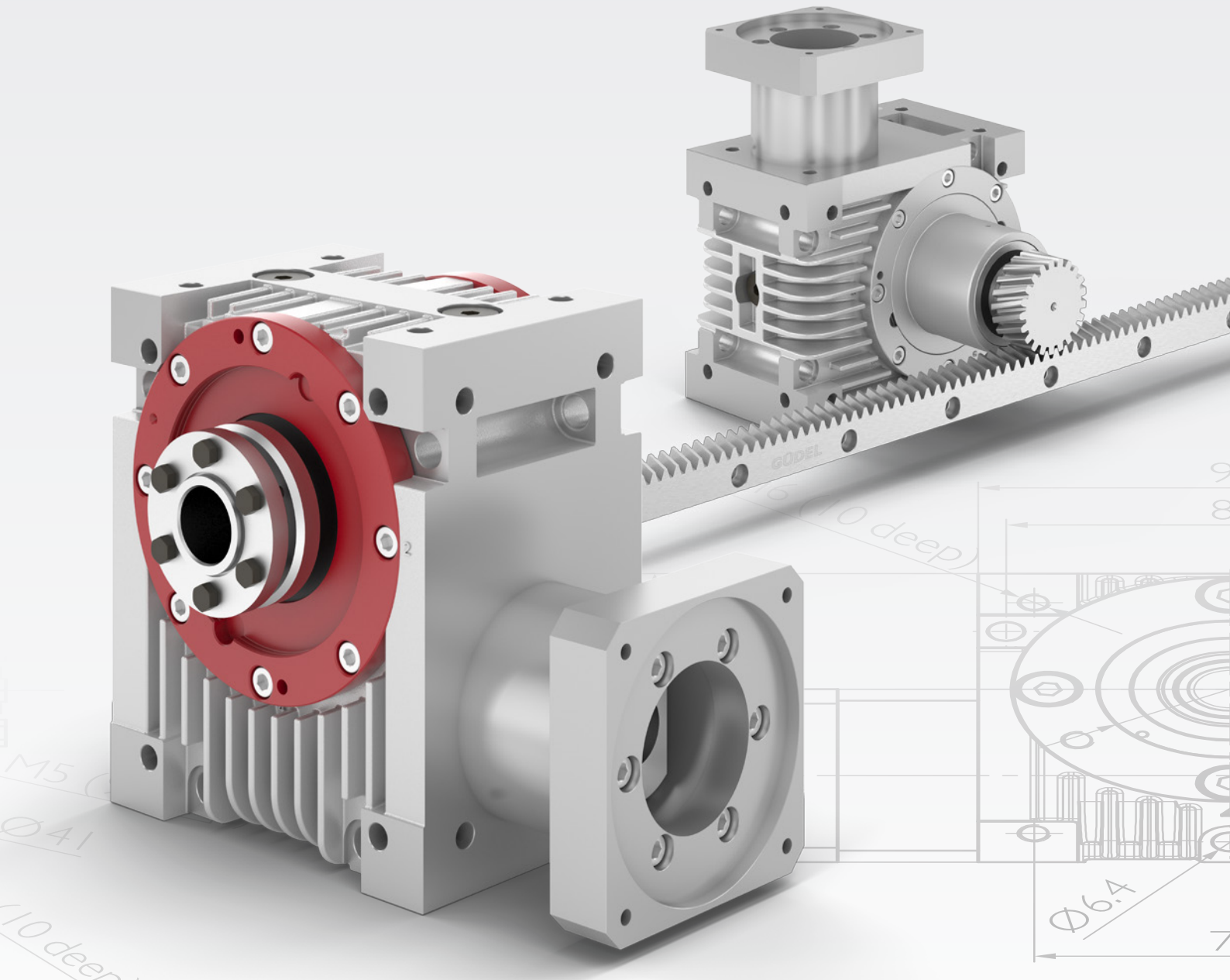
GÜDEL

High Performance Angle Gearboxes



Dear Customers,

Welcome to our fully revised catalog, featuring our current range of high-performance angle gearboxes. We are delighted at your interest, and to have this opportunity to present our products and their advantages in greater detail. As a leading supplier of linear, drive and system technology, with a broad range of products and services and more than 60 years' experience in the industry, we see ourselves as your competent and reliable partner for all aspects of automation.

To start with, the catalog provides an overview of our six different sizes. With thirteen gear ratios and two precision grades, our high-performance angle gearboxes enable you to cover an extremely broad spectrum of use, for virtually all typical applications.

Our gearboxes are optimally complemented by our complete function packages, consisting of racks and pinions – we have everything you need. Benefit from our high level of vertical manufacturing, extensive know-how, and many decades of experience. This enables us to offer special solutions tailored specifically to your needs. Our configuration matrix will give you an initial overview of the range and help you select the high-performance angle gearbox that is right for you.

The main focus of our catalog is the technical data, which we have laid out in a clear, user-friendly manner. A double-page spread for each type of gearbox shows all key technical details. This is followed by useful information regarding our ordering codes and your individual options regarding motor flanges, gearboxes and function packages.

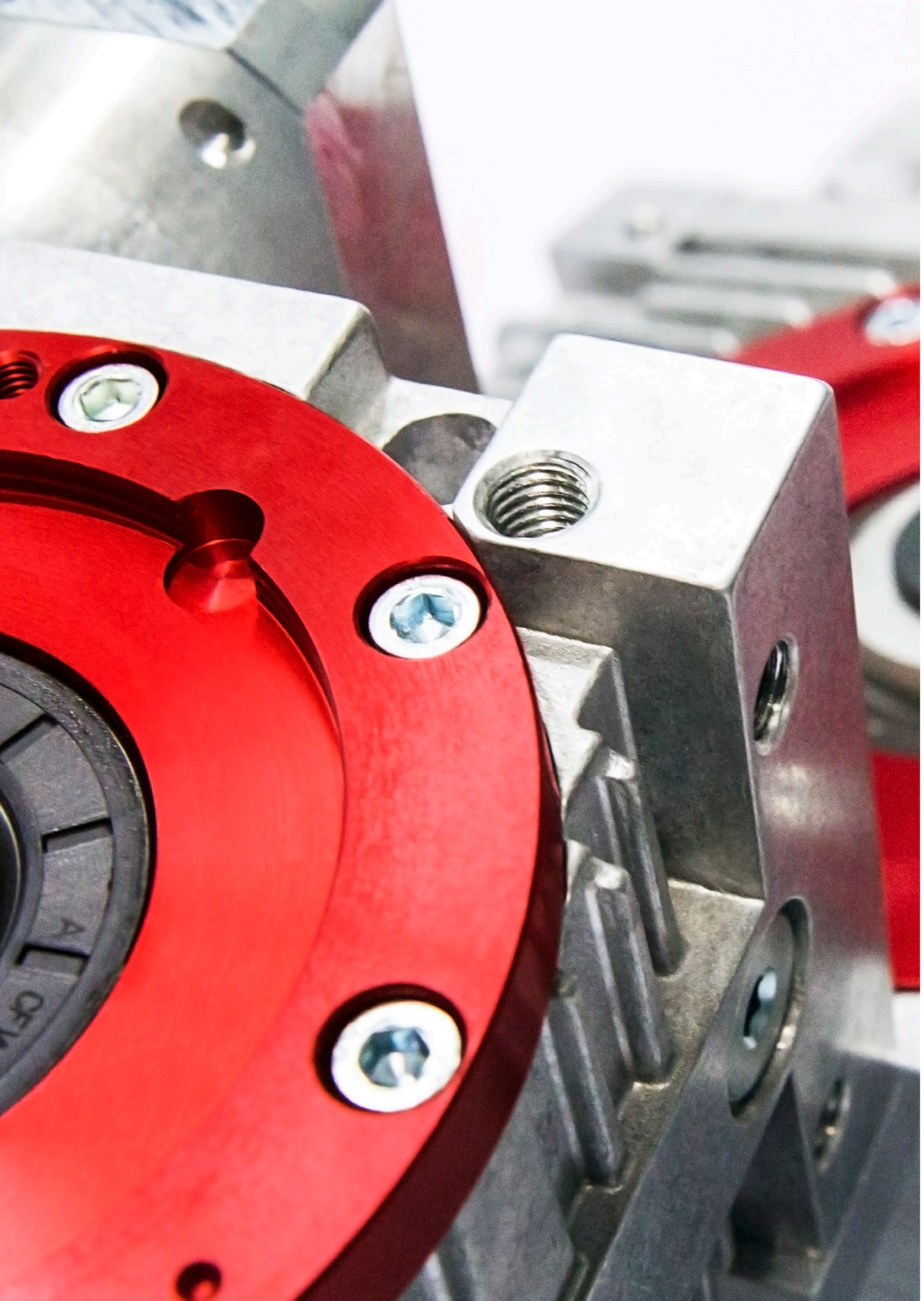
To always provide you with the optimal one-stop solution, we are constantly developing our range of services and products. Our colleagues will be happy to provide you with any further information that you require, or with an individual consultation.

We hope that you enjoy reading and looking through our catalog. We have taken great care to create an attractively designed document that both helps you to swiftly select the right product for your needs and entices you to browse and find inspiration for new ideas.

Best regards,

Walter Zulauf
CTO Güdel Group AG

Markus Ruprecht
CEO Güdel AG



Content

All about Six – All Sizes at a Glance

Our portfolio of high-performance angle gearboxes covers six different sizes. The names for the different sizes correspond to the center distance (in mm) between the input and output shafts: 030, 045, 060, 090, 120 and 180. An extremely broad choice of gear ratios – thirteen in total, ranging from 2 to 60 – enables you to cover the most common areas of application.

Our high-performance angle gearboxes are ideal for all types of angular drives. They are used in mechanical engineering, handling technology and various process applications, and are characterized by their high quality, long service life and minimal maintenance requirements. Our high-performance angle gearboxes are ideally suited for harsh working environments. They are dirt-resistant and can also cope with applications that use very long strokes. Their cooling fins guarantee optimal heat dissipation.

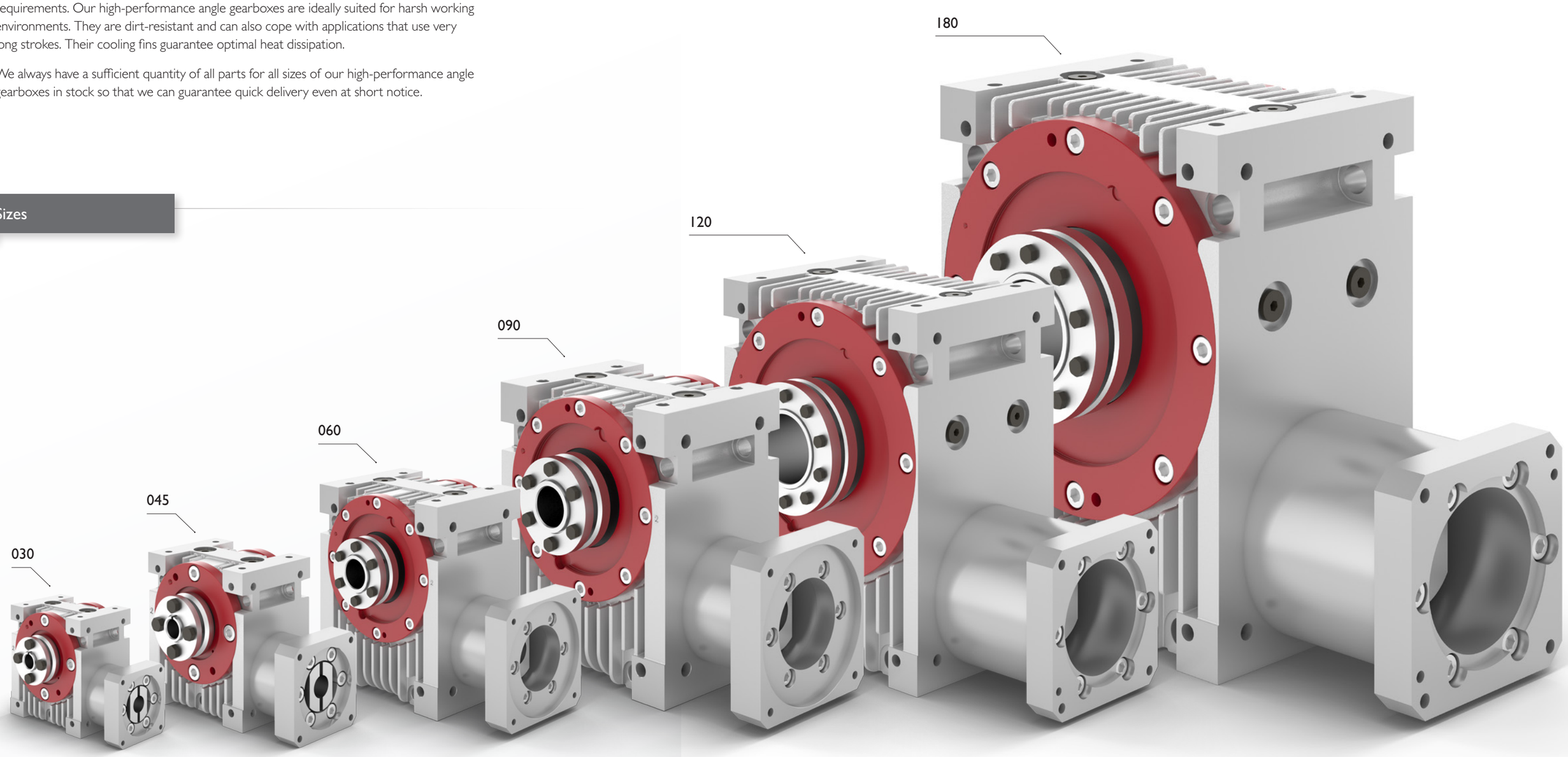
We always have a sufficient quantity of all parts for all sizes of our high-performance angle gearboxes in stock so that we can guarantee quick delivery even at short notice.

Our modular principle allows all the input and output variants within a given size to be combined however you want, in order to achieve a result that is perfectly tuned to your specific application needs. Depending on the gear ratio, you can use the self-locking or no self-locking properties, or the transition area for your requirements.

In addition to their high availability and universal build, our high-performance angle gearboxes also boast special design features such as: closed casing for a range of installation positions, the option to adjust the precision (backlash), great flexibility as regards the motor choice and coupling (motor – gearbox), lubrication, a range of mounting options on all sides, centering at the output and options for centering at the input. All these design features help you to perfectly integrate the angle gearboxes into your machinery or equipment.

We manufacture and assemble the gearboxes in-house, using state-of-the-art aproduction equipment. They are then thoroughly tested in accordance with our rigorous quality standards.

Sizes



Precise or Extra-precise – A Choice of two Grades

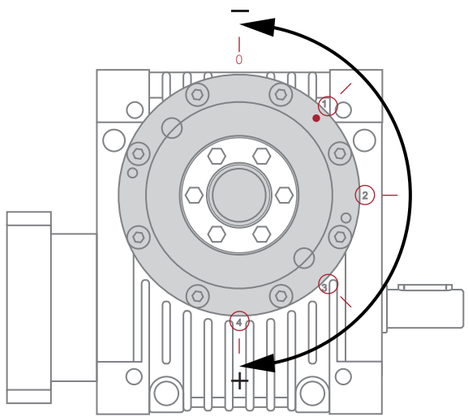
Our high-performance angle gearboxes are available in two precision grades. Precision grade PS stands for standard circumferential backlash and precision grade PR for reduced circumferential backlash. On the higher-precision gearbox (PR), the gear play can be more finely adjusted, with the gear play corresponding to the output shaft's angle of twist (arcmin). To allow for precision re-adjustments, an easy-to-use eccentric system in the output shaft area is standard on all gearboxes, making it possible to set and re-adjust the backlash quickly and easily.

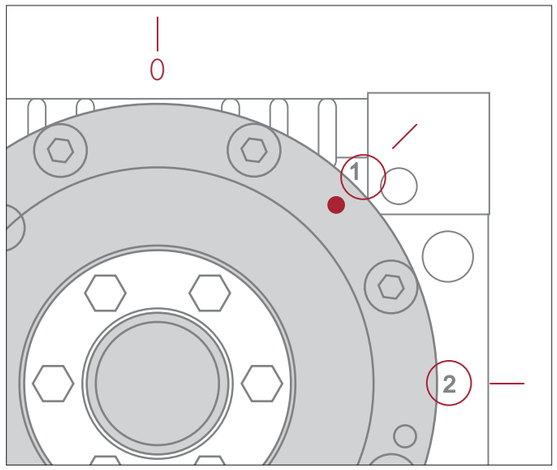
The gearboxes are preset in the factory to the selected precision grade. No re-adjustment is necessary under normal operating conditions, as the increase in backlash should be minimal for gearboxes that are correctly dimensioned and maintained.

Nevertheless, with our re-adjustment mechanism you can reset the backlash quickly, easily and safely over the entire service life – guaranteed. And there is no need to open up the gearbox to do this. You can easily make the re-adjustment yourself using the symmetric rotation of the eccentric flanges on either side of the output bearing. The position markings on the casing help you to define the eccentric position.

Unique Güdel Gear Teeth

Unique Güdel gear teeth, the backlash can be re-adjusted via the output lid.
Rotate both covers in the direction of the next higher number, (marked in red).





Your initial Selection – Speed & Torque

On this page you can narrow down your choice between our high-performance angle gearboxes. Make a selection based on your key requirements – speed and torque – to find the correct gearbox for your application.

