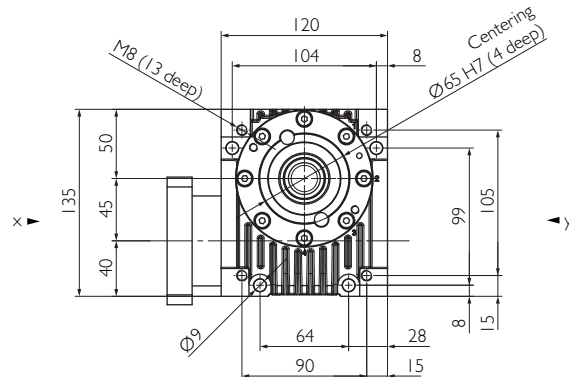
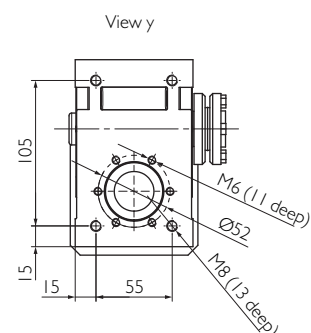
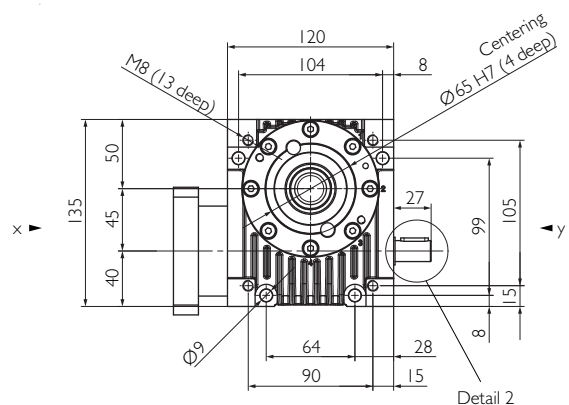
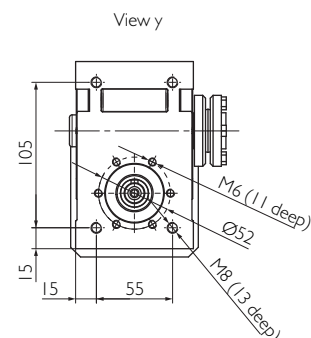
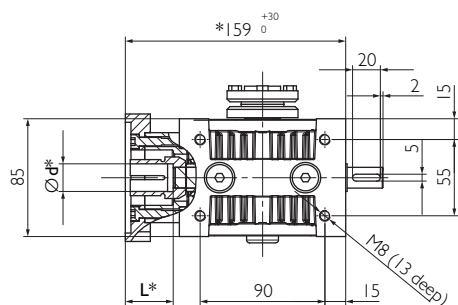
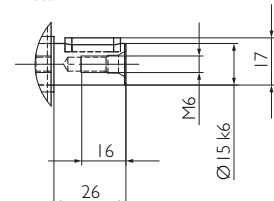


Example HPG 045 A2

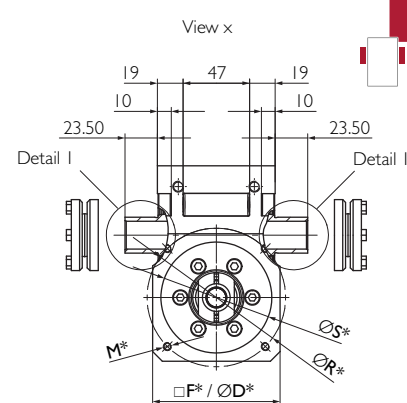
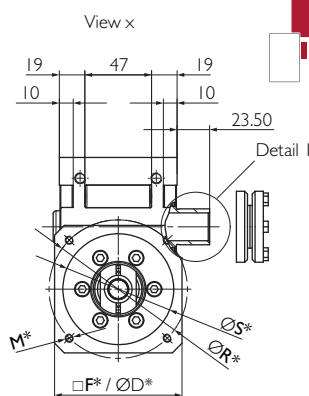
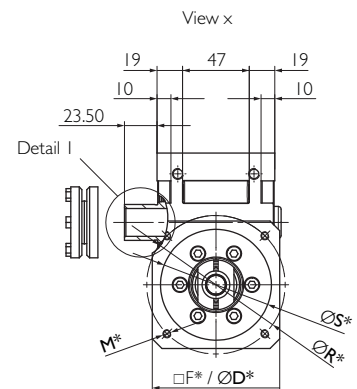


* Motor-specific gearbox dimensions
 $\varnothing d$: $\varnothing$ motor shaft [mm], $6 \leq \varnothing d \leq 24$
 L : Motor shaft length [mm], $20 \leq L \leq 53$

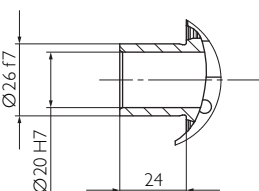
Detail 2



* Motor-specific gearbox dimensions
S: min. 40 [mm], R: Pitch circle Ø [mm], M: Bore hole Ø or thread [mm], □F/ØD: Specify flange [mm]



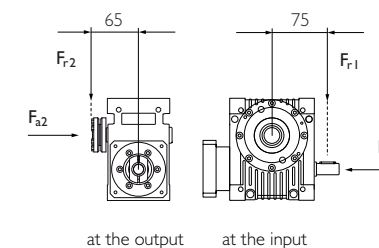
Detail 1



Ratio	i			2	3	4	5	6	8	10	13.33	16	24	30	47	60		
Nominal torque at the output Efficiency	n _{1N} = 500 rpm	T _{2N}	[Nm]	52.7	73.9	83.9	80.5	70.8	81.7	75.5	73.9	75.0	77.9	54.5	79.4	54.5		
		η	[%]	88	88	87	86	85	82	79	75	71	63	59	50	43		
	n _{1N} = 1000 rpm	T _{2N}	[Nm]	43.8	63.3	73.1	71.0	62.9	72.9	67.7	66.4	74.0	72.2	54.5	71.5	55.5		
		η	[%]	89	89	88	87	86	84	81	77	73	65	60	53	45		
	n _{1N} = 1500 rpm	T _{2N}	[Nm]	37.4	55.4	64.8	63.4	56.5	65.8	61.3	60.3	67.2	65.6	55.5	65.1	55.5		
		η	[%]	89	89	89	88	86	84	81	77	74	66	60	53	43		
	n _{1N} = 3000 rpm	T _{2N}	[Nm]	26.0	40.3	48.3	48.1	43.4	51.0	47.8	47.2	52.7	51.6	51.8	51.3	51.8		
η		[%]	88	89	88	87	85	83	80	75	72	64	58	52	45			
n _{1N} = 4500 rpm	T _{2N}	[Nm]	20.0	31.6	38.5	38.7	35.2	41.6	39.2	38.8	43.3	42.5	42.7	42.3	42.7			
	η	[%]	87	87	87	85	83	81	77	73	70	62	54	50	43			
n _{1N} = 6000 rpm	T _{2N}	[Nm]	16.2	26.0	32.0	32.4	29.6	35.2	33.2	33.0	36.8	36.1	36.4	36.0	36.4			
	η	[%]	85	86	85	84	81	79	75	70	66	58	51	46	40			
Max. acceleration torque		T _{2B}	[Nm]	60	90									60			90	60
Emergency stop torque		T _{2Not}	[Nm]	120									80			120	80	
Idling torque ^{a)}		T ₀₁₂	[Nm]	1.05			0.95			0.8								
Max. input speed		n _{1Max}	[rpm]	6000														
Max. backlash ^{b)} at the output	PS	j _t	[arcmin]	<15	<12	<11	<11	<9	<8					<7				
	PR	j _t	[arcmin]	<10	<8	<7	<7	<6	<5.5					<5				
Torsional rigidity vom Abtrieb zum Eintrieb		C _{t21}	[Nm/arcmin]	1.6	2.8	3.6	4	4.3	4.5	4.9	5.3	5.5	5.8	5.5	6	5.5		
Stability at the output		C _{2K}	[Nm/arcmin]	30														
Max. axial force ^{c)d)} at the output		F _{a2max}		720	1000	1600	2200	2800	2900	3300	3700	3900	4700	4700	4800	4800		
Max. radial force ^{c)e)} at the output		F _{r2max}		700	820	1200	1400	1600	1600	1600	1700	1800	2000	2100	2200	2200		
Max. overturning torque ^{c)} at the output		M _{2max}		45	53	76	91	110	100	110	110	110	130	140	140	140		
Max. axial force ^{c)d)} at the input		F _{a1max}		1400	980	860	1000	1300	1100	1300	1300	1200	1200	1200	1200	1200		
Max. radial force ^{c)f)} at the input		F _{r1max}		510	470	430	510	590	550	610	630	580	610	600	620	600		
Mass moment of inertia ^{g)}	Type 1 ^{h)}	J ₁	[10 ⁻⁶ kg m ²]	148	84	62	52	46	41	38	36	36	35	34	34	34		
	Type 2 ^{l)}	J ₁	[10 ⁻⁶ kg m ²]	191	128	106	95	90	84	82	80	79	78	78	77	77		
Service life		L _h	[h]	25000														
Weight without motor components		m	[kg]	4.5														
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 $n_1 = 3000$ rpm; $\frac{2}{3} T_{2N}$ 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 65 mm from the middle of the casing.
- c) f) at a distance of 75 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 90/10°.
- g) h) Motor shaft diameter $\varnothing d$ from $\varnothing 6$ to $\varnothing 20$, calculated at $\varnothing 11$ mm.
- g) i) Motor shaft diameter $\varnothing d$ from $\varnothing 21$ to $\varnothing 24$, calculated at $\varnothing 24$ mm.

