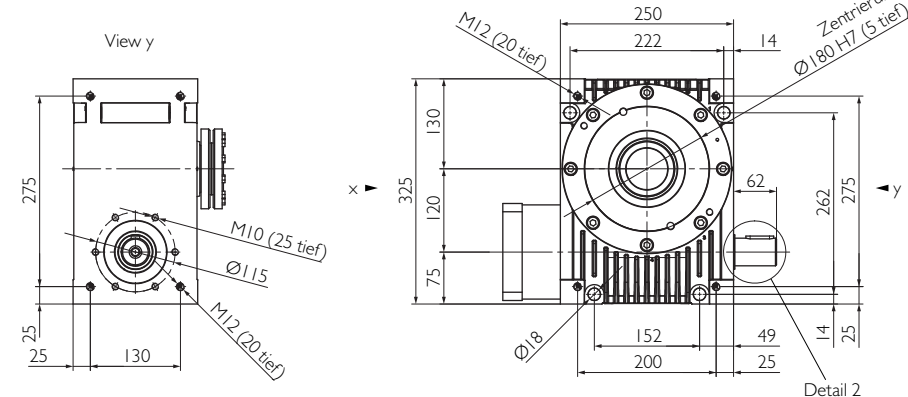
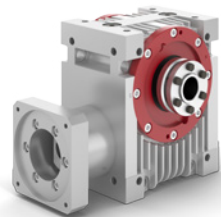
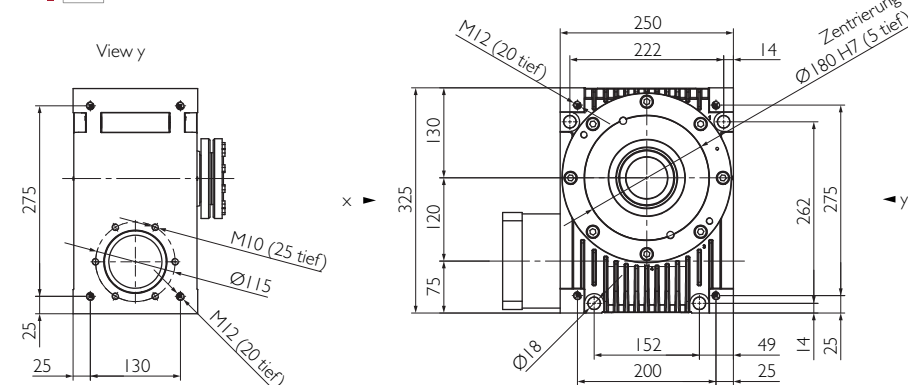
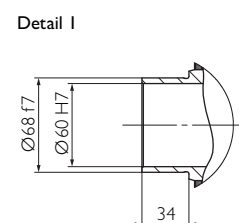
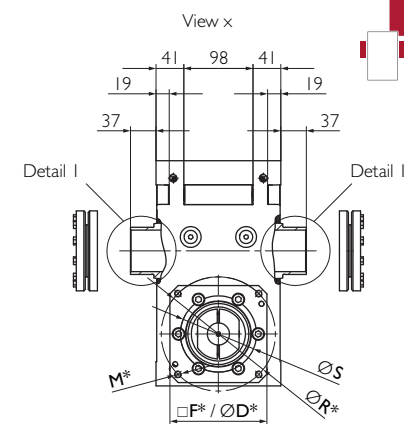
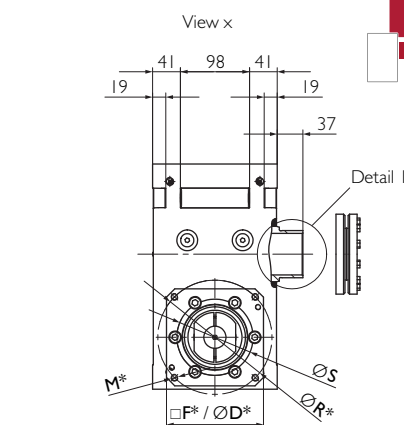
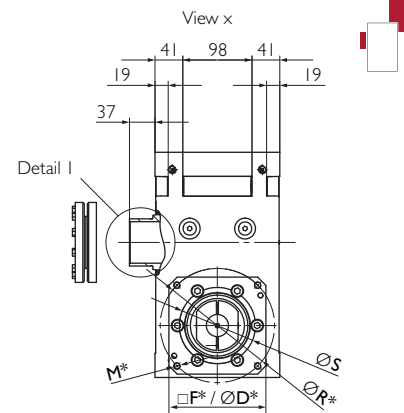
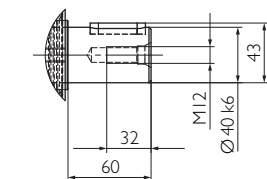




### Detail 2

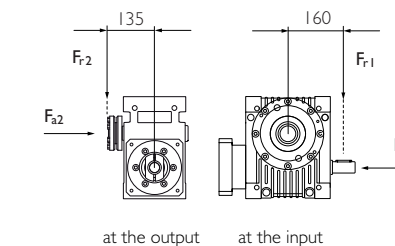


\* Motor-specific gearbox dimensions

**S:** min. 95 [mm], **R:** Pitch circle Ø [mm], **M:** Bore hole Ø or thread [mm], **□F/ØD:** Specify flange [mm]

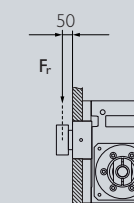
- a) approximate, at  $n_1 = 3000 \text{ rpm}$  and operating temperature.
- b) Precision grade PS (standard backlash) for classic mechanical engineering applications.  
Precision grade PR (reduced backlash) for precise process applications.
- c) Bearing forces: Values valid at  $n_1 = 1500 \text{ rpm}$ ;  $\frac{1}{2} T_{2N}$  and duty cycle of 40%.  
Consult with Güdel for composite bearing forces, axial and radial forces.
- c) d) in relation to shaft center.
- c) e) at a distance of 135 mm from the middle of the casing.
- c) f) at a distance of 160 mm from the middle of the casing.
- g) in relation to the input, including coupling and shrink disc at the output (output 1 & 2) with two shrink discs (output 3) increase values by 340/1².
- g) h) Motor shaft diameter  $\varnothing d$  from  $\varnothing 19$  to  $\varnothing 42$ , calculated at  $\varnothing 28 \text{ mm}$ .
- g) i) Motor shaft diameter  $\varnothing d$  from  $\varnothing 43$  to  $\varnothing 50$ , calculated at  $\varnothing 48 \text{ mm}$ .

### Bearing forces



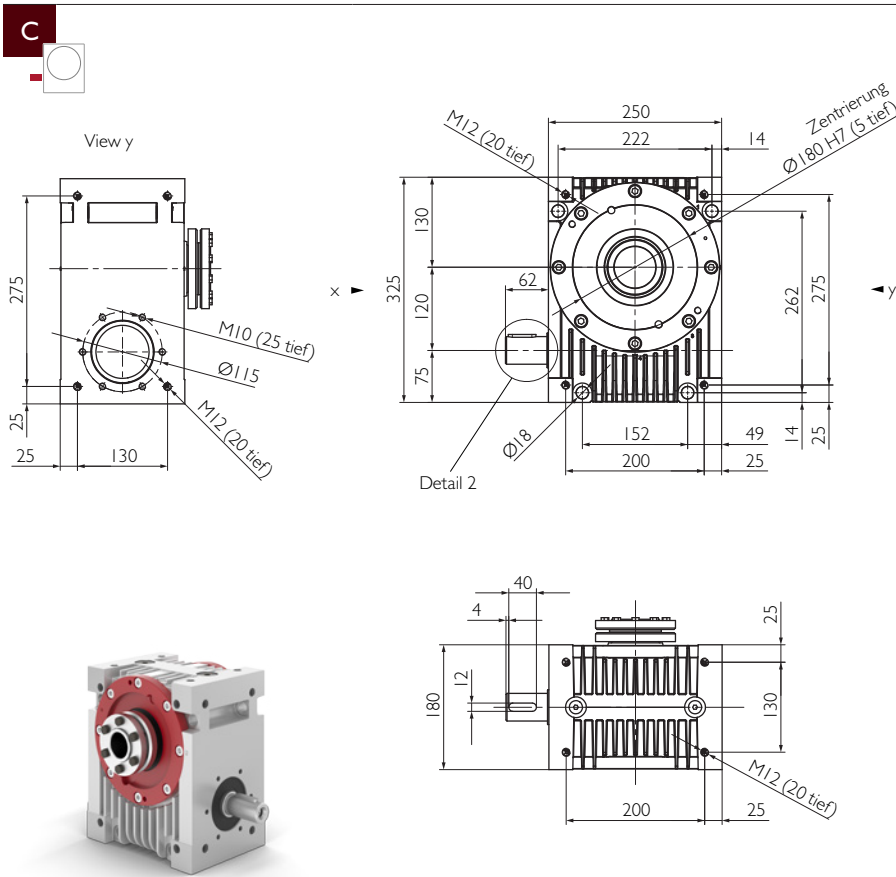
|                                 |                   |        | Output Flange including Bearing & Pinion |       |       |       |       |
|---------------------------------|-------------------|--------|------------------------------------------|-------|-------|-------|-------|
| Radial rigidity                 | C <sub>3</sub>    | [N/mm] | 47000                                    |       |       |       |       |
| Speed                           | n <sub>2N</sub>   | [rpm]  | 1500                                     | 750   | 400   | 150   | 100   |
| Max. radial force <sup>1)</sup> | F <sub>rmax</sub> | [N]    | 11500                                    | 13000 | 17000 | 21000 | 24000 |

j) Bearing forces: Values valid at duty cycle of 40% at a distance of 50mm from the end of the bearing.

