ratio 1:1 to 2:1



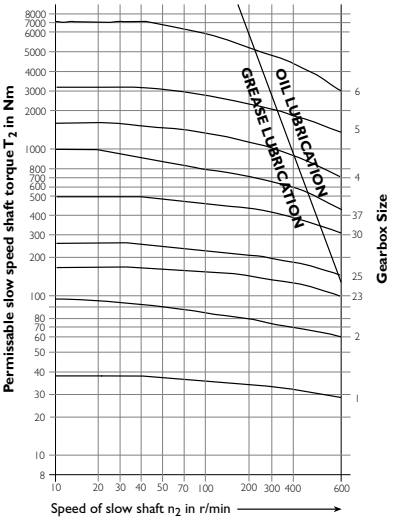
Ratio 3:1



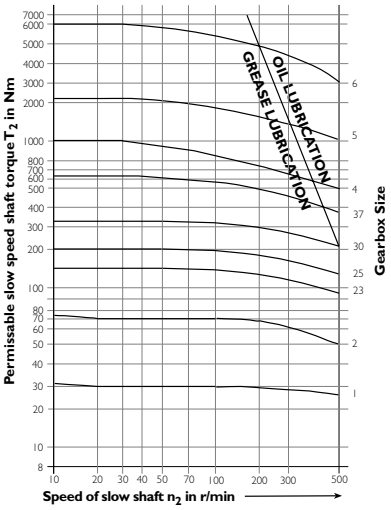
Ratio 4:1



Ratio 5:1



Ratio 6:1



4.3.3.2. Gearbox Efficiency

Size	0	1-23	25-4	5 & 6
Efficiency	0.80	0.90	0.95	0.96

4.3.3.3. Radial Loads

The tables show the maximum radial loads in kN by gearbox type and the individual shafts. Details of axial load capacity on request. Interpolate intermediate values. Below 50 rpm the load capacity remains constant.

$$\text{Radial Force, } F_r = \frac{2000 \times T \times f_z}{d}$$

Where T = gearbox output torque in Nm
f_z = factor from table opposite
d = p.c.d. in mm of gear, sprocket

Factor f_z	Transmission element
1.12	Gears
1.25 - 1.4	Chain sprockets
1.5 - 2.0	V-Belt pulleys
2.0 - 2.5	Flatbelt pulleys with jockey pulley
2.5 - 3	Flatbelt pulleys without jockey pulley

Shaft Speed (rpm)	0		1		2		23		25		30		37		4		5		6	
	D_1	D_2	D_1	D_2	D_1	D_2	D_1	D_2	D_1	D_2	D_1	D_2	D_1	D_2	D_1	D_2	D_1	D_2	D_1	D_2
50	0.51	0.8	0.78	1.5	1.4	2.2	2	3.8	3.2	6.5	5.5	9.9	11	15.5	20	28	40	40	55	70
200	0.39	0.67	1.57	1	0.77	1.6	1.4	2.6	2.3	4.2	4	6.9	7.2	9	15	18	28	29	40	49
1000	0.25	0.4	0.39	0.68	0.57	1	0.9	1.6	1.5	2.8	2.8	4.2	4.8	6.5	8	12	18	18	28	30
3000	0.18	0.3	0.29	0.49	0.45	0.75	0.7	1.3	1.1	2.1	1.9	3.1	3.7	4.8	6.8	8.5	15	15	19	-

4.3.4. Selection

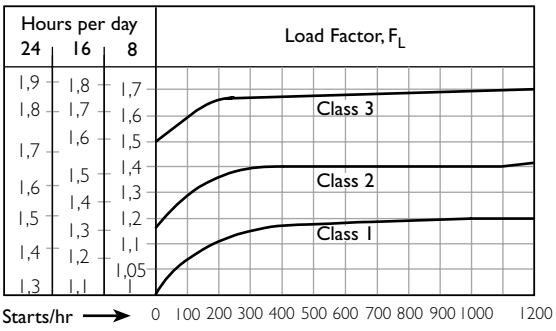
Calculate the power capacity require for the gearbox $P\ (kW) = P_d\ (kW) \times F_L \times F_T$

Where P_d = Power required to drive the machine.
F_L = Load factor (refer to table)
F_T = Temperature factor (refer to table)

Then calculate the slow shaft torque required, T_2. $\text{Slow shaft torque, } T_2\ (Nm) = \frac{9550 \times P(kW)}{\text{Gearbox Output Speed}}$

Select a gearbox using the torque selection charts for the appropriate gear ratio.