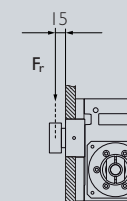
Bearing forces



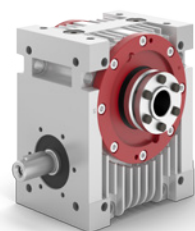
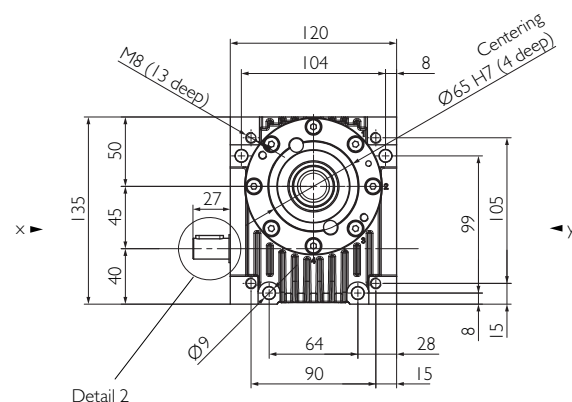
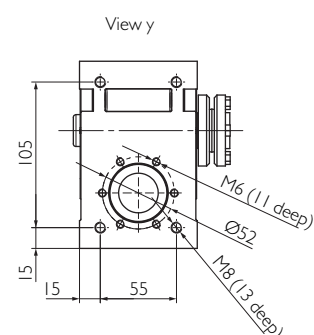
Package

			Output Flange including Bearing & Pinion				
Radial rigidity	C ₃	[N/mm]	23000				
Speed	n _{2N}	[rpm]	1500	750	400	150	100
Max. radial force ¹⁾	F _{rmax}	[N]	1900	2400	2900	3200	3500

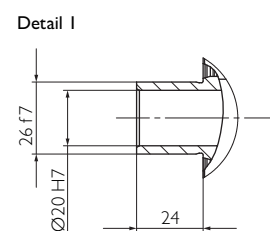
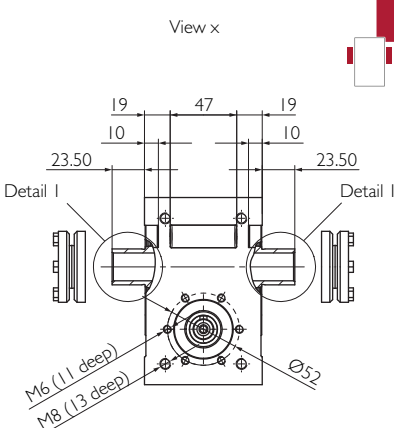
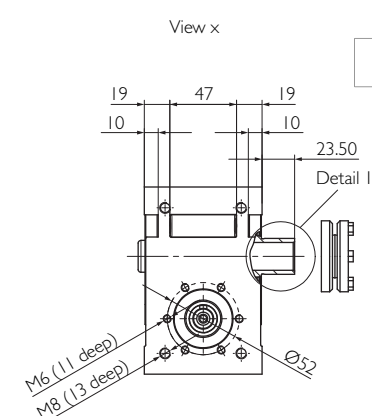
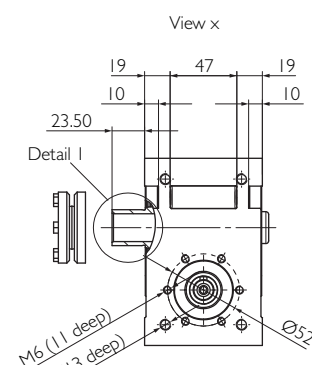
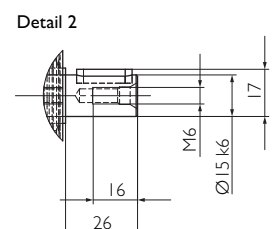
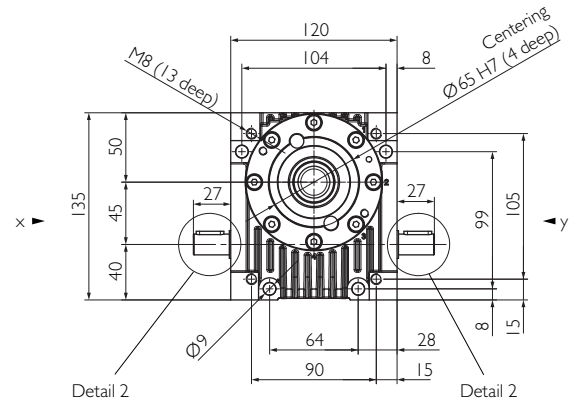
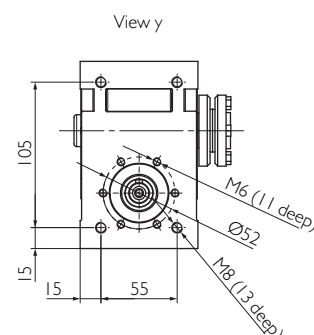
j) Bearing forces: Values valid at duty cycle of 40% at a distance of 15mm from the end of the bearing.



Detailed information about the **Package, Options & Accessories** on pages 46 and 47.



Example HPG 045 C2



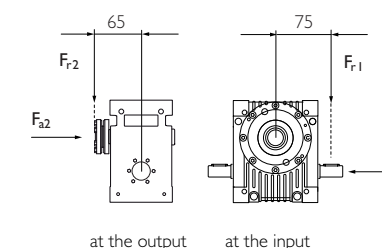
High Performance Angle Gearboxes

Performance

Ratio	i			2	3	4	5	6	8	10	13.33	16	24	30	47	60
Nominal torque at the output Efficiency	n _{1N} = 500 rpm	T _{2N} η	[Nm] [%]	52.7 88	73.9 88	83.9 87	80.5 86	70.8 85	81.7 82	75.5 79	73.9 75	75.0 71	77.9 63	54.5 59	79.4 50	54.5 43
	n _{1N} = 1000 rpm	T _{2N} η	[Nm] [%]	43.8 89	63.3 89	73.1 88	71.0 87	62.9 86	72.9 84	67.7 81	66.4 77	74.0 73	72.2 65	54.5 60	71.5 53	55.5 45
	n _{1N} = 1500 rpm	T _{2N} η	[Nm] [%]	37.4 89	55.4 89	64.8 89	63.4 88	56.5 86	65.8 84	61.3 81	60.3 77	67.2 74	65.6 66	55.5 60	65.1 53	55.5 45
	n _{1N} = 3000 rpm	T _{2N} η	[Nm] [%]	26.0 88	40.3 89	48.3 88	48.1 87	43.4 85	51.0 83	47.8 80	47.2 75	52.7 72	51.6 64	51.8 58	51.3 52	51.8 45
	n _{1N} = 4500 rpm	T _{2N} η	[Nm] [%]	20.0 87	31.6 87	38.5 87	38.7 85	35.2 83	41.6 81	39.2 77	38.8 73	43.3 70	42.5 62	42.7 54	42.3 50	42.7 43
	n _{1N} = 6000 rpm	T _{2N} η	[Nm] [%]	16.2 85	26.0 86	32.0 85	32.4 84	29.6 81	35.2 79	33.2 75	33.0 70	36.8 66	36.1 58	36.4 51	36.0 46	36.4 40
	Max. acceleration torque		T _{2B}	[Nm]	60	90									60	90
Emergency stop torque		T _{2Not}	[Nm]	120									80	120	80	
Idling torque ^{a)}		T ₀₁₂	[Nm]	1.05			0.95			0.8						
Max. input speed		n _{1Max}	[rpm]	6000												
Max. backlash ^{b)} at the output	PS	j _t	[arcmin]	<15	<12	<11	<11	<9	<8					<7		
	PR	j _t	[arcmin]	<10	<8	<7	<7	<6	<5.5					<5		
Torsional rigidity vom Abtrieb zum Eintrieb		C _{t21}	[Nm/arcmin]	1.6	2.8	3.6	4	4.3	4.5	4.9	5.3	5.5	5.8	5.5	6	5.5
Stability at the output		C _{2K}	[Nm/arcmin]	30												
Max. axial force ^{c)} ^{d)} at the output			[N]	720	1000	1600	2200	2800	2900	3300	3700	3900	4700	4700	4800	4800
Max. radial force ^{c)} ^{e)} at the output			[N]	700	820	1200	1400	1600	1600	1600	1700	1800	2000	2100	2200	2200
Max. overturning torque ^{c)} at the output			[Nm]	45	53	76	91	110	100	110	110	110	130	140	140	140
Max. axial force ^{c)} ^{d)} at the input			[N]	1400	980	860	1000	1300	1100	1300	1300	1200	1200	1200	1200	1200
Max. radial force ^{c)} ^{f)} at the input			[N]	510	470	430	510	590	550	610	630	580	610	600	620	600
Mass moment of inertia ^{g)}		J ₁	[10 ⁻⁶ kg m ²]	120	57	34	24	19	13	10	9	8	7	6	6	6
Service life		L _h	[h]	25000												
Weight without motor components		m	[kg]	4												
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														

- 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 $n_1 = 3000$ rpm; $\frac{2}{3} T_{2N}$ 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 65 mm from the middle of the casing.
- f) at a distance of 75 mm from the middle of the casing.
- g) in relations to the input, including shrink disc at the output (output 1 & 2),
with two shrink discs (output 3) increase values by 90/i².