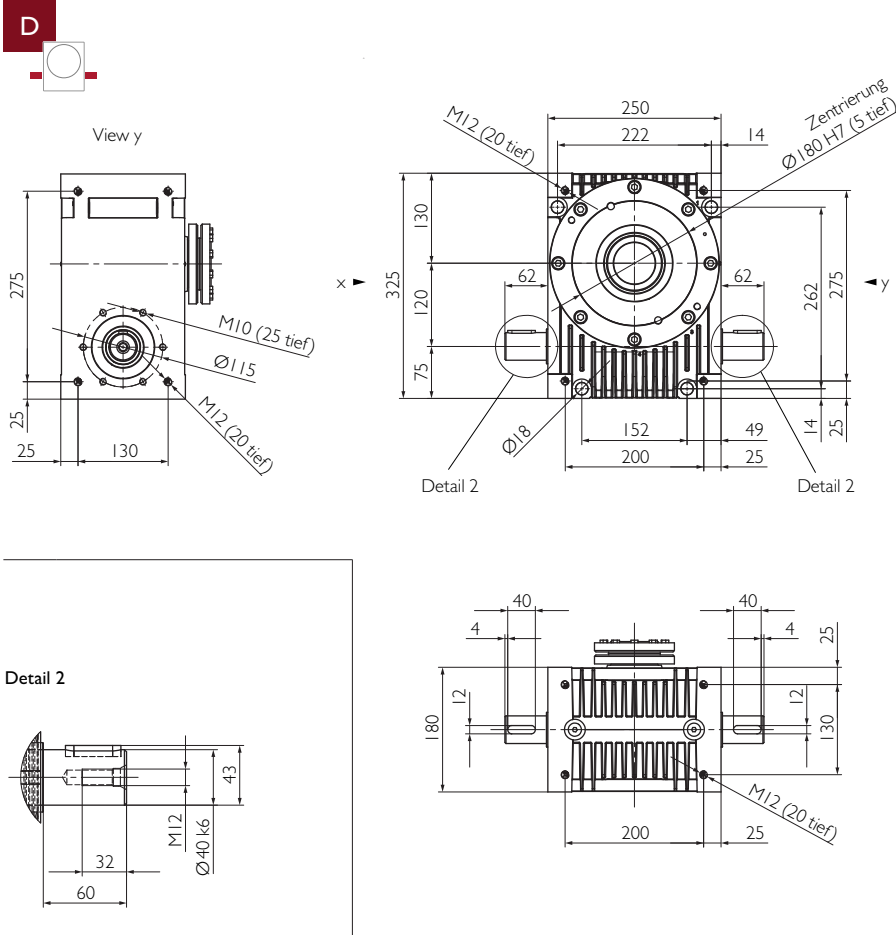


Detailed information about the **Package, Options & Accessories** on pages 88 and 89.

Input

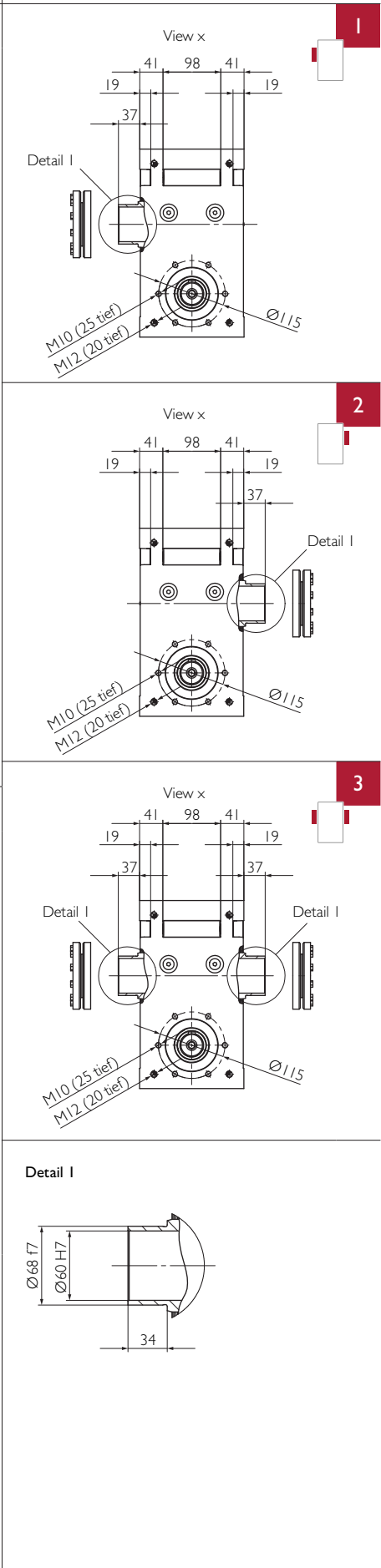


Example HPG 020 A1



Detail 2

Output

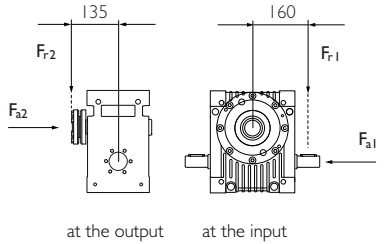


Detail 1

| Ratio                                                       | i                          |                                                   |                                       | 2             | 3    | 4    | 5     | 6     | 8     | 10    | 13.33 | 16    | 24    | 30    | 47    | 60    |      |
|-------------------------------------------------------------|----------------------------|---------------------------------------------------|---------------------------------------|---------------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| Nominal torque at the output<br>Efficiency                  | n <sub>1N</sub> = 500 rpm  | T <sub>2N</sub>                                   | [Nm]                                  | 1177          | 1732 | 2018 | 1969  | 1752  | 2038  | 1895  | 1863  | 1824  | 1900  | 1364  | 1970  | 1364  |      |
|                                                             |                            | η                                                 | [%]                                   | 93            | 93   | 93   | 93    | 92    | 90    | 89    | 87    | 84    | 78    | 75    | 66    | 61    |      |
|                                                             | n <sub>1N</sub> = 1000 rpm | T <sub>2N</sub>                                   | [Nm]                                  | 836           | 1284 | 1534 | 1523  | 1371  | 1609  | 1505  | 1487  | 1658  | 1622  | 1364  | 1612  | 1364  |      |
|                                                             |                            | η                                                 | [%]                                   | 94            | 94   | 94   | 93    | 93    | 91    | 90    | 88    | 85    | 80    | 76    | 68    | 62    |      |
|                                                             | n <sub>1N</sub> = 1500 rpm | T <sub>2N</sub>                                   | [Nm]                                  | 648           | 1020 | 1237 | 1241  | 1126  | 1329  | 1248  | 1237  | 1380  | 1353  | 1364  | 1345  | 1364  |      |
|                                                             |                            | η                                                 | [%]                                   | 94            | 94   | 94   | 93    | 93    | 91    | 90    | 88    | 86    | 80    | 76    | 69    | 62    |      |
|                                                             | n <sub>1N</sub> = 3000 rpm | T <sub>2N</sub>                                   | [Nm]                                  | 387           | 631  | 783  | 798   | 733   | 873   | 826   | 822   | 918   | 903   | 921   | 899   | 921   |      |
|                                                             |                            | η                                                 | [%]                                   | 93            | 94   | 93   | 93    | 93    | 91    | 90    | 88    | 85    | 80    | 74    | 68    | 60    |      |
|                                                             | n <sub>1N</sub> = 4500 rpm | T <sub>2N</sub>                                   | [Nm]                                  | 276           | 457  | 573  | 588   | 543   | 650   | 617   | 616   | 688   | 677   | 689   | 675   | 689   |      |
|                                                             |                            | η                                                 | [%]                                   | 93            | 93   | 93   | 93    | 92    | 91    | 89    | 87    | 84    | 79    | 73    | 66    | 58    |      |
| Max. acceleration torque                                    |                            | T <sub>2B</sub>                                   | [Nm]                                  | 1200          | 2040 |      |       |       |       |       |       |       |       |       | 1400  | 2040  | 1400 |
| Emergency stop torque                                       |                            | T <sub>2not</sub>                                 | [Nm]                                  | 2300          |      |      |       |       |       |       |       |       |       | 1600  | 2300  | 1600  |      |
| Idling torque <sup>a)</sup>                                 |                            | T <sub>012</sub>                                  | [Nm]                                  | 4.5           |      |      | 4     |       |       | 3     |       |       |       |       |       |       |      |
| Max. input speed                                            |                            | n <sub>1Max</sub>                                 | [rpm]                                 | 4500          |      |      |       |       |       |       |       |       |       |       |       |       |      |
| Max. backlash <sup>b)</sup> at the output                   | PS                         | j <sub>k</sub>                                    | [arcmin]                              | <8            | <7   | <6   | <6    | <5    | <5    |       |       |       |       | <4    |       |       |      |
|                                                             | PR                         | j <sub>k</sub>                                    | [arcmin]                              | <5.5          | <4.5 | <4   | <3.5  | <3    | <3    |       |       |       |       | <2.5  |       |       |      |
| Torsional rigidity vom Abtrieb zum Eintrieb                 |                            | C <sub>21</sub>                                   | [Nm/arcmin]                           | 11.5          | 19   | 24.5 | 26.5  | 29    | 31.5  | 34    | 36.5  | 38.5  | 40.5  | 39    | 42.5  | 39    |      |
| Stability at the output                                     |                            | C <sub>2K</sub>                                   | [Nm/arcmin]                           | 165           |      |      |       |       |       |       |       |       |       |       |       |       |      |
| Max. axial force <sup>c)</sup> <sup>d)</sup> at the output  |                            | F <sub>a2max</sub>                                | [N]                                   | 7000          | 9600 | 9500 | 12000 | 16000 | 17000 | 21000 | 25000 | 26000 | 27000 | 27000 | 27000 | 28000 |      |
| Max. radial force <sup>c)</sup> <sup>e)</sup> at the output |                            | F <sub>r2max</sub>                                | [N]                                   | 7700          | 8100 | 7300 | 8800  | 9900  | 10000 | 12000 | 13000 | 13000 | 14000 | 14000 | 14000 | 14000 |      |
| Max. overturning torque <sup>c)</sup> at the output         |                            | M <sub>2max</sub>                                 | [Nm]                                  | 1000          | 1100 | 980  | 1200  | 1300  | 1400  | 1600  | 1800  | 1800  | 1800  | 1800  | 1900  | 1900  |      |
| Max. axial force <sup>c)</sup> <sup>d)</sup> at the input   |                            | F <sub>a1max</sub>                                | [N]                                   | 3600          | 1800 | 730  | 1700  | 3600  | 2100  | 3300  | 3700  | 2500  | 2900  | 2700  | 3100  | 2700  |      |
| Max. radial force <sup>c)</sup> <sup>f)</sup> at the input  |                            | F <sub>r1max</sub>                                | [N]                                   | 1900          | 950  | 390  | 930   | 1900  | 1200  | 1800  | 2000  | 1300  | 1600  | 1400  | 1700  | 1500  |      |
| Mass moment of inertia <sup>g)</sup>                        |                            | J <sub>1</sub>                                    | [10 <sup>-5</sup> kg m <sup>2</sup> ] | 1392          | 660  | 403  | 285   | 220   | 156   | 127   | 103   | 94    | 83    | 80    | 76    | 75    |      |
| Service life                                                |                            | L <sub>h</sub>                                    | [h]                                   | 25000         |      |      |       |       |       |       |       |       |       |       |       |       |      |
| Weight without motor components                             |                            | m                                                 | [kg]                                  | 48            |      |      |       |       |       |       |       |       |       |       |       |       |      |
| Max. permissible housing temperature                        |                            |                                                   | [°C]                                  | +90           |      |      |       |       |       |       |       |       |       |       |       |       |      |
| Ambient temperature                                         |                            |                                                   | [°C]                                  | -15 up to +50 |      |      |       |       |       |       |       |       |       |       |       |       |      |
| Lubrication                                                 |                            | synthetic gear oil (as per DIN 51502: CLP PG 460) |                                       |               |      |      |       |       |       |       |       |       |       |       |       |       |      |
| Painting                                                    |                            | None                                              |                                       |               |      |      |       |       |       |       |       |       |       |       |       |       |      |
| Protection class                                            |                            | IP65                                              |                                       |               |      |      |       |       |       |       |       |       |       |       |       |       |      |

- a) approximate, at  $n_1 = 3000 \text{ rpm}$  and operating temperature.  
b) Precision grade PS (standard backlash) for classic mechanical engineering applications.  
Precision grade PR (reduced backlash) for precise process applications.  
c) Bearing forces: Values valid at  $n_1 = 1500 \text{ rpm}$ ;  $\frac{1}{2} T_{2N}$  and duty cycle of 40%. Consult with Güdel for composite bearing forces, axial and radial forces.  
c) d) in relation to shaft center.  
c) e) at a distance of 135 mm from the middle of the casing.  
c) f) at a distance of 160 mm from the middle of the casing.  
g) in relation to the input, including shrink disc at the output (output 1 & 2), with two shrink discs (output 3) increase values by 340/i<sup>2</sup>.