Ratio & Precision Grades

Precision Grade PS – standard circumferential backlash [arcmin]

PS

	Ratio i												
	no self-locking									transition area		self-locking	
Size	2	3	4	5	6	8	10	13.33	16	24	30	47	60
030	22	18	16	16	14	12	12	12	12	12	11	11	11
045	15	12	11	11	9	8	8	8	8	8	7	7	7
060	13	10	9	9	8	7	7	7	7	7	6	6	6
090	10	8	7	7	6	6	6	6	6	6	5	5	5
120	8	7	6	6	5	5	5	5	5	5	4	4	4
180	5	4	4	4	3	3	3	3	3	3	2.5	2.5	2.5

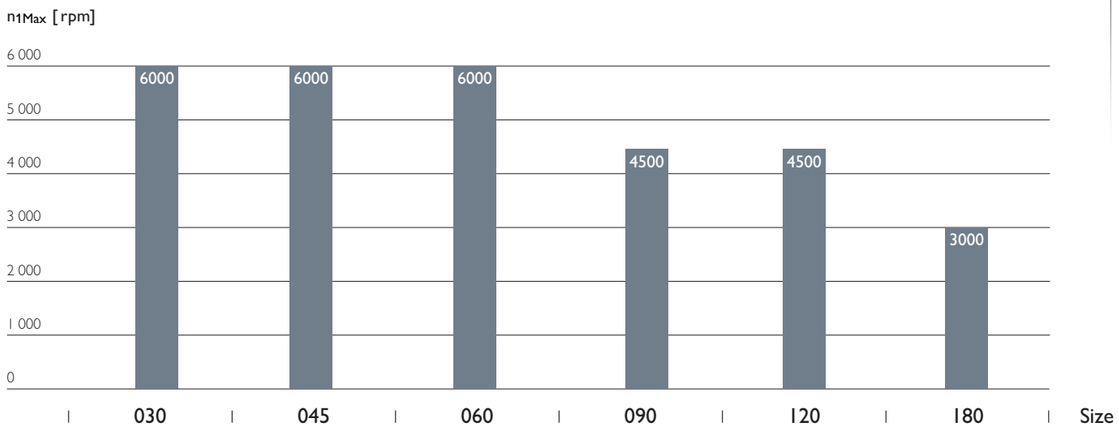
Precision Grade PR – reduced circumferential backlash [arcmin]

PR

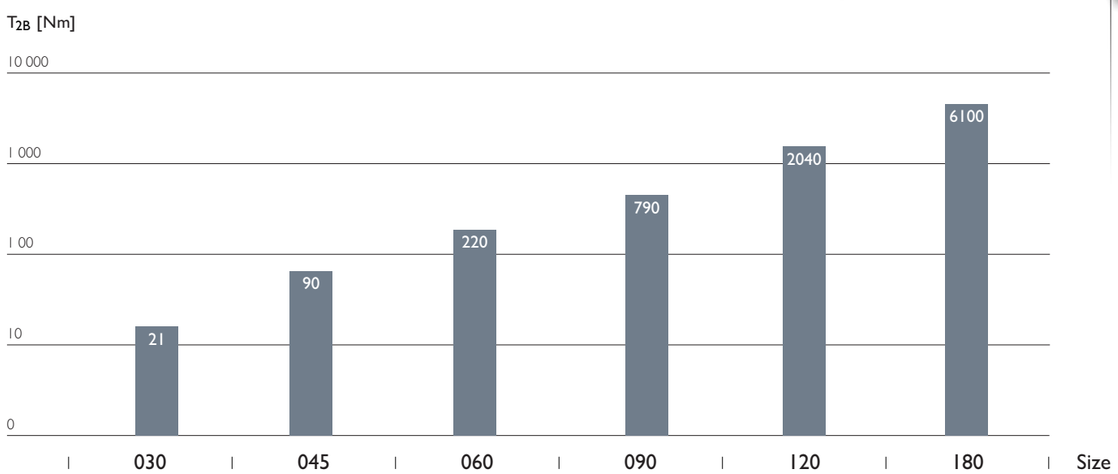
	Ratio i												
	no self-locking									transition area		self-locking	
Size	2	3	4	5	6	8	10	13.33	16	24	30	47	60
045	10	8	7	7	6	5.5	5.5	5.5	5.5	5.5	5	5	5
060	9	7	6	6	5	4.5	4.5	4.5	4.5	4.5	4	4	4
090	6.5	5	4.5	4	4	3.5	3.5	3.5	3.5	3.5	3	3	3
120	5.5	4.5	4	3.5	3	3	3	3	3	3	2.5	2.5	2.5

The following diagrams offer you a preselection of sizes based on the most important performance parameters, maximum speed and maximum torque. The values apply for a sample ratio i = 24.

Maximum Rotation Speed



Maximum Torque

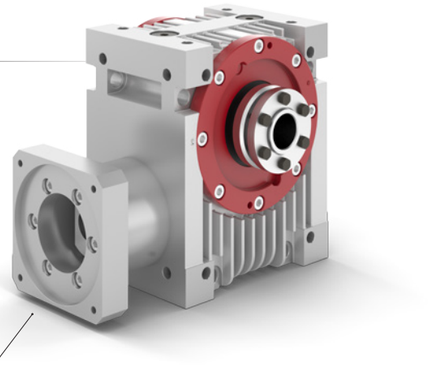


A wide Range of Inputs

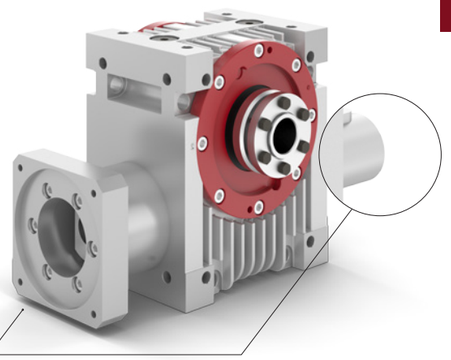
Choose between four different input varieties. Our two standard inputs come with either a motor flange or an input shaft. Our optional inputs offer you the choice of a motor flange with input shaft, or input shafts on both sides.

On the input side of the gearbox there is a low-backlash, positive-locking special coupling, and on the output side there is a shrink disc coupling. These guarantee a backlash-free power train and make it possible to attach a variety of motors. Their dimensions are determined by the mounting dimensions of the motors.

Input with Motor Flange

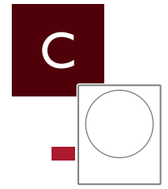


Motor Flange on one side

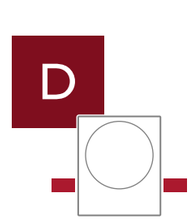


Motor Flange & Input Shaft

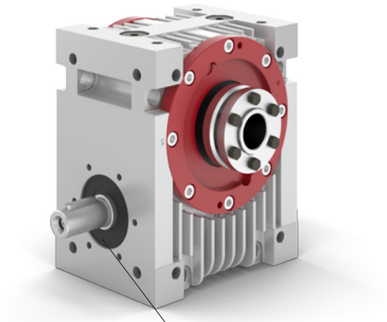
A



B



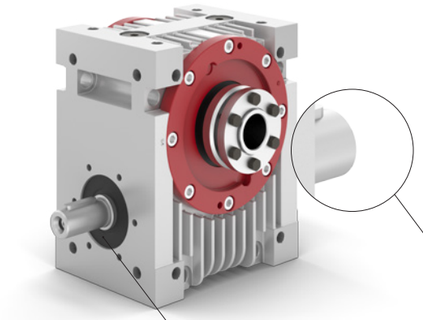
Input Shaft



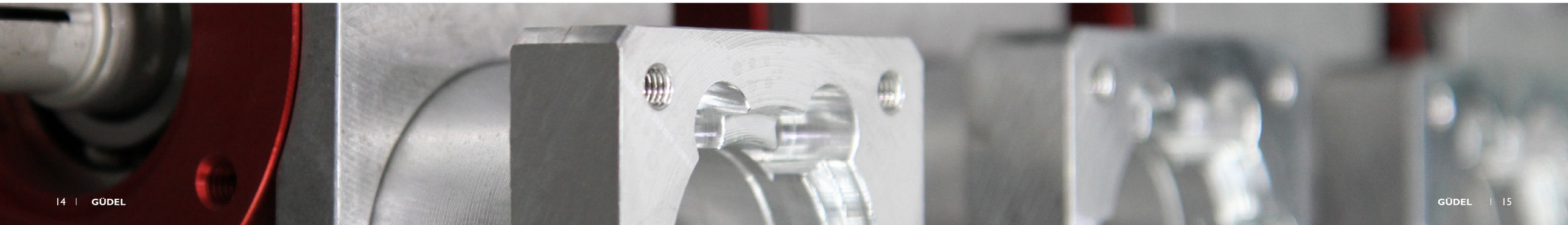
Input Shaft on one side

C

D



Input Shaft on both sides

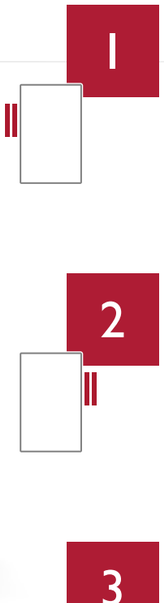


Meeting all your Needs – Standard & Optional Outputs

With our comprehensive range of outputs, you are ideally equipped for every application. Our standard outputs allow you to choose whether you prefer the shrink disc on the right, or left-hand side, or even on both sides.

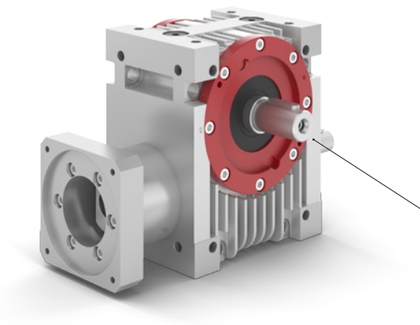
We offer three standard outputs and four optional outputs. The standard outputs include a hollow shaft with shrink disc on the left, hollow shaft with output on the right, and a hollow shaft with shrink disc on both sides of the output. The optional outputs include a shaft on the left of the output, on the right of the output, on both sides of the output, and a hollow shaft on both sides of the output.

Standard Output with Shrink Disc

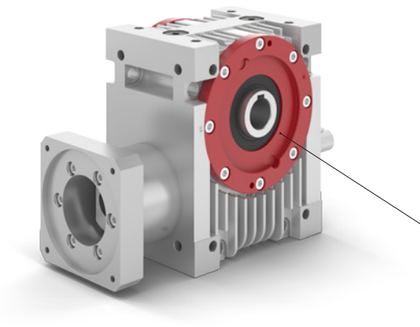


Shrink Disc
to the left (I),
to the right (2)* or
on both sides (3)

Optional Output Shaft



Shaft on the Output
to the left (4),
to the right (5)* or
on both sides (6)



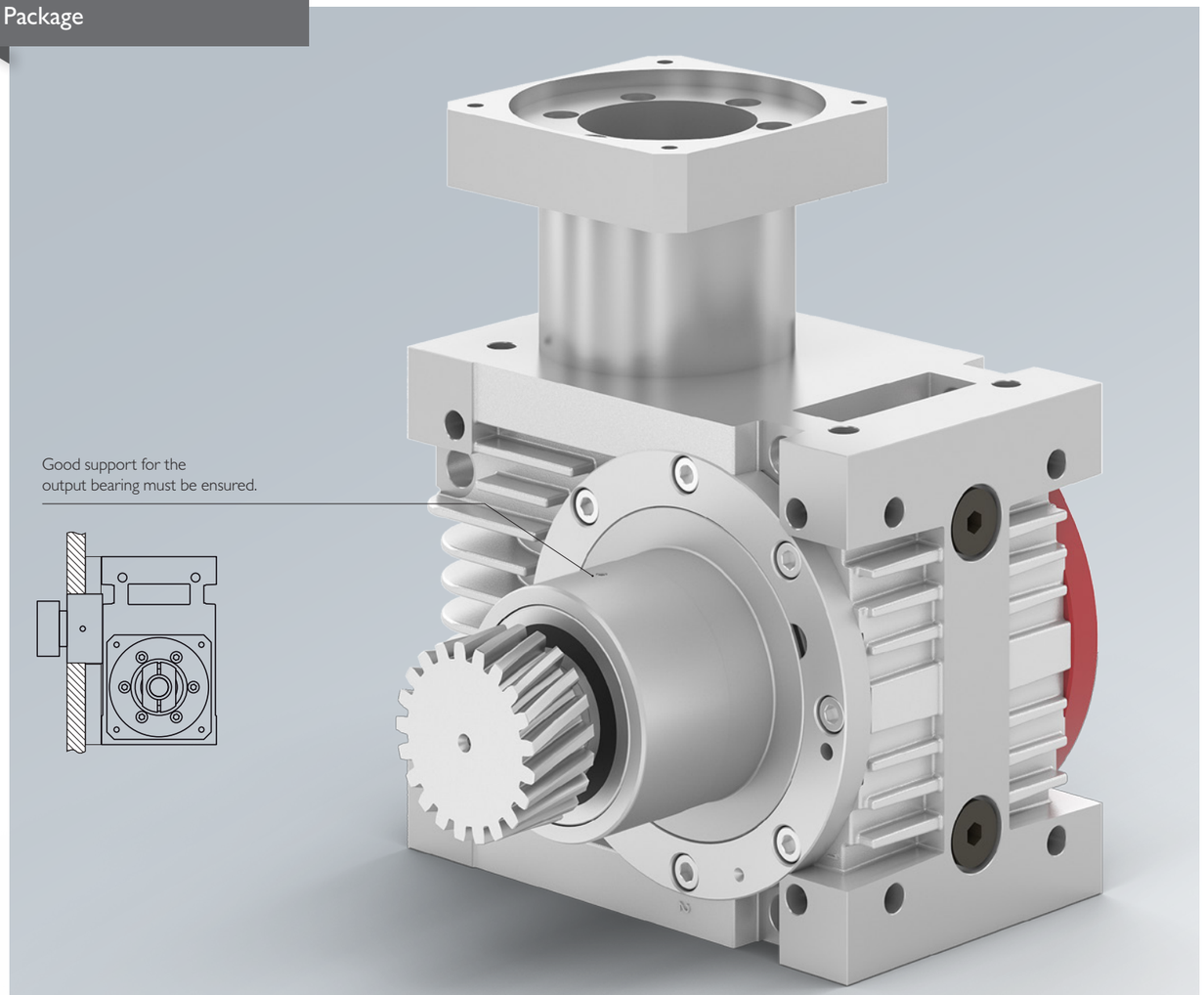
Hollow Shaft of the output
on both sides (7)

* Position right and left is defined by the motor view.

Adaptation Options – Preferably as a Package

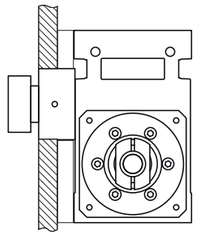
Standard outputs can easily be expanded to packages with our pinion and our output flange. The following choices are available: Shrink disc on the left with pinion and output flange, shrink disc on the right with pinion and output flange. In gearboxes with shrink discs on both sides of the output, an output flange can be positioned on either the left or the right side.

Package



Spacer Elements

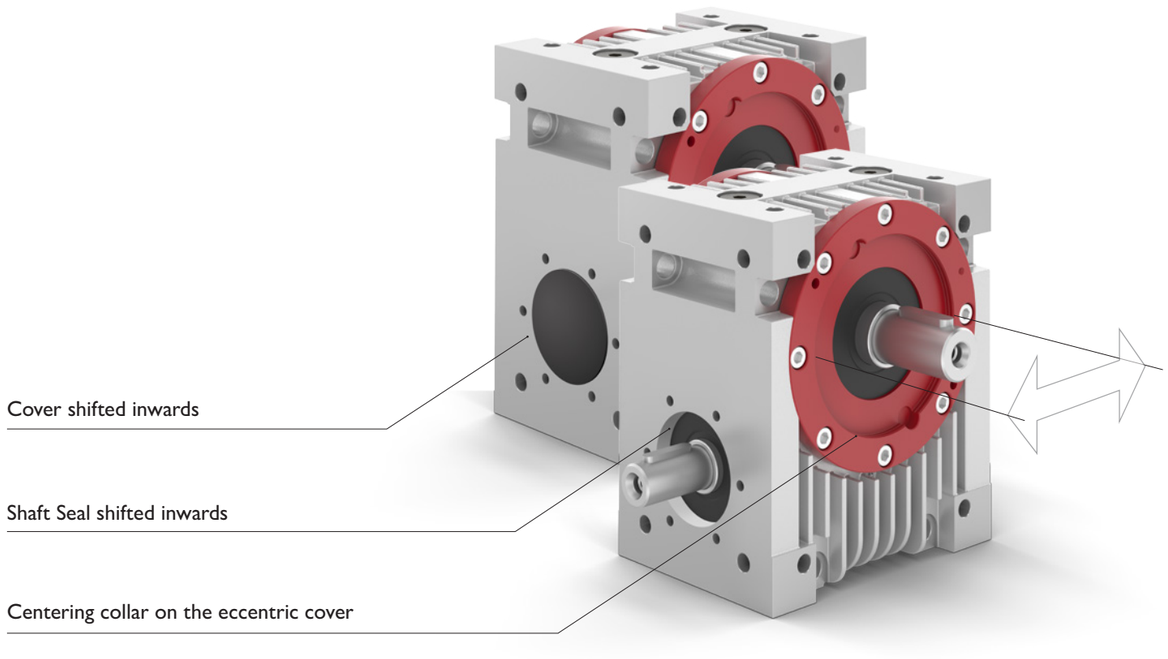
The optional distance elements enable you to attach large, powerful motors to your gearbox easily and without having to carry out any complex additional work on your existing component structure. Depending on the size, we provide spacing strips or plates as assembly elements.



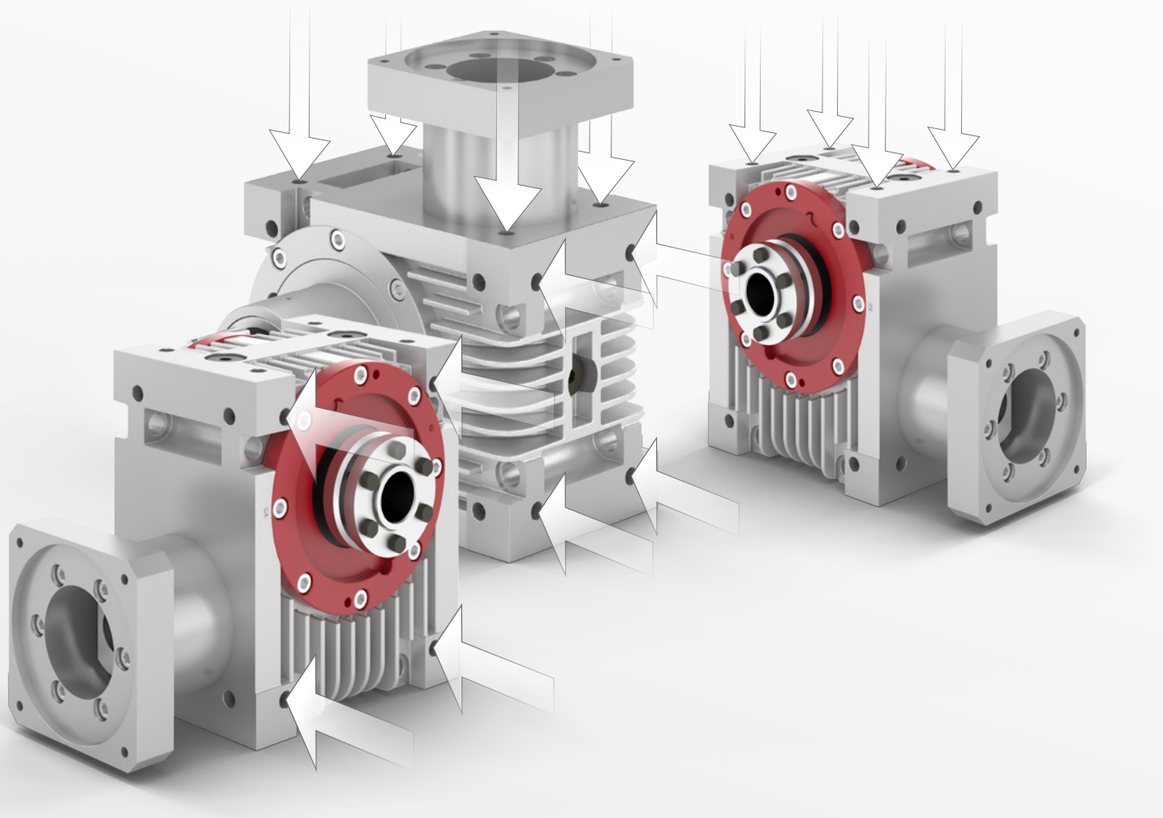
Additional Benefits

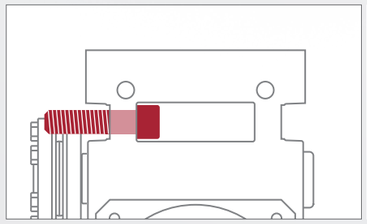
Precision centering Option thanks to an additional Function

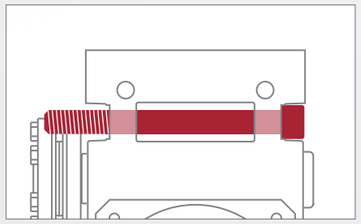
Our high-performance angle gearboxes have a precise centering collar in the eccentric cover on the output side. This centering collar enables you to accurately align and mount the gearbox onto a shaft or bore hole on the output side. If required we can position the shaft seal or sealing cover further inwards. This will enable you to center and mount your attachments as you wish.