Note *Standard gearboxes are grease lubricated and should not exceed a case temperature of 90ºC (194ºF). Consult Neeter Drives for higher temperatures.*



Temperature	Temperature Factor, F_T
10°C	0.85
20°C	1.0
30°C	1.1
40°C	1.2
50°C	1.4

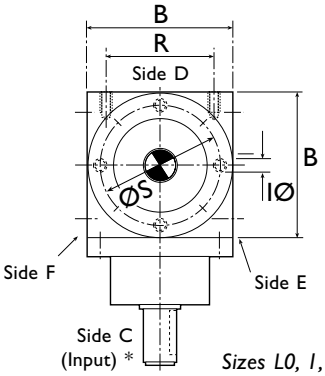
Load Characteristics of the machine

Class 1 Uniform load (torque change + 10%) no masses to be accelerated.

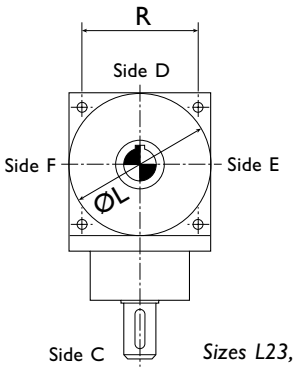
Class 2 Medium shocks, short term overload (torque change + 25%) larger masses to be accelerated.

Class 3 Heavy shocks, short term overload (torque change + 100%) very large masses to be accelerated.