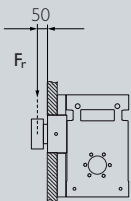
Bearing forces



Package

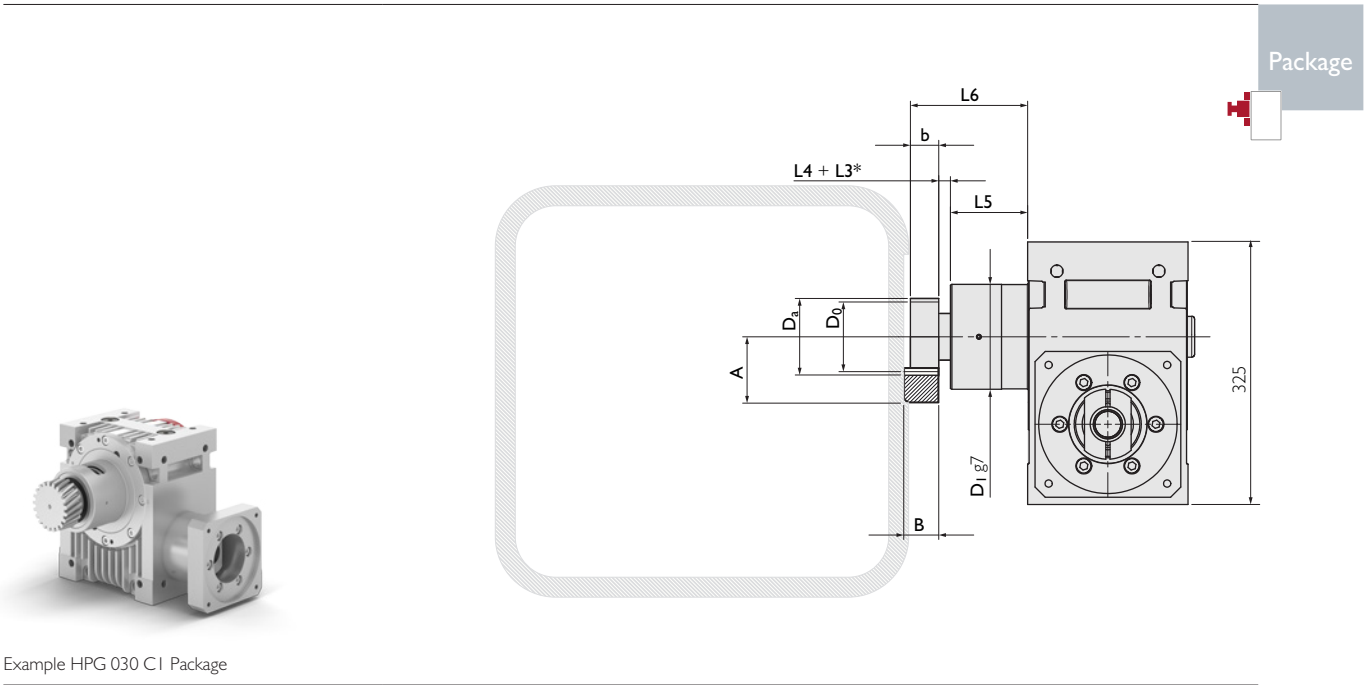
|                                 |                   |        | Output Flange including Bearing & Pinion |       |       |       |       |
|---------------------------------|-------------------|--------|------------------------------------------|-------|-------|-------|-------|
| Radial rigidity                 | C <sub>3</sub>    | [N/mm] | 47000                                    |       |       |       |       |
| Speed                           | n <sub>2N</sub>   | [rpm]  | 1500                                     | 750   | 400   | 150   | 100   |
| Max. radial force <sup>1)</sup> | F <sub>rmax</sub> | [N]    | 11500                                    | 13000 | 17000 | 21000 | 24000 |

j) Bearing forces: Values valid at duty cycle of 40% at a distance of 50 mm from the end of the bearing.

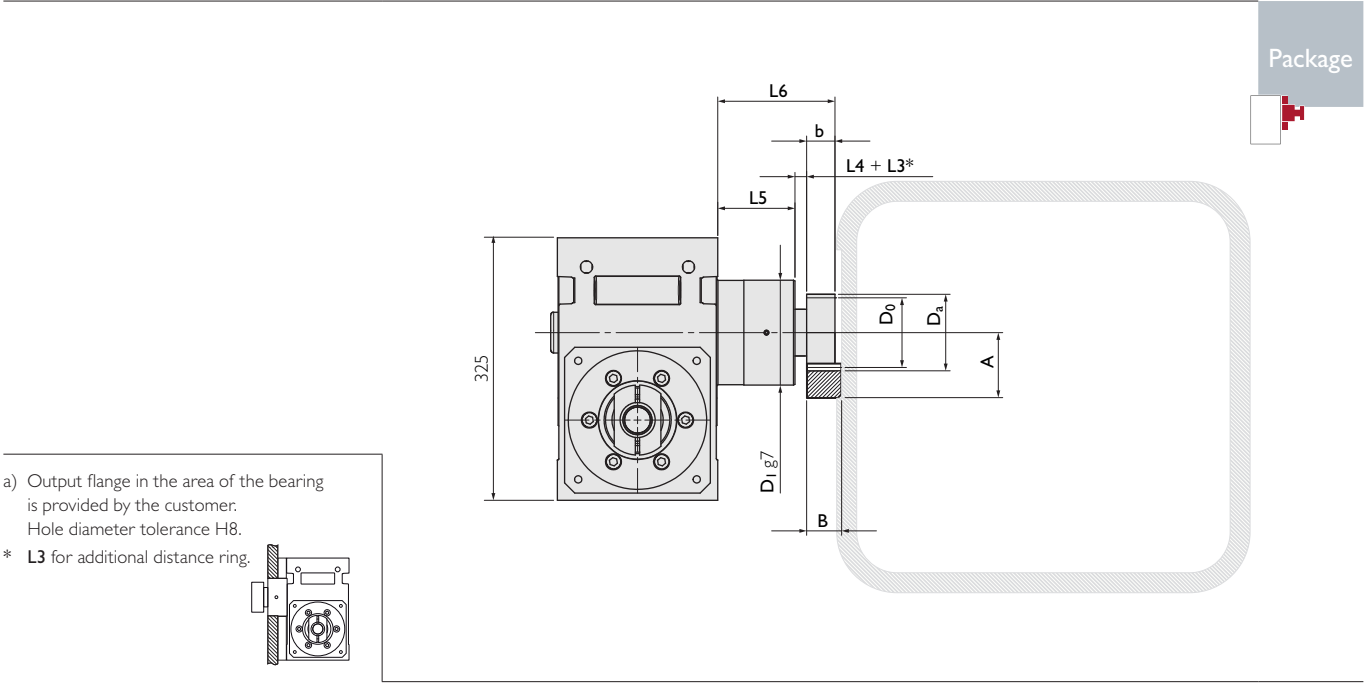


Detailed information about the Package, Options & Accessories on pages 88 and 89.

Output Flange including Bearing & Pinion<sup>a)</sup>



Example HPG 030 C1 Package



a) Output flange in the area of the bearing is provided by the customer. Hole diameter tolerance H8.  
\* L3 for additional distance ring.

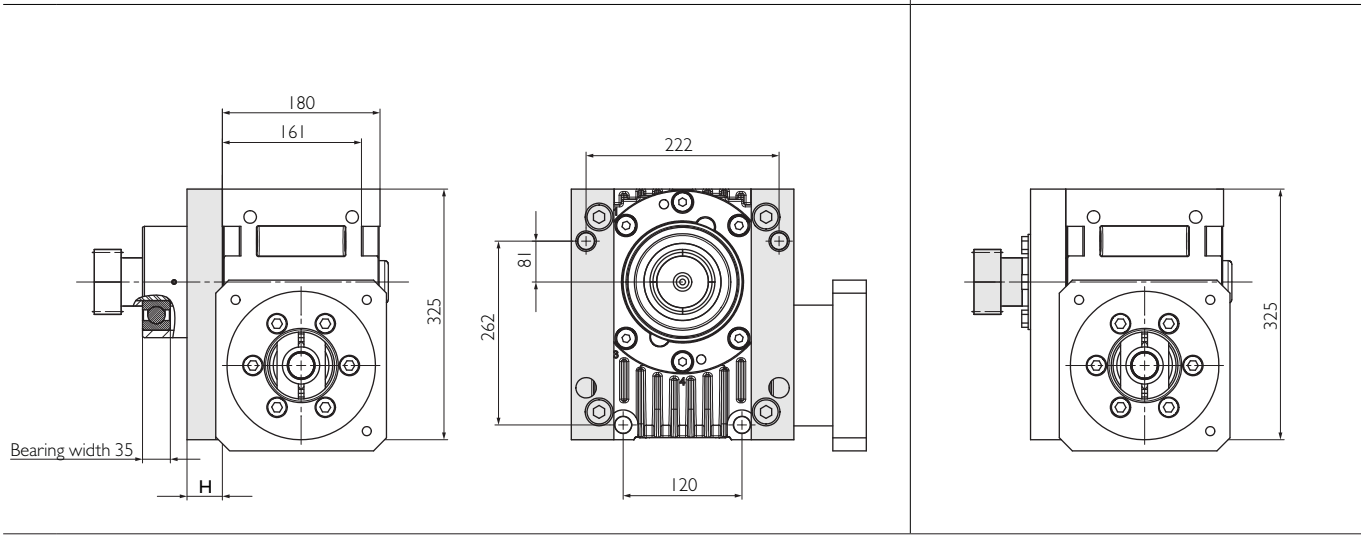
Geometric information

| Helical modular pitch |           |   |    |       |    |    |                |                |                |      |     |       |
|-----------------------|-----------|---|----|-------|----|----|----------------|----------------|----------------|------|-----|-------|
|                       | Part. No. | m | z  | A     | b  | B  | D <sub>a</sub> | D <sub>0</sub> | D <sub>I</sub> | L4   | L5  | L6    |
| Pinion 1              | 211521    | 4 | 20 | 77.44 | 40 | 39 | 92.9           | 84.88          | 180            | 14.5 | 123 | 177.5 |
| Pinion 2              | 211620    | 5 | 20 | 87.05 | 50 | 49 | 116.1          | 106.1          | 180            | 35   | 123 | 208   |

| Straight modular pitch |           |   |    |       |    |    |                |                |                |    |     |     |
|------------------------|-----------|---|----|-------|----|----|----------------|----------------|----------------|----|-----|-----|
|                        | Part. No. | m | z  | A     | b  | B  | D <sub>a</sub> | D <sub>0</sub> | D <sub>I</sub> | L4 | L5  | L6  |
| Pinion 3               | 201620    | 5 | 20 | 84.0  | 50 | 49 | 110.0          | 100.0          | 180            | 35 | 123 | 208 |
| Pinion 4               | 201720    | 6 | 20 | 103.0 | 60 | 60 | 132.0          | 120.0          | 180            | 35 | 123 | 218 |
| Pinion 5               | 201820    | 8 | 20 | 151.0 | 80 | 79 | 176.0          | 160.0          | 180            | 35 | 123 | 238 |