Universal fastening Methods & Positioning of your Gearbox

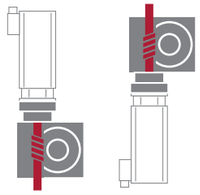


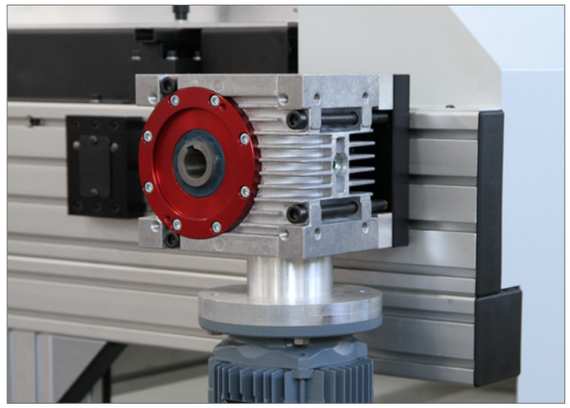




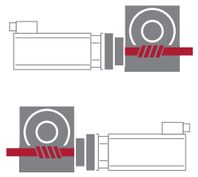
A huge range of fastening methods is possible, for example with long or short screws, as well as as through the multi-directional thread in the casing.

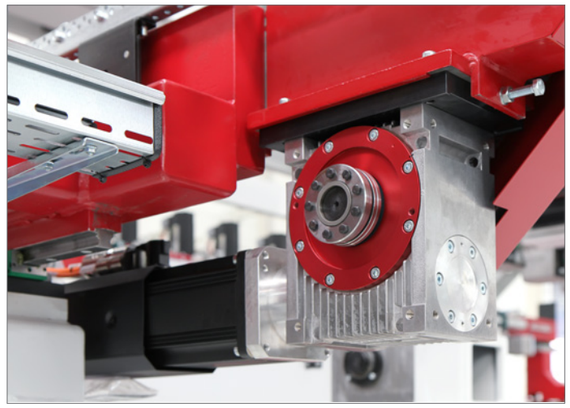
SS vertical standing worm



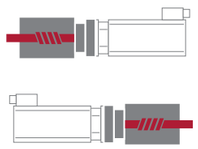


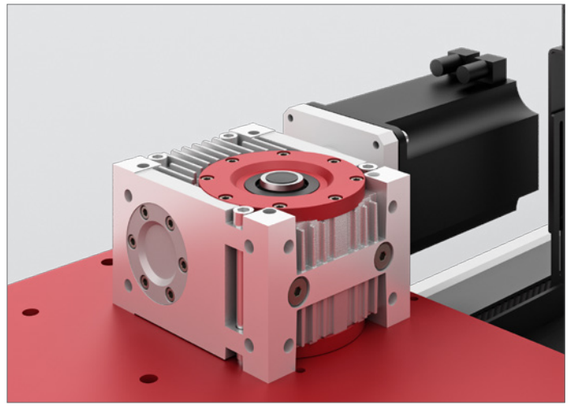
SU vertical worm below



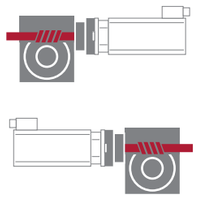


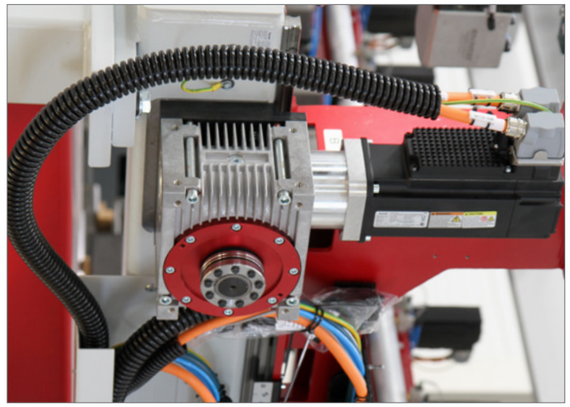
SL flat lying worm





SO vertical worm top





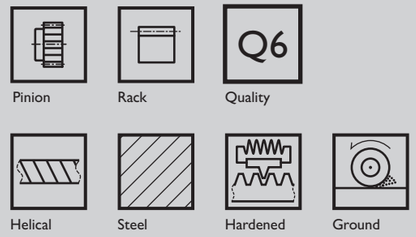
Your ideal Drive Train - Gearbox, Rack & Pinion

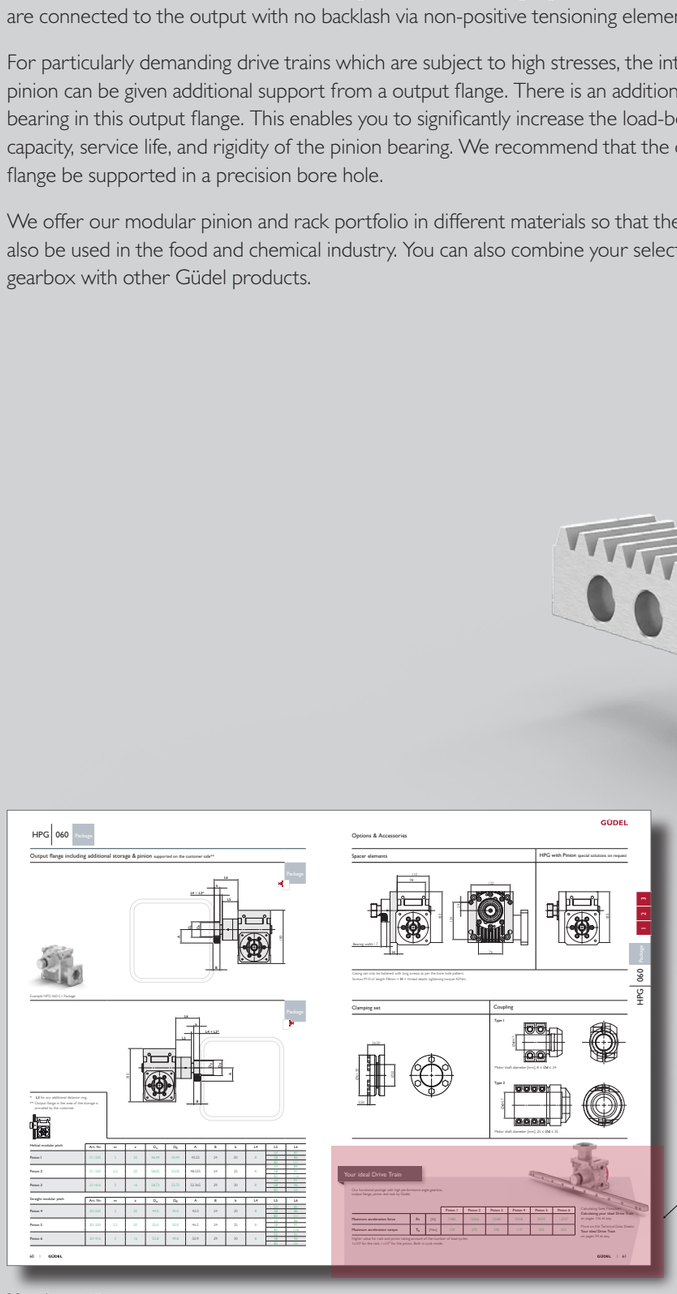
Our gearboxes can be easily combined with our racks and pinions into complete functional packages. The components from our product portfolio are ideal for your high-performance drive train.

For linear systems with a rack-and-pinion drive, you can integrate high-precision, powerful drive pinions directly into our high-performance angle gearbox. The pinions are connected to the output with no backlash via non-positive tensioning elements.

For particularly demanding drive trains which are subject to high stresses, the integrated pinion can be given additional support from a output flange. There is an additional strong bearing in this output flange. This enables you to significantly increase the load-bearing capacity, service life, and rigidity of the pinion bearing. We recommend that the output flange be supported in a precision bore hole.

We offer our modular pinion and rack portfolio in different materials so that they can also be used in the food and chemical industry. You can also combine your selected gearbox with other Güdel products.





Detailed information on the Technical Data Sheets **Package, Options & Accessoires.**

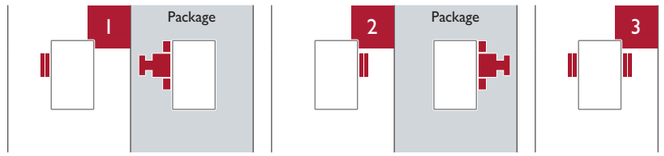
Quality as per DIN 3962 Q6 hardened and ground

Find your appropriate Size & Configuration

Standard Outputs

Hollow Shaft with Shrink Disc

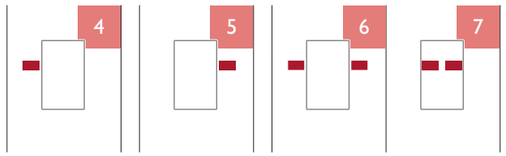
left | right | both sides



Optional Outputs

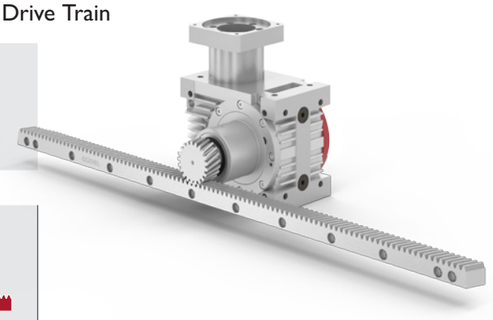
Output Shaft

left | right | both sides



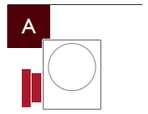
Your ideal Drive Train

Rack & Pinion Program



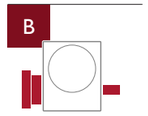
Inputs with Motor Flange

Motor Flange



Size	Standard Outputs: left, 1 Package		Standard Outputs: right, 2 Package		Standard Outputs: both sides, 3	Optional Outputs: left, 4	Optional Outputs: right, 5	Optional Outputs: both sides, 6	Optional Outputs: both sides, 7	Rack & Pinion Program
	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page
030	28-29	32-33	28-29	32-33	28-29	34-35	34-35	34-35	38-39	
045	42-43	46-47	42-43	46-47	42-43	48-49	48-49	48-49	52-53	
060	56-57	60-61	56-57	60-61	56-57	62-63	62-63	62-63	66-67	
090	70-71	74-75	70-71	74-75	70-71	76-77	76-77	76-77	80-81	
120	84-85	88-89	84-85	88-89	84-85	90-91	90-91	90-91	94-95	
180	98-99	100-101	98-99	100-101	*	102-103	102-103	102-103	*	

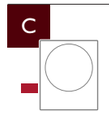
Motor Flange & Input Shaft



Size	Standard Outputs: left, 1 Package		Standard Outputs: right, 2 Package		Standard Outputs: both sides, 3	Optional Outputs: left, 4	Optional Outputs: right, 5	Optional Outputs: both sides, 6	Optional Outputs: both sides, 7	Rack & Pinion Program
	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page
030	28-29	32-33	28-29	32-33	28-29	34-35	34-35	34-35	38-39	
045	42-43	42-43	42-43	42-43	42-43	48-49	48-49	48-49	52-53	
060	56-57	60-61	56-57	60-61	56-57	62-63	62-63	62-63	66-67	
090	70-71	74-75	70-71	74-75	70-71	76-77	76-77	76-77	80-81	
120	84-85	88-89	84-85	88-89	84-85	90-91	90-91	90-91	94-95	

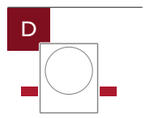
Inputs with Shaft

Input Shaft



Size	Standard Outputs: left, 1 Package		Standard Outputs: right, 2 Package		Standard Outputs: both sides, 3	Optional Outputs: left, 4	Optional Outputs: right, 5	Optional Outputs: both sides, 6	Optional Outputs: both sides, 7	Rack & Pinion Program
	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page
030	30-31	32-33	30-31	32-33	30-31	36-37	36-37	36-37	40-41	
045	44-45	46-47	44-45	46-47	44-45	50-51	50-51	50-51	54-55	
060	58-59	60-61	58-59	60-61	58-59	64-65	64-65	64-65	68-69	
090	72-73	74-75	72-73	74-75	72-73	78-79	78-79	78-79	82-83	
120	86-87	88-89	86-87	88-89	86-87	92-93	92-93	92-93	96-97	

Input Shaft on both sides



Size	Standard Outputs: left, 1 Package		Standard Outputs: right, 2 Package		Standard Outputs: both sides, 3	Optional Outputs: left, 4	Optional Outputs: right, 5	Optional Outputs: both sides, 6	Optional Outputs: both sides, 7	Rack & Pinion Program
	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page
030	30-31	32-33	30-31	32-33	30-31	36-37	36-37	36-37	40-41	
045	44-45	46-47	44-45	46-47	44-45	50-51	50-51	50-51	54-55	
060	58-59	60-61	58-59	60-61	58-59	64-65	64-65	64-65	68-69	
090	72-73	74-75	72-73	74-75	72-73	78-79	78-79	78-79	82-83	
120	86-87	88-89	86-87	88-89	86-87	92-93	92-93	92-93	96-97	

* no request

104-107

Inputs with Motor Flange

Motor Flange

Motor Flange & Input Shaft

Inputs with Shaft

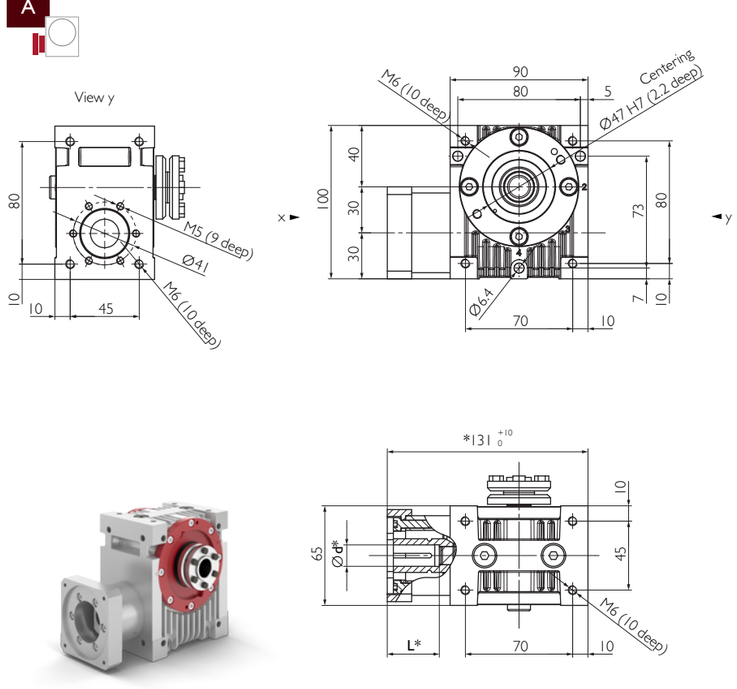
Input Shaft

Input Shaft on both sides


GÜDEL

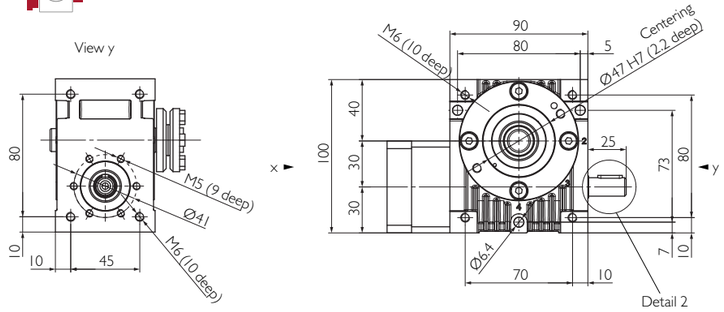
Input

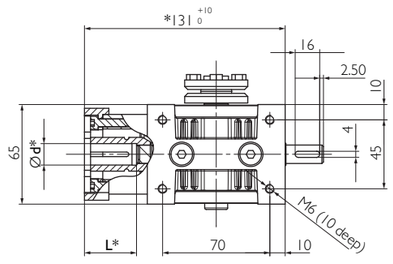
A



Example HPG 030 A2

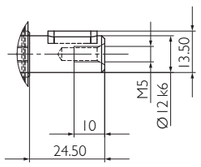
B





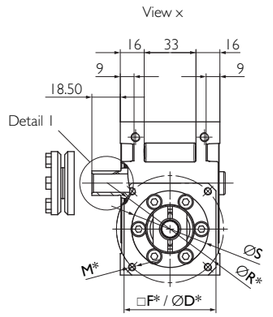
* Motor-specific gearbox dimensions
Ød: Ø motor shaft [mm], 4 ≤ **Ød** ≤ 19
L: Motor shaft length [mm], 20 ≤ **L** ≤ 33

Detail 2

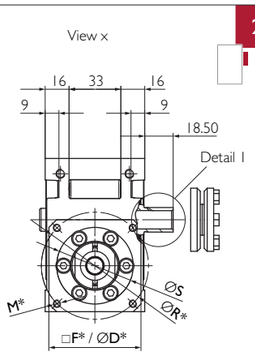


Output

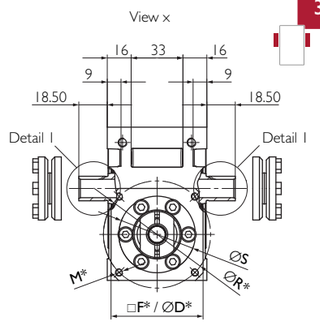
1



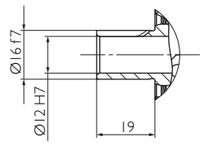
2



3



Detail I

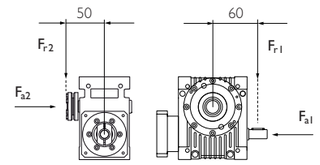


* Motor-specific gearbox dimensions
S: min. 32 [mm], **R**: Pitch circle Ø [mm], **M**: Bore hole Ø or thread [mm], □**F** / Ø**D**: Specify flange [mm]

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}	[Nm]	12.9	17.9	20.1	19.2	16.9	19.4	17.9	17.5	19.5	19.0	8.6	18.8	8.6
		η	[%]	85	84	83	81	80	76	74	67	63	54	48	40	30
	n_{1N} = 1000 rpm	T_{2N}	[Nm]	11.3	16.0	18.3	17.5	15.5	17.9	16.6	16.2	18.1	17.6	8.6	17.5	8.6
		η	[%]	86	86	85	83	81	77	74	68	65	55	50	44	40
	n_{1N} = 1500 rpm	T_{2N}	[Nm]	10.0	14.4	16.7	16.2	14.3	16.6	15.4	15.1	16.9	16.4	8.6	16.3	8.6
		η	[%]	86	86	85	83	80	77	73	68	64	54	49	45	40
	n_{1N} = 3000 rpm	T_{2N}	[Nm]	7.4	11.2	13.3	13.1	11.7	13.7	12.8	12.6	14.0	13.7	8.6	13.6	8.6
		η	[%]	84	84	83	81	77	74	71	67	62	53	48	44	40
	n_{1N} = 4500 rpm	T_{2N}	[Nm]	5.9	9.2	11.0	11.0	9.9	11.6	10.9	10.8	12.0	11.8	10.0	11.7	10.0
		η	[%]	81	82	81	78	76	73	69	65	60	51	47	42	37
	n_{1N} = 6000 rpm	T_{2N}	[Nm]	4.9	7.8	9.4	9.4	8.6	10.1	9.5	9.4	10.5	10.3	10.0	10.2	10.0
		η	[%]	79	79	78	77	75	72	68	62	56	47	42	37	33
Max. acceleration torque		T_{2B}	[Nm]	13	21									10	21	10
Emergency stop torque		T_{2Not}	[Nm]	35										20	35	20
Idling torque[a]		T_{012}	[Nm]	0.65			0.6				0.5					
Max. input speed		n_{1Max}	[rpm]	6000												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<22	<18	<16	<16	<14	<12					<11		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[Nm/arcmin]	0.3	0.45	0.58	0.63	0.66	0.68	0.72	0.74	0.78	0.8	0.75	0.85	0.75
Stability at the output		C_{2K}	[Nm/arcmin]	27												
Max. axial force[c)d)] at the output		F_{a2max}	[N]	910	1200	1500	1800	2200	2100	2300	2500	2700	2900	3100	2900	3100
Max. radial force[c)e)] at the output		F_{r2max}	[N]	640	740	850	970	1100	980	1000	1000	1100	1200	1300	1300	1300
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	32	37	42	48	54	49	50	52	54	60	67	65	67
Max. axial force[c)d)] at the input		F_{a1max}	[N]	890	740	700	780	890	820	890	910	860	880	1100	890	1100
Max. radial force[c)f)] at the input		F_{r1max}	[N]	280	270	280	300	320	320	330	340	330	340	360	340	360
Mass moment of inertia[g)]	Type 1[h)]	J_1	[10^{-7} kg m^2]	344	224	182	163	152	142	137	133	132	130	129	129	129
Service life		L_h	[h]	25000												
Weight without motor components		m	[kg]	2												
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.
c) Bearing forces: Values valid at n_1 = 3000 rpm; ⅔ 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 50 mm from the middle of the casing.
c) f) at a distance of 60 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 360/**i**².
g) h) Motor shaft diameter Ø**d** from Ø4 to Ø19, calculated at Ø9mm.