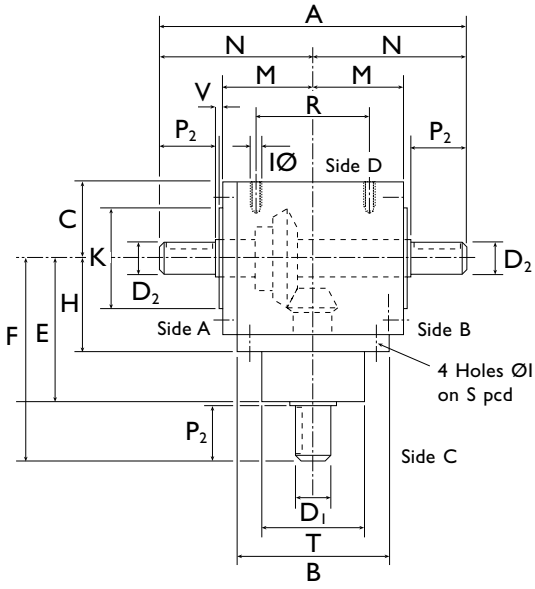
4.3.5. BA Gearbox Dimensions - Series L

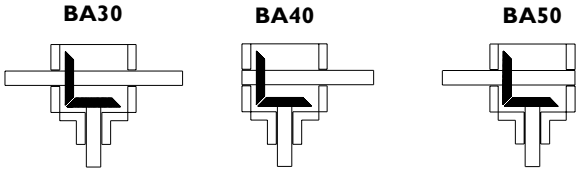


Sizes L0, 1, 2, 25, 30, 4



Sizes L23, 37, 5, 6



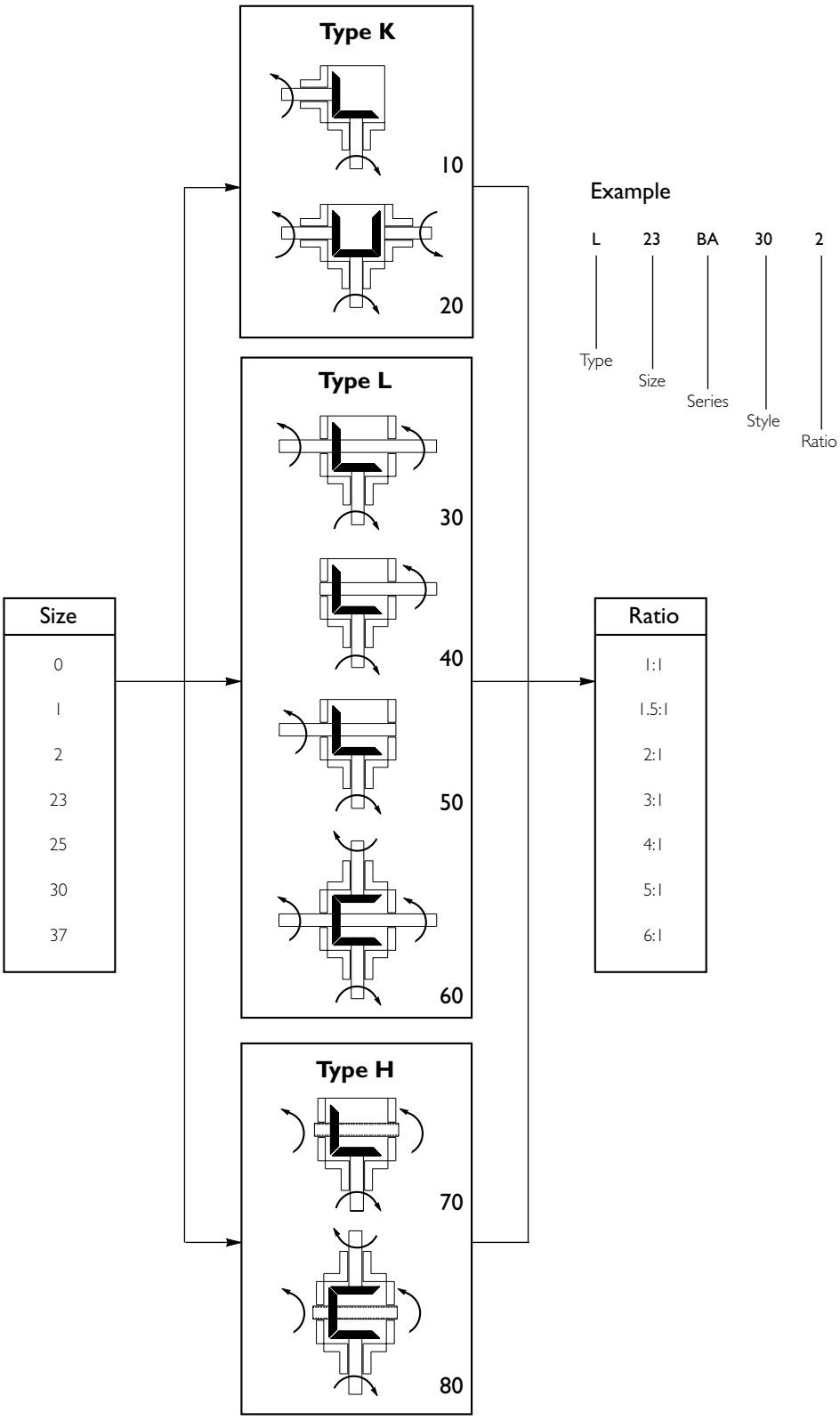


** Side C is output in speed increasing application for ratios over 1:1*

Type	Gear Ratio	A	B	C	D_1 j6	D_2 j6	E	F	H	I	K f7	L h7	M	N	P_1	P_2	R	S	T	V
LO	1 to 2	144	65	32.5	12	12	72	100	42	M6	44	-	42	72	26	26	45	54	44	2
	3 to 4						87	115												
L1	1 to 2	190	90	45	18	18	85	122	55	M8	60	-	55	95	35	35	70	75	60	2
	3				12		85	122												
	4 & 6				12		95	132												
L2	1 to 2	244	120	60	25	25	115	162	75	M10	80	-	72	122	45	45	100	100	80	3
	3				20		115	162							45				80	
	4				20		125	172							45				80	
	5 & 6				15		125	162							35				70	
L23	1 to 2	274	140	70	32	32	128	180	85	M10	-	135	85	137	50	50	110	-	95	-
	3				28		128	180											95	
	4 to 6				24		143	195											85	
L25	1 to 2	320	160	80	35	35	150	212	95	M12	110	-	95	160	60	60	120	135	110	3
	3				28		150	212											100	
	4 to 6				24		170	232											100	
L30	1 to 2	406	200	100	42	42	190	273	120	M12	120	-	117	203	80	80	160	175	120	3
	3 & 4				35			261							68				120	
	5 & 6				28			261							68				110	
L37	1 to 2	454	230	115	55	55	213	305	132	M16	-	225	135	227	90	90	180	-	150	-
	3 to 6				40		228	310							80				120	
L4	1 to 2	570	260	130	60	60	265	380	150	M16	180	-	150	285	110	110	220	230	160	20
	3 to 6				45			360							90					
L5	1 to 2	820	350	175	80 k6	80 K6	385	570	200	M20	200	345	215	410	170	170	285	-	-	20
	3				65 k6			540							140					
	4				60 k6			540							140					
	5 & 6				55 k6			510							110					
L6	1	940	450	225	90	90	445	600	250	M20	-	445	245	470	150	150	360	-	-	-
	1.5 to 2				90		415	570							150					
	3				75		415	540							120					
	4 to 5				70		415	540							120					
	6				60		415	530							110					