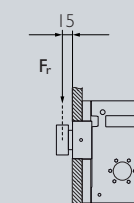
Bearing forces



Package

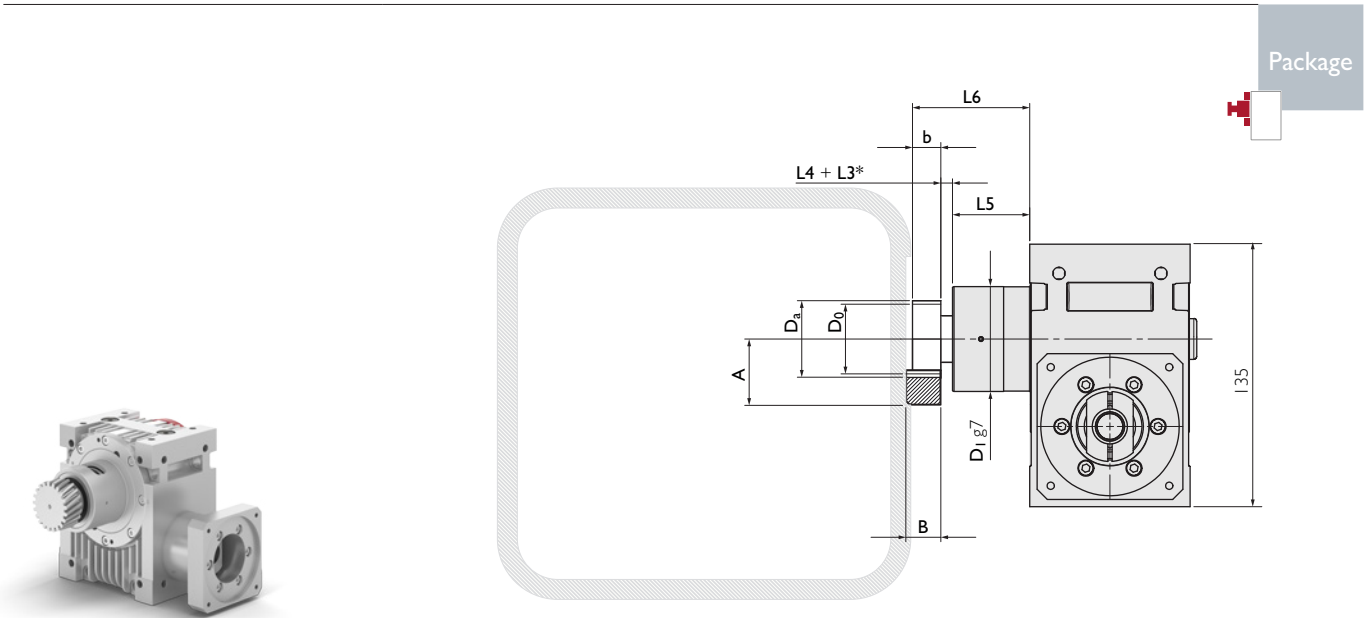
		Output Flange including Bearing & Pinion				
Radial rigidity	C ₃ [N/mm]	23000				
Speed	n _{2N} [rpm]	1500	750	400	150	100
Max. radial force ¹⁾	F _{rmax} [N]	1900	2400	2900	3200	3500

- j) Bearing forces: Values valid at duty cycle of 40% at a distance of 15mm from the end of the bearing.

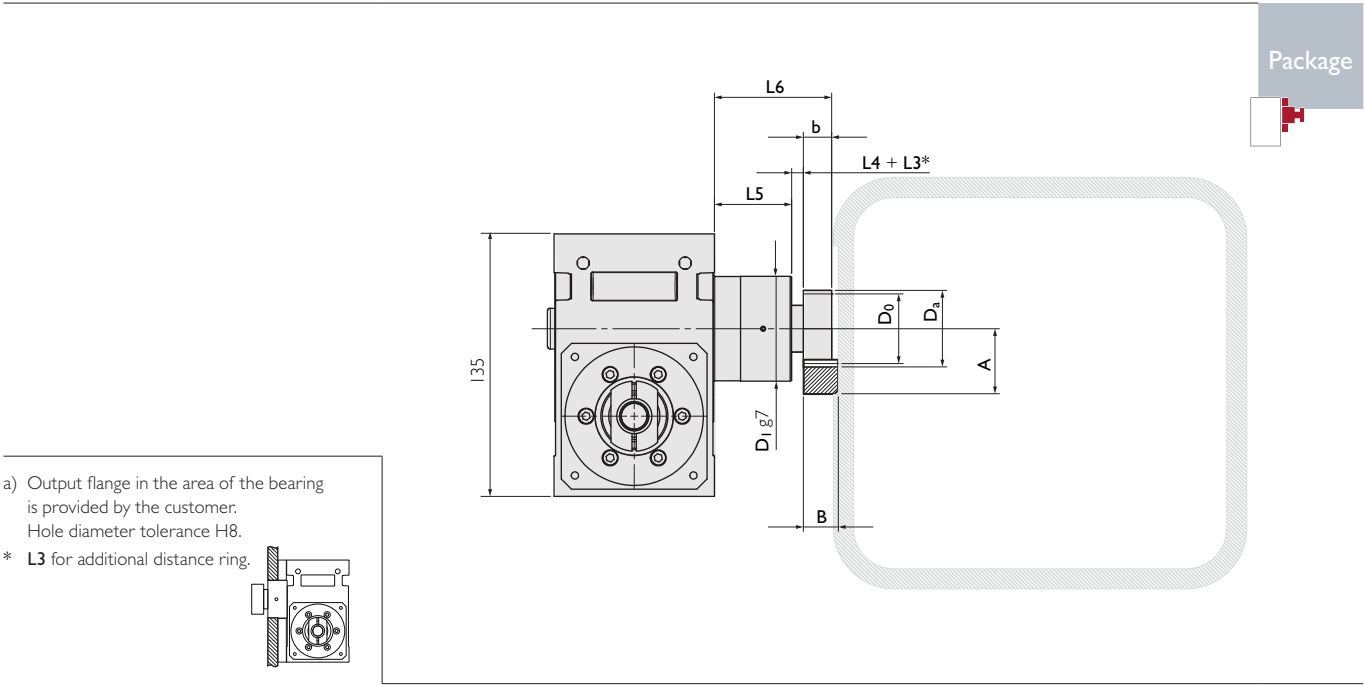


Detailed information about the **Package, Options & Accessories** on pages 46 and 47.

Output Flange including Bearing & Pinion^{a)}



Example HPG 045 A1 Package



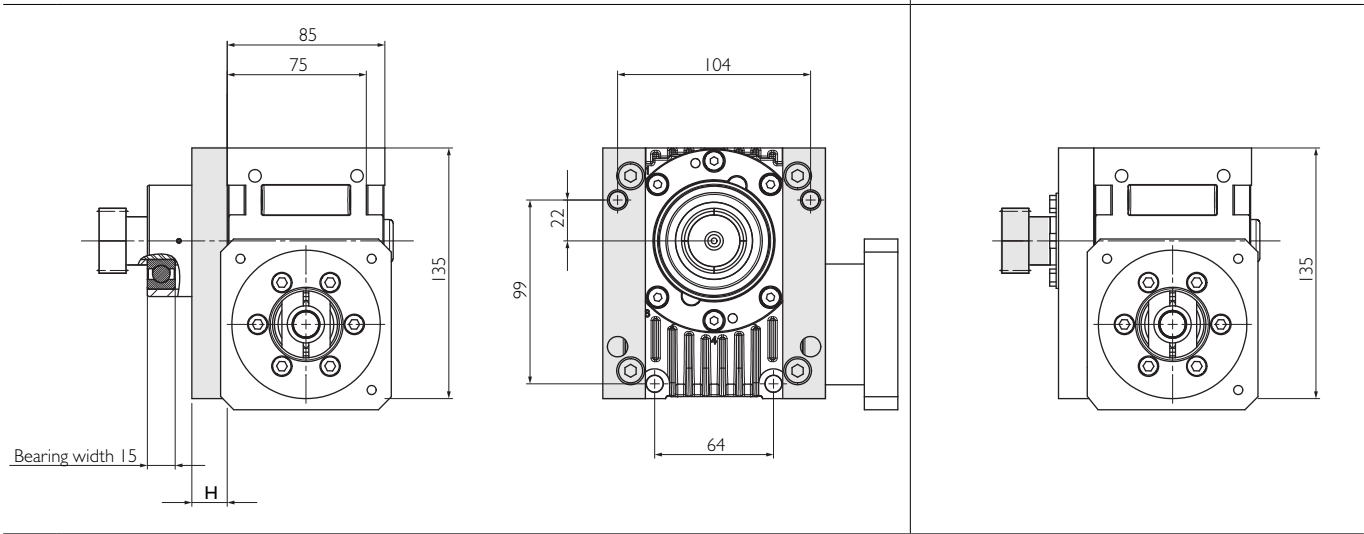
a) Output flange in the area of the bearing is provided by the customer. Hole diameter tolerance H8.
* L3 for additional distance ring.