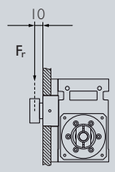
Bearing forces



Package

			Output Flange including Bearing & Pinion				
Radial rigidity	C_3	[N/mm]	22000				
Speed	n_{2N}	[rpm]	1500	750	400	150	100
Max. radial force[j)]	F_{rmax}	[N]	1100	1350	1500	1600	1700

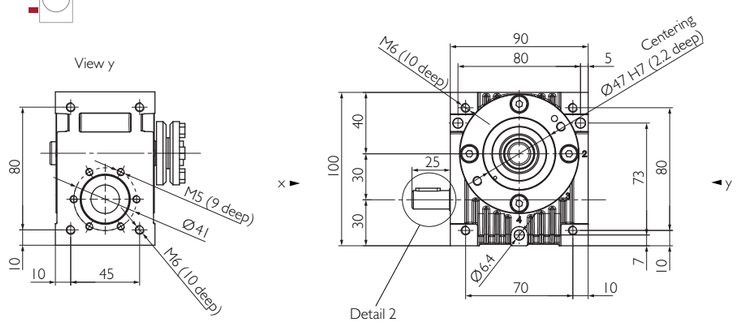
j) Bearing forces: Values valid at duty cycle of 40% at a distance of 10mm from the end of the bearing.

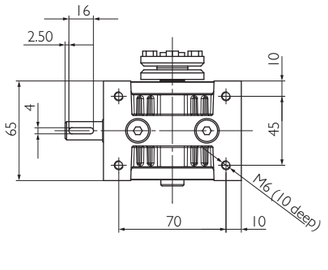


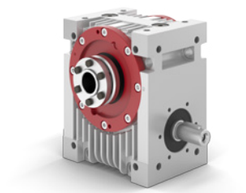
Detailed information about the **Package, Options & Accessories** on pages 32 and 33.

Input

C

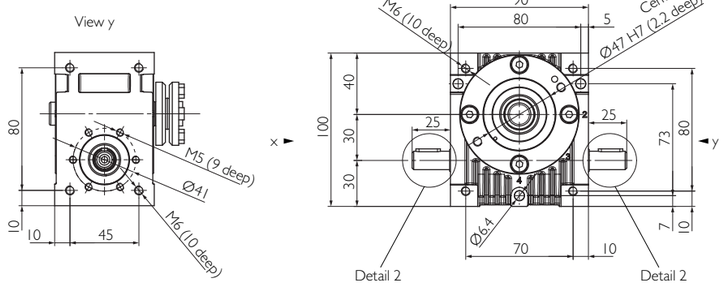


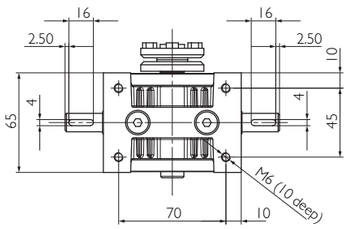




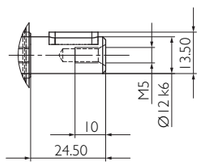
Example HPG 030 C1

D



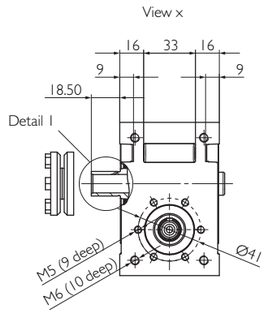


Detail 2

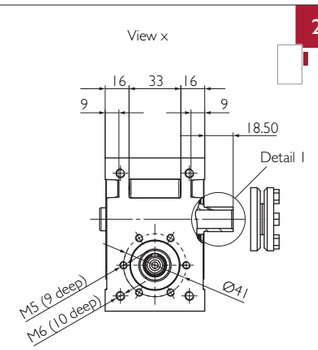


Output

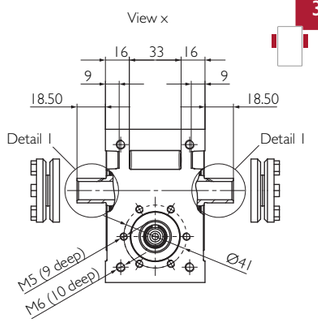
1



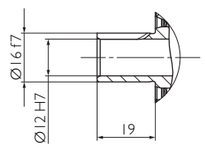
2



3



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]	12.9	17.9	20.1	19.2	16.9	19.4	17.9	17.5	19.5	19.0	8.6	18.8	8.6
		η	[%]	85	84	83	81	80	76	74	67	63	54	48	40	30
	n_{1N} = 1000 rpm	T_{2N}	[Nm]	11.3	16.0	18.3	17.5	15.5	17.9	16.6	16.2	18.1	17.6	8.6	17.5	8.6
		η	[%]	86	86	85	83	81	77	74	68	65	55	50	44	40
	n_{1N} = 1500 rpm	T_{2N}	[Nm]	10.0	14.4	16.7	16.2	14.3	16.6	15.4	15.1	16.9	16.4	8.6	16.3	8.6
		η	[%]	86	86	85	83	80	77	73	68	64	54	49	45	40
	n_{1N} = 3000 rpm	T_{2N}	[Nm]	7.4	11.2	13.3	13.1	11.7	13.7	12.8	12.6	14.0	13.7	8.6	13.6	8.6
		η	[%]	84	84	83	81	77	74	71	67	62	53	48	44	40
	n_{1N} = 4500 rpm	T_{2N}	[Nm]	5.9	9.2	11.0	11.0	9.9	11.6	10.9	10.8	12.0	11.8	10.0	11.7	10.0
		η	[%]	81	82	81	78	76	73	69	65	60	51	47	42	37
	n_{1N} = 6000 rpm	T_{2N}	[Nm]	4.9	7.8	9.4	9.4	8.6	10.1	9.5	9.4	10.5	10.3	10.0	10.2	10.0
		η	[%]	79	79	78	77	75	72	68	62	56	47	42	37	33
Max. acceleration torque		T_{2B}	[Nm]	13	21									10	21	10
Emergency stop torque		T_{2Not}	[Nm]	35										20	35	20
Idling torque[a]		T_{012}	[Nm]	0.65			0.6				0.5					
Max. input speed		n_{1Max}	[rpm]	6000												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<22	<18	<16	<16	<14	<12					<11		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[Nm/arcmin]	0.3	0.45	0.58	0.63	0.66	0.68	0.72	0.74	0.78	0.8	0.75	0.85	0.75
Stability at the output		C_{2K}	[Nm/arcmin]	27												
Max. axial force[c)d)] at the output		F_{a2max}	[N]	910	1200	1500	1800	2200	2100	2300	2500	2700	2900	3100	2900	3100
Max. radial force[c)e)] at the output		F_{r2max}	[N]	640	740	850	970	1100	980	1000	1000	1100	1200	1300	1300	1300
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	32	37	42	48	54	49	50	52	54	60	67	65	67
Max. axial force[c)d)] at the input		F_{a1max}	[N]	890	740	700	780	890	820	890	910	860	880	1100	890	1100
Max. radial force[c)f)] at the input		F_{r1max}	[N]	280	270	280	300	320	320	330	340	330	340	360	340	360
Mass moment of inertia[g]		J_1	[10^{-7} kg m^2]	230	110	68	49	38	28	23	19	18	16	15	15	15
Service life		L_h	[h]	25000												
Weight without motor components		m	[kg]	1.7												
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.

c) Bearing forces: Values valid at n_1 = 3000 rpm; ⅔ T_{2N} and duty cycle of 40%.
Consult with Güdel for composite bearing forces, axial and radial forces.

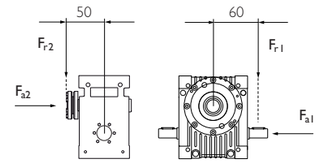
c) d) in relation to shaft center.

c) e) at a distance of 50 mm from the middle of the casing.

c) f) at a distance of 60 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 360/i^2.

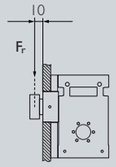
Bearing forces



Package

			Output Flange including Bearing & Pinion				
Radial rigidity	C_3	[N/mm]	22000				
Speed	n_{2N}	[rpm]	1500	750	400	150	100
Max. radial force[j]	F_{rmax}	[N]	1100	1350	1500	1600	1700

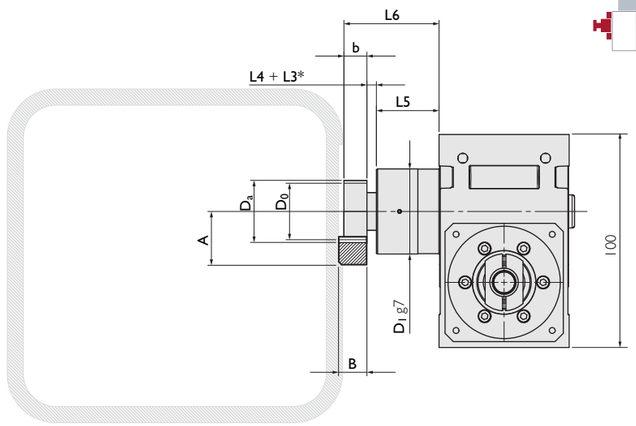
j) Bearing forces: Values valid at duty cycle of 40% at a distance of 10mm from the end of the bearing.

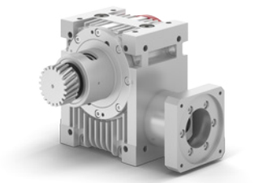


Detailed information about the **Package, Options & Accessories** on pages 32 and 33.

Output Flange including Bearing & Pinion[a)]

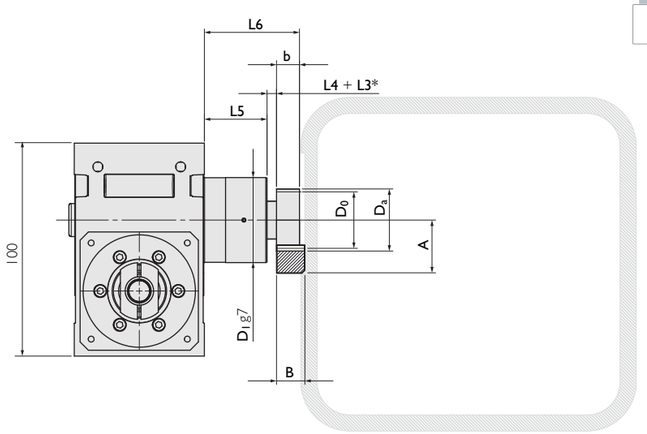
Package





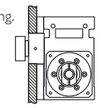
Example HPG 030 A1 Package

Package



a) Output flange in the area of the bearing is provided by the customer. Hole diameter tolerance H8.

* **L3** for additional distance ring.

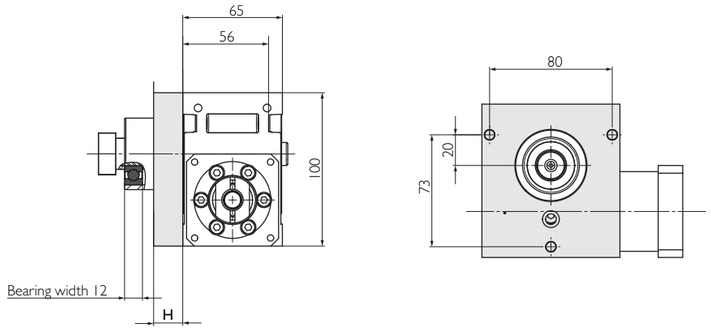


Geometric information

Helical modular pitch	Art. Nr.	m	z	A	b	B	D_a	D_0	D_1	L4	L5	L6
Pinion 1	211116	1.5	16	30.68	20	19	29.36	26.36	47	4.5	38	62.5
											43	67.5

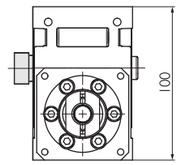
Straight modular pitch	Art. Nr.	m	z	A	b	B	D_a	D_0	D_1	L4	L5	L6
Pinion 2	201116	1.5	16	29.95	20	19	27.9	24.9	47	4.5	38	62.5
											43	67.5

Spacer Elements

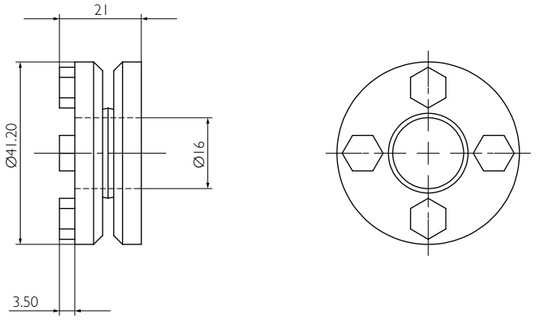


Casing can only be fastened with long screws as per the bore hole pattern.
Screws M6 of length 56mm + **H** + thread depth, tightening torque 9Nm.

with Pinion special solutions on request

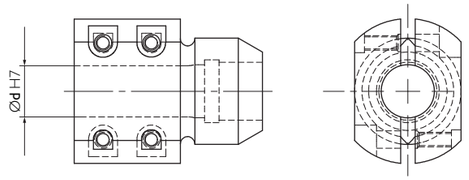


Shrink Disc



Coupling

Type 1



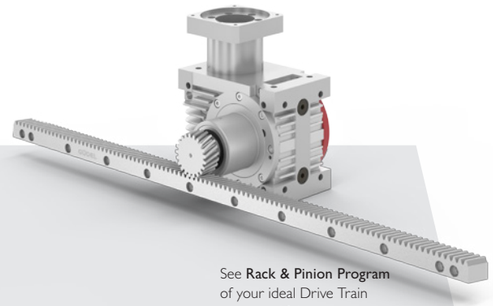
Motor shaft diameter [mm], 4 ≤ Ød ≤ 19

Your ideal Drive Train

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

			Pinion 1	Pinion 2
Maximum acceleration force	F_N	[N]	3178	2888
Maximum acceleration torque	T_N	[Nm]	41	35

Higher value for rack and pinion taking account of the number of load cycles: 1×10^6 for the rack; 1×10^7 for the pinion. Both in cycle mode.

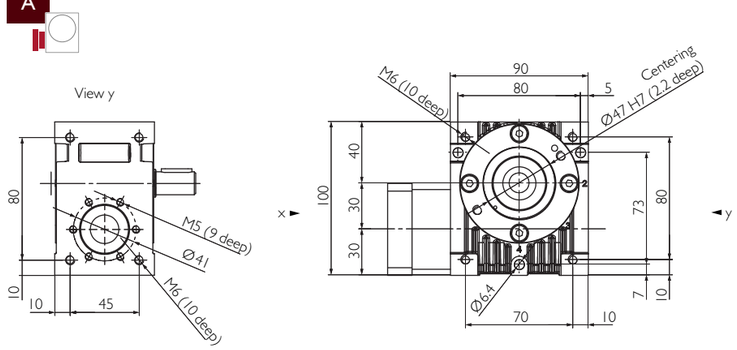


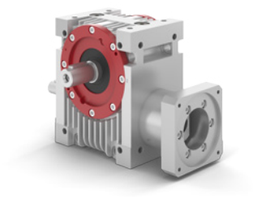
See **Rack & Pinion Program** of your ideal Drive Train on pages 104 et seq.

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

Input

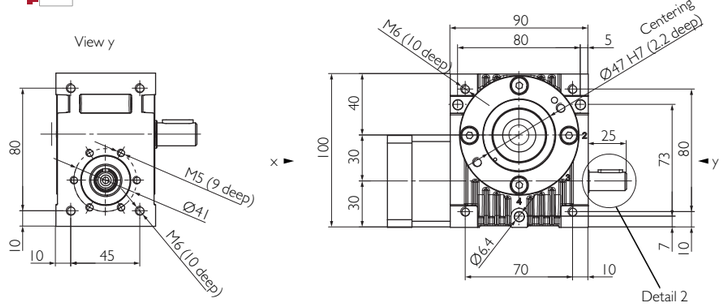
A





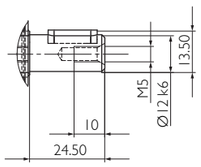
Example HPG 030 B4

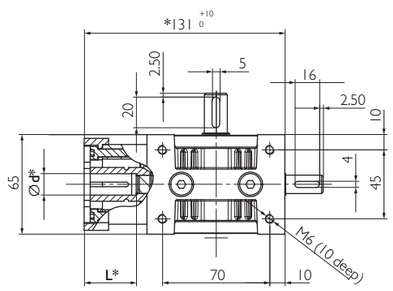
B



* Motor-specific gearbox dimensions
Ød: Ø motor shaft [mm], 4 ≤ **Ød** ≤ 19
L: Motor shaft length [mm], 20 ≤ **L** ≤ 33

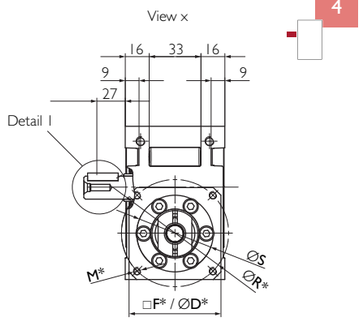
Detail 2





Output

4



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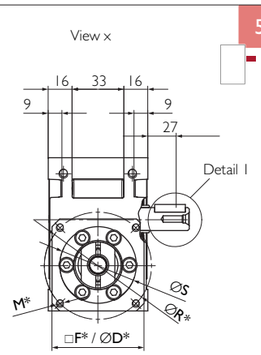

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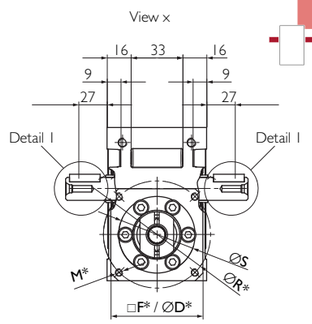
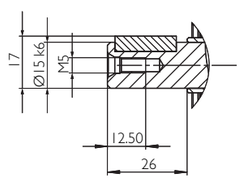


Detail 1



* Motor-specific gearbox dimensions
S: min. 32 [mm], **R:** Pitch circle Ø [mm], **M:** Bore hole Ø or thread [mm], □**F** / Ø**D:** 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}	[Nm]	12.9	17.9	20.1	19.2	16.9	19.4	17.9	17.5	19.5	19.0	8.6	18.8	8.6
		η	[%]	85	84	83	81	80	76	74	67	63	54	48	40	30
	n_{1N} = 1000 rpm	T_{2N}	[Nm]	11.3	16.0	18.3	17.5	15.5	17.9	16.6	16.2	18.1	17.6	8.6	17.5	8.6
		η	[%]	86	86	85	83	81	77	74	68	65	55	50	44	40
	n_{1N} = 1500 rpm	T_{2N}	[Nm]	10.0	14.4	16.7	16.2	14.3	16.6	15.4	15.1	16.9	16.4	8.6	16.3	8.6
		η	[%]	86	86	85	83	80	77	73	68	64	54	49	45	40
	n_{1N} = 3000 rpm	T_{2N}	[Nm]	7.4	11.2	13.3	13.1	11.7	13.7	12.8	12.6	14.0	13.7	8.6	13.6	8.6
		η	[%]	84	84	83	81	77	74	71	67	62	53	48	44	40
	n_{1N} = 4500 rpm	T_{2N}	[Nm]	5.9	9.2	11.0	11.0	9.9	11.6	10.9	10.8	12.0	11.8	10.0	11.7	10.0
		η	[%]	81	82	81	78	76	73	69	65	60	51	47	42	37
	n_{1N} = 6000 rpm	T_{2N}	[Nm]	4.9	7.8	9.4	9.4	8.6	10.1	9.5	9.4	10.5	10.3	10.0	10.2	10.0
		η	[%]	79	79	78	77	75	72	68	62	56	47	42	37	33
Max. acceleration torque		T_{2B}	[Nm]	13	21									10	21	10
Emergency stop torque		T_{2Not}	[Nm]	35										20	35	20
Idling torque[a]		T_{012}	[Nm]	0.65			0.6				0.5					
Max. input speed		n_{1Max}	[rpm]	6000												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<22	<18	<16	<16	<14	<12					<11		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[Nm/arcmin]	0.3	0.45	0.58	0.63	0.66	0.68	0.72	0.74	0.78	0.8	0.75	0.85	0.75
Stability at the output		C_{2K}	[Nm/arcmin]	27												
Max. axial force[c)d)] at the output		F_{a2max}	[N]	910	1200	1500	1800	2200	2100	2300	2500	2700	2900	3100	2900	3100
Max. radial force[c)e)] at the output		F_{r2max}	[N]	640	740	850	970	1100	980	1000	1000	1100	1200	1300	1300	1300
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	32	37	42	48	54	49	50	52	54	60	67	65	67
Max. axial force[c)d)] at the input		F_{a1max}	[N]	890	740	700	780	890	820	890	910	860	880	1100	890	1100
Max. radial force[c)f)] at the input		F_{r1max}	[N]	280	270	280	300	320	320	330	340	330	340	360	340	360
Mass moment of inertia[g)]	Type 1[h)]	J_1	[10^{-7} kg m^2]	344	224	182	163	152	142	137	133	132	130	129	129	129
Service life		L_h	[h]	25000												
Weight without motor components		m	[kg]	2												
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.

c) Bearing forces: Values valid at n_1 = 3000 rpm; ⅔ 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.

