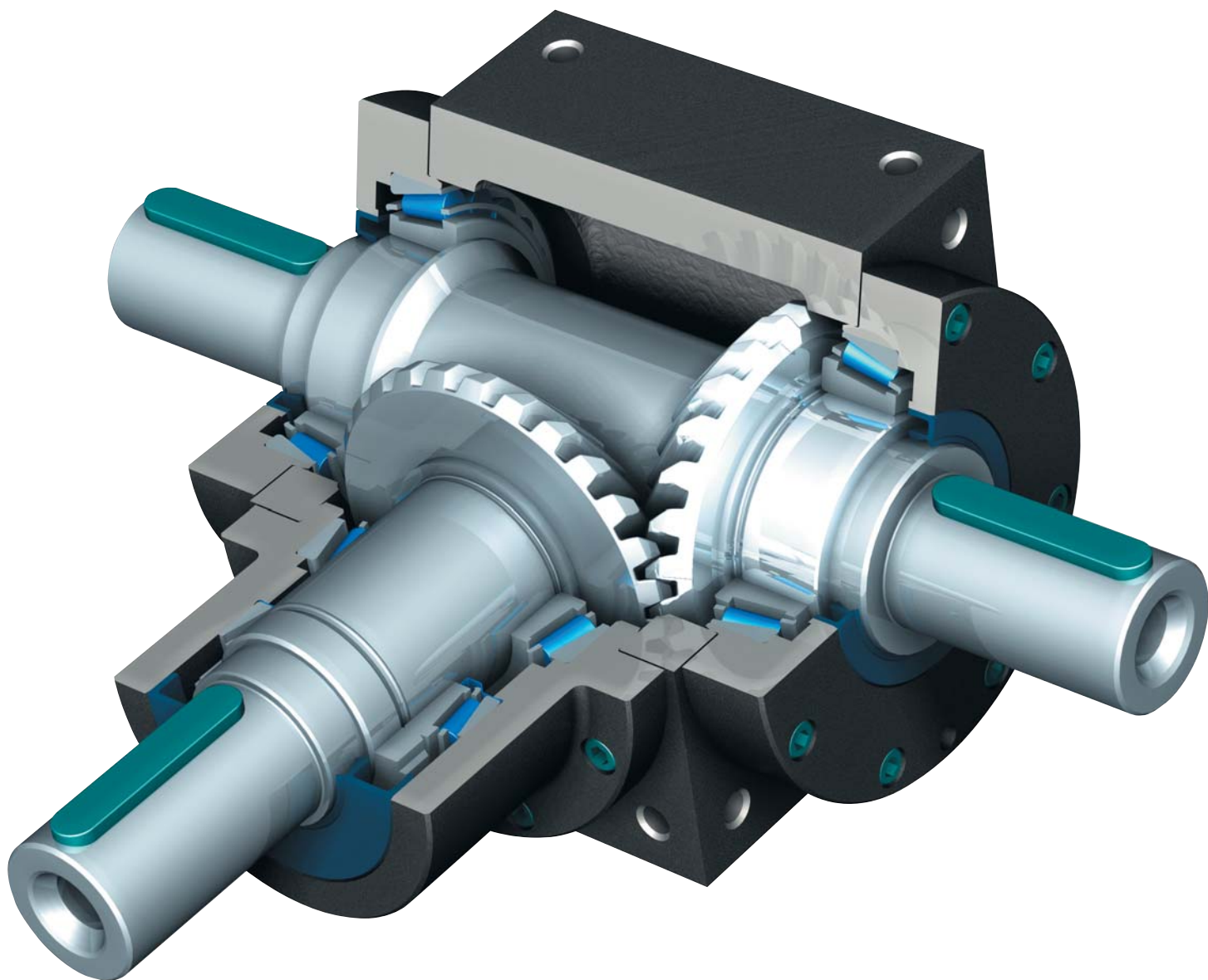


POWER *GEAR*

*The high performance
bevel gearbox*



A close-up, high-angle photograph of a bevel gear assembly. The image shows the intricate teeth of the gears, which are made of a dark, metallic material. The lighting is dramatic, highlighting the sharp edges and the smooth surfaces of the teeth. The background is a soft, out-of-focus blue and white, suggesting a clean, industrial environment. The overall composition is dynamic and emphasizes the precision and complexity of the machinery.

Precision combines with performance.

Bevel gear technology is at the heart of an assembly consisting of gear housing, shafts, flanges and bearings resulting in a high performance gearbox. With over 50 years of experience, MS-GRAESSNER have the competence to offer innovative solutions in bevel gear technology and gearbox assembly suiting a wide range of industrial gearing applications. MS-GRAESSNER are the ideal partner for you.



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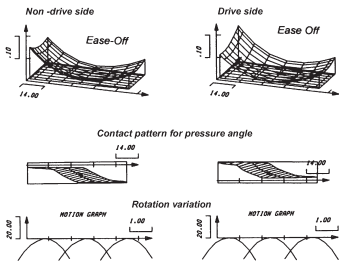
Internal highlights

The design of the new PowerGear range has been influenced by extremely varied applications within many industry sectors.

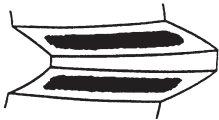
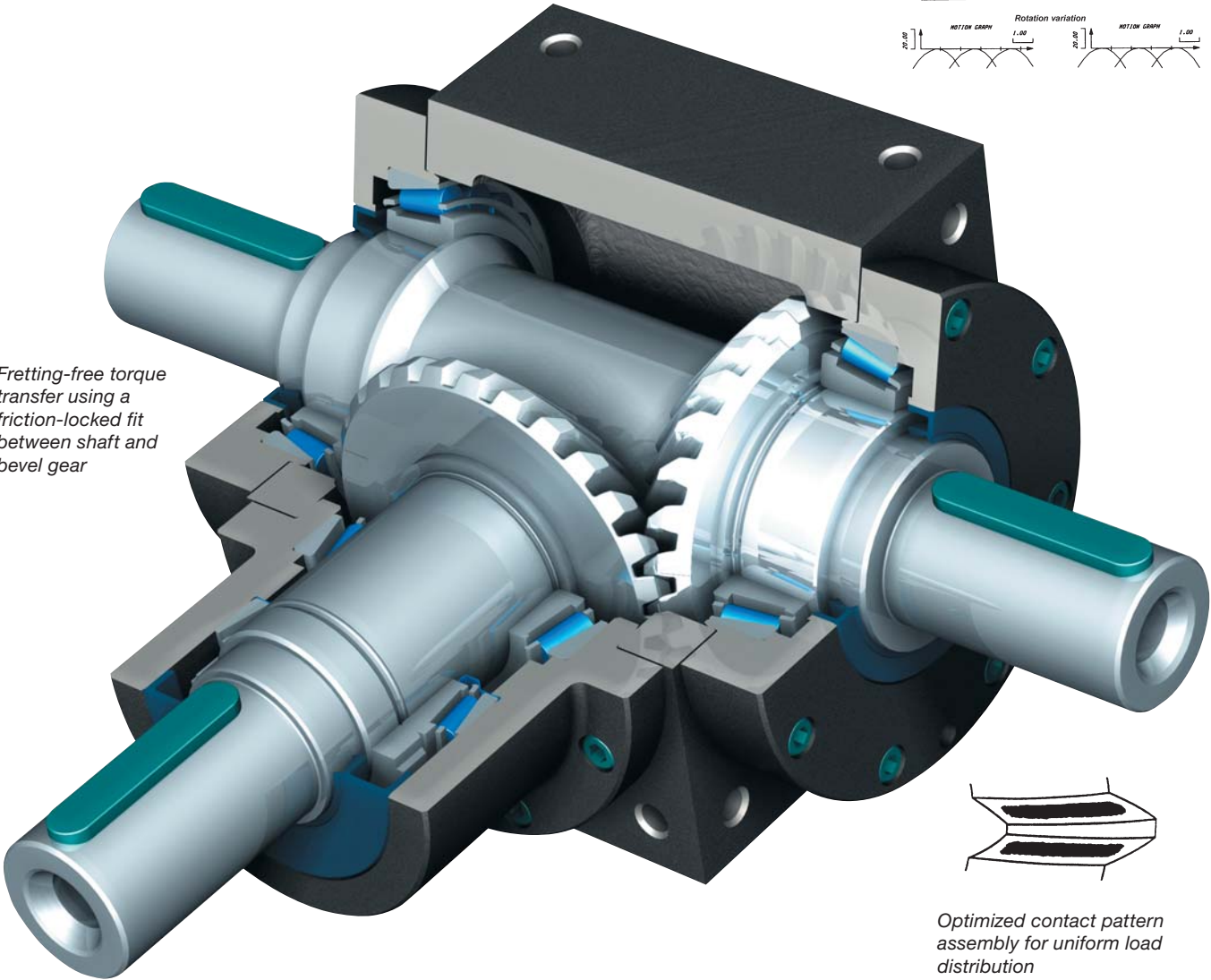
The PowerGear range has been developed with a specific torque/speed relationship in mind and therefore benefits from many advantages.

- The compact and rigid design ensures highest performance whilst being space and weight efficient.
- Lubricated for life, the gearboxes are virtually maintenance-free (dependent on size and whether used under normal conditions).
- The high efficiency rating of 98% saves energy costs.

Optimized Gleason gearing for high torque ratings



Fretting-free torque transfer using a friction-locked fit between shaft and bevel gear



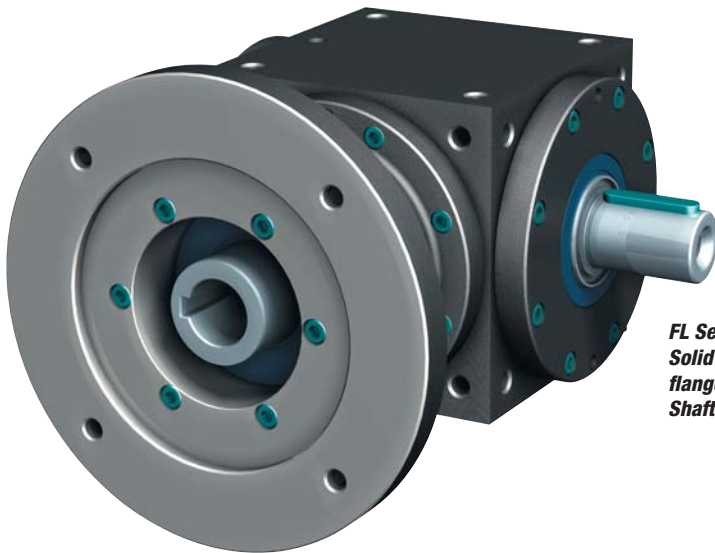
Optimized contact pattern assembly for uniform load distribution

External highlights

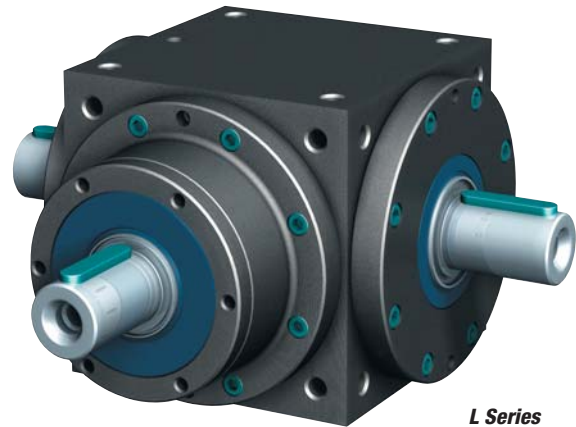
POWER GEAR

Simply choose the PowerGear to suit your application.