Note: *All dimensions in mm.*
Dimensions subject to change without notice.

4.3.6. Standard BA Series Gearbox Selection



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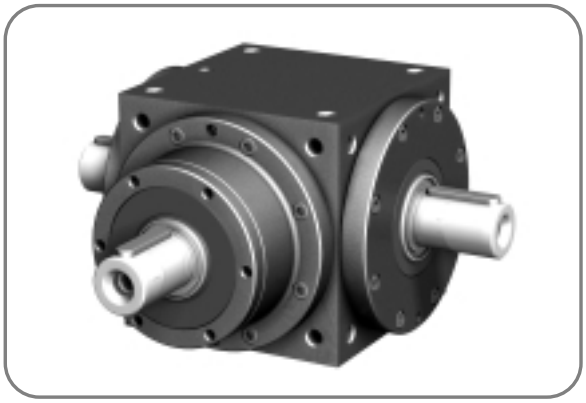
NEETER DRIVE
SPIRAL BEVEL GEARBOXES



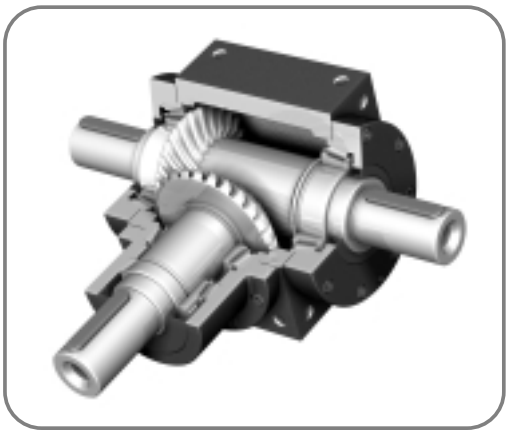
4.4. Neeter Drive PowerGear Range

Studies of many applications covered by our bevel gearboxes have been taken into account in the design of the new PowerGear range. The PowerGear a consistently designed new series has been produced to meet with a specific torque/speed spectrum. The advantages of this approach are:

- The compact and rigid design assures highest performance in a small footprint.
- Lubricated for life, the gearboxes are, depending on their size, maintenance free, if operated under normal conditions.
- Fretting-free torque transfer using a friction locked fit between shaft and bevel gear.

4.4.1. Features of PowerGear Bevel Gearbox

- Housings and flanges manufactured from robust Spheroidal Graphite (SG) iron.
- 8 Gearbox sizes.
- 6 standard ratios from 1:1 to 5:1.
- 2-way, 3-way and 4-way.
- Solid Shafts and Hollow Shafts.
- Motor Adaptors.
- Torque range from 25Nm → 5200Nm.
- Input speeds up to 6500rpm.
- Universal mounting on all sides.
- High quality taper roller bearings giving long operational life.
- Optimised gear tooth pattern during assembly giving uniform load distribution.
- The high efficiency of the gearbox, 98%, reduces energy costs.
- More than 45% of volume economised.
- More than 100% more performance at same construction size.
- More than 60% of weight economised.
- Maintenance Free.



The main advantages of the PowerGear design will be found in applications with requirements of high torque at medium to high speeds, robust unit in a small size, useable in any mounting/working position. Typical applications for the PowerGear are angular torque transfer and torque distribution in single, or multiple shaft configurations. In non-stationary applications where weight is extremely important, the PowerGear design is the ideal solution. For applications requiring a 1:1 ratio unit capable of handling greater torque than the standard PowerGear a higher rated "X" range is available utilising the same size cases.