Geometric information

Helical modular pitch	Art. Nr.	m	z	A	b	B	Da	D0	D1	L4	L5	L6
Pinion 1	211120	1.5	20	33.415	20	19	34.83	31.83	60	4.5	43	67.5
											53	77.5
Pinion 2	211216	2	16	39.575	20	24	39.15	35.15	60	8	43	71
											53	81
Straight modular pitch	Art. Nr.	m	z	A	b	B	Da	D0	D1	L4	L5	L6
Pinion 3	201120	1.5	20	32.5	20	19	33.0	30.0	60	4.5	43	67.5
											53	77.5
Pinion 4	201216	2	16	38.6	20	24	37.2	33.2	60	8	43	71
											53	81

Spacer Elements

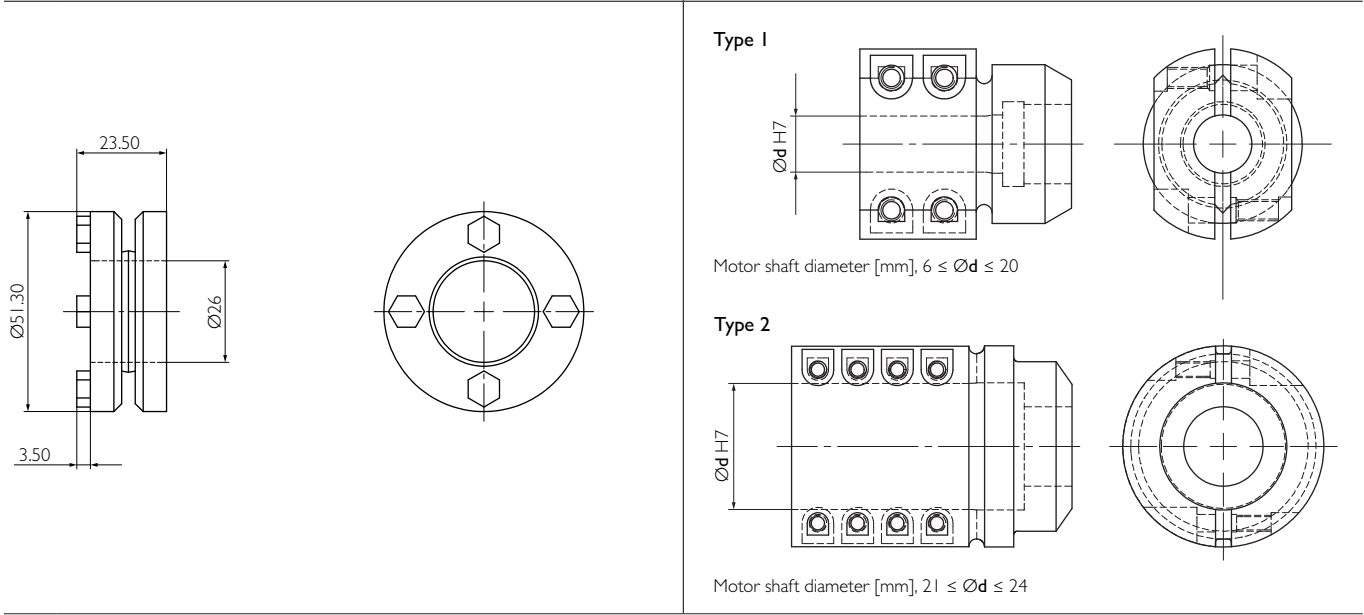
with Pinion special solutions on request



Casing can only be fastened with long screws as per the bore hole pattern. Screws M8 of length 75mm + H + thread depth, tightening torque 22Nm.

Shrink Disc

Coupling

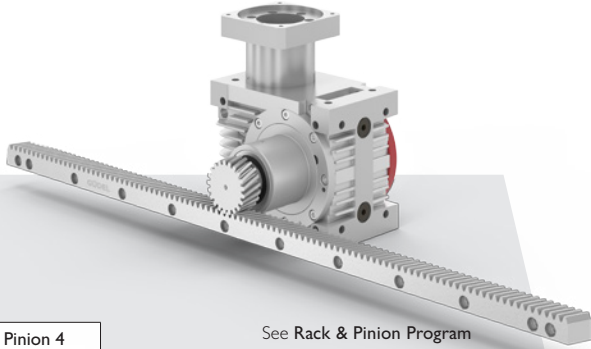


Your ideal Drive Train

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

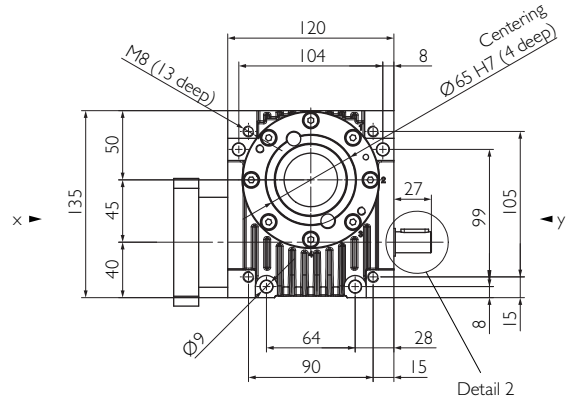
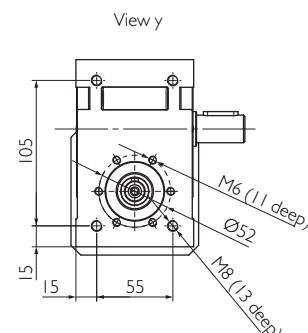
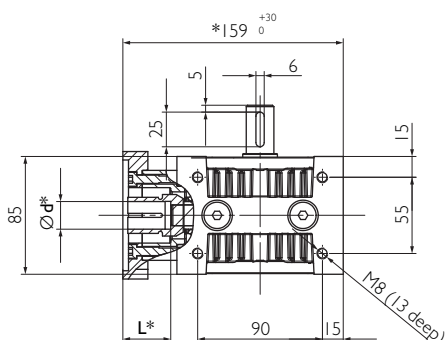
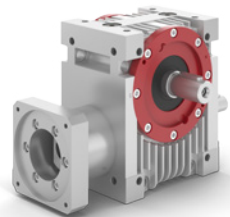
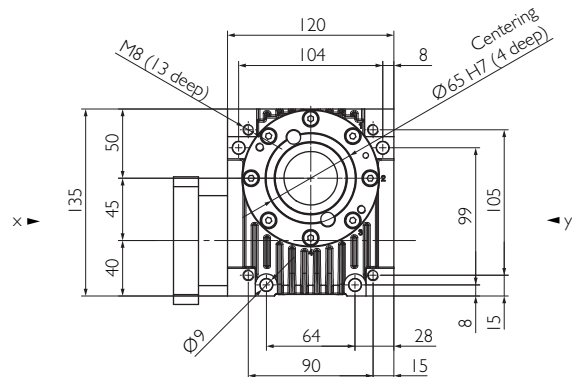
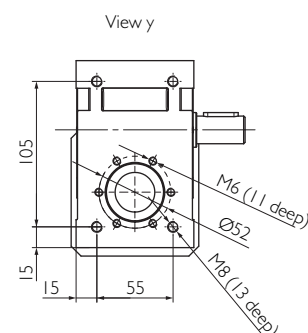
			Pinion 1	Pinion 2	Pinion 3	Pinion 4
Maximum acceleration force	F _N	[N]	4237	5417	3638	4810
Maximum acceleration torque	T _N	[Nm]	67	92	55	77

Higher value for rack and pinion taking account of the number of load cycles: 1x10⁶ for the rack; 1x10⁷ for the pinion. Both in cycle mode.

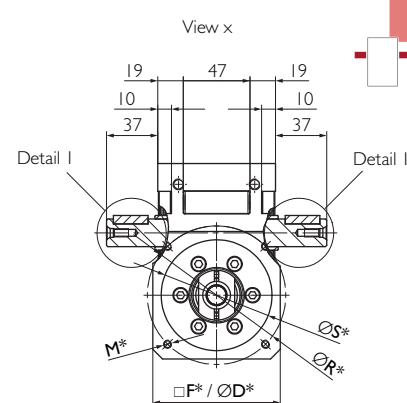
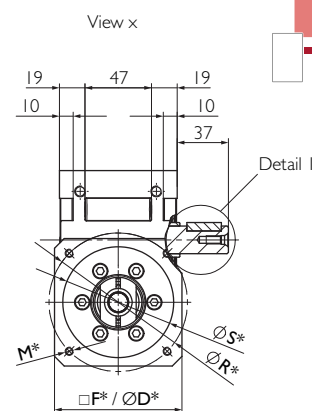
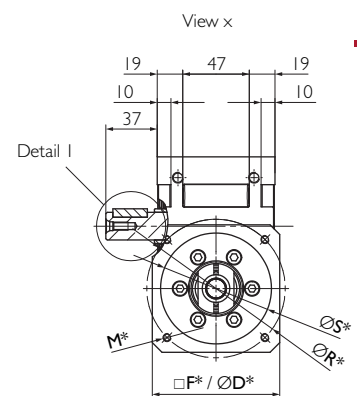
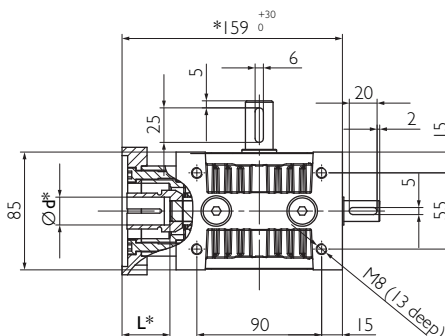
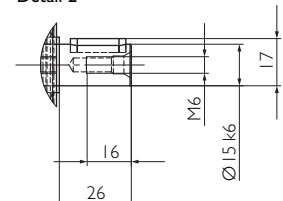


See **Rack & Pinion Program** of your ideal Drive Train on pages 104 et seq.