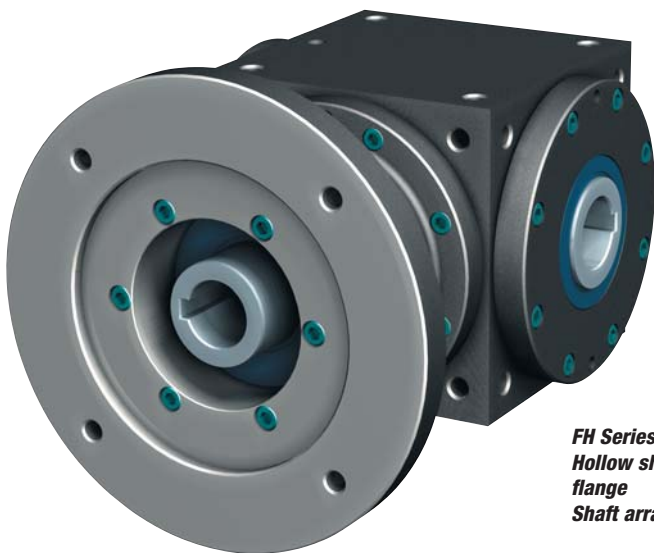
- 11 gearbox sizes, from P54 to P450
- 9 reinforced designs, ratio $i = 1:1$, from X54 to X280
- Ratios from $i = 1:1$ to 5:1
- Input speeds
Up to 7500 min^{-1} for P series, dependent on size
Up to 4000 min^{-1} for X series, dependent on size
- Flange, solid- or hollow shaft version



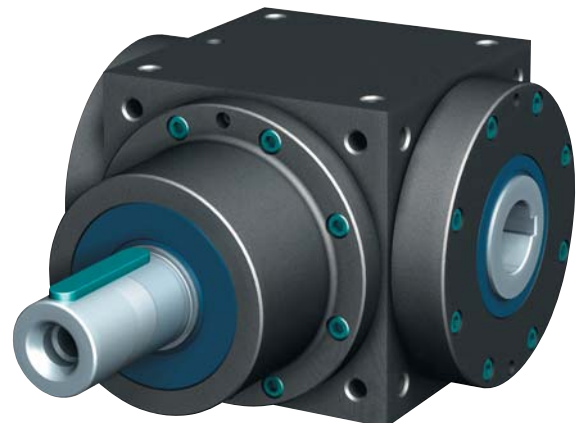
FL Series
Solid shaft version with input flange
Shaft arrangement 13



L Series
Solid shaft version
Shaft arrangement 13



FH Series
Hollow shaft version with input flange
Shaft arrangement 13



H Series
Hollow shaft version
Shaft arrangement 13

| | | Abbr. | Unit | P54 | P75 | P90 | P110 | P140 | P170 | P210 | P240 | P280 |
|---|--|------------------------|-------------------|---|---------|---------|---------|---------|---------|---------|---------|------|
| Output torque | i=1:1 | T _{2N} | Nm | 15 | 45 | 78 | 150 | 360 | 585 | 1300 | 2150 | 3200 |
| | | T _{2B} | Nm | 23 | 68 | 117 | 225 | 540 | 878 | 1950 | 3225 | 4800 |
| | | T _{2Not} | Nm | 30 | 90 | 156 | 300 | 720 | 1170 | 2600 | 4300 | 6400 |
| | i=1.5:1 | T _{2N} | Nm | 15 | 45 | 78 | 150 | 360 | 585 | 1300 | 2150 | 3200 |
| | | T _{2B} | Nm | 23 | 68 | 117 | 225 | 540 | 878 | 1950 | 3225 | 4800 |
| | | T _{2Not} | Nm | 30 | 90 | 156 | 300 | 720 | 1170 | 2600 | 4300 | 6400 |
| | i=2:1 | T _{2N} | Nm | 12 | 42 | 68 | 150 | 330 | 544 | 1220 | 2010 | 3050 |
| | | T _{2B} | Nm | 18 | 63 | 102 | 225 | 495 | 816 | 1830 | 3015 | 4575 |
| | | T _{2Not} | Nm | 24 | 84 | 136 | 300 | 660 | 1088 | 2440 | 4020 | 6100 |
| | i=3:1 | T _{2N} | Nm | 12 | 33 | 54 | 120 | 270 | 450 | 1020 | 1650 | 2850 |
| | | T _{2B} | Nm | 18 | 50 | 81 | 180 | 405 | 675 | 1530 | 2475 | 4275 |
| | | T _{2Not} | Nm | 24 | 66 | 108 | 240 | 540 | 900 | 2040 | 3300 | 5700 |
| | i=4:1 | T _{2N} | Nm | – | 28 | 52 | 100 | 224 | 376 | 860 | 1410 | 2300 |
| | | T _{2B} | Nm | – | 42 | 78 | 150 | 336 | 564 | 1290 | 2115 | 3450 |
| | | T _{2Not} | Nm | – | 56 | 104 | 200 | 448 | 752 | 1720 | 2820 | 4600 |
| i=5:1 | T _{2N} | Nm | – | 25 | 40 | 85 | 196 | 320 | 740 | 1210 | 2000 | |
| | T _{2B} | Nm | – | 38 | 60 | 128 | 294 | 480 | 1110 | 1815 | 3000 | |
| | T _{2Not} | Nm | – | 50 | 80 | 170 | 392 | 640 | 1480 | 2420 | 4000 | |
| Input speed | i= 1:1 | n _{1Standard} | min ⁻¹ | 2500 | 2000 | 1700 | 1400 | 1100 | 1000 | 800 | 700 | 650 |
| | i= 1.5:1 ; 2:1 | n _{1Standard} | min ⁻¹ | 3000 | 2500 | 2000 | 1600 | 1400 | 1300 | 1050 | 950 | 850 |
| | i= 3:1 ; 4:1 ; 5:1 | n _{1Standard} | min ⁻¹ | 3500 | 3000 | 2500 | 2100 | 2000 | 1800 | 1600 | 1350 | 1200 |
| | | n _{1max**} | min ⁻¹ | 7500 | 6500 | 5500 | 4500 | 3500 | 3000 | 2200 | 2000 | 1700 |
| | | | | **On request, special measures required | | | | | | | | |
| Output backlash | Standard | arcmin | ≤ 18 | ≤ 15 | ≤ 14 | ≤ 13 | ≤ 12 | ≤ 12 | ≤ 11 | ≤ 11 | ≤ 11 | |
| | Reduced | arcmin | ≤ 12 | ≤ 9 | ≤ 8 | ≤ 8 | ≤ 7 | ≤ 6 | ≤ 6 | ≤ 6 | ≤ 6 | |
| Permissible radial load | F _{R1max*} | N | 300 | 900 | 1300 | 2000 | 3500 | 5000 | 8500 | 11000 | 15000 | |
| | F _{R2max*} | N | 400 | 1100 | 1600 | 2500 | 4500 | 6000 | 10500 | 15000 | 18000 | |
| Permissible axial load | F _{A1max*} | N | 150 | 450 | 650 | 1000 | 1750 | 2500 | 4250 | 5500 | 7500 | |
| | F _{A2max*} | N | 200 | 550 | 800 | 1250 | 2250 | 3000 | 5250 | 7500 | 9000 | |
| Efficiency at max load | n | % | > 98 | > 98 | > 98 | > 98 | > 98 | > 98 | > 98 | > 98 | > 98 | |
| Running noise at 1500 min ⁻¹ , partial load | Lpa | db(A) | 70 | 70 | 74 | 76 | 77 | 78 | 80 | 82 | 83 | |
| Weight | m | kg | 1.8 | 4.5 | 8.0 | 13.0 | 22.0 | 38.5 | 71.0 | 103.5 | 155.0 | |
| Service life | Lh | h | > 15000 | > 15000 | > 15000 | > 15000 | > 15000 | > 15000 | > 15000 | > 15000 | > 15000 | |
| Lubrication | Synthetic oil, ISO VG 150, up to size P140 inclusive | | | | | | | | | | | |
| Average oil quantity | ltr. | | 0.05 | 0.10 | 0.20 | 0.30 | 0.40 | 1.00 | 2.20 | 2.60 | 3.00 | |
| Operating temperature | °C | -30 bis 90 | | | | | | | | | | |
| Paint | Primary coated RAL 9005 – black | | | | | | | | | | | |
| Mass moments of inertia related to input for shaft arrangement 13 | i=1.0:1 | I ₁ | kgcm ² | 0.28 | 1.79 | 4.93 | 12.5 | 36.8 | 85.9 | 287 | 592 | 1190 |
| | i=1.5:1 | I ₁ | kgcm ² | 0.15 | 1.22 | 3.45 | 9.17 | 22.4 | 54.6 | 179 | 373 | 762 |
| | i=2.0:1 | I ₁ | kgcm ² | 0.11 | 0.95 | 2.78 | 7.41 | 15.6 | 39.3 | 123 | 253 | 506 |
| | i=3.0:1 | I ₁ | kgcm ² | 0.09 | 0.78 | 2.34 | 6.18 | 10.9 | 28.5 | 84.1 | 167 | 328 |
| | i=4.0:1 | I ₁ | kgcm ² | – | 0.72 | 2.18 | 5.71 | 9.19 | 24.5 | 69.9 | 136 | 263 |
| | i=5.0:1 | I ₁ | kgcm ² | – | 0.69 | 2.10 | 5.48 | 8.32 | 22.6 | 62.7 | 120 | 230 |

* Centre of shaft

Thermal performance limit

| | P54 | P75 | P90 | P110 | P140 | P170 | P210 | P240 | P280 |
|---|-----|-----|-----|------|------|------|------|------|------|
| Thermal performance limit P _{therm} (KW) at 20 °C and duty cycle of 100% | 1.6 | 2.9 | 4.1 | 5.7 | 9.2 | 13.2 | 21.2 | 28.4 | 38.4 |

The gearbox performance is limited by the maximum permissible oil bath temperature. The actual effective performance must not exceed the permissible limit when in continuous operation.