Spacer Elements

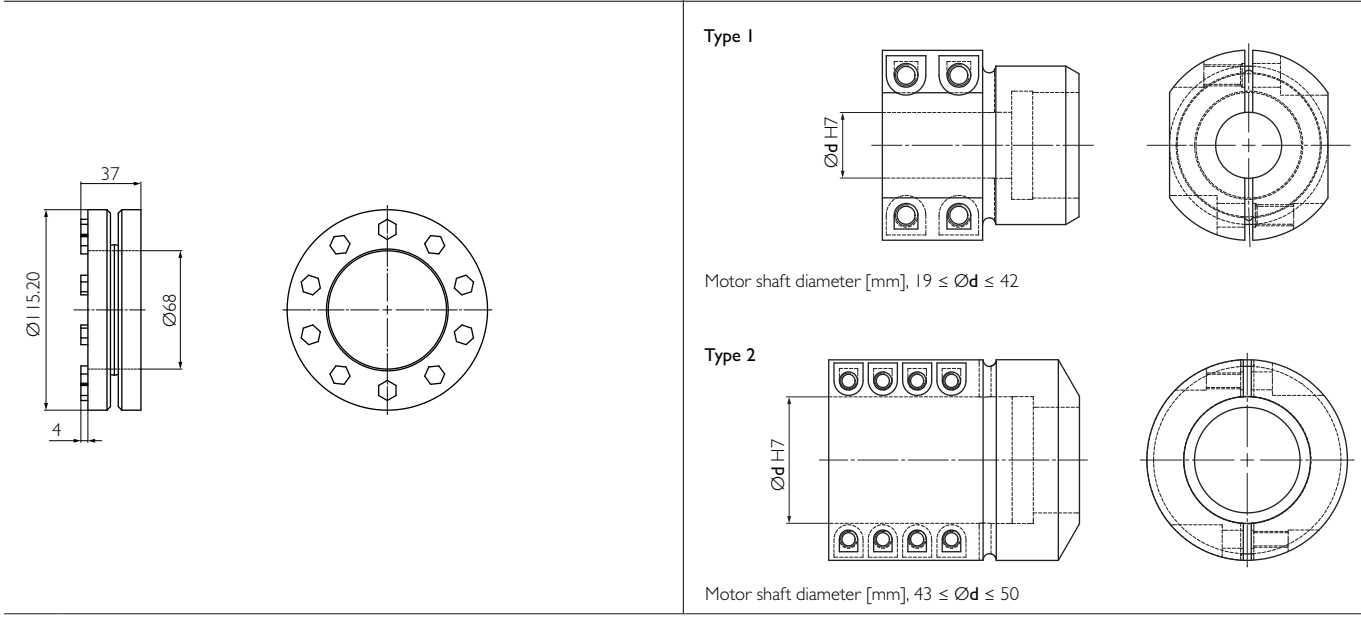
with Pinion special solutions on request



Casing can only be fastened with long screws as per the bore hole pattern. Screws M16 of length 161 mm + H + thread depth, tightening torque 120Nm.

Shrink Disc

Coupling



Your ideal Drive Train

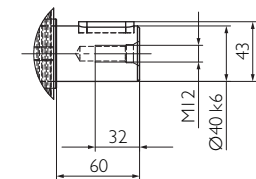
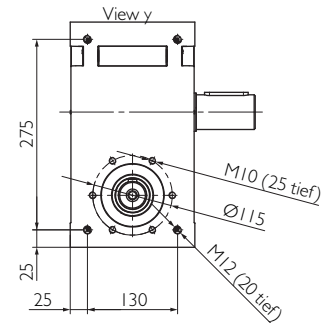
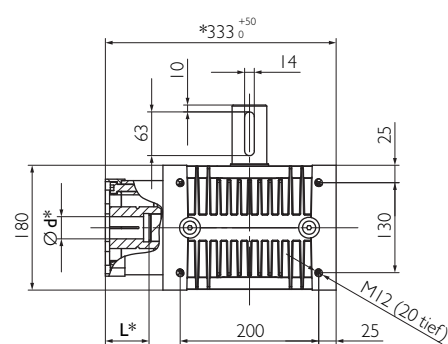
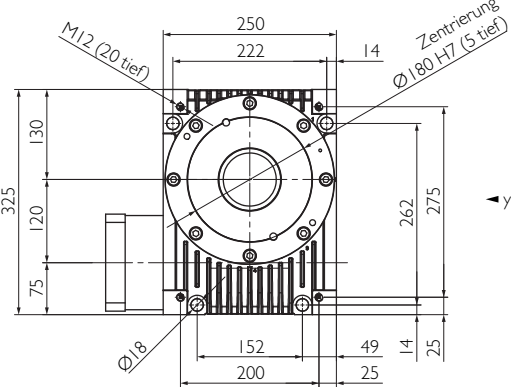
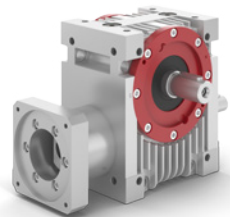
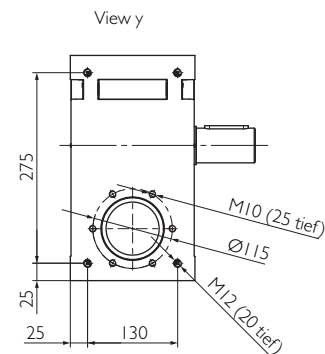
Our Function Package with high-performance angle gearbox, output flange, pinion and rack by Güdel.

|                             |                |      |  | Pinion 1 | Pinion 2 | Pinion 3 | Pinion 4 | Pinion 5 |
|-----------------------------|----------------|------|--|----------|----------|----------|----------|----------|
| Maximum acceleration force  | F <sub>N</sub> | [N]  |  | 25420    | 40680    | 37317    | 52880    | 91220    |
| Maximum acceleration torque | T <sub>N</sub> | [Nm] |  | 1079     | 2158     | 1866     | 3173     | 7298     |

Higher value for rack and pinion taking account of the number of load cycles: 1x10<sup>6</sup> for the rack; 1x10<sup>7</sup> for the pinion. Both in cycle mode.

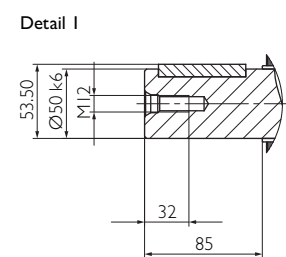
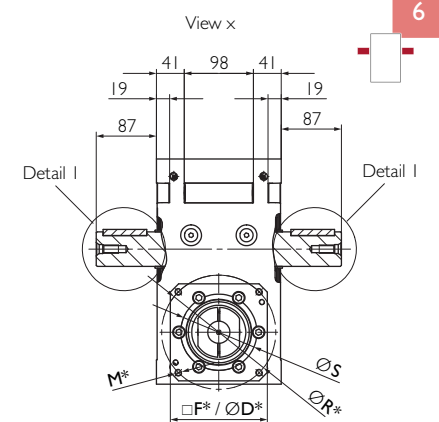
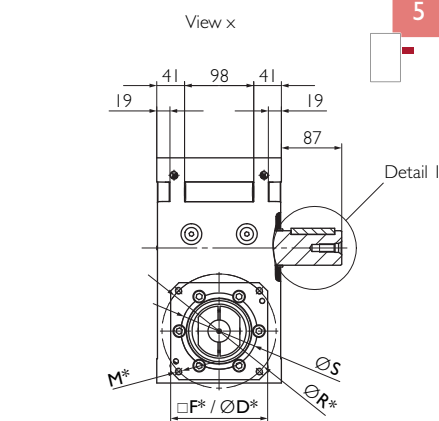
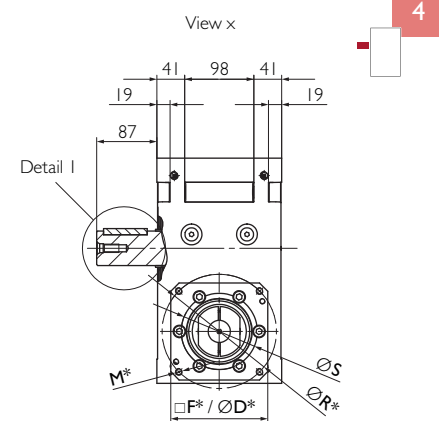
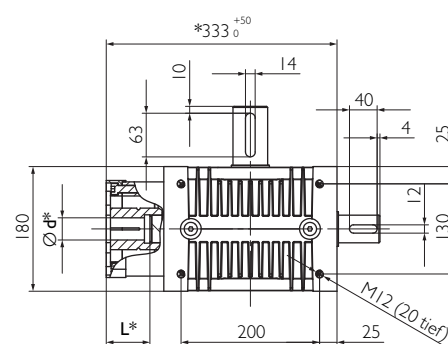
See Rack & Pinion Program of your ideal Drive Train on pages 104 et seq.

See Flowcharts to find your ideal Drive Train on pages 116 et seq.



\* Motor-specific gearbox dimensions  
 $\varnothing d$ :  $\varnothing$  motor shaft [mm],  $19 \leq \varnothing d \leq 50$   
 L: Motor shaft length [mm],  $35 \leq L \leq 112$

Technical drawing of a mechanical part. The drawing shows a cross-section of a component with a semi-circular end. Key dimensions are indicated: a total length of 60, a distance of 32 from the end to a feature, a height of 43, a thread specification of M12, and a hole diameter of  $\varnothing 40$  k6.