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



Detail 2



Technical drawing of a shaft-hub assembly. The shaft has a diameter of $\varnothing 20 \text{ k6}$ and a length of 22.50. The hub has an inner diameter of M6 and a total length of 35. The shaft is inserted into the hub, and the drawing shows the assembly with dimensions 16 and 35 indicating specific lengths.

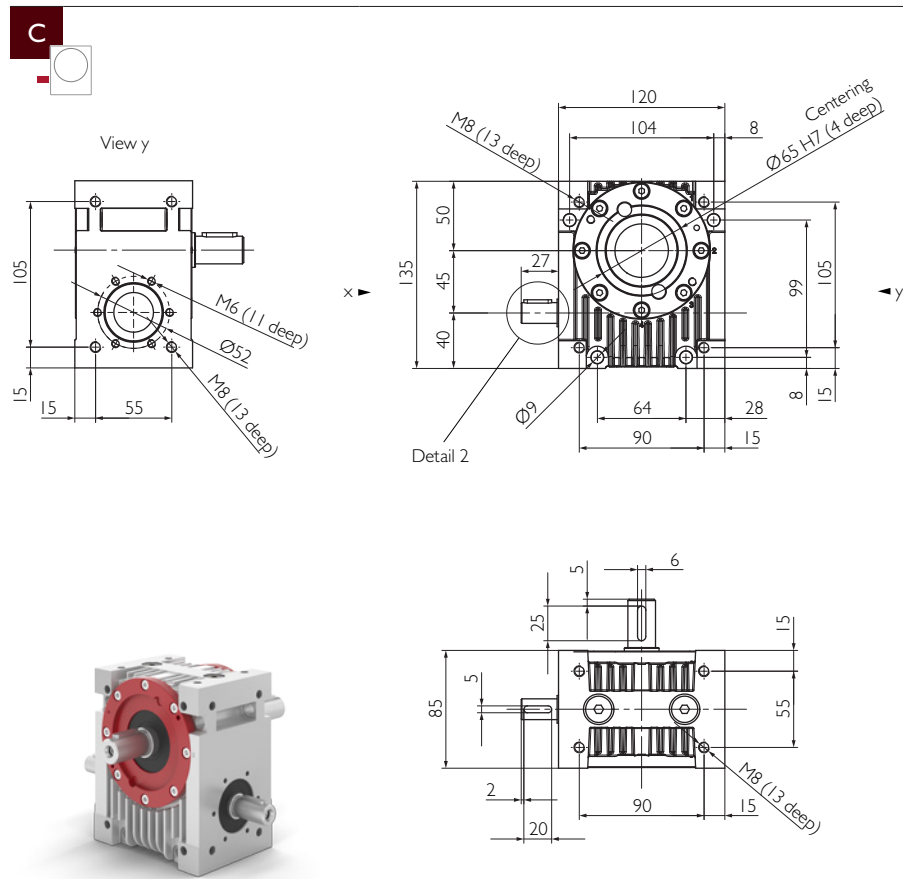
* Motor-specific gearbox dimensions
S: min. 40 [mm], R: Pitch circle Ø [mm], M: Bore hole Ø or thread [mm], □F/ØD: Specify flange [mm]

Ratio	i			2	3	4	5	6	8	10	13.33	16	24	30	47	60
Nominal torque at the output Efficiency	n _{1N} = 500 rpm	T _{2N} η	[Nm] [%]	52.7 88	73.9 88	83.9 87	80.5 86	70.8 85	81.7 82	75.5 79	73.9 75	75.0 71	77.9 63	54.5 59	79.4 50	54.5 43
	n _{1N} = 1000 rpm	T _{2N} η	[Nm] [%]	43.8 89	63.3 89	73.1 88	71.0 87	62.9 86	72.9 84	67.7 81	66.4 77	74.0 73	72.2 65	54.5 60	71.5 53	55.5 45
	n _{1N} = 1500 rpm	T _{2N} η	[Nm] [%]	37.4 89	55.4 89	64.8 89	63.4 88	56.5 86	65.8 84	61.3 81	60.3 77	67.2 74	65.6 66	55.5 60	65.1 53	55.5 45
	n _{1N} = 3000 rpm	T _{2N} η	[Nm] [%]	26.0 88	40.3 89	48.3 88	48.1 87	43.4 85	51.0 83	47.8 80	47.2 75	52.7 72	51.6 64	51.8 58	51.3 52	51.8 45
	n _{1N} = 4500 rpm	T _{2N} η	[Nm] [%]	20.0 87	31.6 87	38.5 87	38.7 85	35.2 83	41.6 81	39.2 77	38.8 73	43.3 70	42.5 62	42.7 54	42.3 50	42.7 43
	n _{1N} = 6000 rpm	T _{2N} η	[Nm] [%]	16.2 85	26.0 86	32.0 85	32.4 84	29.6 81	35.2 79	33.2 75	33.0 70	36.8 66	36.1 58	36.4 51	36.0 46	36.4 40
Max. acceleration torque		T _{2B}	[Nm]	60	90									60	90	60
Emergency stop torque		T _{2Not}	[Nm]	120									80	120	80	
Idling torque ^{a)}		T ₀₁₂	[Nm]	1.05			0.95			0.8						
Max. input speed		n _{1Max}	[rpm]	6000												
Max. backlash ^{b)} at the output	PS	j _k	[arcmin]	<15	<12	<11	<11	<9	<8					<7		
	PR	j _k	[arcmin]	<10	<8	<7	<7	<6	<5.5					<5		
Torsional rigidity vom Abtrieb zum Eitrieb		C _{i21}	[Nm/arcmin]	1.6	2.8	3.6	4	4.3	4.5	4.9	5.3	5.5	5.8	5.5	6	5.5
Stability at the output		C _{2K}	[Nm/arcmin]	30												
Max. axial force ^{c)d)} at the output			[N]	720	1000	1600	2200	2800	2900	3300	3700	3900	4700	4700	4800	4800
Max. radial force ^{c)e)} at the output			[N]	700	820	1200	1400	1600	1600	1600	1700	1800	2000	2100	2200	2200
Max. overturning torque ^{c)} at the output			[Nm]	45	53	76	91	110	100	110	110	110	130	140	140	140
Max. axial force ^{c)d)} at the input			[N]	1400	980	860	1000	1300	1100	1300	1300	1200	1200	1200	1200	1200
Max. radial force ^{c)f)} at the input			[N]	510	470	430	510	590	550	610	630	580	610	600	620	600
Mass moment of inertia ^{g)}	Type 1 ^{h)}	J ₁	[10 ⁻⁶ kg m ²]	148	84	62	52	46	41	38	36	36	35	34	34	34
	Type 2 ⁱ⁾	J ₁	[10 ⁻⁶ kg m ²]	191	128	106	95	90	84	82	80	79	78	78	77	77
Service life		L _h	[h]	25000												
Weight without motor components		m	[kg]	4.5												
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														

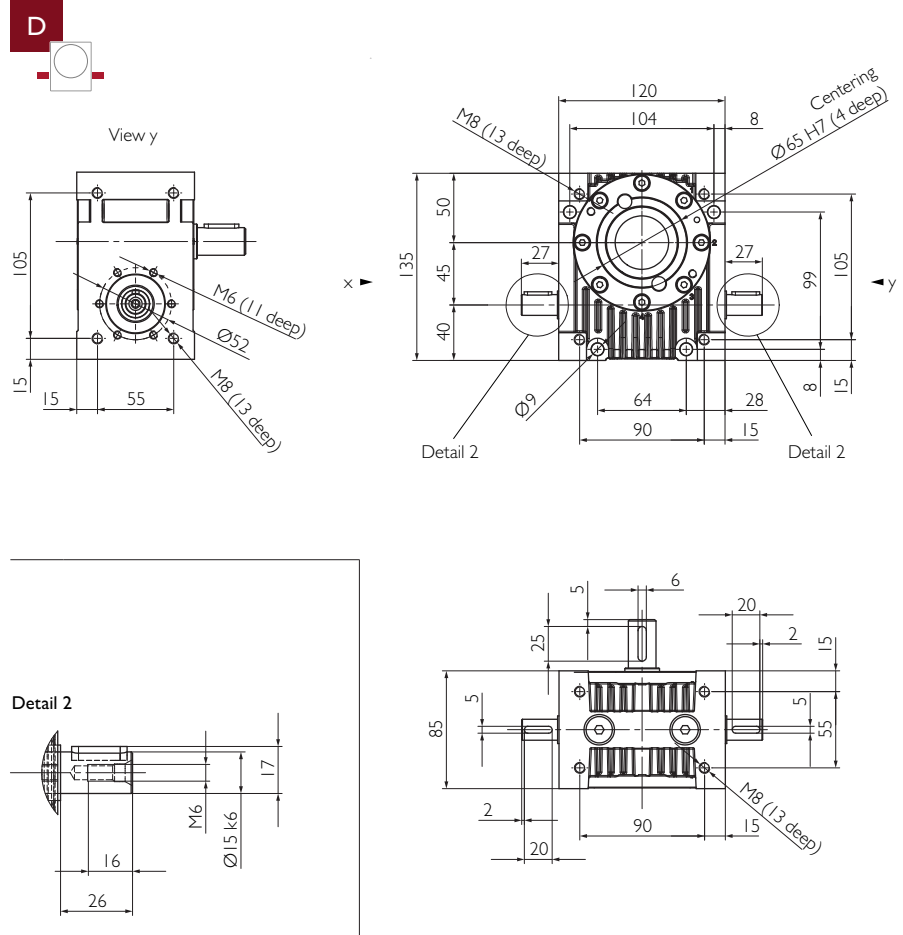
- a) approximate, at $n_1 = 3000$ rpm and operating temperature.
- b) Precision grade PS (standard backlash) for classic mechanical engineering applications.
Precision grade PR (reduced backlash) for precise process applications.
- c) Bearing forces: Values valid at $n_1 = 3000$ rpm; $\frac{3}{4} T_{2N}$ 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 65 mm from the middle of the casing.
- f) at a distance of 75 mm from the middle of the casing.
- g) in relation to the input, including coupling.
- g) h) Motor shaft diameter $\varnothing d$ from $\varnothing 6$ to $\varnothing 20$, calculated at $\varnothing 11$ mm.
- g) i) Motor shaft diameter $\varnothing d$ from $\varnothing 21$ to $\varnothing 24$, calculated at $\varnothing 24$ mm.