For intermittent operation or in the event of increased ambient temperatures, the following factors can be applied as guide values for determining the permissible thermal performance limit.

| | | | | | |
|----------------------|------|------|------|------|------|
| Duty cycle (dc) in % | 100 | 80 | 60 | 40 | 20 |
| Factor | 1.00 | 1.20 | 1.40 | 1.60 | 1.80 |

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

| | | | |
|--|---------|--------|---------------------|
| Example | Gearbox | dc | Ambient Temperature |
| P _{therm} | P140 | 80 % | 30 °C |
| Thermal performance limit P _{therm} = | 9.2 | x 1.20 | x 0.87 = 9.6 KW |

Applicable is: P_{exist.} ≤ P_{therm}

Please see gearbox selection and installation on page 16+17!

| | | Abbr. | Unit | P360 | P450 |
|---|--------------------|---|-------------------|------------|------------|
| Output torque | i=1:1 | T _{2N} | Nm | 3750 | 6600 |
| | | T _{2B} | Nm | 5625 | 9900 |
| | | T _{2Not} | Nm | 7500 | 13200 |
| | i=1.5:1 | T _{2N} | Nm | 3550 | 7000 |
| | | T _{2B} | Nm | 5325 | 10500 |
| | | T _{2Not} | Nm | 7100 | 14000 |
| | i=2:1 | T _{2N} | Nm | 3500 | 7000 |
| | | T _{2B} | Nm | 5250 | 10500 |
| | | T _{2Not} | Nm | 7000 | 14000 |
| | i=3:1 | T _{2N} | Nm | 3350 | 7000 |
| | | T _{2B} | Nm | 5025 | 10500 |
| | | T _{2Not} | Nm | 6700 | 14000 |
| | i=4:1 | T _{2N} | Nm | 2900 | 6600 |
| | | T _{2B} | Nm | 4350 | 9900 |
| | | T _{2Not} | Nm | 5800 | 13200 |
| i=5:1 | T _{2N} | Nm | 2600 | 6000 | |
| | T _{2B} | Nm | 3900 | 9000 | |
| | T _{2Not} | Nm | 5200 | 12000 | |
| Input speed | i= 1:1 | n ₁ Standard | min ⁻¹ | 650 | 550 |
| | i= 1.5:1 ; 2:1 | n ₁ Standard | min ⁻¹ | 850 | 800 |
| | i= 3:1 ; 4:1 ; 5:1 | n ₁ Standard | min ⁻¹ | 1200 | 1100 |
| | | n ₁ max ** | min ⁻¹ | 1400 | 1300 |
| | | **On request, special measures required | | | |
| Output backlash at 2 % max load | Standard | | arcmin | ≤ 11 | ≤ 10 |
| | Reduced | | arcmin | ≤ 6 | ≤ 5 |
| Permissible radial load | i=1:1 – 2:1 | F _{R1} max* | N | 18000 | 22000 |
| | i=3:1 | F _{R1} max* | N | 15000 | 18000 |
| | i=4:1 | F _{R1} max* | N | 11000 | 15000 |
| | i=5:1 | F _{R1} max* | N | 9000 | 11000 |
| | i=1:1 – 5:1 | F _{R2} max* | N | 24000 | 34000 |
| Permissible axial load | i=1:1 – 2:1 | F _{A1} max | N | 9000 | 11000 |
| | i=3:1 | F _{A1} max | N | 7500 | 9000 |
| | i=4:1 | F _{A1} max | N | 5500 | 7500 |
| | i=5:1 | F _{A1} max | N | 4500 | 5500 |
| | i=1:1 – 5:1 | F _{A2} max | N | 12000 | 17000 |
| Efficiency at max load | | n | % | > 98 | > 98 |
| Running noise at 1500 min ⁻¹ , partial load | | Lpa | db(A) | 85 | 85 |
| Weight | | m | kg | 240.0 | 400.0 |
| Service life | | Lh | h | > 15000 | > 15000 |
| Lubrication | | | | | |
| Average oil quantity | | | ltr. | 9.00 | 22.00 |
| Operating temperature | | | °C | -30 bis 90 | -30 bis 90 |
| Paint | | | | | |
| Mass moments of inertia related to input for shaft arrangement 13 | i=1.0:1 | I1 | kgcm ² | 2314 | 7632 |
| | i=1.5:1 | I1 | kgcm ² | 1270 | 4152 |
| | i=2.0:1 | I1 | kgcm ² | 877 | 2764 |
| | i=3.0:1 | I1 | kgcm ² | 467 | 1596 |
| | i=4.0:1 | I1 | kgcm ² | 316 | 1077 |
| | i=5.0:1 | I1 | kgcm ² | 219 | 750 |

* Centre of shaft

Thermal performance limit

| | P360 | P450 |
|--|------|------|
| Thermal performance limit P _{therm} (KW) at 20 °C and duty cycle of 100 % | 60 | 93.4 |

The gearbox performance is limited by the maximum permissible oil bath temperature. The actual effective performance must not exceed the permissible limit when in continuous operation.

| Duty cycle (dc) in % | 100 | 80 | 60 | 40 | 20 |
|----------------------|------|------|------|------|------|
| Factor | 1.00 | 1.20 | 1.40 | 1.60 | 1.80 |

For intermittent operation or in the event of increased ambient temperatures, the following factors can be applied as guide values for determining the permissible thermal performance limit.

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

| Example: | Gearbox | dc | Ambient Temperature |
|--|---------|--------|---------------------|
| P _{therm} | P140 | 80 % | 30 °C |
| Thermal performance limit P _{therm} = | 9.2 | x 1.20 | x 0.87 = 9.6 KW |

Applicable is: P_{exist} ≤ P_{therm}

Please see gearbox selection and installation on page 16+17!

Performance table reinforced design

POWER GEAR

| | Abbr. | Unit | X54 | X75 | X90 | X110 | X140 | X170 | X210 | X240 | X280 | |
|--|--|--------------------|------------|---------|---------|---------|---------|---------|---------|---------|---------|-------|
| Output torque | i=1:1 | | | | | | | | | | | |
| | T _{2N} | Nm | 24 | 87 | 135 | 290 | 625 | 1020 | 2050 | 3350 | 5200 | |
| | T _{2B} | Nm | 36 | 131 | 203 | 435 | 938 | 1530 | 3075 | 5025 | 7800 | |
| | T _{2Not} | Nm | 48 | 174 | 270 | 580 | 1250 | 2040 | 4100 | 6700 | 10400 | |
| Input speed | n _{1Standard} | min ⁻¹ | 2200 | 1800 | 1500 | 1100 | 900 | 850 | 700 | 600 | 500 | |
| | n _{1max**} | min ⁻¹ | 4000 | 3000 | 2500 | 2000 | 2000 | 150 | 1200 | 1200 | 1000 | |
| | **On request, special measures required | | | | | | | | | | | |
| Output backlash | Standard | arcmin | ≤ 18 | ≤ 15 | ≤ 14 | ≤ 13 | ≤ 12 | ≤ 12 | ≤ 11 | ≤ 11 | ≤ 11 | |
| | Reduced | arcmin | ≤ 12 | ≤ 9 | ≤ 8 | ≤ 8 | ≤ 7 | ≤ 6 | ≤ 6 | ≤ 6 | ≤ 6 | |
| Permissible radial load | Centre d1 | F _{1Rmax} | N | 400 | 1500 | 2000 | 3500 | 5500 | 7800 | 12000 | 16000 | 20000 |
| | Centre d2 | F _{2Rmax} | N | 600 | 2000 | 2700 | 4500 | 7500 | 11000 | 16000 | 21000 | 30000 |
| Permissible axial load | Centre d1 | F _{1Amax} | N | 200 | 750 | 1000 | 1750 | 2750 | 3900 | 6000 | 8000 | 10000 |
| | Centre d2 | F _{2Amax} | N | 300 | 1000 | 1350 | 2250 | 3750 | 5500 | 8000 | 10500 | 15000 |
| Efficiency at max load | n | % | > 98 | > 98 | > 98 | > 98 | > 98 | > 98 | > 98 | > 98 | > 98 | |
| Running noise at 1500 min ⁻¹ , partial load | L _{pa} | db(A) | 70 | 70 | 74 | 76 | 77 | 78 | 80 | 82 | 83 | |
| Weight | m | kg | 1.9 | 5.0 | 8.5 | 13.5 | 22.5 | 39.0 | 71.5 | 104.0 | 155.5 | |
| Service life | L _h | h | > 15000 | > 15000 | > 15000 | > 15000 | > 15000 | > 15000 | > 15000 | > 15000 | > 15000 | |
| Lubrication | Synthetic oil, ISO VG 150, up to size P140 inclusive | | | | | | | | | | | |
| Average oil quantity | | ltr. | 0.1 | 0.1 | 0.2 | 0.3 | 0.4 | 1.0 | 2.2 | 2.6 | 3.0 | |
| Operating temperature | | °C | -30 bis 90 | | | | | | | | | |
| Paint | Primary coated RAL 9005 – black | | | | | | | | | | | |
| Mass moments of inertia related to input | shaft arrangement 13 | kgcm ² | 0.34 | 2.26 | 5.99 | 21.4 | 61.3 | 142 | 485 | 987 | 2150 | |

Thermal performance limit

| | X54 | X75 | X90 | X110 | X140 | X170 | X210 | X240 | X280 |
|--|-----|-----|-----|------|------|------|------|------|------|
| Thermal performance limit P _{therm} (KW) at 20 °C and duty cycle of 100 % | 1.6 | 2.9 | 4.1 | 5.7 | 9.2 | 13.2 | 21.2 | 28.4 | 38.4 |

The gearbox performance is limited by the maximum permissible oil bath temperature. The actual effective performance must not exceed the permissible limit when in continuous operation.

For intermittent operation or in the event of increased ambient temperatures, the following factors can be applied as guide values for determining the permissible thermal performance limit.

| | | | | | |
|----------------------|------|------|------|------|------|
| Duty cycle (dc) in % | 100 | 80 | 60 | 40 | 20 |
| Factor | 1.00 | 1.20 | 1.40 | 1.60 | 1.80 |

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

| | | | | | | | |
|---------------------------|---------|-----|---------------------|---|------|---|--------|
| Example: | Gearbox | dc | Ambient Temperature | | | | |
| P _{therm} | X140 | 80% | 30 °C | | | | |
| Thermal performance limit | 9.2 | x | 1.20 | x | 0.87 | = | 9.6 KW |

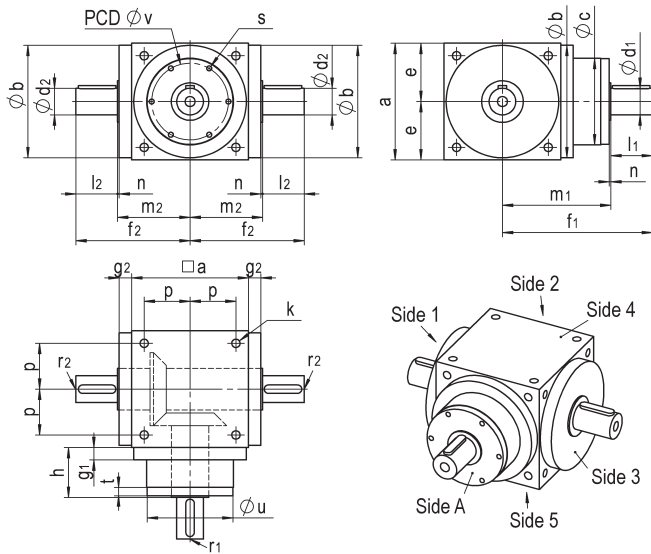
Applicable is: P_{exist.} ≤ P_{therm}

Please see gearbox selection and installation on page 16+17!

