

GEARBOXES

Spiral Bevel Power Gearbox

Internal Highlights

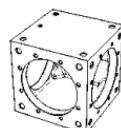
Various application cases and application fields covered by our bevel gears have been taken into account in the design of the new PowerGear range. With PowerGear a consistently designed new series has come up that enables to meet with a specific torque/speed spectrum.

The considerable advantages of this approach are:

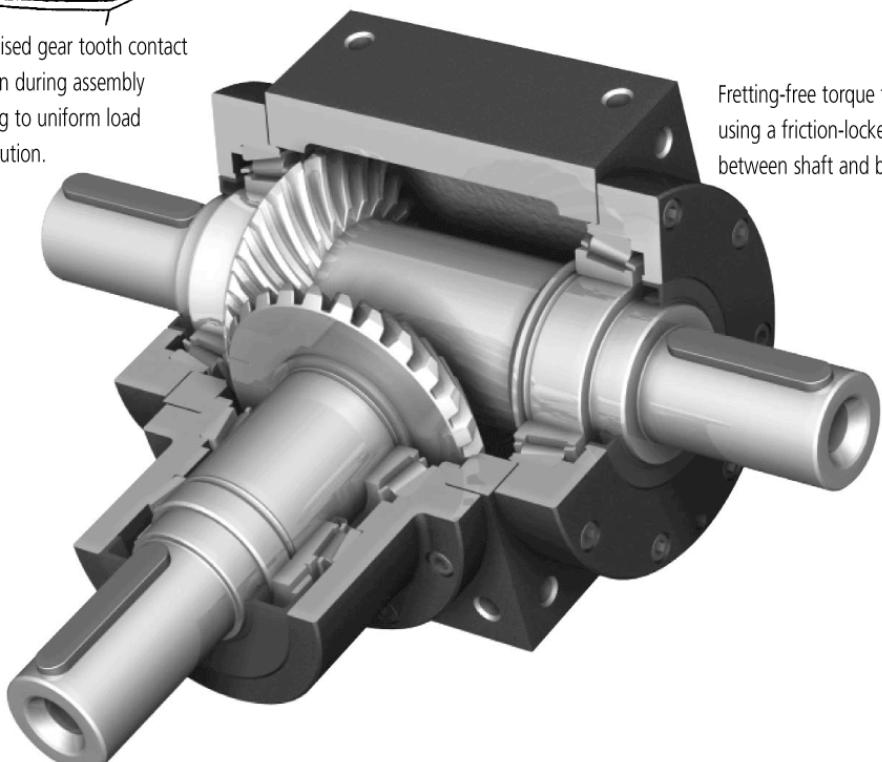
- The compact and rigid design assures highest performance at small dimensions and low weight.
- Lubricated for life, the gearboxes are, depending on their size, maintenance-free, if operated under normal conditions.
- The high industrial efficiency of the gearbox, 98%, saves energy costs.



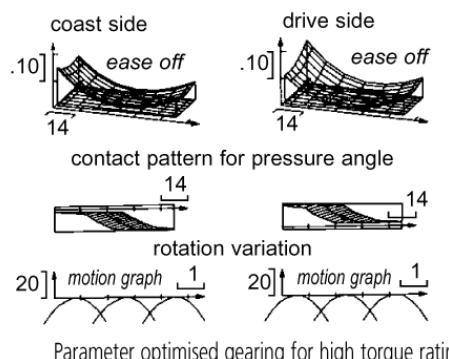
Optimised gear tooth contact pattern during assembly leading to uniform load distribution.