Figure 10.10 consists of two schematic diagrams of a motor, labeled 'at the output' and 'at the input'.
 The left diagram, 'at the output', shows a motor with a horizontal dimension of 65 and a vertical dimension of 75. A downward force F_{r2} is applied at the top center, and a horizontal force F_{a2} is applied to the left at the bottom left. The motor has a circular base with a central shaft and a flange with six bolts.
 The right diagram, 'at the input', shows the same motor with a horizontal dimension of 75 and a vertical dimension of 65. A downward force F_{r1} is applied at the top center, and a horizontal force F_{a1} is applied to the right at the bottom right. The motor has a circular base with a central shaft and a flange with six bolts.

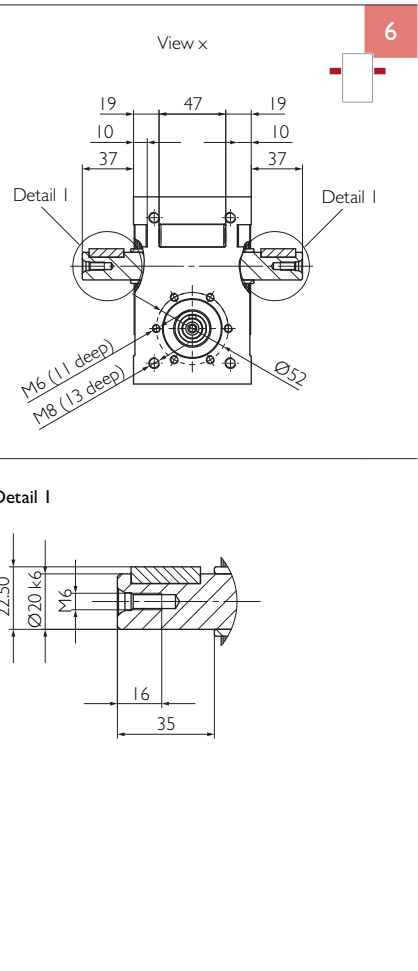
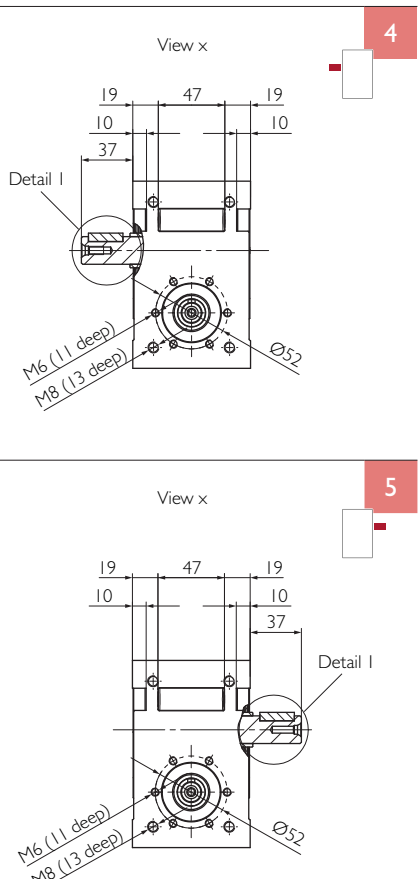
Input



Example HPG 045 D6



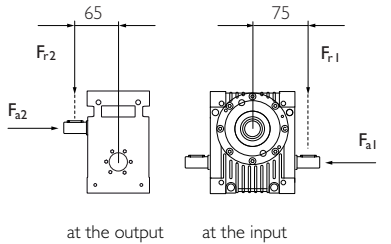
Output

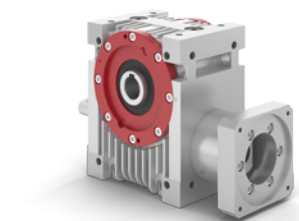
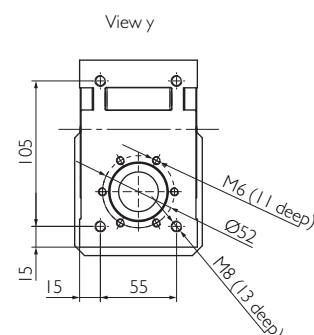


Ratio	i			2	3	4	5	6	8	10	13.33	16	24	30	47	60
Nominal torque at the output Efficiency	$n_{1N} = 500 \text{ rpm}$	T_{2N} η	[Nm] [%]	52.7 88	73.9 88	83.9 87	80.5 86	70.8 85	81.7 82	75.5 79	73.9 75	75.0 71	77.9 63	54.5 59	79.4 50	54.5 43
	$n_{1N} = 1000 \text{ rpm}$	T_{2N} η	[Nm] [%]	43.8 89	63.3 89	73.1 88	71.0 87	62.9 86	72.9 84	67.7 81	66.4 77	74.0 73	72.2 65	54.5 60	71.5 53	55.5 45
	$n_{1N} = 1500 \text{ rpm}$	T_{2N} η	[Nm] [%]	37.4 89	55.4 89	64.8 89	63.4 88	56.5 86	65.8 84	61.3 81	60.3 77	67.2 74	65.6 66	55.5 60	65.1 53	55.5 45
	$n_{1N} = 3000 \text{ rpm}$	T_{2N} η	[Nm] [%]	26.0 88	40.3 89	48.3 88	48.1 87	43.4 85	51.0 83	47.8 80	47.2 75	52.7 72	51.6 64	51.8 58	51.3 52	51.8 45
	$n_{1N} = 4500 \text{ rpm}$	T_{2N} η	[Nm] [%]	20.0 87	31.6 87	38.5 87	38.7 85	35.2 83	41.6 81	39.2 77	38.8 73	43.3 70	42.5 62	42.7 54	42.3 50	42.7 43
	$n_{1N} = 6000 \text{ rpm}$	T_{2N} η	[Nm] [%]	16.2 85	26.0 86	32.0 85	32.4 84	29.6 81	35.2 79	33.2 75	33.0 70	36.8 66	36.1 58	36.4 51	36.0 46	36.4 40
Max. acceleration torque		T_{2B}	[Nm]	60	90									60	90	60
Emergency stop torque		T_{2Not}	[Nm]	120										80	120	80
Idling torque ^{a)}		T_{012}	[Nm]	1.05			0.95			0.8						
Max. input speed		n_{1Max}	[rpm]	6000												
Max. backlash ^{b)} at the output	PS	j_k	[arcmin]	<15	<12	<11	<11	<9	<8					<7		
	PR	j_k	[arcmin]	<10	<8	<7	<7	<6	<5.5					<5		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{21}	[Nm/arcmin]	1.6	2.8	3.6	4	4.3	4.5	4.9	5.3	5.5	5.8	5.5	6	5.5
Stability at the output		C_{2K}	[Nm/arcmin]	30												
Max. axial force ^{c) d)} at the output			[N]	720	1000	1600	2200	2800	2900	3300	3700	3900	4700	4700	4800	4800
Max. radial force ^{c) e)} at the output			[N]	700	820	1200	1400	1600	1600	1600	1700	1800	2000	2100	2200	2200
Max. overturning torque ^{c)} at the output			[Nm]	45	53	76	91	110	100	110	110	110	130	140	140	140
Max. axial force ^{c) d)} at the input			[N]	1400	980	860	1000	1300	1100	1300	1300	1200	1200	1200	1200	1200
Max. radial force ^{c) f)} at the input			[N]	510	470	430	510	590	550	610	630	580	610	600	620	600
Mass moment of inertia ^{g)}		J_1	[10 ⁻⁶ kg m ²]	120	57	34	24	19	13	10	9	8	7	6	6	6
Service life		L_h	[h]	25000												
Weight without motor components		m	[kg]	4												
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														

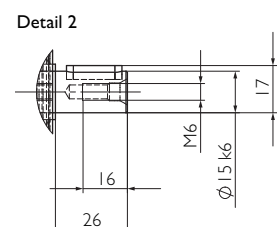
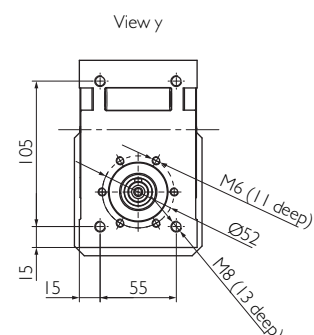
- a) approximate, at $n_1 = 3000 \text{ rpm}$ and operating temperature.
b) Precision grade PS (standard backlash) for classic mechanical engineering applications.
Precision grade PR (reduced backlash) for precise process applications.
c) Bearing forces: Values valid at $n_1 = 3000 \text{ rpm}$; $\frac{1}{2} T_{2N}$ 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 65 mm from the middle of the casing.
c) f) at a distance of 75 mm from the middle of the casing.
g) in relation to the input.