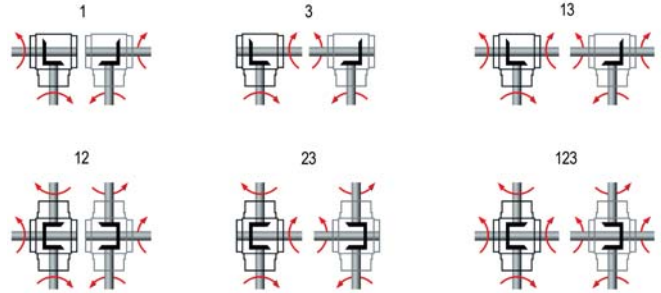
Dimensions and shaft arrangements

L Series

POWER GEAR



Always right view = mirrored illustration



| | P54L | P75L | P90L | P110L | P140L | P170L | P210L | P240L | P280L |
|--------------------------|-----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|
| a | 54 | 75 | 90 | 110 | 140 | 170 | 210 | 240 | 280 |
| Øb_{h7} | 53 | 73 | 88 | 108 | 135 | 165 | 205 | 235 | 275 |
| Øc | 53 | 72 | 86 | 106 | 104 | 128 | 160 | 180 | 200 |
| Ød_{1 k6} | 11 | 16 | 18 | 22 | 32 | 40 | 50 | 55 | 60 |
| l₁ | 23 | 30 | 35 | 40 | 50 | 60 | 75 | 85 | 110 |
| Ød_{2 k6} | 11 | 16 | 18 | 22 | 32 | 40 | 50 | 55 | 60 |
| l₂ | 23 | 30 | 35 | 40 | 50 | 60 | 75 | 85 | 110 |
| e | 27 | 37.5 | 45 | 55 | 70 | 85 | 105 | 120 | 140 |
| f₁ | 95 | 120 | 135 | 155 | 180 | 215 | 265 | 300 | 360 |
| f₂ | 60 | 84 | 97 | 112 | 137 | 162 | 202 | 231 | 276 |
| g₁ | 43 | 15 | 15 | 15 | 15 | 15 | 20 | 25 | 25 |
| g₂ | 9 | 14.5 | 15 | 15 | 15 | 15 | 20 | 25 | 25 |
| h | 45 | 52.5 | 55 | 60 | 60 | 70 | 85 | 95 | 110 |
| k | M5 x14.5* | M6 x12 | M6 x12 | M8 x15.5 | M10 x19.5 | M12 x23 | M16 x30 | M16 x30 | M16 x30 |
| m₁ | 72 | 90 | 100 | 115 | 130 | 155 | 190 | 215 | 250 |
| m₂ | 37 | 54 | 62 | 72 | 87 | 102 | 127 | 146 | 166 |
| n₁ | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| n₂ | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| p | 22 | 30 | 36 | 44 | 55 | 67 | 85 | 95 | 110 |
| r_{1**} | M4 | M5 | M6 | M8 | M12 | M16 | M16 | M20 | M20 |
| r_{2**} | M4 | M5 | M6 | M8 | M12 | M16 | M16 | M20 | M20 |
| s | – | 4x M5 x9 | 4x M5 x12 | 6x M6 x12 | 6x M6 x12 | 6x M8 x14 | 6x M8 x14 | 6x M8 x14 | 6x M10 x17 |
| t | – | 8 | 8 | 8 | 10 | 10 | 10 | 10 | 10 |
| Øu_{g6} | – | 72.9 | 87 | 107 | 103 | 127 | 158 | 178 | 198 |
| Øv | – | 62 | 76 | 92 | 92 | 114 | 142 | 160 | 176 |
| Key_{d1} | 4x4x18 | 5x5x25 | 6x6x28 | 6x6x32 | 10x8x45 | 12x8x50 | 14x9x70 | 16x10x80 | 18x11x100 |
| Key_{d2} | 4x4x18 | 5x5x25 | 6x6x28 | 6x6x32 | 10x8x45 | 12x8x50 | 14x9x70 | 16x10x80 | 18x11x100 |

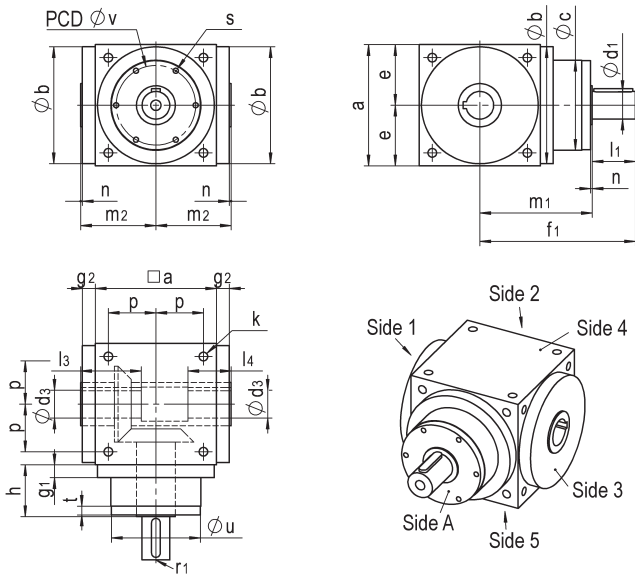
* Thread starts from 7.00 mm depth

** According to Form D, DIN332

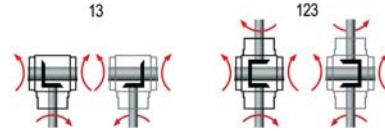
Dimensions and shaft arrangements

H Series

POWER GEAR



Always right view = mirrored illustration

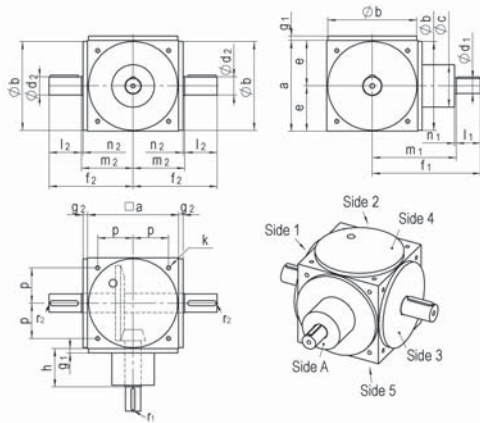


| | P75H | P90H | P110H | P140H | P170H | P210H | P240H | P280H |
|-------------------|----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|
| a | 75 | 90 | 110 | 140 | 170 | 210 | 240 | 280 |
| Øb _{h7} | 73 | 88 | 108 | 135 | 165 | 205 | 235 | 275 |
| Øc | 72 | 86 | 106 | 104 | 128 | 160 | 180 | 200 |
| Ød1 _{k6} | 16 | 18 | 22 | 32 | 40 | 50 | 55 | 60 |
| l1 | 30 | 35 | 40 | 50 | 60 | 75 | 85 | 110 |
| Ød3 ^{H7} | 14 | 18 | 22 | 32 | 40 | 50 | 55 | 60 |
| l3 | 47 | 55 | 60 | 70 | 80 | 95 | 115 | 130 |
| l4 | 32 | 35 | 40 | 50 | 55 | 65 | 80 | 80 |
| e | 37.5 | 45 | 55 | 70 | 85 | 105 | 120 | 140 |
| f1 | 120 | 135 | 155 | 180 | 215 | 265 | 300 | 360 |
| g1 | 15 | 15 | 15 | 15 | 15 | 20 | 25 | 25 |
| g2 | 14.5 | 15 | 15 | 15 | 15 | 20 | 25 | 25 |
| h | 52.5 | 55 | 60 | 60 | 70 | 85 | 95 | 110 |
| k | M6 x12 | M6 x12 | M8 x15.5 | M10 x19.5 | M12 x23 | M16 x30 | M16 x30 | M16 x30 |
| m1 | 90 | 100 | 115 | 130 | 155 | 190 | 215 | 250 |
| m2 | 54 | 62 | 72 | 87 | 102 | 127 | 146 | 166 |
| n1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| n2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| p | 30 | 36 | 44 | 55 | 67 | 85 | 95 | 110 |
| r1 | M5 | M6 | M8 | M12 | M16 | M16 | M20 | M20 |
| s | 4x M5 x9 | 4x M5 x12 | 6x M6 x12 | 6x M6 x12 | 6x M8 x14 | 6x M8 x14 | 6x M8 x14 | 6x M10 x17 |
| t | 8 | 8 | 8 | 10 | 10 | 10 | 10 | 10 |
| Øu _{g6} | 72.9 | 87 | 107 | 103 | 127 | 158 | 178 | 198 |
| Øv | 62 | 76 | 92 | 92 | 114 | 142 | 160 | 176 |
| Key _{d1} | 5x5x25 | 6x6x28 | 6x6x32 | 10x8x45 | 12x8x50 | 14x9x70 | 16x10x80 | 18x11x100 |
| Key _{d2} | 5x5 | 6x6 | 6x6 | 10x8 | 12x8 | 14x9 | 16x10 | 18x11 |

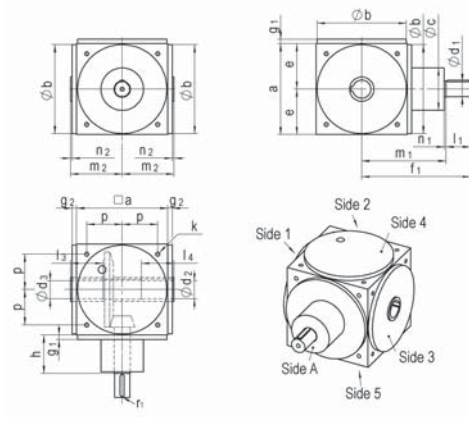
Dimensions and shaft arrangements L Series

POWER GEAR

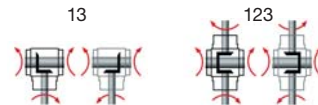
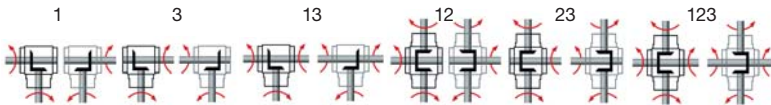
H Series