Housing/Flanges made of spheroidal graphite iron for maximum rigidity



High quality taper roller bearings taking axial and radial loads and guaranteeing long operational life



Parameter optimised gearing for high torque ratings

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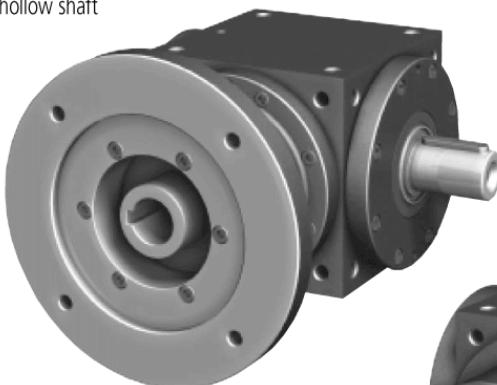
External Highlights

Choose the new PowerGear for your application.

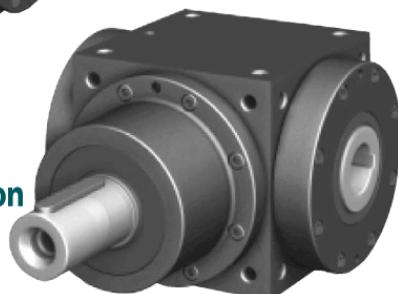
- 8 gearbox sizes, from VP75 to VP280
- additional 8 reinforced executions at ratio $i = 1:1$, from VX75 to VX280
- Ratios from $i = 1:1$ to 5:1
- Input speeds up to 6500 rpm for VP series, depending on size up to 3000 rpm for VX series, depending on size
- Flange, solid or hollow shaft execution



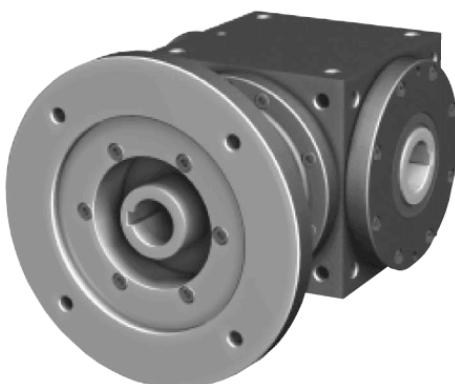
**Solid shaft configuration
Shaft arrangement 13**



**Solid shaft configuration
with input flange
Shaft arrangement 13**



**Hollow shaft configuration
Shaft arrangement 13**



**Hollow shaft
configuration
with input flange
Shaft arrangement 13**

Selected Applications and Application Areas

Typical applications for the PowerGear are angular torque transfer and torque distribution in single, or multiple shaft configuration for lifting arrays or transfer lines. In non-stationary applications where weight is extremely important, the PowerGear design is the ideal solution.