Bearing forces

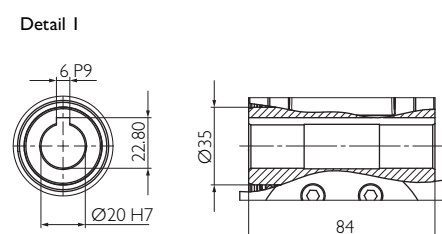
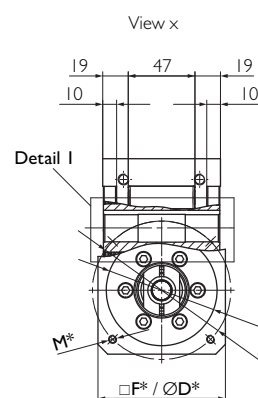
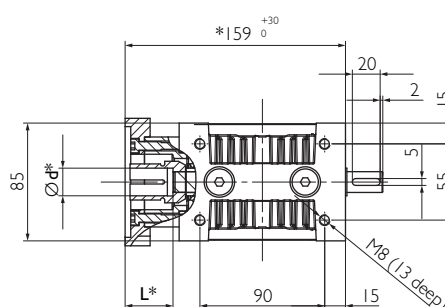
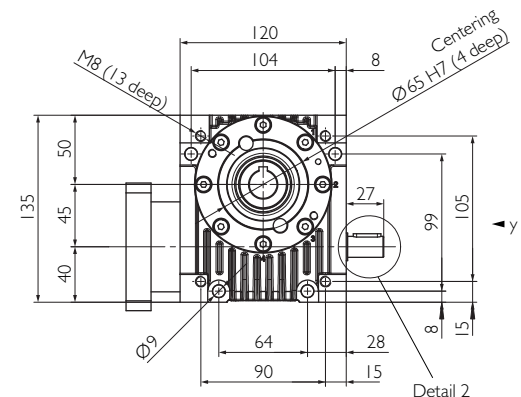
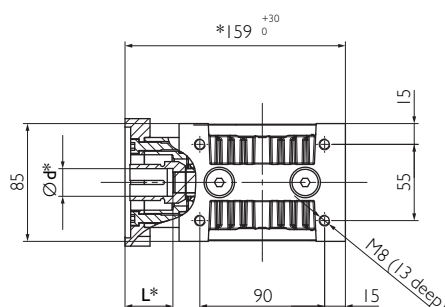
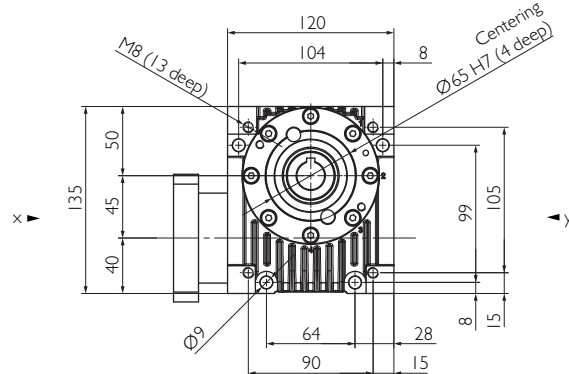




Example HPG 045 B7



* Motor-specific gearbox dimensions
 $\varnothing d$: $\varnothing$ motor shaft [mm], $6 \leq \varnothing d \leq 24$
 L : Motor shaft length [mm], $20 \leq L \leq 53$



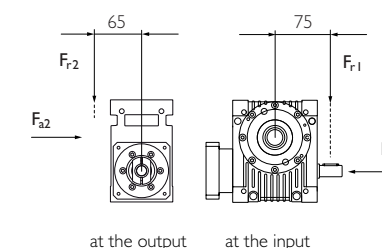
* Motor-specific gearbox dimensions
S: min. 40 [mm], **R:** Pitch circle Ø [mm], **M:** Bore hole Ø or thread [mm], **□F/ØD:** Specify flange [mm]

Performance

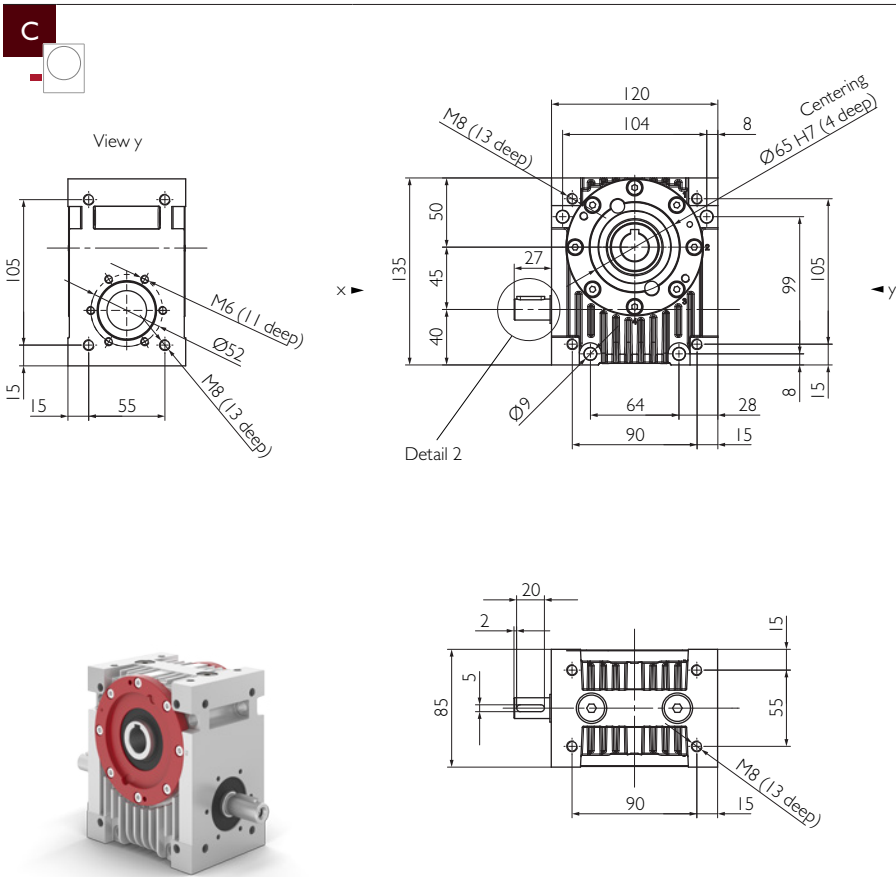
Ratio	i			2	3	4	5	6	8	10	13.33	16	24	30	47	60
Nominal torque at the output Efficiency	n _{1N} = 500 rpm	T _{2N} η	[Nm] [%]	52.7 88	73.9 88	83.9 87	80.5 86	70.8 85	81.7 82	75.5 79	73.9 75	75.0 71	77.9 63	54.5 59	79.4 50	54.5 43
	n _{1N} = 1000 rpm	T _{2N} η	[Nm] [%]	43.8 89	63.3 89	73.1 88	71.0 87	62.9 86	72.9 84	67.7 81	66.4 77	74.0 73	72.2 65	54.5 60	71.5 53	55.5 45
	n _{1N} = 1500 rpm	T _{2N} η	[Nm] [%]	37.4 89	55.4 89	64.8 89	63.4 88	56.5 86	65.8 84	61.3 81	60.3 77	67.2 74	65.6 66	55.5 60	65.1 53	55.5 45
	n _{1N} = 3000 rpm	T _{2N} η	[Nm] [%]	26.0 88	40.3 89	48.3 88	48.1 87	43.4 85	51.0 83	47.8 80	47.2 75	52.7 72	51.6 64	51.8 58	51.3 52	51.8 45
	n _{1N} = 4500 rpm	T _{2N} η	[Nm] [%]	20.0 87	31.6 87	38.5 87	38.7 85	35.2 83	41.6 81	39.2 77	38.8 73	43.3 70	42.5 62	42.7 54	42.3 50	42.7 43
	n _{1N} = 6000 rpm	T _{2N} η	[Nm] [%]	16.2 85	26.0 86	32.0 85	32.4 84	29.6 81	35.2 79	33.2 75	33.0 70	36.8 66	36.1 58	36.4 51	36.0 46	36.4 40
Max. acceleration torque		T _{2B}	[Nm]	60	90									60	90	60
Emergency stop torque		T _{2Not}	[Nm]	120									80	120	80	
Idling torque ^{a)}		T ₀₁₂	[Nm]	1.05			0.95			0.8						
Max. input speed		n _{1Max}	[rpm]	6000												
Max. backlash ^{b)} at the output	PS	j _t	[arcmin]	<15	<12	<11	<11	<9	<8					<7		
	PR	j _t	[arcmin]	<10	<8	<7	<7	<6	<5.5					<5		
Torsional rigidity vom Abtrieb zum Eintrieb		C _{Q1}	[Nm/arcmin]	1.6	2.8	3.6	4	4.3	4.5	4.9	5.3	5.5	5.8	5.5	6	5.5
Stability at the output		C _{2K}	[Nm/arcmin]	30												
Max. axial force ^{c)d)} at the output			[N]	360	600	1100	1600	2200	2400	2700	3100	3200	4000	4300	4400	4400
Max. radial force ^{c)e)} at the output			[N]	370	580	780	1200	1400	1400	1400	1500	1500	1700	1900	1900	1900
Max. overturning torque ^{c)} at the output			[Nm]	24	38	51	75	89	88	91	96	98	110	120	120	120
Max. axial force ^{c)d)} at the input			[N]	1400	980	860	1000	1300	1100	1300	1300	1200	1200	1200	1200	1200
Max. radial force ^{c)f)} at the input			[N]	510	470	430	510	590	550	610	630	580	610	600	620	600
Mass moment of inertia ^{g)}	Type 1 ^{h)}	J ₁	[10 ⁻⁶ kg m ²]	125	74	57	48	44	39	37	36	35	34	34	34	34
	Type 2 ⁱ⁾	J ₁	[10 ⁻⁶ kg m ²]	168	118	100	92	87	83	81	79	79	78	78	77	77
Service life		L _h	[h]	25000												
Weight without motor components		m	[kg]	4.5												
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 $n_1 = 3000$ rpm; $\frac{3}{4} T_{2N}$ 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 65 mm from the middle of the casing.
- f) at a distance of 75 mm from the middle of the casing.
- g) in relation to the input, including coupling.
- g) h) Motor shaft diameter $\varnothing$ d from $\varnothing 6$ to $\varnothing 20$, calculated at $\varnothing 11$ mm.
- g) i) Motor shaft diameter $\varnothing$ d from $\varnothing 21$ to $\varnothing 24$, calculated at $\varnothing 24$ mm.