Always right view = mirrored illustration



Always right view = mirrored illustration

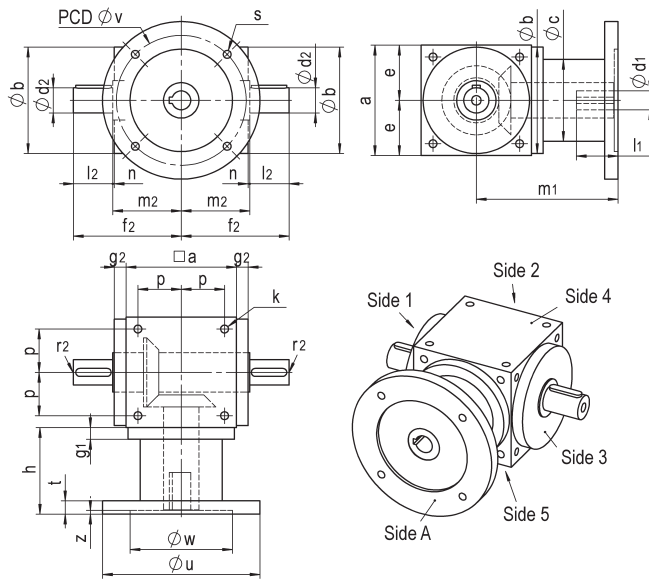


| | | P360L | P450L |
|--------------------------|-----------|-----------|-----------|
| a | i=1:1-5:1 | 360 | 450 |
| Øb_{h7} | i=1:1-5:1 | 350 | 440 |
| Øc | i=1:1-2:1 | 210 | 250 |
| | i=3:1-5:1 | 170 | 210 |
| Ød_{1 k6} | i=1:1-2:1 | 75 | 90 |
| | i=3:1 | 60 | 75 |
| | i=4:1 | 55 | 70 |
| | i=5:1 | 50 | 60 |
| l₁ | i=1:1-2:1 | 120 | 160 |
| | i=3:1 | 110 | 120 |
| | i=4:1 | 85 | 120 |
| | i=5:1 | 80 | 110 |
| Ød_{2 k6} | i=1:1-5:1 | 75 | 90 |
| l₂ | i=1:1-5:1 | 120 | 160 |
| e | i=1:1-5:1 | 180 | 225 |
| f₁ | i=1:1-2:1 | 445 | 570 |
| | i=3:1 | 435 | 530 |
| | i=4:1 | 410 | 530 |
| | i=5:1 | 405 | 520 |
| f₂ | i=1:1-5:1 | 325 | 410 |
| g₁ | i=1:1-5:1 | 22 | 22 |
| g₂ | i=1:1-5:1 | 22 | 22 |
| h | i=1:1-5:1 | 145 | 185 |
| k | i=1:1-5:1 | M20 x37.5 | M20 x37.5 |
| m₁ | i=1:1-5:1 | 325 | 410 |
| m₂ | i=1:1-5:1 | 205 | 250 |
| n₁ | i=1:1-5:1 | 3 | 3 |
| n₂ | i=1:1-5:1 | 3 | 3 |
| p | i=1:1-5:1 | 140 | 175 |
| r₁ | i=1:1-2:1 | M20 | M24 |
| | i=3:1 | M20 | M20 |
| | i=4:1 | M20 | M20 |
| | i=5:1 | M16 | M20 |
| r₂ | i=1:1-5:1 | M20 | M24 |
| s | i=1:1-5:1 | - | - |
| t | i=1:1-5:1 | - | - |
| Øu_{g6} | i=1:1-5:1 | - | - |
| Øv | i=1:1-5:1 | - | - |
| Key_{d1} | i=1:1-2:1 | 20x12x110 | 25x14x140 |
| | i=3:1 | 18x11x100 | 20x12x110 |
| | i=4:1 | 16x10x80 | 20x12x110 |
| | i=5:1 | 14x9x70 | 18x11x100 |
| Key_{d2} | i=1:1-5:1 | 20x12x110 | 25x14x140 |

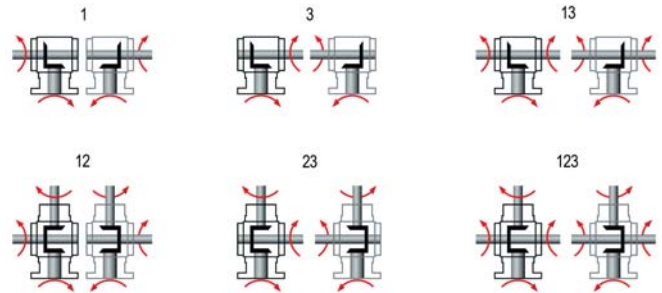
| | | P360H | P450H |
|--------------------------|-----------|-----------|-----------|
| a | i=1:1-5:1 | 360 | 450 |
| Øb_{h7} | i=1:1-5:1 | 350 | 440 |
| Øc | i=1:1-2:1 | 210 | 250 |
| | i=3:1-5:1 | 170 | 210 |
| Ød_{1 k6} | i=1:1-2:1 | 75 | 90 |
| | i=3:1 | 60 | 75 |
| | i=4:1 | 55 | 70 |
| | i=5:1 | 50 | 60 |
| l₁ | i=1:1-2:1 | 120 | 160 |
| | i=3:1 | 110 | 120 |
| | i=4:1 | 85 | 120 |
| | i=5:1 | 80 | 110 |
| Ød_{3 h7} | i=1:1-5:1 | 75 | 90 |
| l₃ | i=1:1-5:1 | 165 | 200 |
| l₄ | i=1:1-5:1 | 105 | 140 |
| e | i=1:1-5:1 | 180 | 225 |
| f₁ | i=1:1-2:1 | 445 | 570 |
| | i=3:1 | 435 | 530 |
| | i=4:1 | 410 | 530 |
| | i=5:1 | 405 | 520 |
| g₁ | i=1:1-5:1 | 22 | 22 |
| g₂ | i=1:1-5:1 | 22 | 22 |
| h | i=1:1-5:1 | 145 | 185 |
| k | i=1:1-5:1 | M20 x37.5 | M20 x37.5 |
| m₁ | i=1:1-5:1 | 325 | 410 |
| m₂ | i=1:1-5:1 | 205 | 250 |
| n₁ | i=1:1-5:1 | 3 | 3 |
| n₂ | i=1:1-5:1 | 3 | 3 |
| p | i=1:1-5:1 | 140 | 175 |
| r₁ | i=1:1-2:1 | M20 | M24 |
| | i=3:1 | M20 | M20 |
| | i=4:1 | M20 | M20 |
| | i=5:1 | M16 | M20 |
| s | i=1:1-5:1 | - | - |
| t | i=1:1-5:1 | - | - |
| Øu_{g6} | i=1:1-5:1 | - | - |
| Øv | i=1:1-5:1 | - | - |
| Key_{d1} | i=1:1-2:1 | 20x12x110 | 25x14x140 |
| | i=3:1 | 18x11x100 | 20x12x110 |
| | i=4:1 | 16x10x80 | 20x12x110 |
| | i=5:1 | 14x9x70 | 18x11x100 |
| Key_{d2} | i=1:1-5:1 | 20x12 | 25x14 |

Dimensions and shaft arrangements FL Series

POWER GEAR



Always right view = mirrored illustration



| | P75FL | P90FL | P110FL | P140FL | P170FL | P210FL | P240FL | P280FL |
|--------------------|--------|--------|----------|-----------|---------|---------|----------|-----------|
| a | 75 | 90 | 110 | 140 | 170 | 210 | 240 | 280 |
| Øb _{h7} | 73 | 88 | 108 | 135 | 165 | 205 | 235 | 275 |
| Øc | 72 | 86 | 106 | 104 | 128 | 160 | 180 | 200 |
| Ød _{2 k6} | 16 | 18 | 22 | 32 | 40 | 50 | 55 | 60 |
| l ₂ | 30 | 35 | 40 | 50 | 60 | 75 | 85 | 110 |
| e | 37.5 | 45 | 55 | 70 | 85 | 105 | 120 | 140 |
| f ₂ | 84 | 97 | 112 | 137 | 162 | 202 | 231 | 276 |
| g ₁ | 15 | 15 | 15 | 15 | 15 | 20 | 25 | 25 |
| g ₂ | 14.5 | 15 | 15 | 15 | 15 | 20 | 25 | 25 |
| h | 62.5 | 68 | 80 | 110 | 130 | 170 | 180 | 185 |
| k | M6 x12 | M6 x12 | M8 x15.5 | M10 x19.5 | M12 x23 | M16 x30 | M16 x30 | M16 x30 |
| m ₁ | 100 | 113 | 135 | 180 | 215 | 275 | 300 | 325 |
| m ₂ | 54 | 62 | 72 | 87 | 102 | 127 | 146 | 166 |
| n ₂ | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| p | 30 | 36 | 44 | 55 | 67 | 85 | 95 | 110 |
| r ₂ | M5 | M6 | M8 | M12 | M16 | M16 | M20 | M20 |
| t | 14 | 14 | 17 | 17 | 20 | 20 | 20 | 20 |
| Key _{d2} | 5x5x25 | 6x6x28 | 6x6x32 | 10x8x45 | 12x8x50 | 14x9x70 | 16x10x80 | 18x11x100 |
| Z | 4.5 | 4.5 | 5 | 5 | 6 | 6 | 6 | 6 |

Also available with flange and coupling

Input shaft Ød1^{G7} x L1 with keyway to DIN 6885/1

| | | | | | | | |
|-----------|-----------|-----------|------------|------------|-------------|-------------|--------------|
| 14x33/5x5 | 14x33/5x5 | 19x43/6x6 | 24x53/8x7 | 28x63/8x7 | 38x83/10x8 | 38x83/10x8 | 48x115/14x9 |
| | 19x43/6x6 | 24x53/8x7 | 28x63/8x7 | 32x83/10x8 | 42x115/12x8 | 42x115/12x8 | 55x115/16x10 |
| | | | 32x63/10x8 | 38x83/10x8 | 48x115/14x9 | 48x115/14x9 | |

Input flange B5 Øu / Øv with 4 threaded holes s / Øw^{F7}

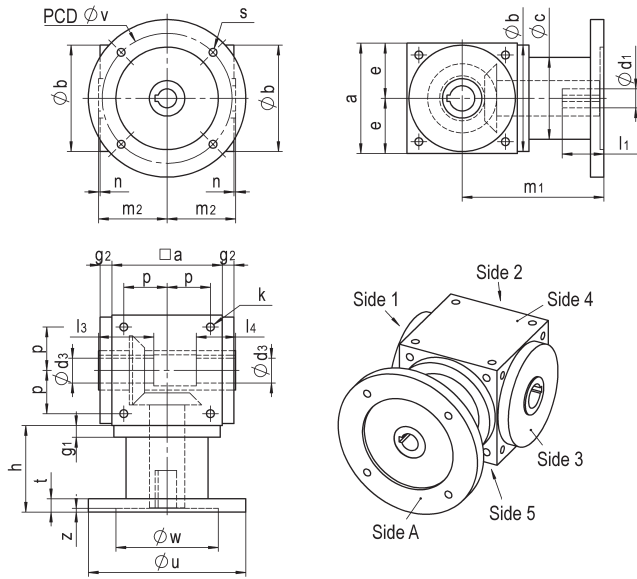
| | | | | | | | |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 120/100+6/80 | 120/100+6/80 | 120/100+6/80 | 160/130+8/110 | 200/165+10/130 | | 250/215+12/180 | 300/265+12/230 |
| 140/115+8/95 | 140/115+8/95 | 140/115+8/95 | 200/165+10/130 | 250/215+12/180 | 250/215+12/180 | 300/265+12/230 | 350/300+16/250 |
| 160/130+8/110 | 160/130+8/110 | 160/130+8/110 | 250/215+12/180 | 300/265+12/230 | 300/265+12/230 | 350/300+16/250 | 400/350+16/300 |
| 200/165+10/130 | 200/165+10/130 | 200/165+10/130 | 300/265+12/230 | 350/300+16/250 | 350/300+16/250 | 400/350+16/300 | 450/400+16/350 |

Input flange B14 Øu / Øv with bore holes s / Øw^{F7}

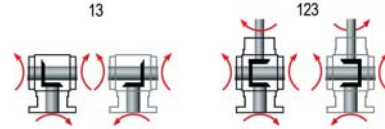
| | | | | | | | |
|----------------|----------------|----------------|----------------|----------------|--|--|--|
| 120/100+6.6/80 | | | | | | | |
| 140/115+9/95 | 140/115+9/95 | | | | | | |
| 160/130+9/110 | 160/130+9/110 | 160/130+9/110 | 160/130+9/110 | | | | |
| 200/165+11/130 | 200/165+11/130 | 200/165+11/130 | 200/165+11/130 | 200/165+11/130 | | | |