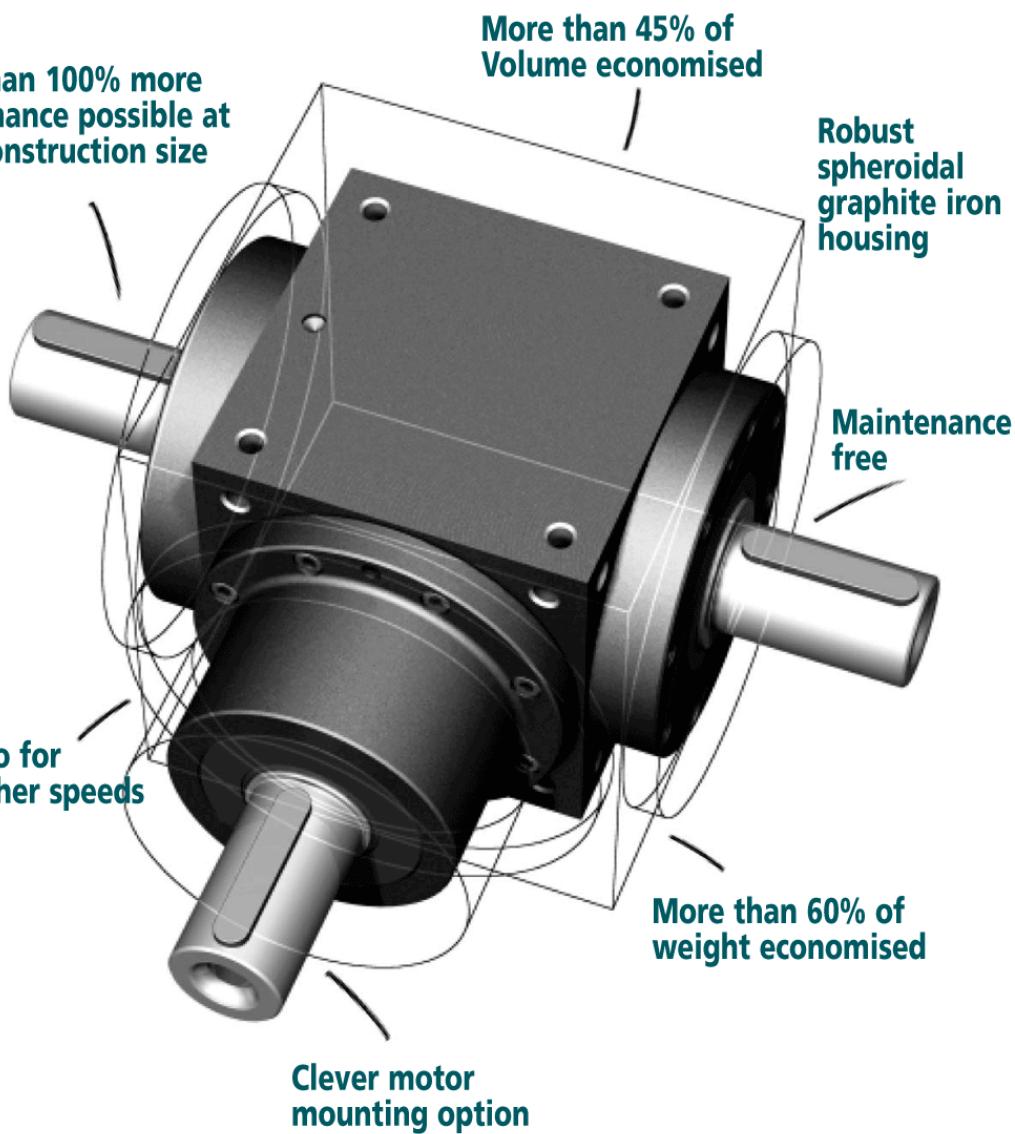
The real advantages of the PowerGear design will be found in applications with the following requirements:

- High torque
- Low weight and smallest dimensions
- Robust, reliable and maintenance-free



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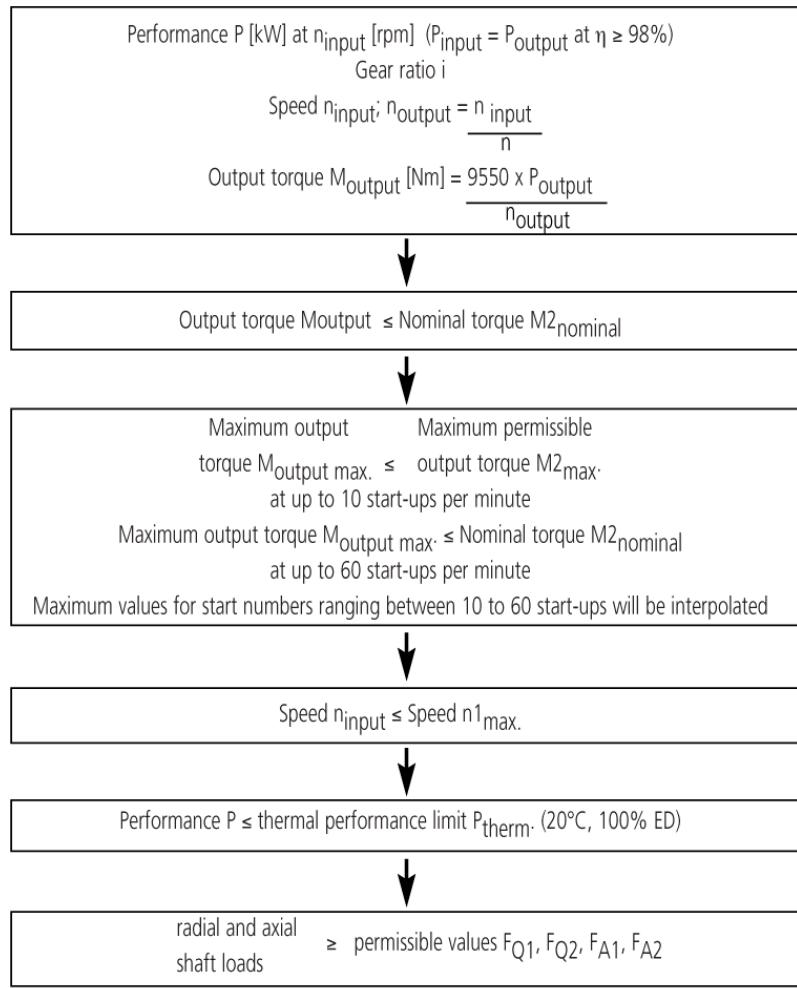
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Gearbox Selection and Verification