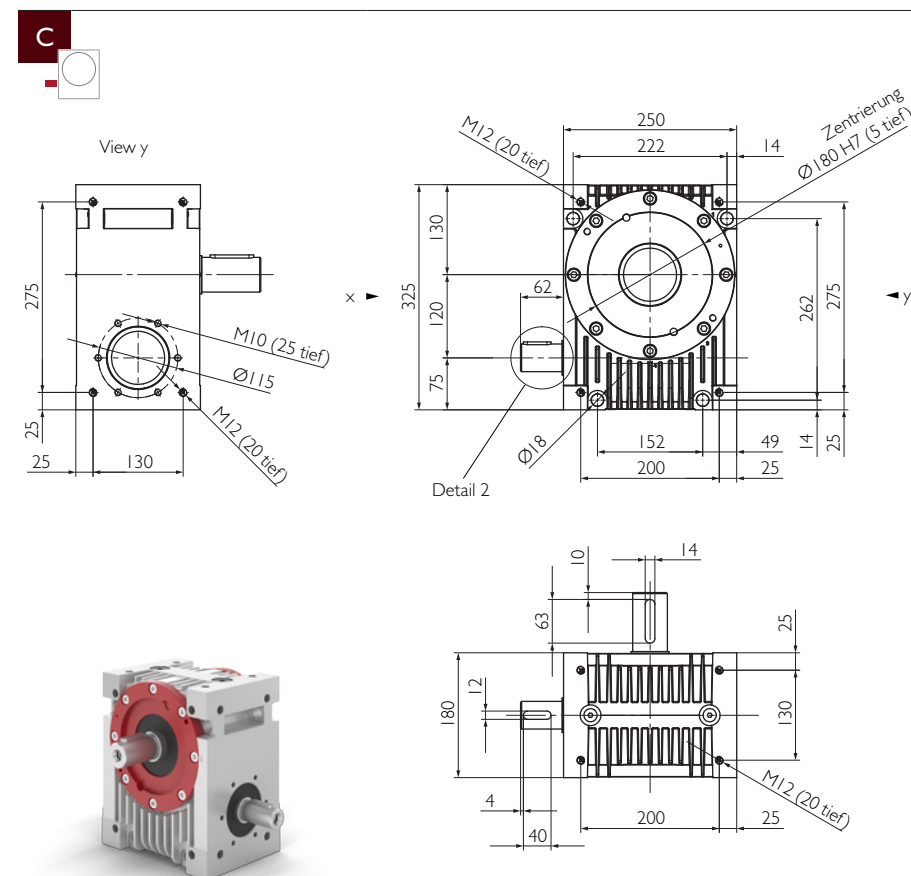
\* Motor-specific gearbox dimensions  
**S:** min. 95 [mm], **R:** Pitch circle Ø [mm], **M:** Bore hole Ø or thread [mm], **□F/ØD:** Specify flange [mm]

- approximate, at  $n_1 = 3000$  rpm and operating temperature.
- Precision grade PS (standard backlash) for classic mechanical engineering applications.  
Precision grade PR (reduced backlash) for precise process applications.
- Bearing forces: Values valid at  $n_1 = 1500$  rpm;  $\frac{1}{2} T_{2N}$  and duty cycle of 40%.  
Consult with Güdel for composite bearing forces, axial and radial forces.
- d) in relation to shaft center.
- e) at a distance of 135 mm from the middle of the casing.
- f) at a distance of 160 mm from the middle of the casing.
- in relation to the input, including coupling.
- h) Motor shaft diameter  $\varnothing d$  from  $\varnothing 19$  to  $\varnothing 42$ , calculated at  $\varnothing 28$  mm.
- i) Motor shaft diameter  $\varnothing d$  from  $\varnothing 43$  to  $\varnothing 50$ , calculated at  $\varnothing 48$  mm.