4.4.2. Neeter Drive PowerGear Performance Ratings

PowerGear		P75	P90	P110	P140	P170	P210	P240	P280
1:1	Output Torque, M2 (Nm)	45	78	150	360	585	1300	2150	3200
	Max Torque M2*	68	117	225	540	878	1950	3225	4800
1.5:1	Output Torque, M2 (Nm)	45	78	150	360	585	1300	2150	3200
	Max Torque M2*	68	117	225	540	878	1950	3225	4800
2:1	Output Torque, M2 (Nm)	42	68	150	330	544	1220	2010	3050
	Max Torque M2*	63	102	225	495	816	1830	3015	4575
3:1	Output Torque, M2 (Nm)	33	54	120	270	450	1020	1650	2850
	Max Torque M2*	50	81	180	405	675	1530	2475	4275
4:1	Output Torque, M2 (Nm)	28	52	100	224	376	860	1410	2300
	Max Torque M2*	42	78	150	336	564	1290	2115	3450
5:1	Output Torque, M2 (Nm)	25	40	85	196	320	740	1210	2000
	Max Torque M2*	38	60	128	294	480	1110	1815	3000
Max Speed	Input Speed, N1 (rpm)	6500	5500	4500	3500	3000	2200	2000	1700
at 2% Max Load	Standard Output Backlash (arcmin)	6 to 15	6 to 14	6 to 13	6 to 13	6 to 12	6 to 12	6 to 12	6 to 11
	Minimum Output Backlash (arcmin)	5 to 6	4 to 6	4 to 6	3 to 6	3 to 6	3 to 6	3 to 6	3 to 6
Allowable Radial Load (N)	Input Shaft d1	900	1300	2000	3500	5000	8500	11000	15000
	Output Shaft d2	1100	1600	2500	4500	6000	10500	15000	18000
Allowable Axial Load (N)	Input Shaft d1	450	650	1000	1750	2500	4250	5500	7500
	Output Shaft d2	550	800	1250	2250	3000	5250	7500	9000
Weight (kg)		4.5	8	13	22	38.5	71	103.5	155
Thermal	Performance Limit (kW)	5.5	7.4	10.8	16.1	23.4	28.6	45.3	60.3

Operating temperature: -30°C → +100°C

Service Life > 15000 hours (when correctly installed and operated within capabilities).

The maximum allowable oil bath temperature limits the gearbox performance. The required effective performance must not exceed the limit values allowed for continuous duty.

Duty cycle per hour in %	100	80	60	40	20
Factor	1.0	1.2	1.4	1.6	1.8

If on intermittent duty or in the event of increased ambient temperatures, the following factors can be applied as guide values for the determination of the related allowable thermal performance limit.

Ambient temperature °C	10	20	30	40	50
Factor	1.20	1.00	0.87	0.75	0.62

For all the PowerGear gearbox details request a full catalogue from Neeter Drive

4.4.3. Examples of PowerGear Bevel Gearbox Arrangements

4.4.4. Neeter Drive PowerGear Selection Procedure

(a) Make initial gearbox selection based on defined information about the application:

Performance required P (kW) at n_{input} (rpm)

Note: $P_{input} \approx P_{output}$ at efficiency of 98% approximately.

Input speed required (rpm).

Output speed required (rpm).

Duty cycle required (ED).

Ambient Temperature.

Gear Ratio = input speed (n_{input}) / output speed (n_{output})

Select nearest gear ratio to the exact calculated value.

Output Torque M_{output} (Nm) = (9550 * P_{output})/n_{output}

(b) Check Performance Capabilities

Check that output torque required is less than gearbox torque rating.

$M_{output} \leq$ Nominal Torque $M2_{nominal}$

Check speed rating

Speed $n_{input} \leq$ Speed $N1_{max}$

Check Thermal Performance Rating of gearbox.

Performance P ≤ thermal performance limit P_{therm}

Check Radial and Axial load rating of gearbox

Radial and axial shaft loads ≤ allowable values.

Note: *Force contact point on shaft is the middle of the shaft.*