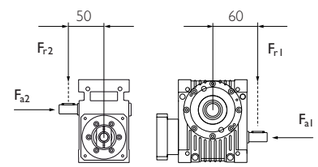
c) e) at a distance of 50 mm from the middle of the casing.

c) f) at a distance of 60 mm from the middle of the casing.

g) in relation to the input, including coupling.

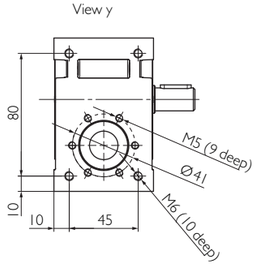
g) h) Motor shaft diameter Ø**d** from Ø4 to Ø19, calculated at Ø9mm.

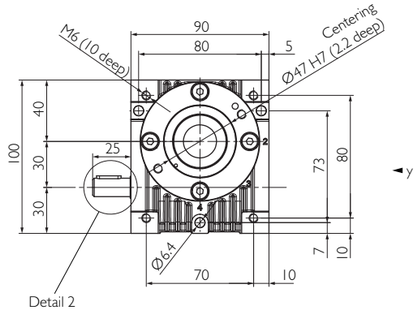
Bearing forces

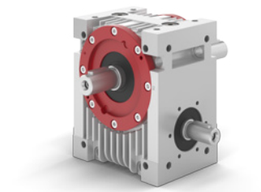


Input

C

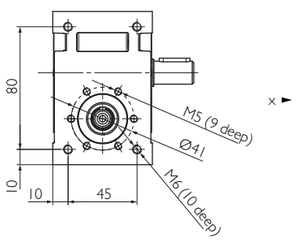


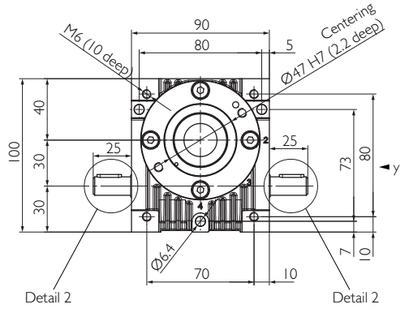


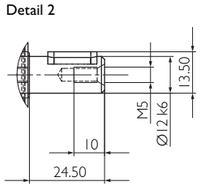


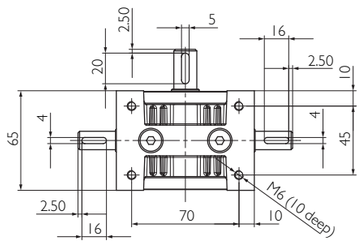
Example HPG 030 C6

D



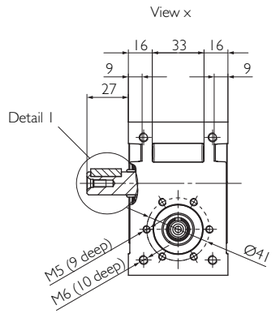






Output

4



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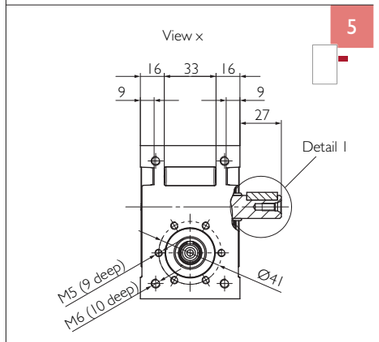

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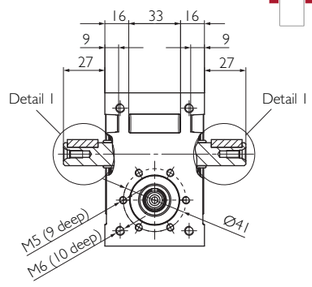
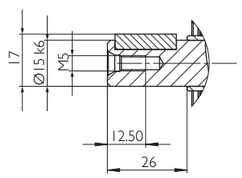


Detail 1



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]	12.9	17.9	20.1	19.2	16.9	19.4	17.9	17.5	19.5	19.0	8.6	18.8	8.6
		η	[%]	85	84	83	81	80	76	74	67	63	54	48	40	30
	n_{1N} = 1000 rpm	T_{2N}	[Nm]	11.3	16.0	18.3	17.5	15.5	17.9	16.6	16.2	18.1	17.6	8.6	17.5	8.6
		η	[%]	86	86	85	83	81	77	74	68	65	55	50	44	40
	n_{1N} = 1500 rpm	T_{2N}	[Nm]	10.0	14.4	16.7	16.2	14.3	16.6	15.4	15.1	16.9	16.4	8.6	16.3	8.6
		η	[%]	86	86	85	83	80	77	73	68	64	54	49	45	40
	n_{1N} = 3000 rpm	T_{2N}	[Nm]	7.4	11.2	13.3	13.1	11.7	13.7	12.8	12.6	14.0	13.7	8.6	13.6	8.6
		η	[%]	84	84	83	81	77	74	71	67	62	53	48	44	40
	n_{1N} = 4500 rpm	T_{2N}	[Nm]	5.9	9.2	11.0	11.0	9.9	11.6	10.9	10.8	12.0	11.8	10.0	11.7	10.0
		η	[%]	81	82	81	78	76	73	69	65	60	51	47	42	37
	n_{1N} = 6000 rpm	T_{2N}	[Nm]	4.9	7.8	9.4	9.4	8.6	10.1	9.5	9.4	10.5	10.3	10.0	10.2	10.0
		η	[%]	79	79	78	77	75	72	68	62	56	47	42	37	33
Max. acceleration torque		T_{2B}	[Nm]	13	21									10	21	10
Emergency stop torque		T_{2Not}	[Nm]	35										20	35	20
Idling torque[a]		T_{012}	[Nm]	0.65			0.6				0.5					
Max. input speed		n_{1Max}	[rpm]	6000												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<22	<18	<16	<16	<14	<12					<11		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[Nm/arcmin]	0.3	0.45	0.58	0.63	0.66	0.68	0.72	0.74	0.78	0.8	0.75	0.85	0.75
Stability at the output		C_{2K}	[Nm/arcmin]	27												
Max. axial force[c)d)] at the output		F_{a2max}	F_{a2max}	910	1200	1500	1800	2200	2100	2300	2500	2700	2900	3100	2900	3100
Max. radial force[c)e)] at the output		F_{r2max}	F_{r2max}	640	740	850	970	1100	980	1000	1000	1100	1200	1300	1300	1300
Max. overturning torque[c)] at the output		M_{2max}	M_{2max}	32	37	42	48	54	49	50	52	54	60	67	65	67
Max. axial force[c)d)] at the input		F_{a1max}	F_{a1max}	890	740	700	780	890	820	890	910	860	880	1100	890	1100
Max. radial force[c)f)] at the input		F_{r1max}	F_{r1max}	280	270	280	300	320	320	330	340	330	340	360	340	360
Mass moment of inertia[g]		J_1	[10^{-7} kg m^2]	230	110	68	49	38	28	23	19	18	16	15	15	15
Service life		L_h	[h]	25000												
Weight without motor components		m	[kg]	1.7												
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.

c) Bearing forces: Values valid at n_1 = 3000 rpm; ⅔ T_{2N} and duty cycle of 40%.
Consult with Güdel for composite bearing forces, axial and radial forces.

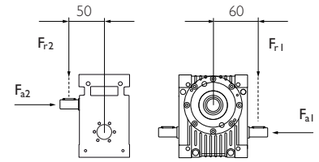
c) d) in relation to shaft center.

c) e) at a distance of 50 mm from the middle of the casing.

c) f) at a distance of 60 mm from the middle of the casing.

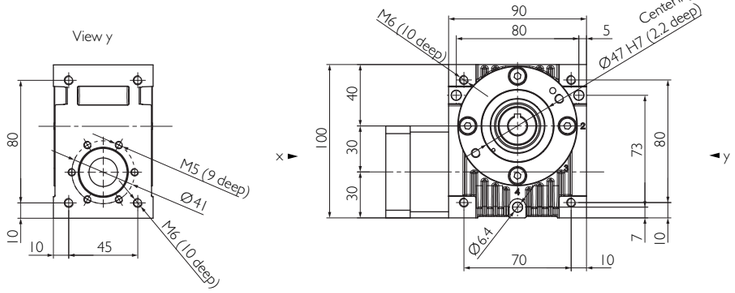
g) in relation to the input.

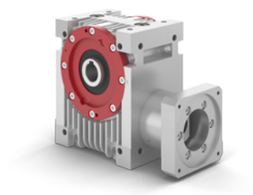
Bearing forces

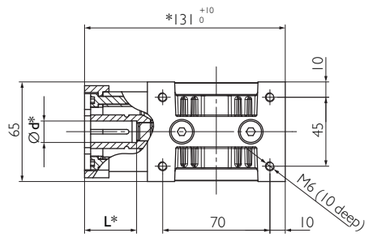


Input

A

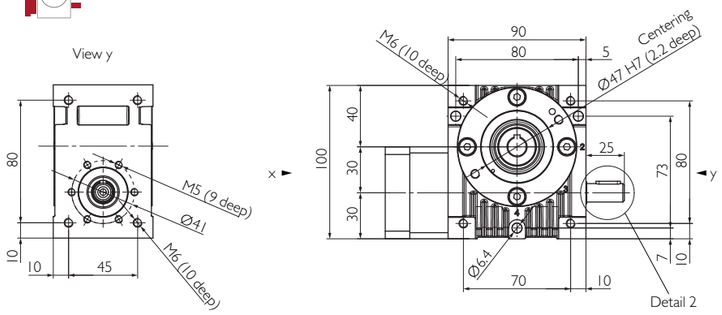


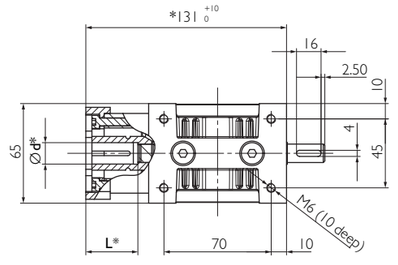




Example HPG 030 A7

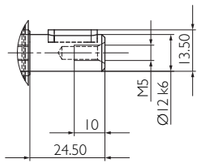
B





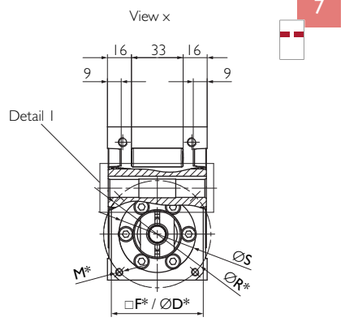
* Motor-specific gearbox dimensions
Ød: Ø motor shaft [mm], 4 ≤ **Ød** ≤ 19
L: Motor shaft length [mm], 20 ≤ **L** ≤ 33

Detail 2

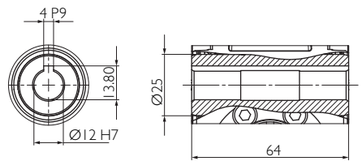


Output

7



Detail 1

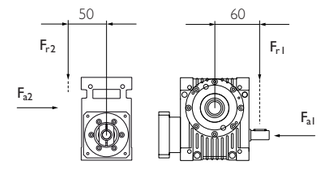


* Motor-specific gearbox dimensions
S: min. 32 [mm], **R:** Pitch circle Ø [mm], **M:** Bore hole Ø or thread [mm], □**F** / Ø**D:** Specify flange [mm]

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}	[Nm]	12.9	17.9	20.1	19.2	16.9	19.4	17.9	17.5	19.5	19.0	8.6	18.8	8.6
		η	[%]	85	84	83	81	80	76	74	67	63	54	48	40	30
	n_{1N} = 1000 rpm	T_{2N}	[Nm]	11.3	16.0	18.3	17.5	15.5	17.9	16.6	16.2	18.1	17.6	8.6	17.5	8.6
		η	[%]	86	86	85	83	81	77	74	68	65	55	50	44	40
	n_{1N} = 1500 rpm	T_{2N}	[Nm]	10.0	14.4	16.7	16.2	14.3	16.6	15.4	15.1	16.9	16.4	8.6	16.3	8.6
		η	[%]	86	86	85	83	80	77	73	68	64	54	49	45	40
	n_{1N} = 3000 rpm	T_{2N}	[Nm]	7.4	11.2	13.3	13.1	11.7	13.7	12.8	12.6	14.0	13.7	8.6	13.6	8.6
		η	[%]	84	84	83	81	77	74	71	67	62	53	48	44	40
	n_{1N} = 4500 rpm	T_{2N}	[Nm]	5.9	9.2	11.0	11.0	9.9	11.6	10.9	10.8	12.0	11.8	10.0	11.7	10.0
		η	[%]	81	82	81	78	76	73	69	65	60	51	47	42	37
	n_{1N} = 6000 rpm	T_{2N}	[Nm]	4.9	7.8	9.4	9.4	8.6	10.1	9.5	9.4	10.5	10.3	10.0	10.2	10.0
		η	[%]	79	79	78	77	75	72	68	62	56	47	42	37	33
Max. acceleration torque		T_{2B}	[Nm]	13	21									10	21	10
Emergency stop torque		T_{2Not}	[Nm]	35										20	35	20
Idling torque[a]		T_{012}	[Nm]	0.65			0.6				0.5					
Max. input speed		n_{1Max}	[rpm]	6000												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<22	<18	<16	<16	<14	<12					<11		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[Nm/arcmin]	0.3	0.45	0.58	0.63	0.66	0.68	0.72	0.74	0.78	0.8	0.75	0.85	0.75
Stability at the output		C_{2K}	[Nm/arcmin]	27												
Max. axial force[c) d)] at the output		F_{a2max}	[N]	560	770	1000	1300	1600	1600	1700	1900	2000	2400	2700	2600	2700
Max. radial force[c) e)] at the output		F_{r2max}	[N]	510	570	660	770	860	800	810	850	880	990	1100	1100	1100
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	26	29	33	38	43	40	41	43	44	49	55	53	55
Max. axial force[c) d)] at the input		F_{a1max}	[N]	890	740	700	780	890	820	890	910	860	880	1100	890	1100
Max. radial force[c) f)] at the input		F_{r1max}	[N]	280	270	280	300	320	320	330	340	330	340	360	340	360
Mass moment of inertia[g]	Type 1[h]	J_1	[10^{-7} kg m^2]	252	183	159	148	142	136	133	131	130	129	129	129	129
Service life		L_h	[h]	25000												
Weight without motor components		m	[kg]	2												
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												

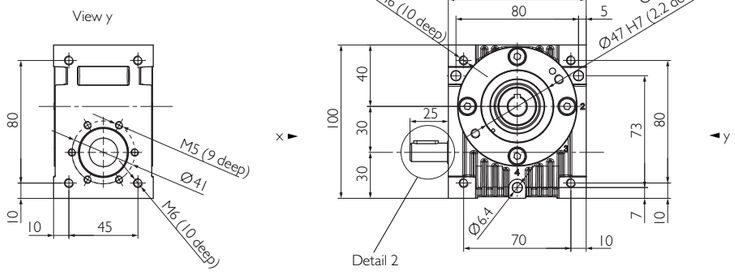
a) approximate, at n_1 = 3000 rpm and operating temperature.
b) Precision grade PS (standard backlash) for classic mechanical engineering applications.
c) Bearing forces: Values valid at n_1 = 3000 rpm; ⅓ T_{2N} and duty cycle of 40%.
Consult with Güdel for composite bearing forces, axial and radial forces.
c) d) in relation to shaft center.
c) e) at a distance of 50 mm from the middle of the casing.
c) f) at a distance of 60 mm from the middle of the casing.
g) in relation to the input, including coupling.
g) h) Motor shaft diameter Ø**d** from Ø4 to Ø19, calculated at Ø9mm.