Example:

Distribution gearbox

Given:

$$n_1 = 3000 \text{ rpm}$$

$$n_2 = 750 \text{ rpm}$$

$$P = 15.5 \text{ kW}$$

$$\text{ED} = 100\%$$

$$\text{Ambient temperature} = 20^\circ\text{C}$$

$$\text{Selection: } i = n_1 / n_2 \quad i = \frac{3000 \text{ rpm}}{750 \text{ rpm}}$$

$$i = 4:1$$

$$M_2 = 9550 \times P / n_2$$

$$M_2 = 197.37 \quad M_2 = \frac{9550 \times 15.5 \text{ kW}}{750 \text{ rpm}}$$

$$\text{Gearbox P140 4:1}$$

$$M_{2,\text{exist.}} \leq M_{2,\text{nominal}} \quad M_{2,\text{exist.}} \leq 197.37 \text{ Nm} \leq M_{2,\text{nominal}} \leq 224 \text{ Nm}$$

$$n_{1,\text{exist.}} \leq n_{1,\text{max.}} \quad 3000 \text{ rpm} \leq 3500 \text{ rpm max.}$$

$$P_{\text{exist.}} \leq P_{\text{therm.}} \quad P = 15.5 \text{ kW} \leq P_{\text{therm.}} \leq 16.1 \text{ kW}$$

Selected: VP140L 4:1

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POWER GEAR	Unit	VP75	VP90	VP110	VP140	VP170	VP210	VP240	VP280
1:1 Nominal torque M2	Nm	45	78	150	360	585	1300	2150	3200
Max. permissible torque M2*		68	117	225	540	878	1950	225	4800
1.5:1 Nominal torque M2	Nm	45	78	150	360	585	1300	2150	3200
Max. permissible torque M2*		68	117	225	540	878	1950	3225	4800
2:1 Nominal torque M2	Nm	42	68	150	330	544	1220	2010	3050
Max. permissible torque M2*		63	102	225	495	816	1830	3015	4575
3:1 Nominal torque M2	Nm	33	54	120	270	450	1020	1650	2850
Max. permissible torque M2*		50	81	180	405	675	1530	2475	4275
4:1 Nominal torque M2	Nm	28	52	100	224	376	860	1410	2300
Max. permissible torque M2*		42	78	150	336	564	1290	2115	3450
5:1 Nominal torque M2	Nm	25	40	85	196	320	740	1210	2000
Max. permissible torque M2*		38	60	128	294	480	1110	1815	3000
max.rpm at input n1	rpm	6500	5500	4500	3500	3000	2200	2000	1700
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				
permissible radial load*									
input shaft d1	N	900	1300	2000	3500	5000	8500	11000	15000
permissible radial load*									
output shaft d2	N	1100	1600	2500	4500	6000	10500	15000	18000
permissible axial load*									
input shaft d1	N	450	650	1000	1750	2500	4250	5500	7500
permissible axial load*									
output shaft d2	N	550	800	1250	2250	3000	5250	7500	9000
efficiency at max. load *	%				> 98				
Running noise at 1500rpm,partial load	db(A)	70	74	76	77	78	80	82	83
Weight	kg	4.5	8.0	13.0	22.0	38.5	71.0	103.5	155.0
Service life h > 15.000									
Lubrication									up to and including VP140: synthetic lubrication oils, ISO VG 150
Operating temperature									-30°C up to 100°C
Paint									Primer coating RAL 9005 - dull black