Dimensions and shaft arrangements FH Series

POWER GEAR



Always right view = mirrored illustration



| | P75FH | P90FH | P110FH | P140FH | P170FH | P210FH | P240FH | P280FH |
|--------------------------|--------|--------|----------|-----------|---------|---------|---------|---------|
| a | 75 | 90 | 110 | 140 | 170 | 210 | 240 | 280 |
| Øb_{h7} | 73 | 88 | 108 | 135 | 165 | 205 | 235 | 275 |
| Øc | 72 | 86 | 106 | 104 | 128 | 160 | 180 | 200 |
| Ød_{3 k6} | 14 | 18 | 22 | 32 | 40 | 50 | 55 | 60 |
| e | 37.5 | 45 | 55 | 70 | 85 | 105 | 120 | 140 |
| g₁ | 15 | 15 | 15 | 15 | 15 | 20 | 25 | 25 |
| g₂ | 14.5 | 15 | 15 | 15 | 15 | 20 | 25 | 25 |
| h | 62.5 | 68 | 80 | 110 | 130 | 170 | 180 | 185 |
| k | M6 x12 | M6 x12 | M8 x15.5 | M10 x19.5 | M12 x23 | M16 x30 | M16 x30 | M16 x30 |
| l₃ | 47 | 55 | 60 | 70 | 80 | 95 | 115 | 130 |
| l₄ | 32 | 35 | 40 | 50 | 55 | 65 | 80 | 80 |
| m₁ | 100 | 113 | 135 | 180 | 215 | 275 | 300 | 325 |
| m₂ | 54 | 62 | 72 | 87 | 102 | 127 | 146 | 166 |
| n₂ | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| p | 30 | 36 | 44 | 55 | 67 | 85 | 95 | 110 |
| t | 14 | 14 | 17 | 17 | 20 | 20 | 20 | 20 |
| Key_{d3} | 5x5 | 6x6 | 6x6 | 10x8 | 12x8 | 14x9 | 16x10 | 18x11 |
| Z | 4.5 | 4.5 | 5 | 5 | 6 | 6 | 6 | 6 |

Also available with flange and coupling

Input shaft Ød1^{G7} x L1 with keyway to DIN 6885/1

| | | | | | | | |
|-----------|-----------|-----------|------------|------------|-------------|-------------|--------------|
| 14x33/5x5 | 14x33/5x5 | 19x43/6x6 | 24x53/8x7 | 28x63/8x7 | 38x83/10x8 | 38x83/10x8 | 48x115/14x9 |
| | 19x43/6x6 | 24x53/8x7 | 28x63/8x7 | 32x83/10x8 | 42x115/12x8 | 42x115/12x8 | 55x115/16x10 |
| | | | 32x63/10x8 | 38x83/10x8 | 48x115/14x9 | 48x115/14x9 | |

Input flange B5 Øu / Øv with 4 threaded holes s / Øw^{F7}

| | | | | | | | |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 120/100+6/80 | 120/100+6/80 | 120/100+6/80 | 160/130+8/110 | 200/165+10/130 | | 250/215+12/180 | 300/265+12/230 |
| 140/115+8/95 | 140/115+8/95 | 140/115+8/95 | 200/165+10/130 | 250/215+12/180 | 250/215+12/180 | 300/265+12/230 | 350/300+16/250 |
| 160/130+8/110 | 160/130+8/110 | 160/130+8/110 | 250/215+12/180 | 300/265+12/230 | 300/265+12/230 | 350/300+16/250 | 400/350+16/300 |
| 200/165+10/130 | 200/165+10/130 | 200/165+10/130 | 300/265+12/230 | 350/300+16/250 | 350/300+16/250 | 400/350+16/300 | 450/400+16/350 |

Input flange B14 Øu / Øv with bore holes s / Øw^{F7}

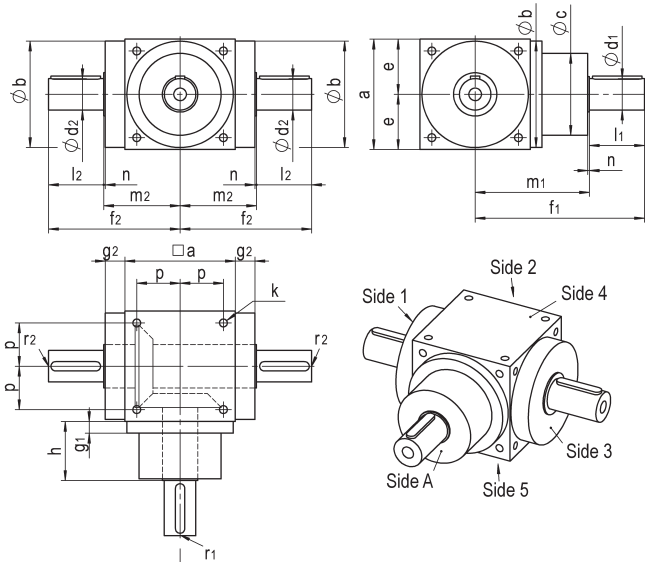
| | | | | | | | |
|----------------|----------------|----------------|----------------|----------------|--|--|--|
| 120/100+6.6/80 | | | | | | | |
| 140/115+9/95 | 140/115+9/95 | | | | | | |
| 160/130+9/110 | 160/130+9/110 | 160/130+9/110 | 160/130+9/110 | | | | |
| 200/165+11/130 | 200/165+11/130 | 200/165+11/130 | 200/165+11/130 | 200/165+11/130 | | | |

Dimensions and shaft arrangements

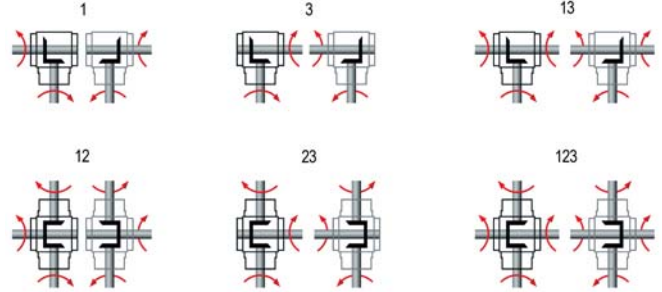
Reinforced design

L Series

POWER GEAR



Always right view = mirrored illustration



| | X54L | X75L | X90L | X110L | X140L | X170L | X210L | X240L | X280L |
|--------------------------|------------------------|----------|-----------|-----------|-----------|---------|-----------|-----------|-----------|
| a | 54 | 75 | 90 | 110 | 140 | 170 | 210 | 240 | 280 |
| Øb_{h7} | 53 | 73 | 88 | 108 | 135 | 165 | 205 | 235 | 275 |
| Øc | 53 | 72 | 86 | 106 | 104 | 128 | 160 | 180 | 200 |
| Ød_{1 k6} | 14 | 20 | 25 | 35 | 40 | 50 | 60 | 70 | 80 |
| l₁ | 30 | 35 | 40 | 60 | 70 | 80 | 110 | 120 | 150 |
| Ød_{2 k6} | 14 | 20 | 25 | 35 | 40 | 50 | 60 | 70 | 80 |
| l₂ | 30 | 35 | 40 | 60 | 70 | 80 | 110 | 120 | 150 |
| e | 27 | 37.5 | 45 | 55 | 70 | 85 | 105 | 120 | 140 |
| f₁ | 102 | 125 | 140 | 175 | 215 | 255 | 320 | 360 | 425 |
| f₂ | 69 | 93 | 105 | 140 | 167 | 197 | 252 | 282 | 338 |
| g₁ | 43 | 15 | 15 | 15 | 15 | 15 | 20 | 25 | 25 |
| g₂ | 11 | 18.5 | 18 | 23 | 25 | 30 | 35 | 40 | 46 |
| h | 45 | 52.5 | 55 | 60 | 75 | 90 | 105 | 120 | 135 |
| k | M5 x14.5 ¹⁾ | M6 x12 | M6 x12 | M8 x15.5 | M10 x19.5 | M12 x23 | M16 x30 | M16 x30 | M16 x30 |
| m₁ | 72 | 90 | 100 | 115 | 145 | 175 | 210 | 240 | 275 |
| m₂ | 39 | 58 | 65 | 80 | 97 | 117 | 142 | 162 | 188 |
| n₁ | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| n₂ | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| p | 22 | 30 | 36 | 44 | 55 | 67 | 85 | 95 | 110 |
| r₁ | M5 | M6 | M10 | M12 | M16 | M16 | M20 | M20 | M20 |
| r₂ | M5 | M6 | M10 | M12 | M16 | M16 | M20 | M20 | M20 |
| s | – | 4x M5 x9 | 4x M5 x12 | 6x M6 x12 | – | – | – | – | – |
| t | – | 8 | 8 | 8 | – | – | – | – | – |
| Øu_{g6} | – | 72.9 | 87 | 107 | – | – | – | – | – |
| Øv | – | 62 | 76 | 92 | – | – | – | – | – |
| Key_{d1} | 5x5x25 | 6x6x28 | 8x7x32 | 10x8x50 | 12x8x63 | 14x9x70 | 18x11x100 | 20x12x110 | 22x14x140 |
| Key_{d2} | 5x5x25 | 6x6x28 | 8x7x32 | 10x8x50 | 12x8x63 | 14x9x70 | 18x11x100 | 20x12x110 | 22x14x140 |

¹⁾ Thread starts from 7.00 mm depth

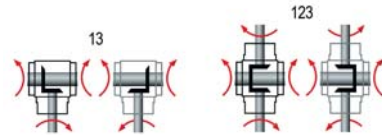
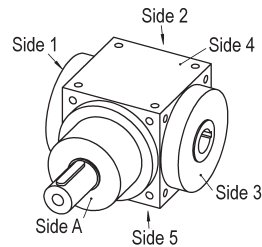
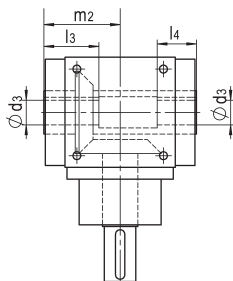
Dimensions and shaft arrangements

Reinforced design

H Series

POWER GEAR

Always right view = mirrored illustration



| | X75H | X90H | X110H | X140H | X170H | X210H | X240H | X280H |
|--------------------------|----------|-----------|-----------|-----------|---------|-----------|-----------|-----------|
| a | 75 | 90 | 110 | 140 | 170 | 210 | 240 | 280 |
| Øb_{h7} | 73 | 88 | 108 | 135 | 165 | 205 | 235 | 275 |
| Øc | 72 | 86 | 106 | 104 | 128 | 160 | 180 | 200 |
| Ød_{1 k6} | 20 | 25 | 35 | 40 | 50 | 60 | 70 | 80 |
| l₁ | 35 | 40 | 60 | 70 | 80 | 110 | 120 | 150 |
| Ød_{3 H7} | 14 | 18 | 22 | 32 | 40 | 50 | 55 | 60 |
| l₃ | 47 | 50 | 60 | 70 | 95 | 95 | 115 | 130 |
| l₄ | 32 | 35 | 45 | 50 | 70 | 70 | 80 | 90 |
| e | 37.5 | 45 | 55 | 70 | 85 | 105 | 120 | 140 |
| f₁ | 125 | 140 | 175 | 215 | 255 | 320 | 360 | 425 |
| f₂ | – | – | – | – | – | – | – | – |
| g₁ | 15 | 15 | 15 | 15 | 15 | 20 | 25 | 25 |
| g₂ | 18.5 | 18 | 23 | 25 | 30 | 35 | 40 | 46 |
| h | 52.5 | 55 | 60 | 75 | 90 | 105 | 120 | 135 |
| k | M6 x12 | M6 x12 | M8 x15.5 | M10 x19.5 | M12 x23 | M16 x30 | M16 x30 | M16 x30 |
| m₁ | 90 | 100 | 115 | 145 | 175 | 210 | 240 | 275 |
| m₂ | 58 | 65 | 80 | 97 | 117 | 142 | 162 | 188 |
| n₁ | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| n₂ | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| p | 30 | 36 | 44 | 55 | 67 | 85 | 95 | 110 |
| r₁ | M6 | M10 | M12 | M16 | M16 | M20 | M20 | M20 |
| r₂ | – | – | – | – | – | – | – | – |
| s | 4x M5 x9 | 4x M5 x12 | 6x M6 x12 | – | – | – | – | – |
| t | 8 | 8 | 8 | – | – | – | – | – |
| Øu_{g6} | 72.9 | 87 | 107 | – | – | – | – | – |
| Øv | 62 | 76 | 92 | – | – | – | – | – |
| Key_{d1} | 6x6x28 | 8x7x32 | 10x8x50 | 12x8x63 | 14x9x70 | 18x11x100 | 20x12x110 | 22x14x140 |
| Key_{d2} | 5x5 | 6x6 | 6x6 | 10x8 | 12x8 | 14x9 | 16x10 | 18x11 |