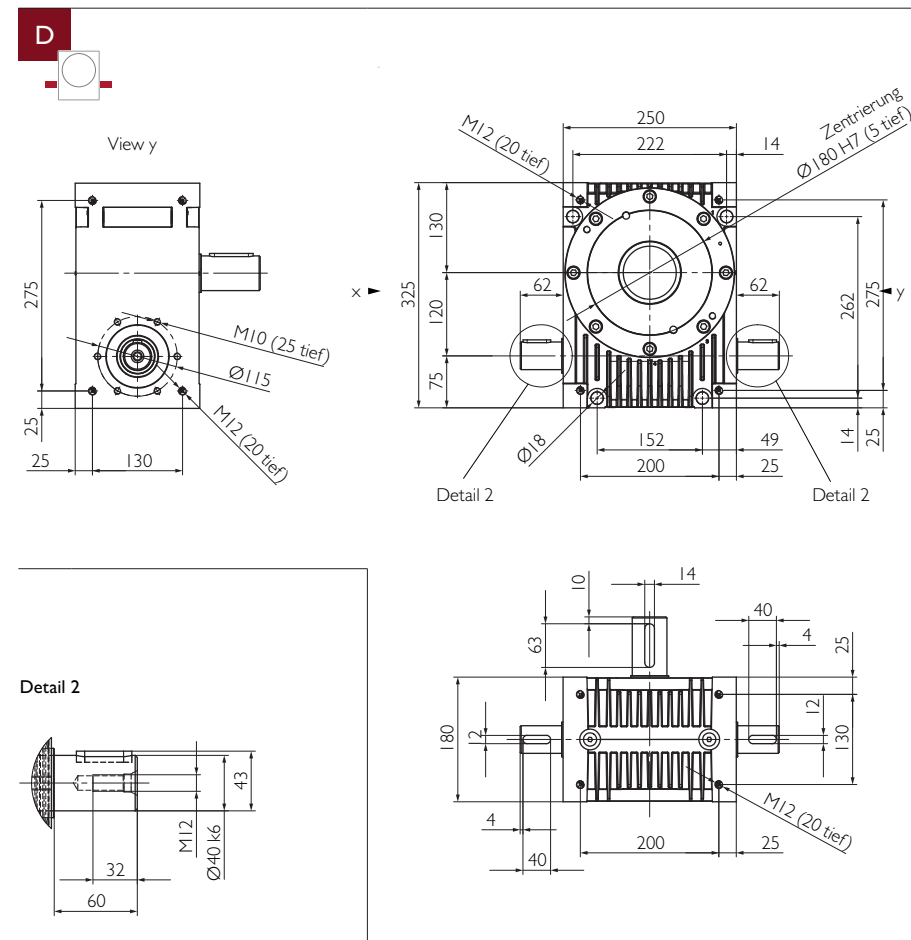
at the output      at the input



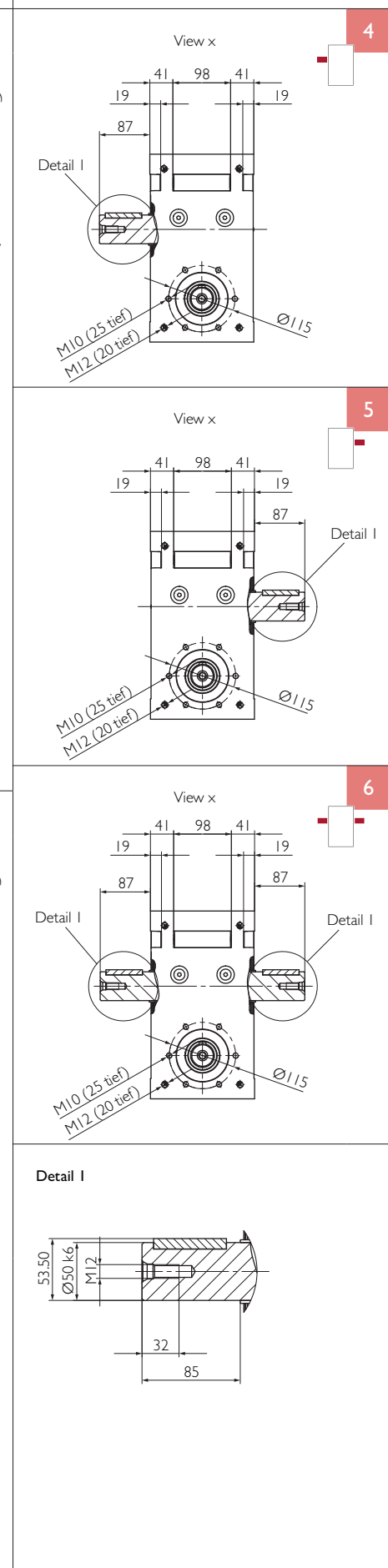
Input



Example HPG 120 C4



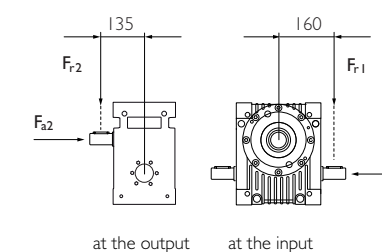
Output



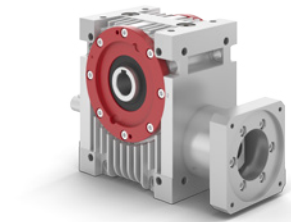
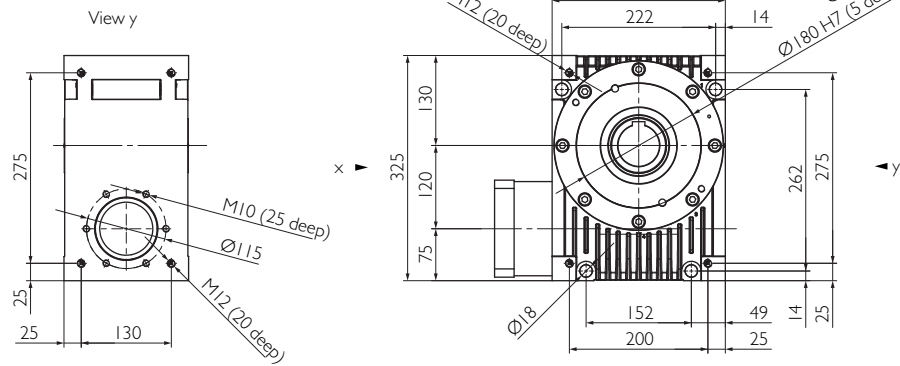
| Ratio                                               | i                         |                                                   |                                       | 2             | 3          | 4          | 5          | 6          | 8          | 10         | 13.33      | 16         | 24         | 30         | 47         | 60         |
|-----------------------------------------------------|---------------------------|---------------------------------------------------|---------------------------------------|---------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Nominal torque at the output<br>Efficiency          | n <sub>1N</sub> = 500rpm  | T <sub>2N</sub><br>η                              | [Nm]<br>[%]                           | 1177<br>93    | 1732<br>93 | 2018<br>93 | 1969<br>93 | 1752<br>92 | 2038<br>90 | 1895<br>89 | 1863<br>87 | 1824<br>84 | 1900<br>78 | 1364<br>75 | 1970<br>66 | 1364<br>61 |
|                                                     | n <sub>1N</sub> = 1000rpm | T <sub>2N</sub><br>η                              | [Nm]<br>[%]                           | 836<br>94     | 1284<br>94 | 1534<br>94 | 1523<br>93 | 1371<br>93 | 1609<br>91 | 1505<br>90 | 1487<br>88 | 1658<br>85 | 1622<br>80 | 1364<br>76 | 1612<br>68 | 1364<br>62 |
|                                                     | n <sub>1N</sub> = 1500rpm | T <sub>2N</sub><br>η                              | [Nm]<br>[%]                           | 648<br>94     | 1020<br>94 | 1237<br>94 | 1241<br>93 | 1126<br>93 | 1329<br>91 | 1248<br>90 | 1237<br>88 | 1380<br>86 | 1353<br>80 | 1364<br>76 | 1345<br>69 | 1364<br>62 |
|                                                     | n <sub>1N</sub> = 3000rpm | T <sub>2N</sub><br>η                              | [Nm]<br>[%]                           | 387<br>93     | 631<br>94  | 783<br>93  | 798<br>93  | 733<br>93  | 873<br>91  | 826<br>90  | 822<br>88  | 918<br>85  | 903<br>80  | 921<br>74  | 899<br>68  | 921<br>60  |
|                                                     | n <sub>1N</sub> = 4500rpm | T <sub>2N</sub><br>η                              | [Nm]<br>[%]                           | 276<br>93     | 457<br>93  | 573<br>93  | 588<br>93  | 543<br>92  | 650<br>91  | 617<br>89  | 616<br>87  | 688<br>84  | 677<br>79  | 689<br>73  | 675<br>66  | 689<br>58  |
| Max. acceleration torque                            |                           | T <sub>2B</sub>                                   | [Nm]                                  | 1200          | 2040       |            |            |            |            |            |            |            |            | 1400       | 2040       | 1400       |
| Emergency stop torque                               |                           | T <sub>2not</sub>                                 | [Nm]                                  | 2300          |            |            |            |            |            |            |            |            |            | 1600       | 2300       | 1600       |
| Idling torque <sup>a)</sup>                         |                           | T <sub>012</sub>                                  | [Nm]                                  | 4.5           |            |            | 4          |            |            | 3          |            |            |            |            |            |            |
| Max. input speed                                    |                           | n <sub>1Max</sub>                                 | [rpm]                                 | 4500          |            |            |            |            |            |            |            |            |            |            |            |            |
| Max. backlash <sup>b)</sup> at the output           | PS                        | j <sub>t</sub>                                    | [arcmin]                              | <8            | <7         | <6         | <6         | <5         | <5         |            |            |            |            | <4         |            |            |
|                                                     | PR                        | j <sub>t</sub>                                    | [arcmin]                              | <5.5          | <4.5       | <4         | <3.5       | <3         | <3         |            |            |            |            | <2.5       |            |            |
| Torsional rigidity vom Abtrieb zum Eintrieb         |                           | C <sub>t21</sub>                                  | [Nm/arcmin]                           | 11.5          | 19         | 24.5       | 26.5       | 29         | 31.5       | 34         | 36.5       | 38.5       | 40.5       | 39         | 42.5       | 39         |
| Stability at the output                             |                           | C <sub>2K</sub>                                   | [Nm/arcmin]                           | 138           |            |            |            |            |            |            |            |            |            |            |            |            |
| Max. axial force <sup>c)d)</sup> at the output      |                           | F <sub>a2max</sub>                                | [N]                                   | 2400          | 3900       | 3600       | 6200       | 9100       | 10000      | 13000      | 16000      | 17000      | 18000      | 18000      | 19000      | 19000      |
| Max. radial force <sup>c)e)</sup> at the output     |                           | F <sub>r2max</sub>                                | [N]                                   | 2500          | 2500       | 2700       | 3600       | 6200       | 6500       | 7500       | 8600       | 8700       | 9000       | 9100       | 9200       | 9200       |
| Max. overturning torque <sup>c)</sup> at the output |                           | M <sub>2max</sub>                                 | [Nm]                                  | 340           | 340        | 360        | 480        | 830        | 880        | 1000       | 1200       | 1200       | 1200       | 1200       | 1200       | 1200       |
| Max. axial force <sup>c)d)</sup> at the input       |                           | F <sub>a1max</sub>                                | [N]                                   | 3600          | 1800       | 730        | 1700       | 3600       | 2100       | 3300       | 3700       | 2500       | 2900       | 2700       | 3100       | 2700       |
| Max. radial force <sup>c)f)</sup> at the input      |                           | F <sub>r1max</sub>                                | [N]                                   | 1900          | 950        | 390        | 930        | 1900       | 1200       | 1800       | 2000       | 1300       | 1600       | 1400       | 1700       | 1500       |
| Mass moment of inertia <sup>g)</sup>                |                           | J <sub>1</sub>                                    | [10 <sup>-5</sup> kg m <sup>2</sup> ] | 1392          | 660        | 403        | 285        | 220        | 156        | 127        | 103        | 94         | 83         | 80         | 76         | 75         |
| Service life                                        |                           | L <sub>h</sub>                                    | [h]                                   | 25000         |            |            |            |            |            |            |            |            |            |            |            |            |
| Weight without motor components                     |                           | m                                                 | [kg]                                  | 46            |            |            |            |            |            |            |            |            |            |            |            |            |
| Max. permissible housing temperature                |                           |                                                   | [°C]                                  | +90           |            |            |            |            |            |            |            |            |            |            |            |            |
| Ambient temperature                                 |                           |                                                   | [°C]                                  | -15 up to +50 |            |            |            |            |            |            |            |            |            |            |            |            |
| Lubrication                                         |                           | synthetic gear oil (as per DIN 51502: CLP PG 460) |                                       |               |            |            |            |            |            |            |            |            |            |            |            |            |
| Painting                                            |                           | None                                              |                                       |               |            |            |            |            |            |            |            |            |            |            |            |            |
| Protection class                                    |                           | IP65                                              |                                       |               |            |            |            |            |            |            |            |            |            |            |            |            |

- a) approximate, at  $n_1 = 3000\text{rpm}$  and operating temperature.  
b) Precision grade PS (standard backlash) for classic mechanical engineering applications.  
Precision grade PR (reduced backlash) for precise process applications.  
c) Bearing forces: Values valid at  $n_1 = 1500\text{rpm}$ ;  $\frac{1}{2} T_{2N}$  and duty cycle of 40%.  
Consult with Güdel for composite bearing forces, axial and radial forces.  
c) d) in relation to shaft center.  
c) e) at a distance of 135 mm from the middle of the casing.  
c) f) at a distance of 160 mm from the middle of the casing.  
g) in relation to the input.

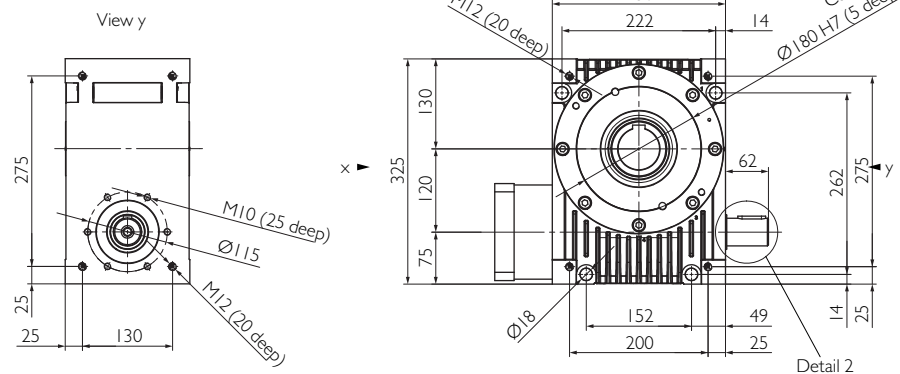
Bearing forces



Input

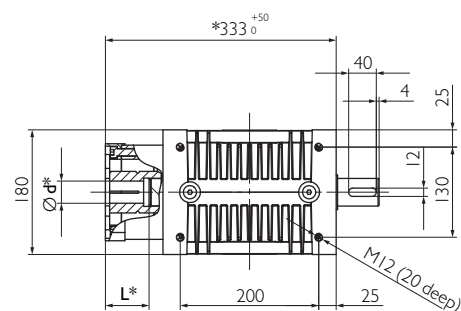
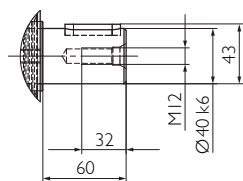


Example HPG 120 A7



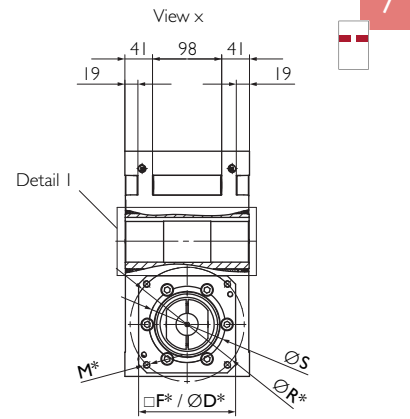
\* Motor-specific gearbox dimensions  
 $\varnothing d$ :  $\varnothing$  motor shaft [mm],  $19 \leq \varnothing d \leq 50$   
 $L$ : Motor shaft length [mm],  $35 \leq L \leq 112$

### Detail 2

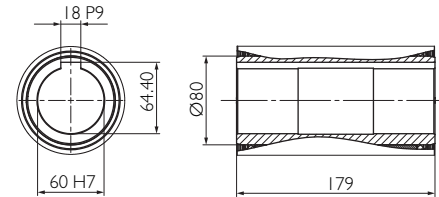


\* Motor-specific gearbox dimensions  
**S:** min. 95 [mm], **R:** Pitch circle Ø [mm], **M:** Bore hole Ø or thread [mm], **□F/ØD:** Specify flange [mm]