§ at 2% max. load *Force contact point is midth of Shaft

Thermal Performance Limit

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

Gearbox Size	VP75	VP90	VP110	Vp140	VP170	VP210	VP240	VP280
Thermal performance limit (Kw)	5.5	7.4	10.8	16.1	23.4	28.6	45.3	60.3

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

Duty cycle per hour =	100%	80%	60%	40%	20%
Factor	1	1.2	1.4	1.6	1.8
Ambient temperature °C	10	10	30	40	50
Factor	1.2	1.0	0.87	0.75	0.62

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Spiral Bevel Power Gearbox - Reinforced Design

POWER GEAR	Unit	VX75	VX90	VX110	VX140	VX170	VX210	VX240	VX280
1:1 Nominal torque M2	Nm	87	135	290	625	1020	2050	3350	5200
Max. permissible torque M2*		131	203	435	938	1530	3075	5025	7800
max.rpm at input n1	rpm	3000	2500	2000	2000	1500	1200	1200	1000
standard output backlash§	arcmin	6 to 14	6 to 14	6 to 13	6 to 12	6 to 12	6 to 11	6 to 11	6 to 11
minimum output backlash§	arcmin	4 to 6	4 to 6	3 to 6	3 to 6	3 to 6	3 to 6	3 to 6	3 to 6
permissible radial load*									
input shaft d1	N	1500	2000	3500	5500	7800	12000	16000	20000
permissible radial load*									
output shaft d2	N	2000	2700	4500	7500	11000	16000	21000	30000
permissible axial load*									
input shaft d1	N	750	1000	1750	2750	3900	6000	8000	10000
permissible axial load*									
output shaft d2	N	1000	1350	2250	3750	5500	8000	10500	15000
efficiency at max. load *	%				> 98				
Running noise at 1500rpm,partial load	db(A)	70	74	76	77	78	80	82	83
Weight	kg	5.0	8.5	13.5	22.5	39.0	71.5	104.0	155.5
Service life					h > 15.000				
Lubrication					up to and including VX140: synthetic lubrication oils, ISO VG 150				
Operating temperature					-30°C up to 100°C				
Paint					Primer coating RAL 9005 - dull black				

§ at 2% max. load *Force contact point is midth of Shaft

INERTIA I1

at the input (kgcm²)

Ratio i	VP75L13	VP90L13	VP110L13	VP140L13	VP170L13	VP210L13	VP240L13	VP280L
1.0	1.79	4.93	12.50	36.8	85.9	287	592	1190
1.5	1.22	3.45	9.17	22.4	54.6	179	373	762
2.0	0.95	2.78	7.41	15.6	39.3	123	253	506
3.0	0.78	2.34	6.18	10.9	28.5	84.1	167	328
4.0	0.72	2.18	5.71	9.19	24.5	69.9	136	263
5.0	0.69	2.10	5.48	8.32	22.6	62.7	120	230

Ratio i	VX75L13	VX90L13	VX110L13	VX140L13	VX170L13	VX210L13	VX240L13	VX280L
1.0	2.26	5.99	21.4	61.3	142	485	987	2150