Selection

For entire PowerGear range

Performance P [kW] at n_1 [min^{-1}]
 $(P_1 \approx P_2 \text{ at } \eta \geq 98 \%)$
 Ratio i
 Speed $n_1, n_2 = n_1/i$
 Output torque T_2 [Nm] = $9550 \cdot \frac{P_2}{n_2}$



Existing output torque $T_{2N\text{exist.}} \leq$ permissible output torque $T_{2N\text{perm.}}$



Maximum existing acceleration torque $T_{2B\text{exist.}} \leq$ maximum permissible acceleration torque $T_{2B\text{perm.}}$
 or up to 10 start-ups per minute



Maximum existing acceleration torque $T_{2B\text{exist.}} \leq$ maximum permissible nominal torque $T_{2N\text{perm.}}$
 or up to 60 start-ups per minute
 Maximum values for start-ups between 10 and 60 start-ups are interpolated



Existing speed $n_{1\text{exist.}} \leq$ nominal speed n_{1N}
 In cases of higher speeds, please contact us as modifications will be necessary
 (pressure lubrication etc., see options on page 18).



Existing performance $P_{\text{exist.}} \leq$ thermal performance limit P_{therm} (20 °C, 100 % duty cycle)
 The thermal performance limit varies inline with different ambient temperatures and duty cycles. Please use the factors in the table below as guide values. If the existing performance reaches or exceeds the thermal performance, please contact us as modifications will be necessary (additional cooling, see options on page 18).



Radial and axial load of the shafts \leq maximum permissible values $F_{R1\text{max}}, F_{R2\text{max}}, F_{A1\text{max}}, F_{A2\text{max}}$
 These are guide values, dependent on additional loads. Upon request we calculate these values individually.

Factors for the thermal performance limit:

| | | | | | |
|---------------------|-----|-----|-----|-----|-----|
| Duty cycle (dc) [%] | 100 | 80 | 60 | 40 | 20 |
| Factor | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 |

| | | | | | |
|--------------------------|-----|-----|------|------|------|
| Ambient temperature [°C] | 10 | 20 | 30 | 40 | 50 |
| Factor | 1.2 | 1.0 | 0.87 | 0.75 | 0.62 |

Selection

For entire PowerGear range

Calculation example:

Given: $n_1 = 1448 \text{ min}^{-1}$
 $n_2 = 362 \text{ min}^{-1}$
 $P = 7.5 \text{ kW}$
 $dc = 100 \%$
Ambient temperature: 20°C

Selection: $i = \frac{n_1}{n_2} \quad i = \frac{1448 \text{ min}^{-1}}{362 \text{ min}^{-1}} = 4$

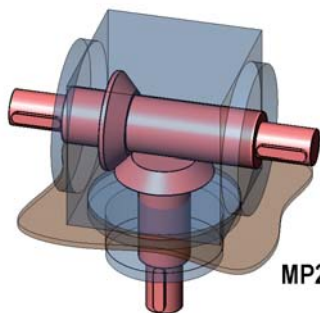
$$T_2 = 9550 \cdot \frac{P}{n_2} = 9550 \cdot \frac{7.5 \text{ kW}}{362 \text{ min}^{-1}} = 197.86 \text{ Nm}$$

→ Gearbox P140 4:1

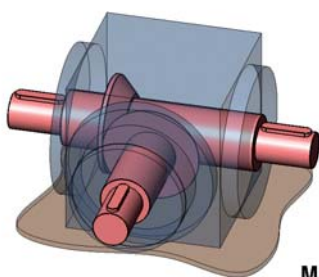
$$\begin{aligned} T_{2N\text{exist.}} &= 197.86 \text{ Nm} \leq T_{2N\text{perm.}} = 224 \text{ Nm} \\ n_{1\text{exist.}} &= 1448 \text{ min}^{-1} \leq n_{1N} = 2000 \text{ min}^{-1} \\ P_{\text{exist.}} &= 7.5 \text{ kW} \leq P_{\text{therm}} = 9.2 \text{ kW} \end{aligned}$$

Selected: P140L 4:1

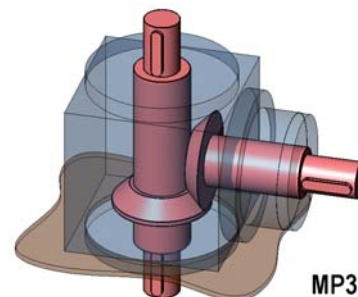
Installation position



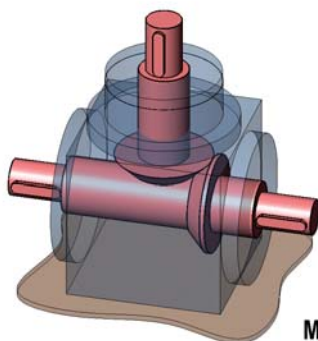
MP2



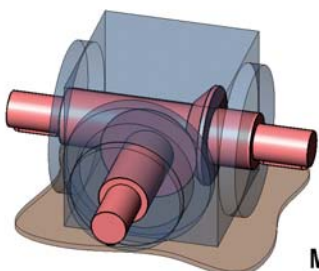
MP4



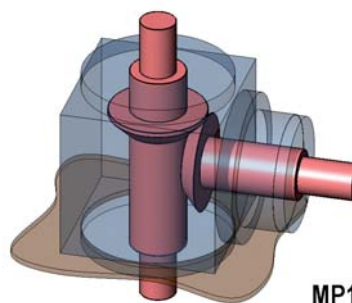
MP3



MP6



MP5



MP1

Options

Additional Cooling

1. Oil circulation lubrication system for better cooling

Gearbox is supplied ready for connection to an external oil supply. The external oil supply consists of at least an oil tank, air-oil cooler, an oil pump and pipework between oil tank and gearbox.

2. Cooling packs

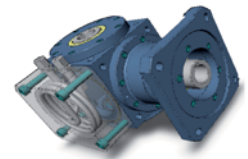
Gearbox heat dissipation is increased through mounted aluminium fins

3. Cooling packs with additional fan

Gearbox heat dissipation is increased through mounted aluminium fins and an additional radial fan

4. Water cooling

Gearbox is supplied ready for connection to an external water cooler. The oil reservoir is cooled by a cooling coil.



Oil pressure lubrication

For high speeds it may be necessary to pre-lubricate the gear teeth and bearings.

To achieve this, the gearbox is connected to an external pressure lubrication system (similar to the circulation lubrication system).

Oil pressure lubrication can also be combined with additional cooling.

Standard is splash lubrication.



Viton shaft seals

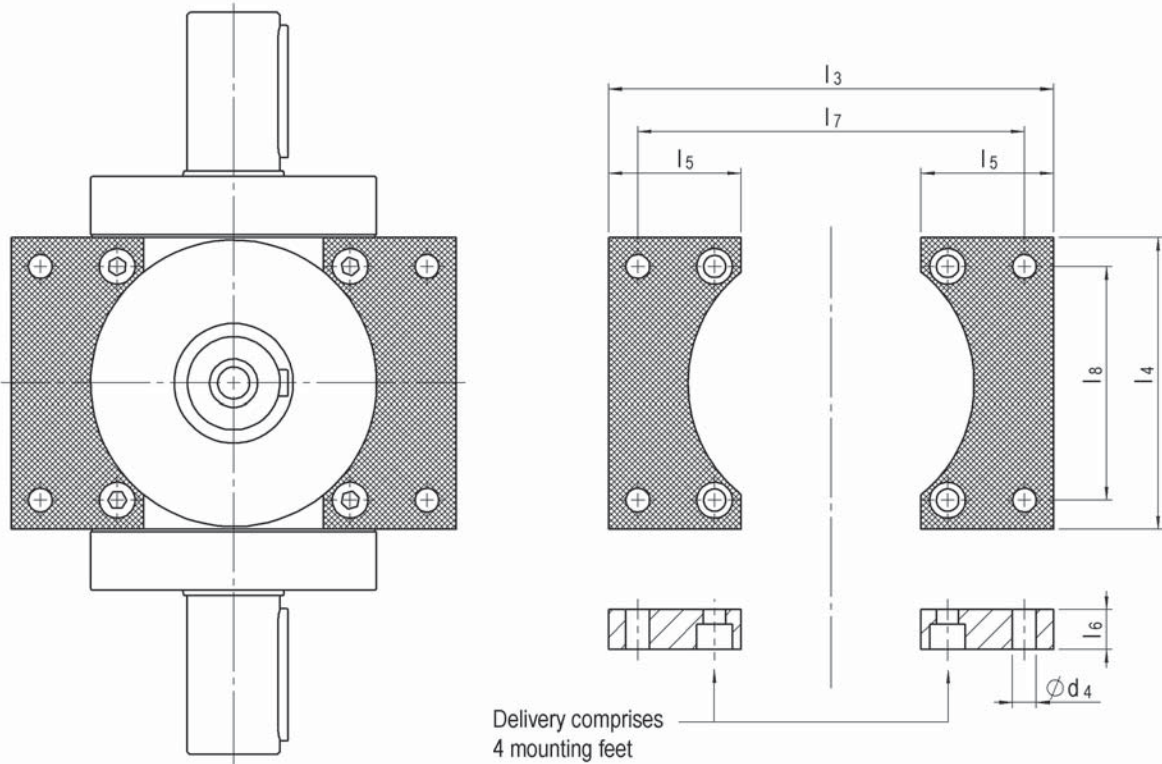
Necessary, if high gearbox temperatures are expected

Square motor flange

For all F Series gearboxes (standard = round flanges)

Gearboxes with minimal backlash

See performance tables page 6-8



Universal mounting feet

| | l 3 (mm) | l 4 (mm) - 0.5 | l 5 (mm) | l 6 (mm) | l 7 (mm) + - 0.2 | l 8 (mm) + - 0.2 | Ød4 (mm) | Cylindrical screw DIN 912 | Weight per pair (kg) |
|------|----------|-------------------|----------|----------|---------------------|---------------------|----------|------------------------------|-------------------------|
| P075 | 122 | 75 | 40 | 17 | 108 | 60 | 6.6 | M 6 x 12 | 0.6 |
| P090 | 145 | 90 | 45 | 17 | 125 | 72 | 6.6 | M 6 x 12 | 0.8 |
| P110 | 168 | 110 | 50 | 17 | 146 | 88 | 9.0 | M 8 x 18 | 1.1 |
| P140 | 208 | 140 | 60 | 20 | 178 | 110 | 11.0 | M 10 x 25 | 1.9 |
| P170 | 250 | 170 | 70 | 20 | 215 | 134 | 14.0 | M 12 x 25 | 2.7 |
| P210 | 310 | 210 | 90 | 25 | 265 | 170 | 18.0 | M 16 x 35 | 5.2 |
| P240 | 345 | 240 | 100 | 30 | 295 | 190 | 18.0 | M 16 x 35 | 8.0 |
| P280 | 385 | 280 | 100 | 30 | 335 | 220 | 18.0 | M 16 x 35 | 9.6 |
| P360 | 480 | 360 | 125 | 23 | 430 | 280 | 22.0 | M 20 x 40 | 15.0 |
| P450 | 580 | 450 | 140 | 23 | 520 | 350 | 22.0 | M 20 x 40 | 21.2 |

Oil filling

Our gearbox sizes P54 to P140 (X75 to X14) are filled as standard with synthetic oil.
For sizes P170 to P450 (X170 to X280), oil filling requires additional ordering.
On request, we can also fill the gearboxes with **food quality recognised (USDA)** oil.