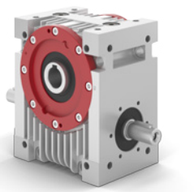
Bearing forces



Input

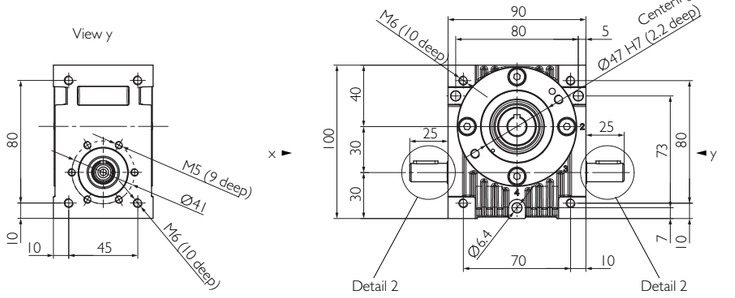
C



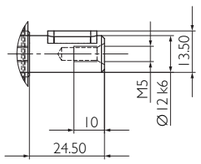


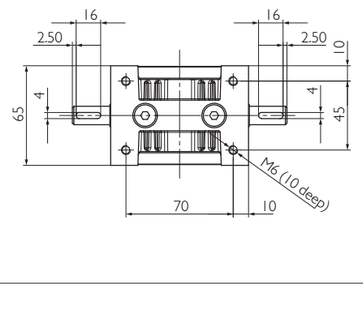
Example HPG 030 C7

D



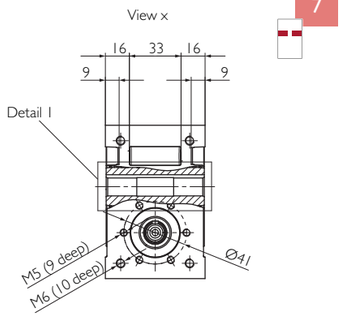
Detail 2



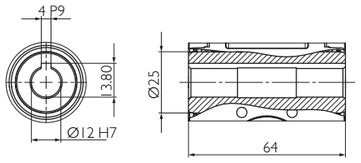


Output

7



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]	12.9	17.9	20.1	19.2	16.9	19.4	17.9	17.5	19.5	19.0	8.6	18.8	8.6
		η	[%]	85	84	83	81	80	76	74	67	63	54	48	40	30
	n_{1N} = 1000 rpm	T_{2N}	[Nm]	11.3	16.0	18.3	17.5	15.5	17.9	16.6	16.2	18.1	17.6	8.6	17.5	8.6
		η	[%]	86	86	85	83	81	77	74	68	65	55	50	44	40
	n_{1N} = 1500 rpm	T_{2N}	[Nm]	10.0	14.4	16.7	16.2	14.3	16.6	15.4	15.1	16.9	16.4	8.6	16.3	8.6
		η	[%]	86	86	85	83	80	77	73	68	64	54	49	45	40
	n_{1N} = 3000 rpm	T_{2N}	[Nm]	7.4	11.2	13.3	13.1	11.7	13.7	12.8	12.6	14.0	13.7	8.6	13.6	8.6
		η	[%]	84	84	83	81	77	74	71	67	62	53	48	44	40
	n_{1N} = 4500 rpm	T_{2N}	[Nm]	5.9	9.2	11.0	11.0	9.9	11.6	10.9	10.8	12.0	11.8	10.0	11.7	10.0
		η	[%]	81	82	81	78	76	73	69	65	60	51	47	42	37
	n_{1N} = 6000 rpm	T_{2N}	[Nm]	4.9	7.8	9.4	9.4	8.6	10.1	9.5	9.4	10.5	10.3	10.0	10.2	10.0
		η	[%]	79	79	78	77	75	72	68	62	56	47	42	37	33
Max. acceleration torque		T_{2B}	[Nm]	13	21									10	21	10
Emergency stop torque		T_{2Not}	[Nm]	35										20	35	20
Idling torque[a]		T_{012}	[Nm]	0.65			0.6				0.5					
Max. input speed		n_{1Max}	[rpm]	6000												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<22	<18	<16	<16	<14	<12					<11		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[Nm/arcmin]	0.3	0.45	0.58	0.63	0.66	0.68	0.72	0.74	0.78	0.8	0.75	0.85	0.75
Stability at the output		C_{2K}	[Nm/arcmin]	27												
Max. axial force[c)d)] at the output		F_{a2max}	[N]	560	770	1000	1300	1600	1600	1700	1900	2000	2400	2700	2600	2700
Max. radial force[c)e)] at the output		F_{r2max}	[N]	510	570	660	770	860	800	810	850	880	990	1100	1100	1100
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	26	29	33	38	43	40	41	43	44	49	55	53	55
Max. axial force[c)d)] at the input		F_{a1max}	[N]	890	740	700	780	890	820	890	910	860	880	1100	890	1100
Max. radial force[c)f)] at the input		F_{r1max}	[N]	280	270	280	300	320	320	330	340	330	340	360	340	360
Mass moment of inertia[g]		J_1	[10^{-7} kg m^2]	138	69	45	34	28	22	19	17	16	15	15	15	15
Service life		L_h	[h]	25000												
Weight without motor components		m	[kg]	1.6												
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.

c) Bearing forces: Values valid at n_1 = 3000 rpm; ⅔ T_{2N} and duty cycle of 40%.
Consult with Güdel for composite bearing forces, axial and radial forces.

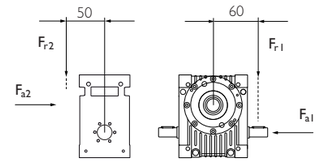
c) d) in relation to shaft center.

c) e) at a distance of 50 mm from the middle of the casing.

c) f) at a distance of 60 mm from the middle of the casing.

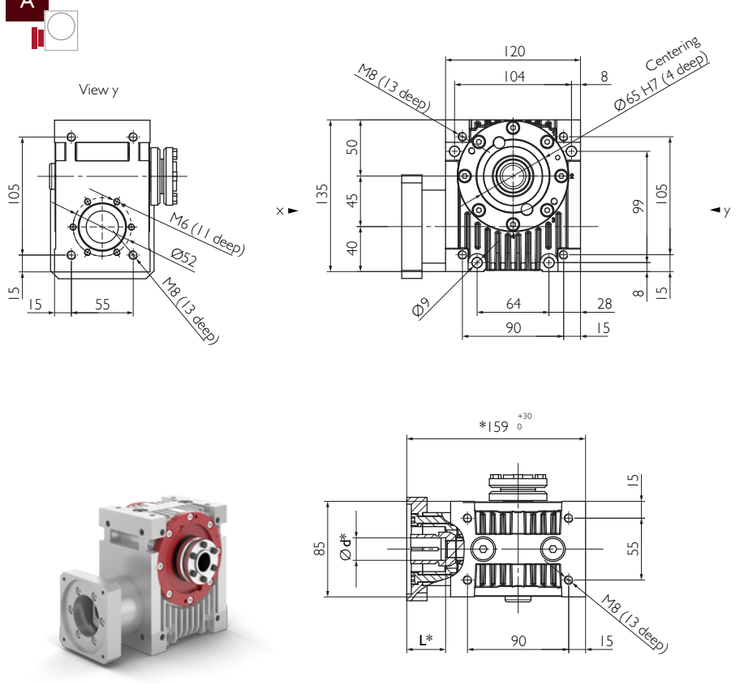
g) in relation to the input.

Bearing forces



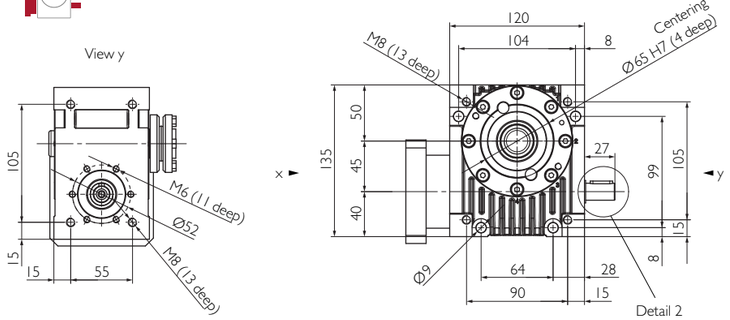
Input

A



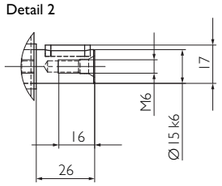
Example HPG 045 A2

B



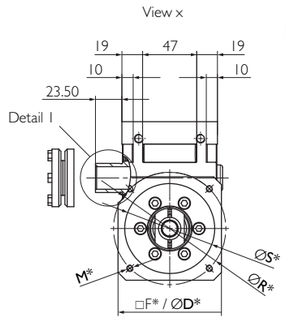
* Motor-specific gearbox dimensions
Ød: Ø motor shaft [mm], 6 ≤ **Ød** ≤ 24
L: Motor shaft length [mm], 20 ≤ **L** ≤ 53

Detail 2

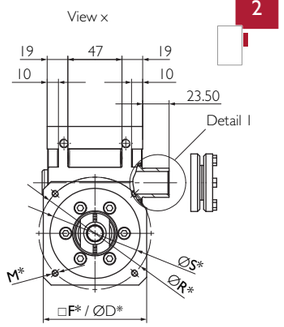


Output

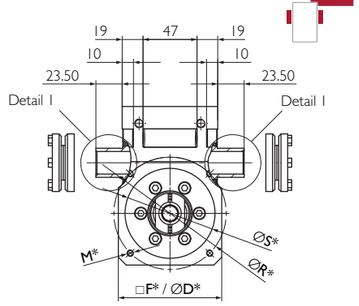
1



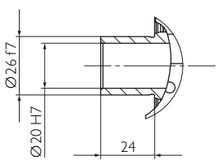
2



3



Detail I



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

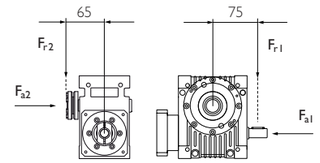
a) approximate, at n_1 = 3000 rpm and operating temperature.

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; ⅔ 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/i^2.
g) h) Motor shaft diameter Ø**d** from Ø6 to Ø20, calculated at Ø11mm.
g) i) Motor shaft diameter Ø**d** from Ø21 to Ø24, calculated at Ø24mm.

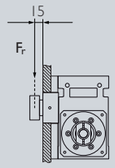
Bearing forces



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[j)]	F_{rmax}	[N]	1900	2400	2900	3200	3500

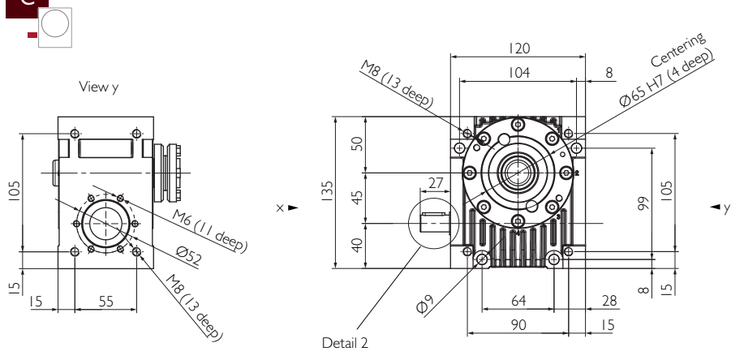
j) Bearing forces: Values valid at duty cycle of 40% at a distance of 15mm from the end of the bearing.

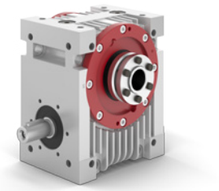


Detailed information about the **Package, Options & Accessories** on pages 46 and 47.

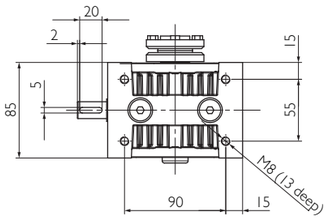
Input

C

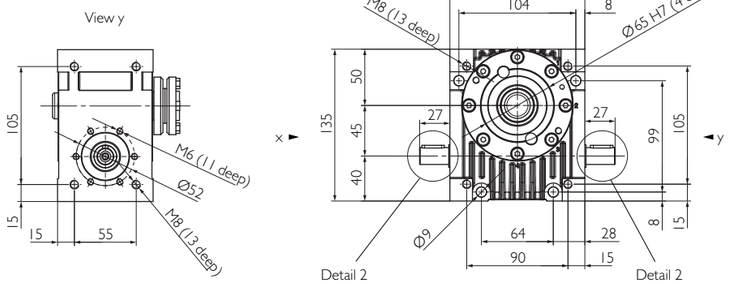


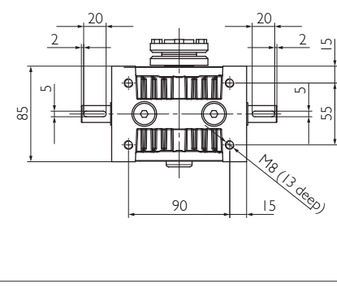


Example HPG 045 C2

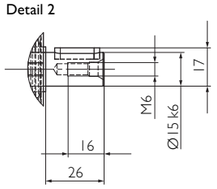


D



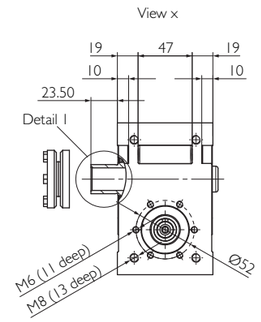


Detail 2

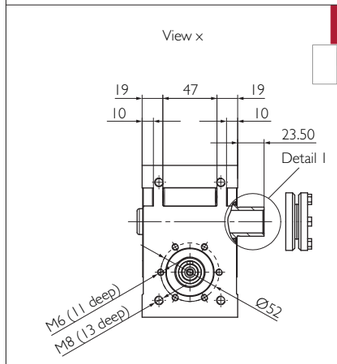


Output

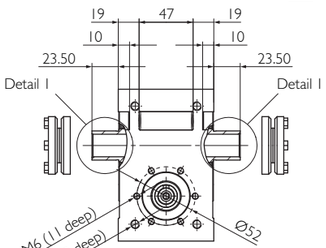
1



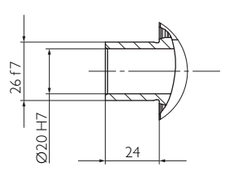
2



3



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	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_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												

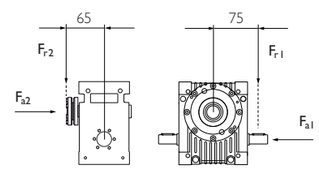
a) approximate, at n_1 = 3000 rpm and operating temperature.

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; ⅔ 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 relations to the input, including shrink disc at the output (output 1 & 2), with two shrink discs (output 3) increase values by 90/i^2.

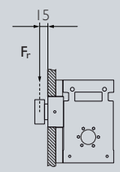
Bearing forces



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[j]	F_{rmax}	[N]	1900	2400	2900	3200	3500

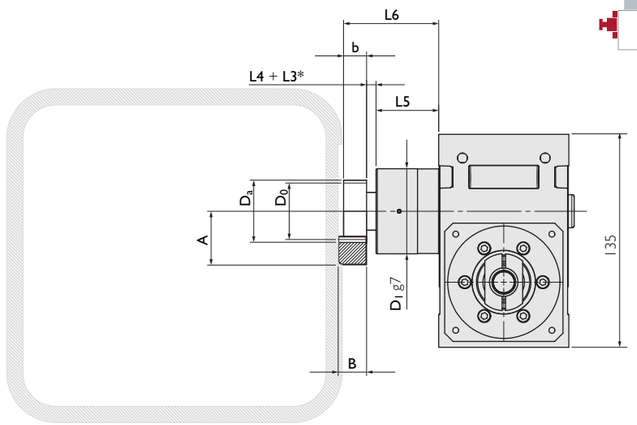
j) Bearing forces: Values valid at duty cycle of 40% at a distance of 15mm from the end of the bearing.

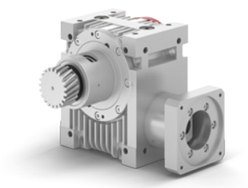


Detailed information about the **Package, Options & Accessories** on pages 46 and 47.

Output Flange including Bearing & Pinion[a)]

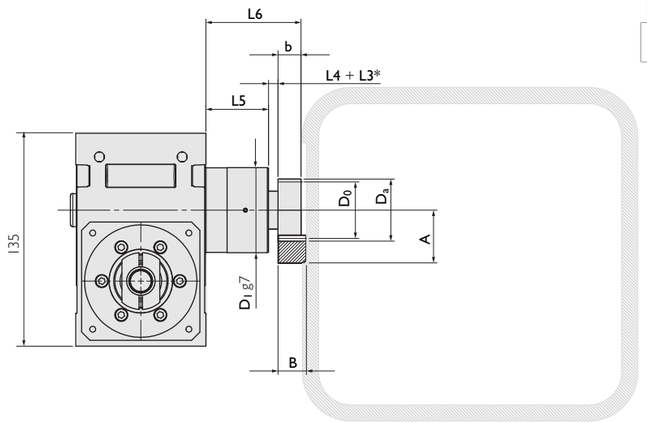
Package





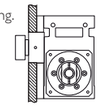
Example HPG 045 A1 Package

Package



a) Output flange in the area of the bearing is provided by the customer. Hole diameter tolerance H8.

* **L3** for additional distance ring.

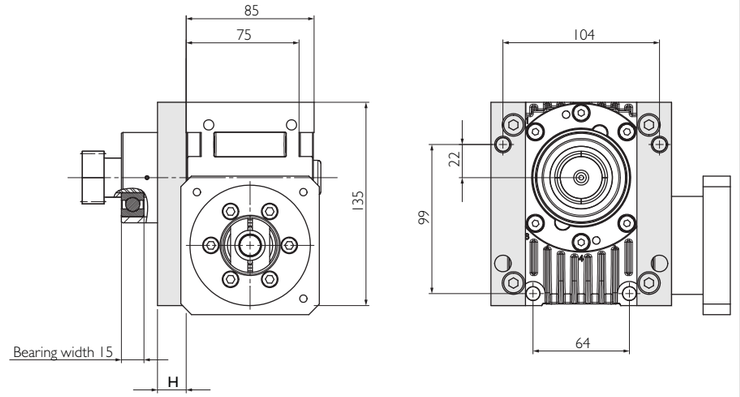


Geometric information

Helical modular pitch	Art. Nr.	m	z	A	b	B	D_a	D_0	D_1	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

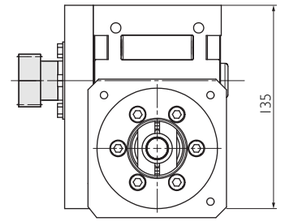
Straight modular pitch	Art. Nr.	m	z	A	b	B	D_a	D_0	D_1	L4	L5	L6
Pinion 3	201120	1.5	20	32.5	20	19	33.0	30.0	60	4.5	43	67.5
											53	77.5
Pinion 4	201216	2	16	38.6	20	24	37.2	33.2	60	8	43	71
											53	81

Spacer Elements

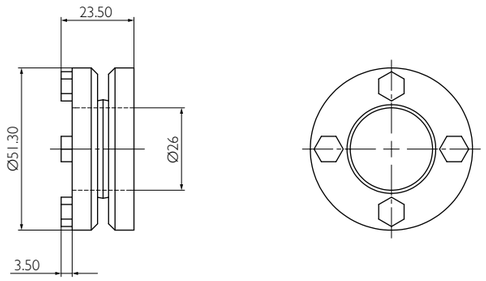


Casing can only be fastened with long screws as per the bore hole pattern.
Screws M8 of length 75mm + **H** + thread depth, tightening torque 22Nm.

with Pinion special solutions on request

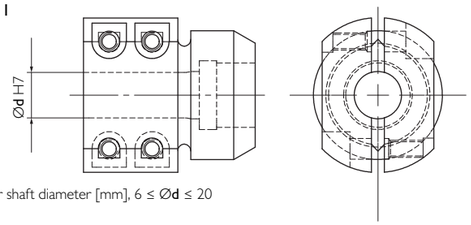


Shrink Disc



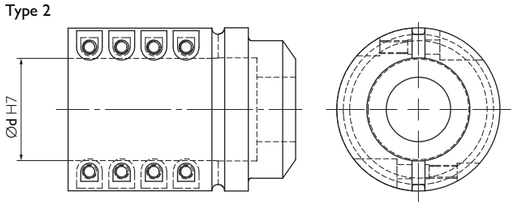
Coupling

Type 1



Motor shaft diameter [mm], 6 ≤ Ø**d** ≤ 20

Type 2



Motor shaft diameter [mm], 21 ≤ Ø**d** ≤ 24

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

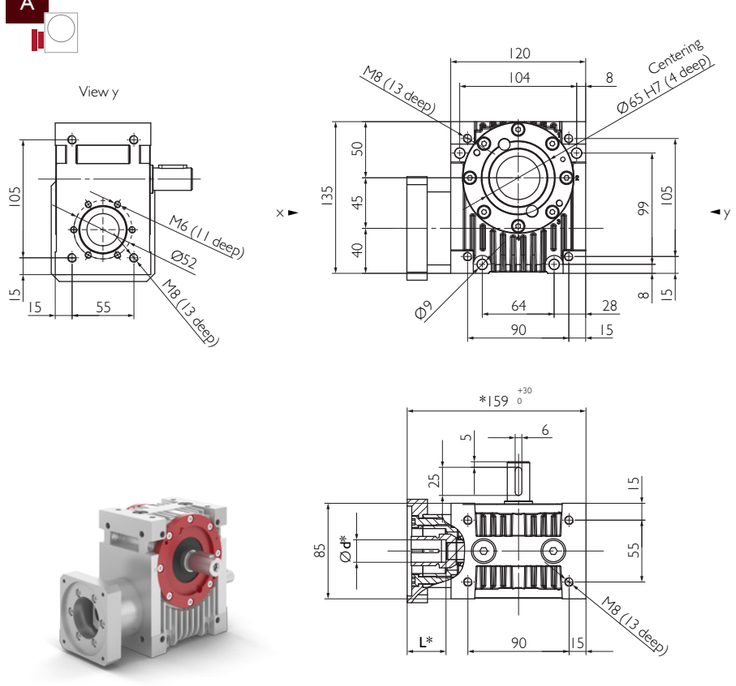
Higher value for rack and pinion taking account of the number of load cycles: 1×10^6 for the rack; 1×10^7 for the pinion. Both in cycle mode.