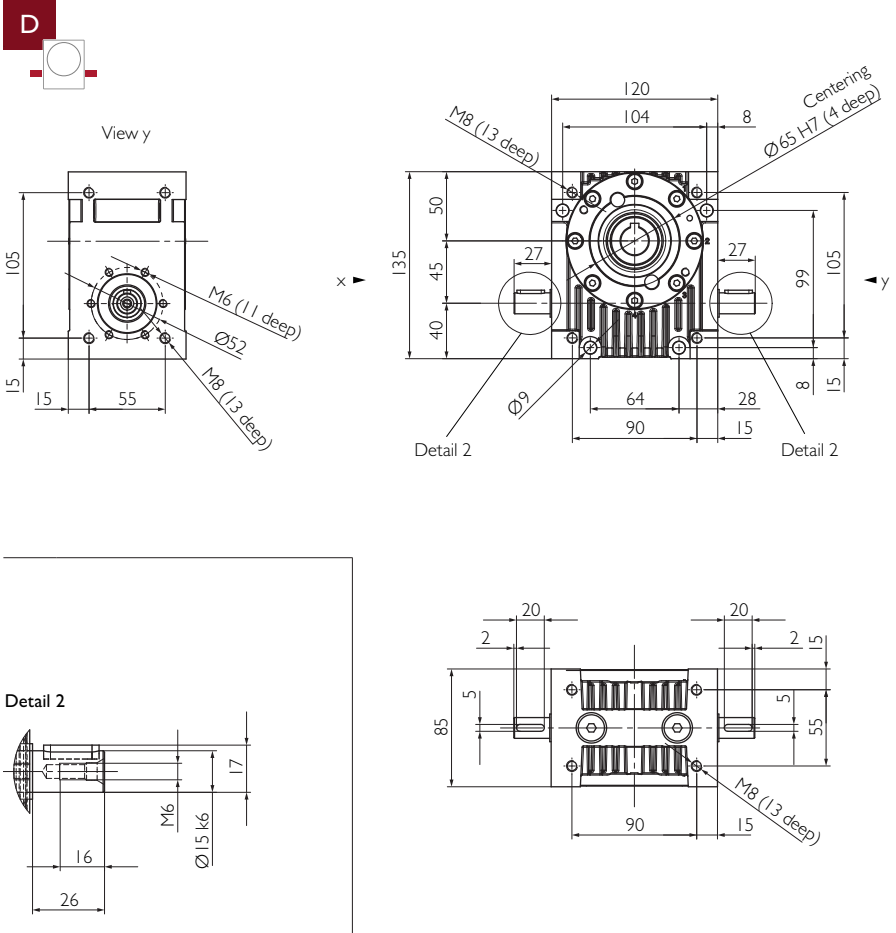
Bearing forces



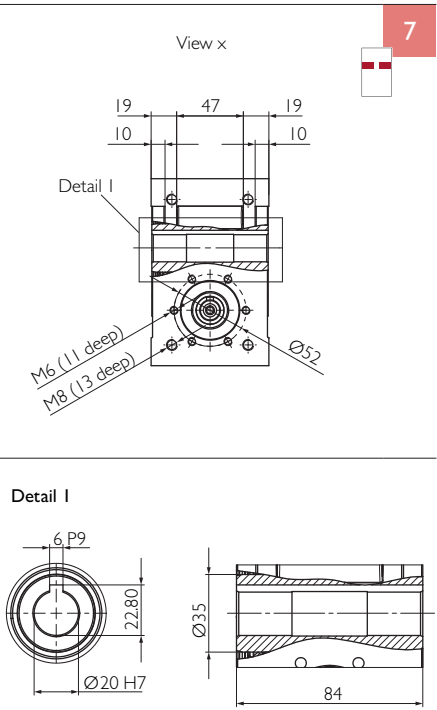
Input



Example HPG 045 D7



Output



Ratio	i			2	3	4	5	6	8	10	13.33	16	24	30	47	60	
Nominal torque at the output Efficiency	n _{1N} = 500 rpm	T _{2N}	[Nm]	52.7	73.9	83.9	80.5	70.8	81.7	75.5	73.9	75.0	77.9	54.5	79.4	54.5	
		η	[%]	88	88	87	86	85	82	79	75	71	63	59	50	43	
	n _{1N} = 1000 rpm	T _{2N}	[Nm]	43.8	63.3	73.1	71.0	62.9	72.9	67.7	66.4	74.0	72.2	54.5	71.5	55.5	
		η	[%]	89	89	88	87	86	84	81	77	73	65	60	53	45	
	n _{1N} = 1500 rpm	T _{2N}	[Nm]	37.4	55.4	64.8	63.4	56.5	65.8	61.3	60.3	67.2	65.6	55.5	65.1	55.5	
		η	[%]	89	89	89	88	86	84	81	77	74	66	60	53	45	
	n _{1N} = 3000 rpm	T _{2N}	[Nm]	26.0	40.3	48.3	48.1	43.4	51.0	47.8	47.2	52.7	51.6	51.8	51.3	51.8	
		η	[%]	88	89	88	87	85	83	80	75	72	64	58	52	45	
	n _{1N} = 4500 rpm	T _{2N}	[Nm]	20.0	31.6	38.5	38.7	35.2	41.6	39.2	38.8	43.3	42.5	42.7	42.3	42.7	
		η	[%]	87	87	87	85	83	81	77	73	70	62	54	50	43	
n _{1N} = 6000 rpm	T _{2N}	[Nm]	16.2	26.0	32.0	32.4	29.6	35.2	33.2	33.0	36.8	36.1	36.4	36.0	36.4		
	η	[%]	85	86	85	84	81	79	75	70	66	58	51	46	40		
Max. acceleration torque		T _{2B}	[Nm]	60	90										60	90	60
Emergency stop torque		T _{2Not}	[Nm]	120										80	120	80	
Idling torque ^{a)}		T ₀₁₂	[Nm]	1.05			0.95				0.8						
Max. input speed		n _{1Max}	[rpm]	6000													
Max. backlash ^{b)} at the output	PS	j _k	[arcmin]	<15	<12	<11	<11	<9	<8					<7			
	PR	j _k	[arcmin]	<10	<8	<7	<7	<6	<5.5					<5			
Torsional rigidity vom Abtrieb zum Eintrieb		C ₂₁	[Nm/arcmin]	1.6	2.8	3.6	4	4.3	4.5	4.9	5.3	5.5	5.8	5.5	6	5.5	
Stability at the output		C _{2K}	[Nm/arcmin]	30													
Max. axial force ^{c)} ^{d)} at the output			[N]	360	600	1100	1600	2200	2400	2700	3100	3200	4000	4300	4400	4400	
Max. radial force ^{c)} ^{e)} at the output			[N]	370	580	780	1200	1400	1400	1400	1500	1500	1700	1900	1900	1900	
Max. overturning torque ^{c)} at the output			[Nm]	24	38	51	75	89	88	91	96	98	110	120	120	120	
Max. axial force ^{c)} ^{d)} at the input			[N]	1400	980	860	1000	1300	1100	1300	1300	1200	1200	1200	1200	1200	
Max. radial force ^{c)} ^{f)} at the input			[N]	510	470	430	510	590	550	610	630	580	610	600	620	600	
Mass moment of inertia ^{g)}		J ₁	[10 ⁻⁶ kg m ²]	97	47	29	21	16	12	10	8	7	7	6	6	6	
Service life		L _h	[h]	25000													
Weight without motor components		m	[kg]	4													
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 $n_1 = 3000 \text{ rpm}$; $\frac{1}{2} T_{2N}$ 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 65 mm from the middle of the casing.
c) f) at a distance of 75 mm from the middle of the casing.
g) in relation to the input.

Bearing forces