Shorter shafts

Possible for existing shafts

Plain shafts

(Without keyways) are possible

Customised designs

Further customised designs available on request.

| Lubricant | Speed up to min ⁻¹ | Viscosity ISO VG DIN 51519 at 40 °C (mm ² /s) | Brand | | | | |
|--|-------------------------------|--|---------------------|---|---|--|--|
| | | | Aral | Castrol performance | ESSO | Mobil | Shell |
| Mineral oils | 500 | VG 220 | Degol BG 220 Plus | Optigear BM 220 Tribol 1100/220 | Spartan EP 220 | Mobilgear 600 XP 220 | Shell Omala F220 Shell Omala 220 |
| | 1000 | VG 150 | Degol BG 150 Plus | Optigear BM 150 Tribol 1100/150 | Spartan EP 150 | Mobilgear 600 XP 150 | Shell Omala F150 Shell Omala 150 |
| | 1500 | VG 100 | Degol BG 100 Plus | Optigear BM 100 Tribol 1100/100 | Spartan EP 100 | Mobilgear 600 XP 100 | Shell Omala F100 Shell Omala 100 |
| | over 2000 | VG 68 | Degol BG 68 Plus | | Spartan EP 68 | Mobilgear 600 XP 68 | Shell Omala 68 |
| Mineral oils for hypoid drives | to 2000 | SAE Class 85W-90 | | | | Mobilube GX 85W-90 | |
| | over 2000 | SAE Class 80W | | | | Mobilube GX 80W-A | |
| Polyglykole (PG-Oil) | 500 | VG 220 | Degol GS 220 | Tribol 800/220 | | Mobil Glygoyle 30 | Shell Tivela S 220 Shell Cassida WG 220 |
| | 1000 | VG 150 | Degol GS 150 | Tribol 800/150 | | Mobil Glygoyle 22 | Shell Tivela S150 Shell Cassida WG 150 |
| | from 2000 | VG 100 | | Tribol 800/100 | | Mobil Glygoyle 11 (VG 85) | |
| Poly-a-Olefine (PAO-Oil) | 500 | VG 220 | Degol PAS 220 | Optigear Synth. A220 Alphasyn EP 220 | | Mobil SHC 630 Mobilgear SHC XMP 220 | Shell Omala HD220 |
| | 1000 (3000) | VG 150 | Degol PAS 150 | Alphasyn EP 150 | | Mobil SHC 629 Mobilgear SHC XMP 150 | Shell Omala HD150 |
| | 1500 | VG 100 | | | | Mobil SHC 627 | |
| | from 1500 | VG 68 | | | | Mobil SHC 626 | |
| Physiologically uncritical oils (PHY-Oil) | | | Aral | Castrol performance | Klüber | Mobil | Shell |
| | 1000 | VG 220 | Aral Eural Gear 220 | Optileb GT 220 Tribol FoodProof 1800/220 | *Klüberoil 4 UH1 – 220 N **Klübersynth UH1 6-220 | Mobil DTE FM 220 | Shell Cassida WG 220 |
| | 1500 | VG 150 | Aral Eural Gear 150 | Optileb GT 150 | *Klüberoil 4 UH1 – 150 **Klübersynth UH1 6-150 | Mobil DTE FM 150 | |
| USDA -H1 Registered | from 1500 | VG 100 | Aral Eural Gear 68 | Optileb GT 100 | *Klüberoil 4 UH1 - 68 N | | |

* Synthetic KW-Oil, Ester oil

** Polyglykoloil

Oil quantities (dependent on ratio, speed, shaft arrangement and installation position)

| Size | P54 | P75/X75 | P90/X90 | P110/X110 | P140/X140 | P170/X170 | P210/X210 | P240/X240 | P280/X280 | P360 | P450 |
|-------------------|------|---------|---------|-----------|-----------|-----------|-----------|-----------|-----------|------|------|
| Average | 0.05 | 0.1 l | 0.2 l | 0.3 l | 0.4 l | 1.0 l | 2.2 l | 2.6 l | 3.0 l | 9.0 | 22.0 |
| max amount of oil | – | – | – | 0.35 l | 0.6 l | 1.2 l | 2.5 l | 3.5 l | 5.0 l | 15.0 | 32.0 |

POWERGEAR gearboxes, size P75 to P140 and X75 to X140 are supplied ready lubricated for life with a high-quality Poly-Alpha-Olefin synthetic oil. They are therefore maintenance free. Up to size P110/X110 there are no oil drain holes included. Only from size P140/X140 do the gearboxes include oil drain holes to enable optional oil changes.

POWERGEAR gearboxes, size P170 to P450 and X170 to X280 are supplied without lubricant if not ordered additionally.

For operating temperatures of max 80 °C , we recommend the use of mineral gear oil CLP DIN 51517 to ISO VG-Class 100 (DIN 51519).

For operating temperatures of up to 90 °C, we recommend the use of Poly-Alpha-Olefin synthetic gear oil CLP DIN 51517, part 3, to ISO VG-Class 150 (DIN 51519).

The lifespan of the oil at 80 °C average temperature in the gearbox without any relevant change in the quality of the oil, indicated by the oil producers are maximum values:

- for mineral oils, biodegradable oil and physiologically uncritical oil at least 2 years or 10.000 operating hours
- for Poly-Alpha-Olefine and Polyglykole at least 4 years or 20.000 operating hours

Please note:

The actual lifespan may be longer but for temperatures of over 80 °C could equally be shorter. As a rule, the lifespan of the oil is reduced by 50% for a temperature increase of 10%.

The condition of the gearbox and especially the leak tightness requires checking at regular intervals.

Service kits of wear and tear parts with full instructions are available from our service department.

| | | | | | | | | | | |
|-----------|---|-----------|---|-----------|---|-----------|---|-----------|---|-----------|
| P | - | 075 | - | L | - | 1,00:1 | - | Wa. 1 | - | |
| 1. | | 2. | | 3. | | 4. | | 5. | | 6. |

- 1. Gearbox range** P = PowerGear Standard Page 6+7
 X = PowerGear Reinforced Design Page 8
- 2. Size**
- 3. Series** L – Solid shaft Page 9+11/Page 14
 FL – Solid shaft with flange Page 12
 H – Hollow shaft Page 10+11/Page 15
 FH – Hollow shaft with flange Page 13
- 4. Ratio**
- 5. Shaft arrangement** Page 9–15
- 6. Additional data** • Installation position Page 17
 • Input speeds
 Maximum application speed
 For FL/FH Series, please indicate d1, flange version B5 or B14
 and flange diameter Page 12+13
- Options – if required Page 18+19
 - Customised design – on request



Germany

MS-GRAESSNER GmbH & Co. KG
THE GEAR COMPANY
Kuchenäcker 11
D-72135 Dettenhausen
Tel.: +49 (0) 71 57/123-0
Fax: +49 (0) 71 57/123-212
E-Mail: mail@graessner.de
www.graessner.de

Austria

GRAESSNER GmbH
Perfektastraße 61
Objekt 6/2
A-1230 Wien
Tel.: +43 (1) 69924 30-0
Fax: +43 (1) 69924 30-20
E-Mail: graessner@graessner.at
www.graessner.at

France

MS-GRAESSNER GmbH & Co. KG
14, rue du Prêtreur
F-67500 Haguenau
Tel.: +33 (0) 3 88 86 06 48
Mobil: +33 (0) 6 82 07 49 92
E-Mail: claude.rebmann@graessner.com
www.graessner.com

**Further information regarding the distribution network of MS-GRAESSNER can be found on:
HYPERLINK "<http://www.graessner.com>" www.graessner.com**

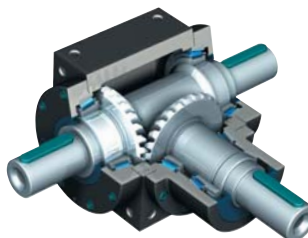
BEVEL GEAR



Spiral, Hypoid and Zerol BevelGears

- Standard range and customised designs
- Module ms up to 0.5 to 12
- Diameters up to 410 mm
- Shaft angles from 10° to 170°
- More than 50 years of experience
- In-house gearing calculation
- We manufacture to your drawing or advise you of possible alternatives
- Ground gear teeth

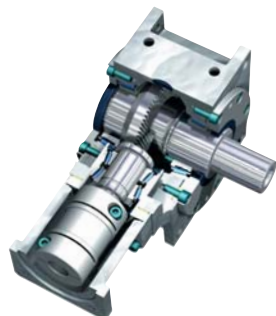
POWER GEAR



The high performance bevel gearbox

- High torque, small size
- For medium input speeds
- Ratios $i = 1:1$ up to 5:1
- Torques up to 7000 Nm
- Output via solid and hollow shaft
- Motor mounting either directly or via flange and coupling

DYNA GEAR



The highly dynamic servo right angle gearbox

- Hypoid gearing
- High input speeds at medium to high torques
- Ratios, **single-stage**, $i = 3:1$ to 15:1
- Ratios, two-stage, up to 150:1
- Torques up to 1440 Nm
- Flexible motor mounting via flange and coupling
- Low backlash ≤ 2 arcmin
- Variable ratios and uniform dimensions

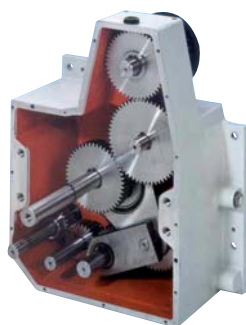
DYNA GEAR

Economy The cost-effective servo right angle gearbox



- Hypoid gearing
- High input speeds at medium torques
- Ratios, **single-stage**, $i = 5:1, 8:1, 10:1$ and 15:1
- Torques up to 1440 Nm
- Flexible motor mounting via flange and coupling
- Backlash ≤ 6 arcmin
- Variable ratios and uniform dimensions

DESIGN GEAR



The customised gearbox

- Two-stage bevel helical gearbox with ratios up to $i = 50:1$
- Single-stage gearboxes available as gear-change and reversing gearboxes
- Forced oil circulation lubrication system gearboxes for high speeds and torques
- Labyrinth sealed gearboxes with an efficiency of $> 99\%$
- Special gearboxes with additional functional elements
- Endless possibilities, please ask

PLANET GEAR



The planetary gearbox

- Ratios, single-stage and two-stage, $i = 3:1$ to 100:1 (higher ratios on request)
- Torques up to 540 Nm
- Flexible motor mounting via flange, with clamping or keyway
- Any installation position
- Economy or precision version