## Output



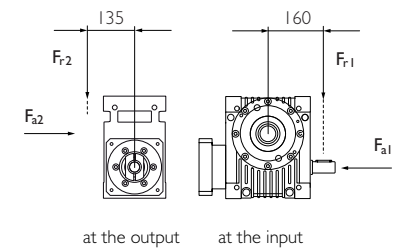
### Detail 1



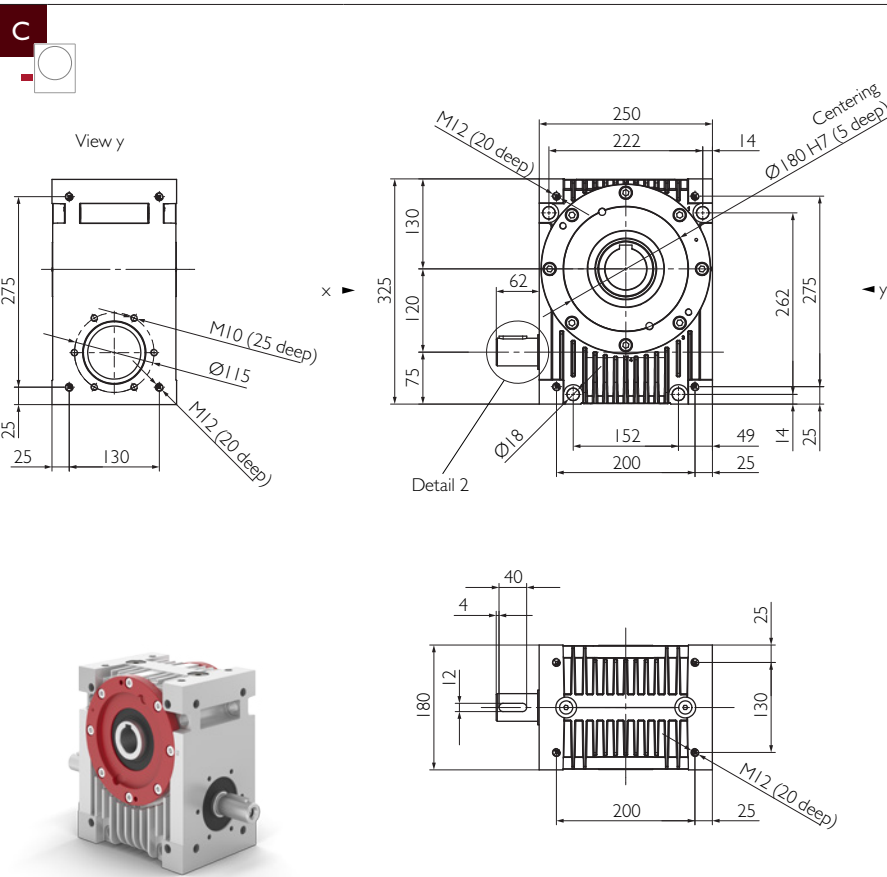
| Ratio                                               | i                         |                                                   | 2                                     | 3             | 4          | 5          | 6          | 8          | 10         | 13.33      | 16         | 24         | 30         | 47         | 60         |            |
|-----------------------------------------------------|---------------------------|---------------------------------------------------|---------------------------------------|---------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Nominal torque at the output<br>Efficiency          | n <sub>1N</sub> = 500rpm  | T <sub>2N</sub><br>η                              | [Nm]<br>[%]                           | 1177<br>93    | 1732<br>93 | 2018<br>93 | 1969<br>93 | 1752<br>92 | 2038<br>90 | 1895<br>89 | 1863<br>87 | 1824<br>84 | 1900<br>78 | 1364<br>75 | 1970<br>66 | 1364<br>61 |
|                                                     | n <sub>1N</sub> = 1000rpm | T <sub>2N</sub><br>η                              | [Nm]<br>[%]                           | 836<br>94     | 1284<br>94 | 1534<br>94 | 1523<br>93 | 1371<br>93 | 1609<br>91 | 1505<br>90 | 1487<br>88 | 1658<br>85 | 1622<br>80 | 1364<br>76 | 1612<br>68 | 1364<br>62 |
|                                                     | n <sub>1N</sub> = 1500rpm | T <sub>2N</sub><br>η                              | [Nm]<br>[%]                           | 648<br>94     | 1020<br>94 | 1237<br>94 | 1241<br>93 | 1126<br>93 | 1329<br>91 | 1248<br>90 | 1237<br>88 | 1380<br>86 | 1353<br>80 | 1364<br>76 | 1345<br>69 | 1364<br>62 |
|                                                     | n <sub>1N</sub> = 3000rpm | T <sub>2N</sub><br>η                              | [Nm]<br>[%]                           | 387<br>93     | 631<br>94  | 783<br>93  | 798<br>93  | 733<br>93  | 873<br>91  | 826<br>90  | 822<br>88  | 918<br>85  | 903<br>80  | 921<br>74  | 899<br>68  | 921<br>60  |
|                                                     | n <sub>1N</sub> = 4500rpm | T <sub>2N</sub><br>η                              | [Nm]<br>[%]                           | 276<br>93     | 457<br>93  | 573<br>93  | 588<br>93  | 543<br>92  | 650<br>91  | 617<br>89  | 616<br>87  | 688<br>84  | 677<br>79  | 689<br>73  | 675<br>66  | 689<br>58  |
| Max. acceleration torque                            |                           | T <sub>2B</sub>                                   | [Nm]                                  | 1200          | 2040       |            |            |            |            |            |            |            |            | 1400       | 2040       | 1400       |
| Emergency stop torque                               |                           | T <sub>2not</sub>                                 | [Nm]                                  | 2300          |            |            |            |            |            |            |            |            | 1600       | 2300       | 1600       |            |
| Idling torque <sup>a)</sup>                         |                           | T <sub>012</sub>                                  | [Nm]                                  | 4.5           |            |            | 4          |            |            | 3          |            |            |            |            |            |            |
| Max. input speed                                    |                           | n <sub>1Max</sub>                                 | [rpm]                                 | 4500          |            |            |            |            |            |            |            |            |            |            |            |            |
| Max. backlash <sup>b)</sup> at the output           | PS                        | j <sub>t</sub>                                    | [arcmin]                              | <8            | <7         | <6         | <6         | <5         | <5         |            |            |            |            | <4         |            |            |
|                                                     | PR                        | j <sub>t</sub>                                    | [arcmin]                              | <5.5          | <4.5       | <4         | <3.5       | <3         | <3         |            |            |            |            | <2.5       |            |            |
| Torsional rigidity vom Abtrieb zum Eintrieb         |                           | C <sub>21</sub>                                   | [Nm/arcmin]                           | 11.5          | 19         | 24.5       | 26.5       | 29         | 31.5       | 34         | 36.5       | 38.5       | 40.5       | 39         | 42.5       | 39         |
| Stability at the output                             |                           | C <sub>2K</sub>                                   | [Nm/arcmin]                           | 165           |            |            |            |            |            |            |            |            |            |            |            |            |
| Max. axial force <sup>c)d)</sup> at the output      |                           | F <sub>a2max</sub>                                | [N]                                   | 7000          | 9600       | 9500       | 12000      | 16000      | 17000      | 21000      | 25000      | 26000      | 27000      | 27000      | 27000      | 28000      |
| Max. radial force <sup>c)e)</sup> at the output     |                           | F <sub>r2max</sub>                                | [N]                                   | 7700          | 8100       | 7300       | 8800       | 9900       | 10000      | 12000      | 13000      | 13000      | 14000      | 14000      | 14000      | 14000      |
| Max. overturning torque <sup>c)</sup> at the output |                           | M <sub>2max</sub>                                 | [Nm]                                  | 1000          | 1100       | 980        | 1200       | 1300       | 1400       | 1600       | 1800       | 1800       | 1800       | 1800       | 1900       | 1900       |
| Max. axial force <sup>c)d)</sup> at the input       |                           | F <sub>a1max</sub>                                | [N]                                   | 3600          | 1800       | 730        | 1700       | 3600       | 2100       | 3300       | 3700       | 2500       | 2900       | 2700       | 3100       | 2700       |
| Max. radial force <sup>c)f)</sup> at the input      |                           | F <sub>r1max</sub>                                | [N]                                   | 1900          | 950        | 390        | 930        | 1900       | 1200       | 1800       | 2000       | 1300       | 1600       | 1400       | 1700       | 1500       |
| Mass moment of inertia <sup>g)</sup>                | Type 1 <sup>h)</sup>      | J <sub>1</sub>                                    | [10 <sup>-5</sup> kg m <sup>2</sup> ] | 1388          | 703        | 463        | 352        | 292        | 232        | 204        | 183        | 174        | 164        | 161        | 157        | 156        |
|                                                     | Type 2 <sup>i)</sup>      | J <sub>1</sub>                                    | [10 <sup>-5</sup> kg m <sup>2</sup> ] | 1511          | 826        | 586        | 475        | 415        | 355        | 327        | 306        | 297        | 286        | 283        | 280        | 279        |
| Service life                                        |                           | L <sub>h</sub>                                    | [h]                                   | 25000         |            |            |            |            |            |            |            |            |            |            |            |            |
| Weight without motor components                     |                           | m                                                 | [kg]                                  | 50            |            |            |            |            |            |            |            |            |            |            |            |            |
| Max. permissible housing temperature                |                           |                                                   | [°C]                                  | +90           |            |            |            |            |            |            |            |            |            |            |            |            |
| Ambient temperature                                 |                           |                                                   | [°C]                                  | -15 up to +50 |            |            |            |            |            |            |            |            |            |            |            |            |
| Lubrication                                         |                           | synthetic gear oil (as per DIN 51502: CLP PG 460) |                                       |               |            |            |            |            |            |            |            |            |            |            |            |            |
| Painting                                            |                           | None                                              |                                       |               |            |            |            |            |            |            |            |            |            |            |            |            |
| Protection class                                    |                           | IP65                                              |                                       |               |            |            |            |            |            |            |            |            |            |            |            |            |

- a) approximate, at  $n_1 = 3000$  rpm and operating temperature.
- b) Precision grade PS (standard backlash) for classic mechanical engineering applications.  
Precision grade PR (reduced backlash) for precise process applications.
- c) Bearing forces: Values valid at  $n_1 = 1500$  rpm;  $\frac{1}{2} T_{2N}$  and duty cycle of 40%.  
Consult with Güdel for composite bearing forces, axial and radial forces.
- d) in relation to shaft center.
- e) at a distance of 135 mm from the middle of the casing.
- f) at a distance of 160 mm from the middle of the casing.
- g) in relation to the input, including coupling.
- g) h) Motor shaft diameter  $\varnothing d$  from  $\varnothing 19$  to  $\varnothing 42$ , calculated at  $\varnothing 28$  mm.
- g) i) Motor shaft diameter  $\varnothing d$  from  $\varnothing 43$  to  $\varnothing 50$ , calculated at  $\varnothing 48$  mm.