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.

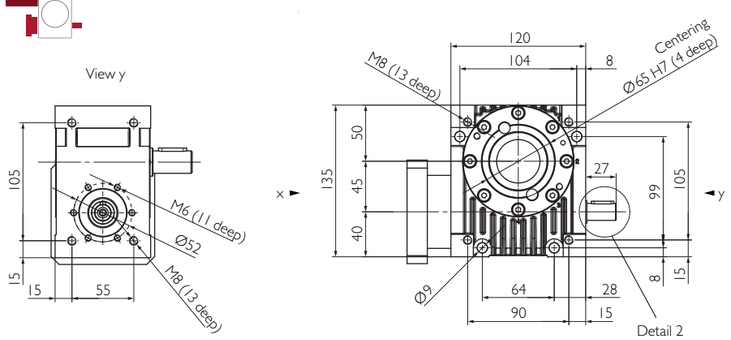
Input

A



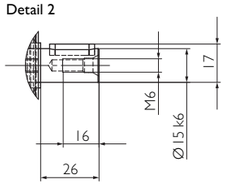
Example HPG 045 B5

B



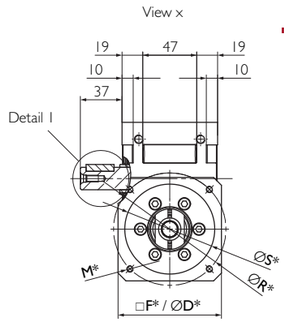
* Motor-specific gearbox dimensions
Ød: Ø motor shaft [mm], 6 ≤ **Ød** ≤ 24
L: Motor shaft length [mm], 20 ≤ **L** ≤ 53

Detail 2

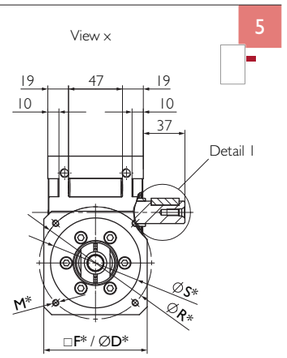


Output

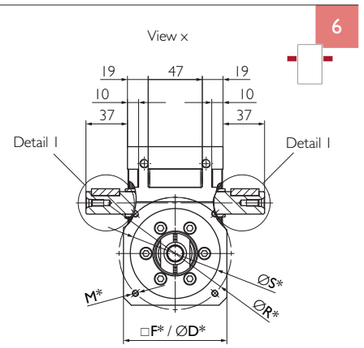
4



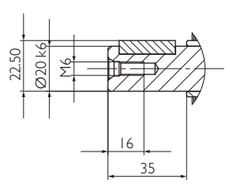
5



6



Detail I



* Motor-specific gearbox dimensions
S: min. 40 [mm], **R:** Pitch circle Ø [mm], **M:** Bore hole Ø or thread [mm], □**F** / Ø**D:** 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}	[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_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)]	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; ⅔ 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.

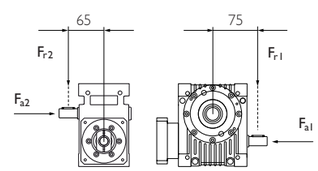
c) f) at a distance of 75 mm from the middle of the casing.

g) in relation to the input, including coupling.

g) h) Motor shaft diameter Ød from Ø6 to Ø20, calculated at Ø11mm.

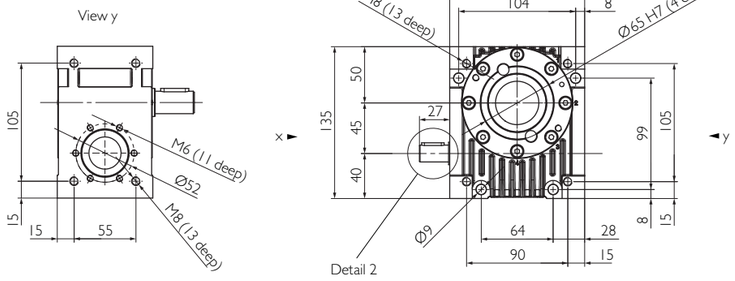
g) i) Motor shaft diameter Ød from Ø21 to Ø24, calculated at Ø24mm.

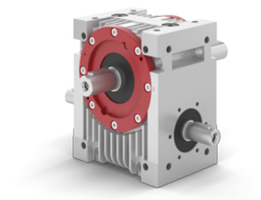
Bearing forces



Input

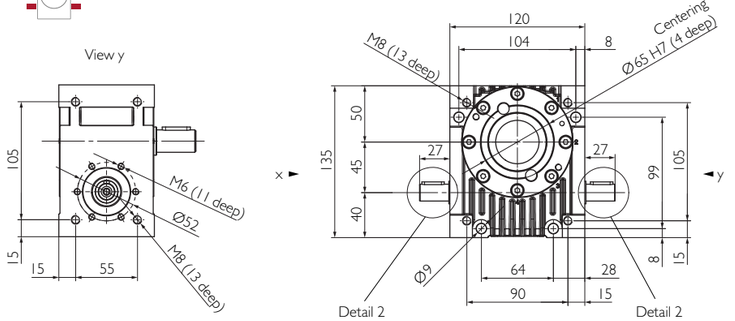
C

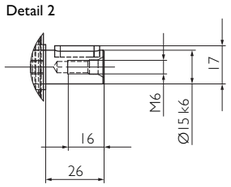


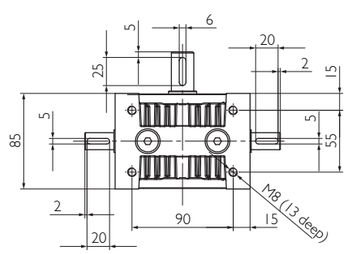


Example HPG 045 D6

D

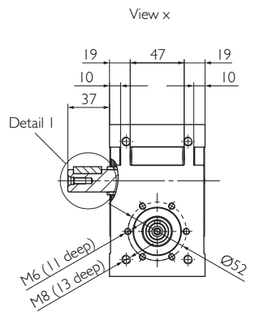




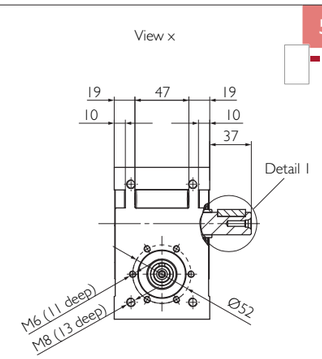


Output

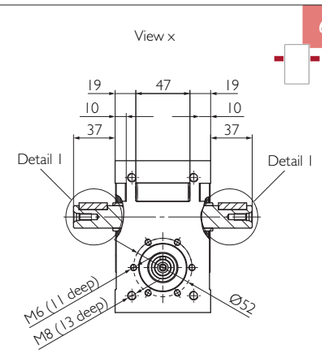
4



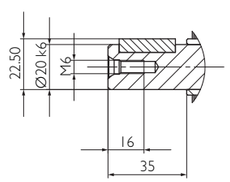
5



6



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	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_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												

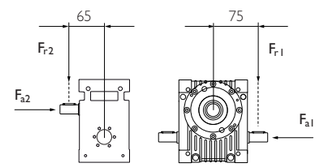
a) approximate, at n_1 = 3000 rpm and operating temperature.

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; ⅔ 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.

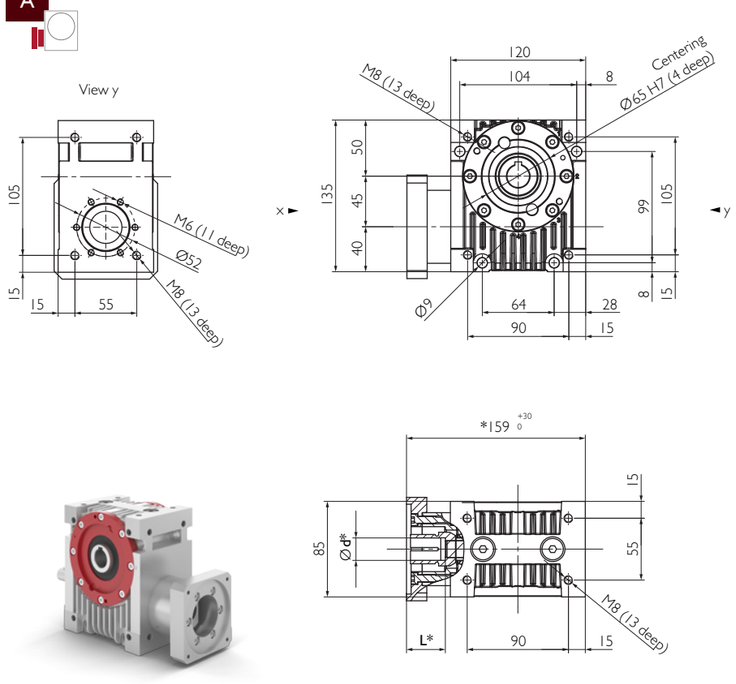
g) in relation to the input.

Bearing forces



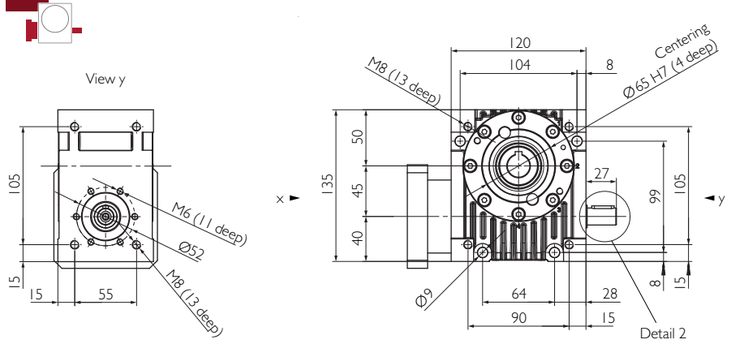
Input

A



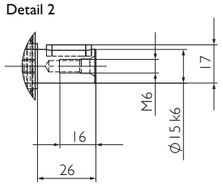
Example HPG 045 B7

B



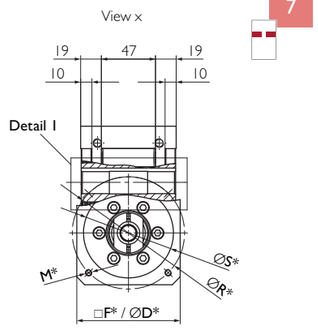
* Motor-specific gearbox dimensions
Ød: Ø motor shaft [mm], 6 ≤ **Ød** ≤ 24
L: Motor shaft length [mm], 20 ≤ **L** ≤ 53

Detail 2

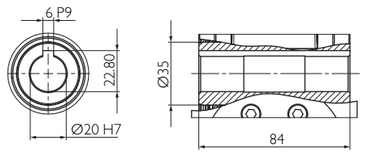


Output

7



Detail I



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

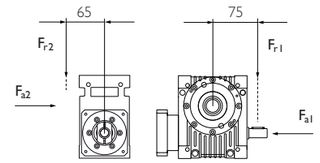
a) approximate, at n_1 = 3000 rpm and operating temperature.

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; ⅔ 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.

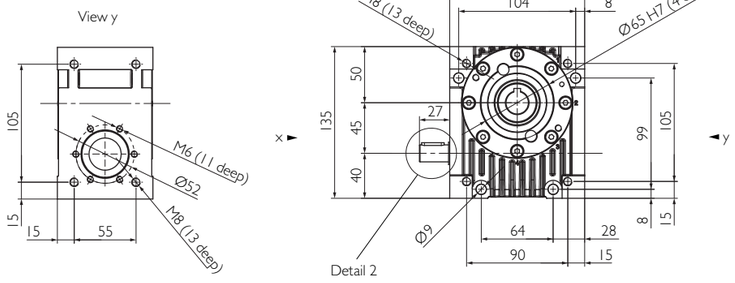
g) in relation to the input, including coupling.
g) h) Motor shaft diameter Ø**d** from Ø6 to Ø20, calculated at Ø11mm.
g) i) Motor shaft diameter Ø**d** from Ø21 to Ø24, calculated at Ø24mm.

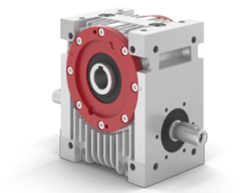
Bearing forces



Input

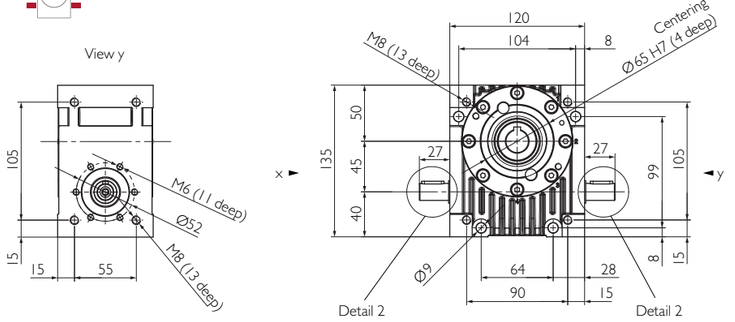
C

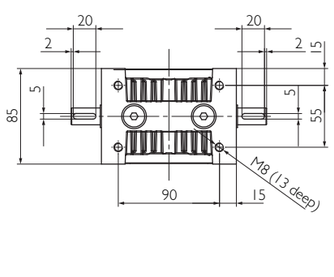




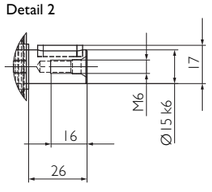
Example HPG 045 D7

D



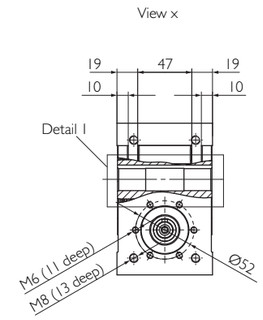


Detail 2

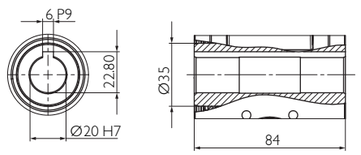


Output

7



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	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_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]	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 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; ⅔ T_{2N} and duty cycle of 40%.
Consult with Güdel for composite bearing forces, axial and radial forces.

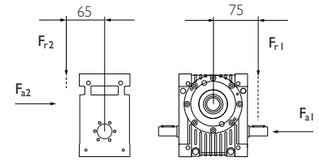
c) d) in relation to shaft center.

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.

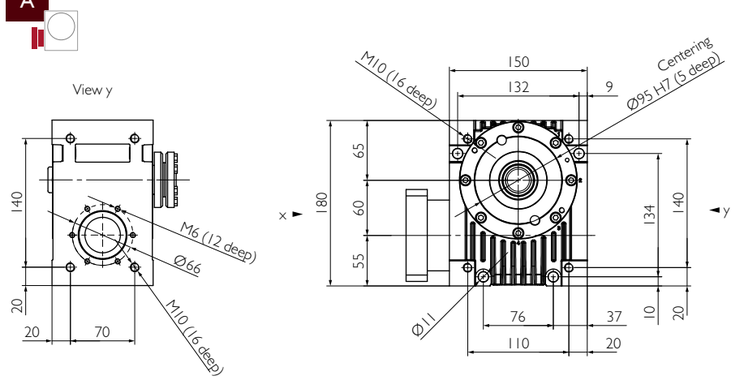
Bearing forces

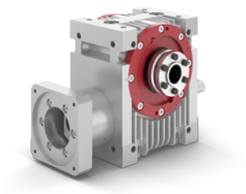


at the output at the input

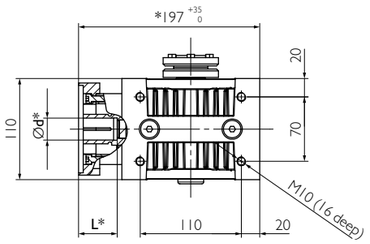
Input

A

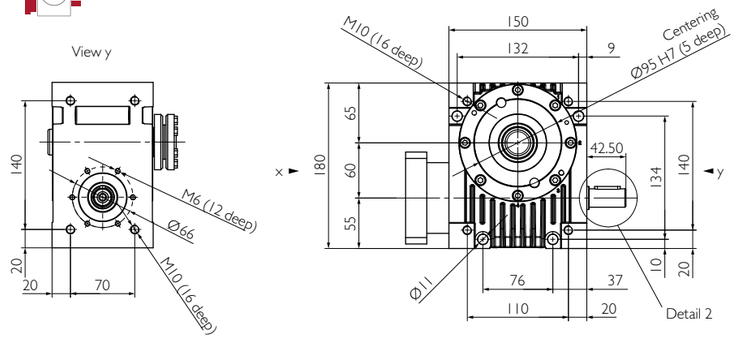


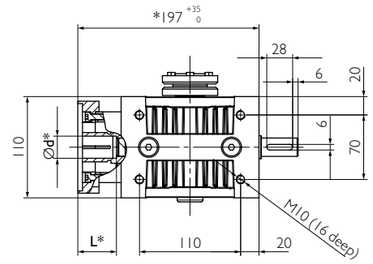


Example HPG 060 B2



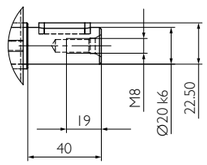
B





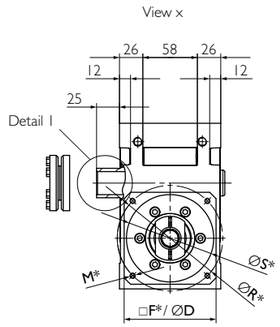
* Motor-specific gearbox dimensions
Ød: Ø motor shaft [mm], 8 ≤ **Ød** ≤ 35
L: Motor shaft length [mm], 25 ≤ **L** ≤ 66