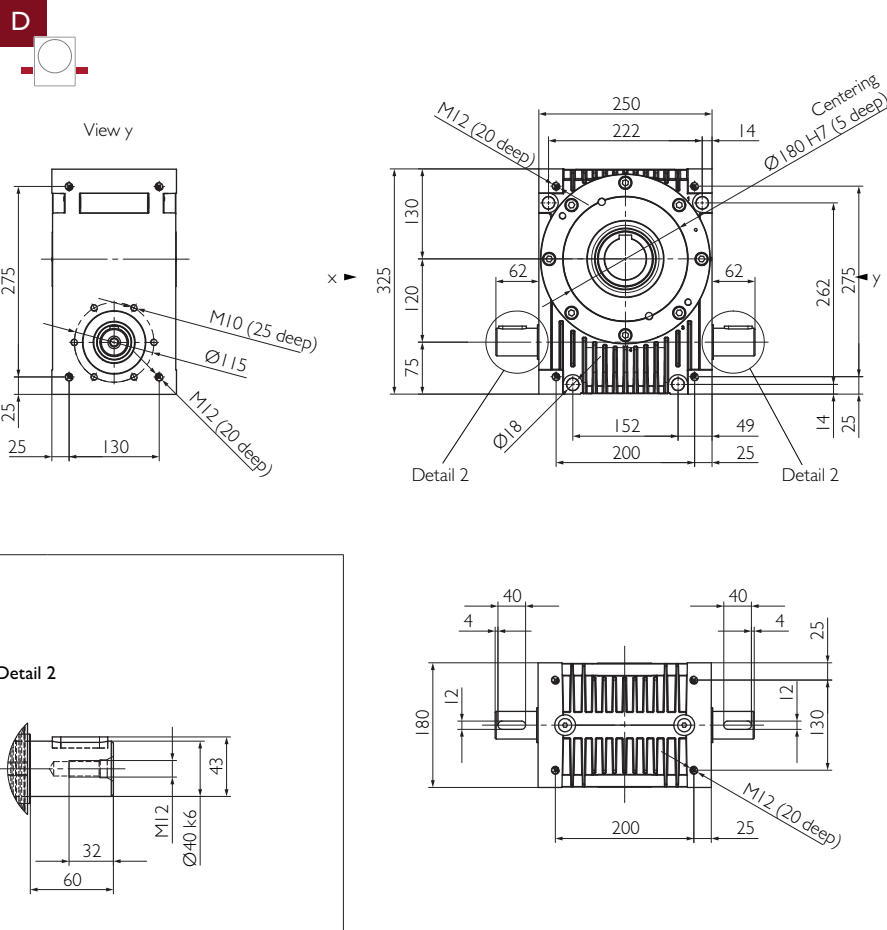
### Bearing forces



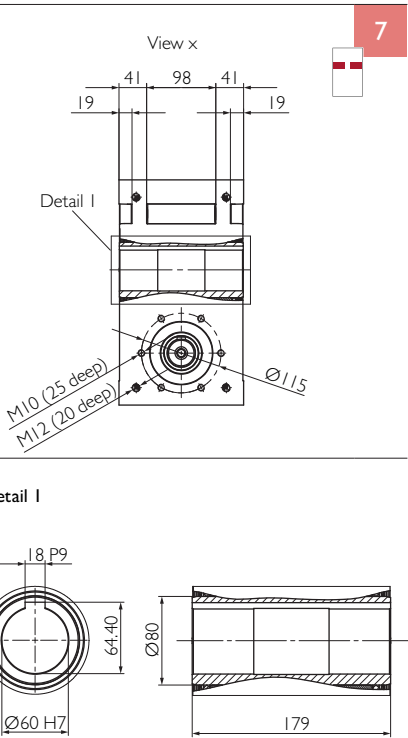
Input



Example HPG 120 D7



Output



| Ratio                                               | i                         |                                                   |                                       | 2             | 3    | 4    | 5     | 6     | 8     | 10    | 13.33 | 16    | 24    | 30    | 47    | 60    |  |
|-----------------------------------------------------|---------------------------|---------------------------------------------------|---------------------------------------|---------------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| Nominal torque at the output<br>Efficiency          | n <sub>1N</sub> = 500rpm  | T <sub>2N</sub>                                   | [Nm]                                  | 1177          | 1732 | 2018 | 1969  | 1752  | 2038  | 1895  | 1863  | 1824  | 1900  | 1364  | 1970  | 1364  |  |
|                                                     |                           | η                                                 | [%]                                   | 93            | 93   | 93   | 93    | 92    | 90    | 89    | 87    | 84    | 78    | 75    | 66    | 61    |  |
|                                                     | n <sub>1N</sub> = 1000rpm | T <sub>2N</sub>                                   | [Nm]                                  | 836           | 1284 | 1534 | 1523  | 1371  | 1609  | 1505  | 1487  | 1658  | 1622  | 1364  | 1612  | 1364  |  |
|                                                     |                           | η                                                 | [%]                                   | 94            | 94   | 94   | 93    | 93    | 91    | 90    | 88    | 85    | 80    | 76    | 68    | 62    |  |
|                                                     | n <sub>1N</sub> = 1500rpm | T <sub>2N</sub>                                   | [Nm]                                  | 648           | 1020 | 1237 | 1241  | 1126  | 1329  | 1248  | 1237  | 1380  | 1353  | 1364  | 1345  | 1364  |  |
|                                                     |                           | η                                                 | [%]                                   | 94            | 94   | 94   | 93    | 93    | 91    | 90    | 88    | 86    | 80    | 76    | 69    | 62    |  |
|                                                     | n <sub>1N</sub> = 3000rpm | T <sub>2N</sub>                                   | [Nm]                                  | 387           | 631  | 783  | 798   | 733   | 873   | 826   | 822   | 918   | 903   | 921   | 899   | 921   |  |
|                                                     |                           | η                                                 | [%]                                   | 93            | 94   | 93   | 93    | 93    | 91    | 90    | 88    | 85    | 80    | 74    | 68    | 60    |  |
|                                                     | n <sub>1N</sub> = 4500rpm | T <sub>2N</sub>                                   | [Nm]                                  | 276           | 457  | 573  | 588   | 543   | 650   | 617   | 616   | 688   | 677   | 689   | 675   | 689   |  |
|                                                     |                           | η                                                 | [%]                                   | 93            | 93   | 93   | 93    | 92    | 91    | 89    | 87    | 84    | 79    | 73    | 66    | 58    |  |
| Max. acceleration torque                            |                           | T <sub>2B</sub>                                   | [Nm]                                  | 1200          | 2040 |      |       |       |       |       |       |       |       | 1400  | 2040  | 1400  |  |
| Emergency stop torque                               |                           | T <sub>2not</sub>                                 | [Nm]                                  | 2300          |      |      |       |       |       |       |       |       |       | 1600  | 2300  | 1600  |  |
| Idling torque <sup>a)</sup>                         |                           | T <sub>012</sub>                                  | [Nm]                                  | 4.5           |      |      | 4     |       |       | 3     |       |       |       |       |       |       |  |
| Max. input speed                                    |                           | n <sub>1Max</sub>                                 | [rpm]                                 | 4500          |      |      |       |       |       |       |       |       |       |       |       |       |  |
| Max. backlash <sup>b)</sup> at the output           | PS                        | j <sub>t</sub>                                    | [arcmin]                              | <8            | <7   | <6   | <6    | <5    | <5    |       |       |       |       | <4    |       |       |  |
|                                                     | PR                        | j <sub>t</sub>                                    | [arcmin]                              | <5.5          | <4.5 | <4   | <3.5  | <3    | <3    |       |       |       |       | <2.5  |       |       |  |
| Torsional rigidity vom Abtrieb zum Eintrieb         |                           | C <sub>21</sub>                                   | [Nm/arcmin]                           | 11.5          | 19   | 24.5 | 26.5  | 29    | 31.5  | 34    | 36.5  | 38.5  | 40.5  | 39    | 42.5  | 39    |  |
| Stability at the output                             |                           | C <sub>2K</sub>                                   | [Nm/arcmin]                           | 165           |      |      |       |       |       |       |       |       |       |       |       |       |  |
| Max. axial force <sup>c)d)</sup> at the output      |                           | F <sub>a2max</sub>                                | [N]                                   | 7000          | 9600 | 9500 | 12000 | 16000 | 17000 | 21000 | 25000 | 26000 | 27000 | 27000 | 27000 | 28000 |  |
| Max. radial force <sup>c)e)</sup> at the output     |                           | F <sub>r2max</sub>                                | [N]                                   | 7700          | 8100 | 7300 | 8800  | 9900  | 10000 | 12000 | 13000 | 13000 | 14000 | 14000 | 14000 | 14000 |  |
| Max. overturning torque <sup>c)</sup> at the output |                           | M <sub>2max</sub>                                 | [Nm]                                  | 1000          | 1100 | 980  | 1200  | 1300  | 1400  | 1600  | 1800  | 1800  | 1800  | 1800  | 1900  | 1900  |  |
| Max. axial force <sup>c)d)</sup> at the input       |                           | F <sub>a1max</sub>                                | [N]                                   | 3600          | 1800 | 730  | 1700  | 3600  | 2100  | 3300  | 3700  | 2500  | 2900  | 2700  | 3100  | 2700  |  |
| Max. radial force <sup>c)f)</sup> at the input      |                           | F <sub>r1max</sub>                                | [N]                                   | 1900          | 950  | 390  | 930   | 1900  | 1200  | 1800  | 2000  | 1300  | 1600  | 1400  | 1700  | 1500  |  |
| Mass moment of inertia <sup>g)</sup>                |                           | J <sub>1</sub>                                    | [10 <sup>-5</sup> kg m <sup>2</sup> ] | 1307          | 622  | 382  | 271   | 211   | 151   | 123   | 102   | 93    | 82    | 79    | 76    | 75    |  |
| Service life                                        |                           | L <sub>h</sub>                                    | [h]                                   | 25000         |      |      |       |       |       |       |       |       |       |       |       |       |  |
| Weight without motor components                     |                           | m                                                 | [kg]                                  | 46            |      |      |       |       |       |       |       |       |       |       |       |       |  |
| Max. permissible housing temperature                |                           |                                                   | [°C]                                  | +90           |      |      |       |       |       |       |       |       |       |       |       |       |  |
| Ambient temperature                                 |                           |                                                   | [°C]                                  | -15 up to +50 |      |      |       |       |       |       |       |       |       |       |       |       |  |
| Lubrication                                         |                           | synthetic gear oil (as per DIN 51502: CLP PG 460) |                                       |               |      |      |       |       |       |       |       |       |       |       |       |       |  |
| Painting                                            |                           | None                                              |                                       |               |      |      |       |       |       |       |       |       |       |       |       |       |  |
| Protection class                                    |                           | IP65                                              |                                       |               |      |      |       |       |       |       |       |       |       |       |       |       |  |

- a) approximate, at  $n_1 = 3000\text{rpm}$  and operating temperature.  
b) Precision grade PS (standard backlash) for classic mechanical engineering applications.  
Precision grade PR (reduced backlash) for precise process applications.  
c) Bearing forces: Values valid at  $n_1 = 1500\text{rpm}$ ;  $\frac{1}{2} T_{2N}$  and duty cycle of 40%.  
Consult with Güdel for composite bearing forces, axial and radial forces.  
c) d) in relation to shaft center.  
c) e) at a distance of 135 mm from the middle of the casing.  
c) f) at a distance of 160 mm from the middle of the casing.  
g) in relation to the input.

Bearing forces