Detail 2

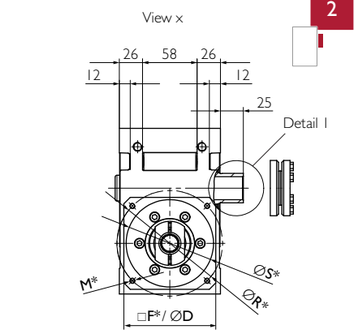


Output

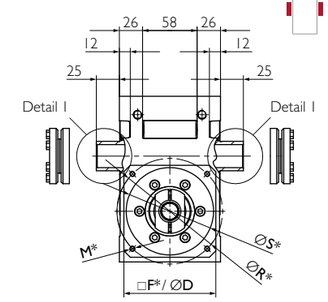
1



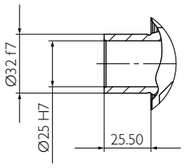
2



3



Detail I



* Motor-specific gearbox dimensions
S: min. 54 [mm], **R:** Pitch circle Ø [mm], **M:** Bore hole Ø or thread [mm], □**F**/Ø**D:** 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}	[Nm]	135	192	219	211	186	215	199	195	195	202	144	209	144
		η	[%]	89	89	88	88	87	84	82	78	74	67	64	54	50
	n_{1N} = 1000 rpm	T_{2N}	[Nm]	107	158	184	180	160	186	173	170	190	185	144	184	144
		η	[%]	90	90	90	89	88	86	84	81	77	70	65	56	53
	n_{1N} = 1500 rpm	T_{2N}	[Nm]	89	135	159	157	140	164	153	151	168	165	144	163	144
		η	[%]	90	91	90	89	89	86	84	81	78	70	65	56	52
	n_{1N} = 3000 rpm	T_{2N}	[Nm]	59	93	113	113	103	121	114	113	126	124	126	123	126
		η	[%]	90	90	90	89	88	86	83	80	77	69	64	55	50
	n_{1N} = 4500 rpm	T_{2N}	[Nm]	44	71	88	89	81	96	91	90	101	99	101	98	101
		η	[%]	89	89	89	88	87	84	82	78	75	67	61	52	47
	n_{1N} = 6000 rpm	T_{2N}	[Nm]	35	58	71	73	67	80	75	75	84	82	84	82	84
		η	[%]	88	88	88	87	85	83	80	75	72	64	58	48	44
Max. acceleration torque		T_{2B}	[Nm]	140	220									150	220	150
Emergency stop torque		T_{2Not}	[Nm]	300										200	300	200
Idling torque[a]		T_{012}	[Nm]	1.45			1.3				1.1					
Max. input speed		n_{1Max}	[rpm]	6000												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<13	<10	<9	<9	<8	<7					<6		
	PR	j_t	[arcmin]	<9	<7	<6	<6	<5	<4.5					<4		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[Nm/arcmin]	2.5	4.8	7.6	8.6	10	11	12.1	13.3	14.5	15.4	15	16	15
Stability at the output		C_{2K}	[Nm/arcmin]	42												
Max. axial force[c)d)] at the output		F_{a2max}	[N]	1300	1700	2600	3600	4400	4100	4500	5100	5300	6500	7300	7500	7500
Max. radial force[c)e)] at the output		F_{r2max}	[N]	1300	1500	2100	2500	2800	2400	2500	2600	2700	3100	3300	3300	3300
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	110	120	170	200	220	190	200	210	220	250	270	270	270
Max. axial force[c)d)] at the input		F_{a1max}	[N]	1700	990	750	1000	1400	1100	1400	1600	1200	1400	1300	1500	1300
Max. radial force[c)f)] at the input		F_{r1max}	[N]	690	510	390	520	720	560	710	760	610	650	620	690	630
Mass moment of inertia[g)]	Type 1[h)]	J_1	[10^{-6} kg m^2]	550	304	218	178	157	135	125	117	114	110	109	108	108
	Type 2[i)]	J_1	[10^{-6} kg m^2]	760	515	428	389	367	345	335	328	325	321	320	319	318
Service life		L_h	[h]	25000												
Weight without motor components		m	[kg]	9												
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												

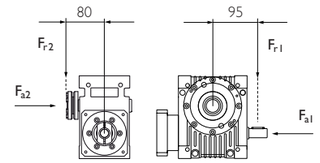
a) approximate, at n_1 = 3000 rpm and operating temperature.

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; ⅔ 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 80 mm from the middle of the casing.
c) f) at a distance of 95 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 200/i^2.
g) h) Motor shaft diameter Ø**d** from Ø8 to Ø24, calculated at Ø19mm.
g) i) Motor shaft diameter Ø**d** from Ø25 to Ø35, calculated at Ø28mm.

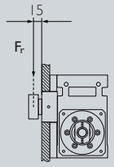
Bearing forces



Package

			Output Flange including Bearing & Pinion				
Radial rigidity	C_3	[N/mm]	24000				
Speed	n_{2N}	[rpm]	1500	750	400	150	100
Max. radial force[j)]	F_{rmax}	[N]	2500	3200	4000	4500	5000

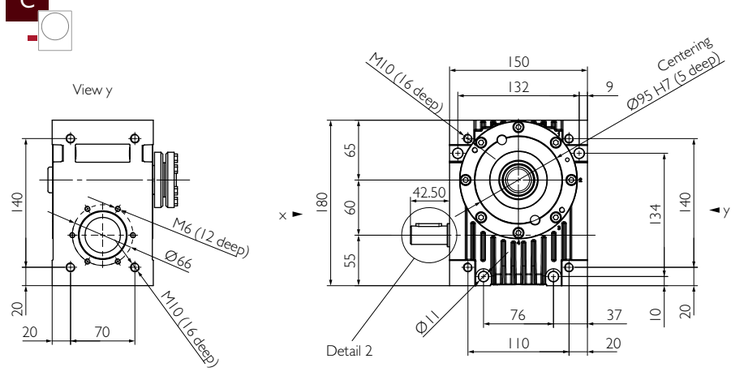
j) Bearing forces: Values valid at duty cycle of 40% at a distance of 15 mm from the end of the bearing.

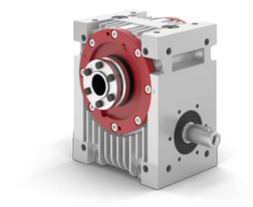


Detailed information about the **Package, Options & Accessories** on pages 60 and 61.

Input

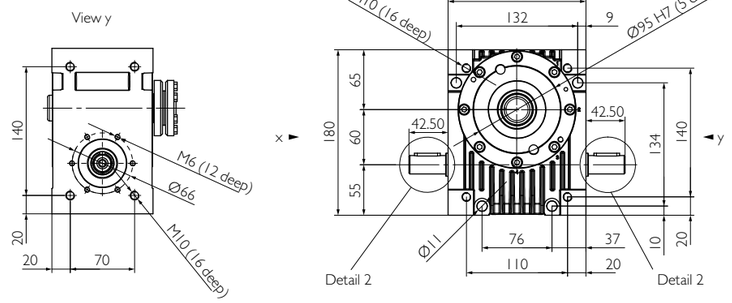
C

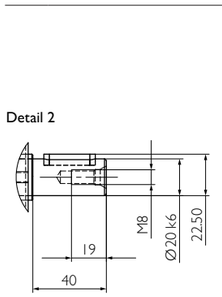


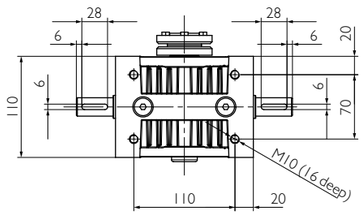


Example HPG 060 C1

D

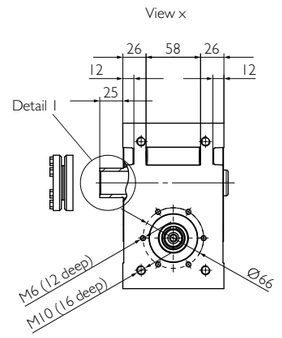




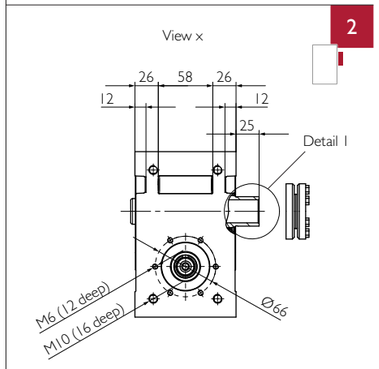


Output

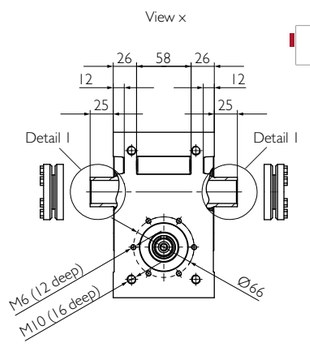
1



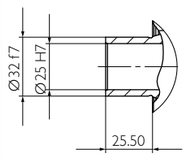
2



3



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]	135	192	219	211	186	215	199	195	195	202	144	209	144
		η	[%]	89	89	88	88	87	84	82	78	74	67	64	54	50
	n_{1N} = 1000 rpm	T_{2N}	[Nm]	107	158	184	180	160	186	173	170	190	185	144	184	144
		η	[%]	90	90	90	89	88	86	84	81	77	70	65	56	53
	n_{1N} = 1500 rpm	T_{2N}	[Nm]	89	135	159	157	140	164	153	151	168	165	144	163	144
		η	[%]	90	91	90	89	89	86	84	81	78	70	65	56	52
	n_{1N} = 3000 rpm	T_{2N}	[Nm]	59	93	113	113	103	121	114	113	126	124	126	123	126
		η	[%]	90	90	90	89	88	86	83	80	77	69	64	55	50
	n_{1N} = 4500 rpm	T_{2N}	[Nm]	44	71	88	89	81	96	91	90	101	99	101	98	101
		η	[%]	89	89	89	88	87	84	82	78	75	67	61	52	47
	n_{1N} = 6000 rpm	T_{2N}	[Nm]	35	58	71	73	67	80	75	75	84	82	84	82	84
		η	[%]	88	88	88	87	85	83	80	75	72	64	58	48	44
Max. acceleration torque		T_{2B}	[Nm]	140	220									150	220	150
Emergency stop torque		T_{2Not}	[Nm]	300										200	300	200
Idling torque[a]		T_{012}	[Nm]	1.45			1.3				1.1					
Max. input speed		n_{1Max}	[rpm]	6000												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<13	<10	<9	<9	<8	<7					<6		
	PR	j_t	[arcmin]	<9	<7	<6	<6	<5	<4.5					<4		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[Nm/arcmin]	2.5	4.8	7.6	8.6	10	11	12.1	13.3	14.5	15.4	15	16	15
Stability at the output		C_{2K}	[Nm/arcmin]	42												
Max. axial force[c)d)] at the output		F_{a2max}	[N]	1300	1700	2600	3600	4400	4100	4500	5100	5300	6500	7300	7500	7500
Max. radial force[c)e)] at the output		F_{r2max}	[N]	1300	1500	2100	2500	2800	2400	2500	2600	2700	3100	3300	3300	3300
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	110	120	170	200	220	190	200	210	220	250	270	270	270
Max. axial force[c)d)] at the input		F_{a1max}	[N]	1700	990	750	1000	1400	1100	1400	1600	1200	1400	1300	1500	1300
Max. radial force[c)f)] at the input		F_{r1max}	[N]	690	510	390	520	720	560	710	760	610	650	620	690	630
Mass moment of inertia[g]		J_1	[10^{-6} kg m^2]	467	221	135	95	74	52	42	34	31	27	26	25	25
Service life		L_h	[h]	25000												
Weight without motor components		m	[kg]	9												
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; ⅔ T_{2N} and duty cycle of 40%.
Consult with Güdel for composite bearing forces, axial and radial forces.

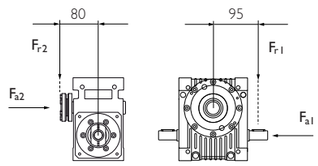
c) d) in relation to shaft center.

c) e) at a distance of 80 mm from the middle of the casing.

c) f) at a distance of 95 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 200/i^2.

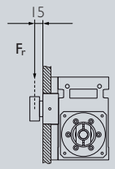
Bearing forces



Package

			Output Flange including Bearing & Pinion				
Radial rigidity	C_3	[N/mm]	24000				
Speed	n_{2N}	[rpm]	1500	750	400	150	100
Max. radial force[j]	F_{rmax}	[N]	2500	3200	4000	4500	5000

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

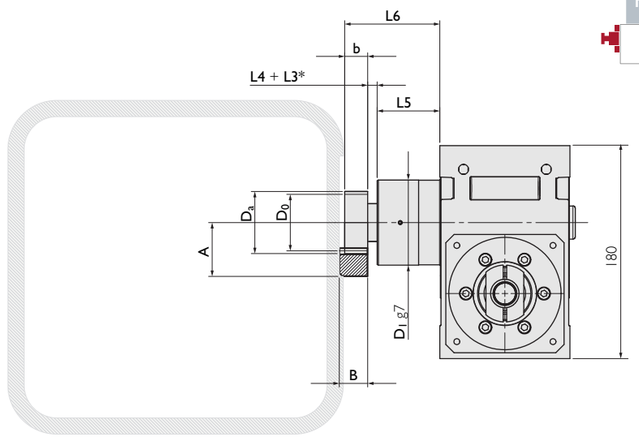


Detailed information about the **Package, Options & Accessories** on pages 60 and 61.

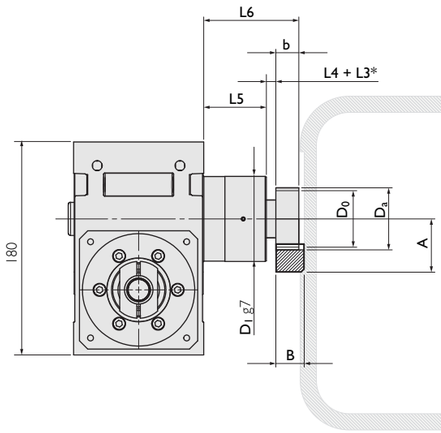
Output Flange including Bearing & Pinion[a)]

Package

Example HPG 060 C1 Package

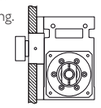


Package



a) Output flange in the area of the bearing is provided by the customer. Hole diameter tolerance H8.

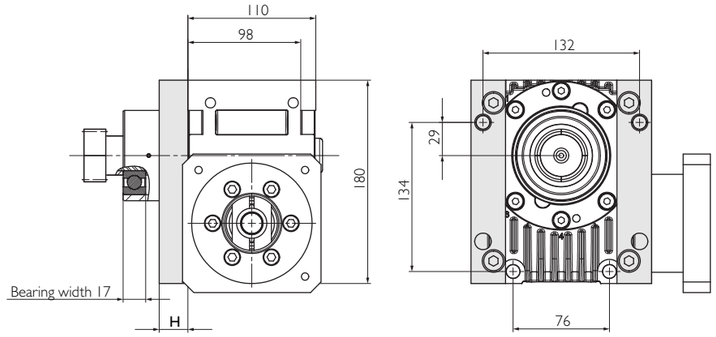
* **L3** for additional distance ring.



Helical modular pitch	Art. Nr.	m	z	A	b	B	D_a	D_0	D_1	L4	L5	L6
Pinion 1	211220	2	20	43.22	20	24	46.44	42.44	72	8	53	81
											58	86
											83	111
Pinion 2	211320	2.5	20	48.025	25	24	58.05	53.05	72	8	53	86
											58	91
											83	116
Pinion 3	211416	3	16	52.365	30	29	58.73	52.73	52.73	8	53	91
											58	96
											83	121

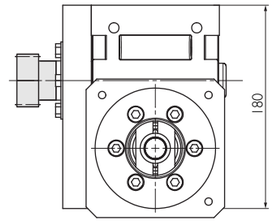
Straight modular pitch	Art. Nr.	m	z	A	b	B	D_a	D_0	D_1	L4	L5	L6
Pinion 4	201220	2	20	42.0	20	24	44.0	40.0	72	8	53	81
											58	86
											83	111
Pinion 5	201320	2.5	20	46.5	25	24	55.0	50.0	72	8	53	86
											58	91
											83	116
Pinion 6	201416	3	16	50.9	30	29	55.8	49.8	72	8	53	91
											58	96
											83	121

Spacer Elements

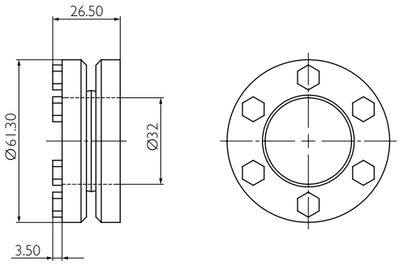


Casing can only be fastened with long screws as per the bore hole pattern.
Screws M10 of length 98mm + **H** + thread depth, tightening torque 42Nm.

with Pinion special solutions on request

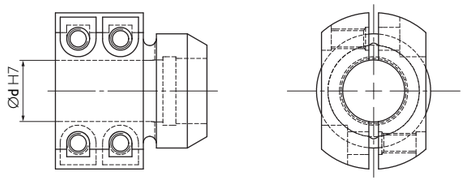


Shrink Disc



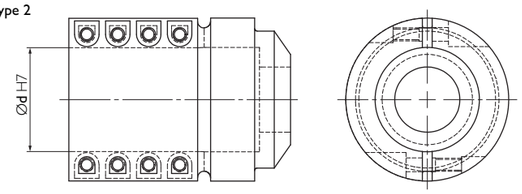
Coupling

Type 1



Motor shaft diameter [mm], 8 ≤ Ø**d** ≤ 24

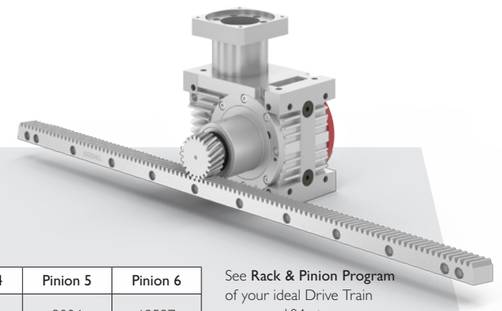
Type 2



Motor shaft diameter [mm], 25 ≤ Ø**d** ≤ 35

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	Pinion 6
Maximum acceleration force	F_N	[N]	7480	10363	13589	5958	9004	12597
Maximum acceleration torque	T_N	[Nm]	159	275	346	119	225	302

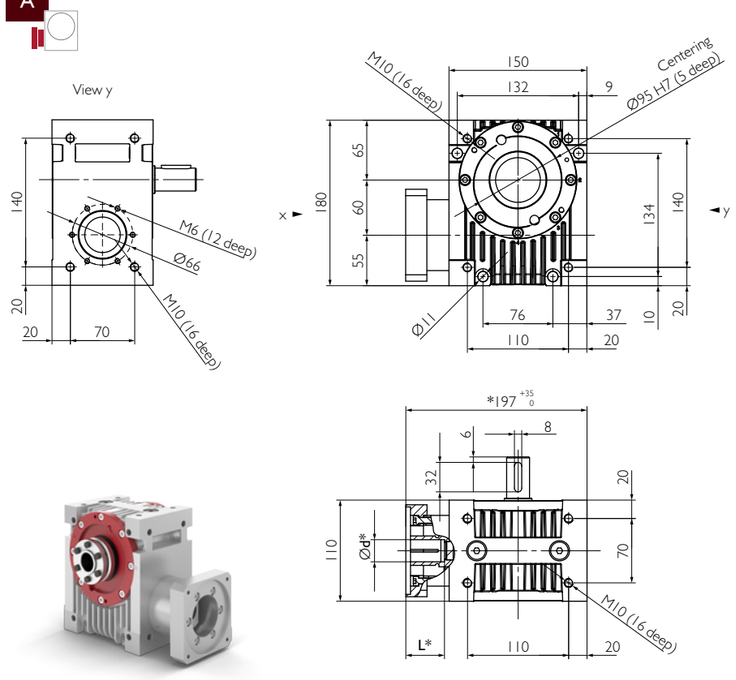
Higher value for rack and pinion taking account of the number of load cycles: 1×10^6 for the rack; 1×10^7 for the pinion. Both in cycle mode.

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.

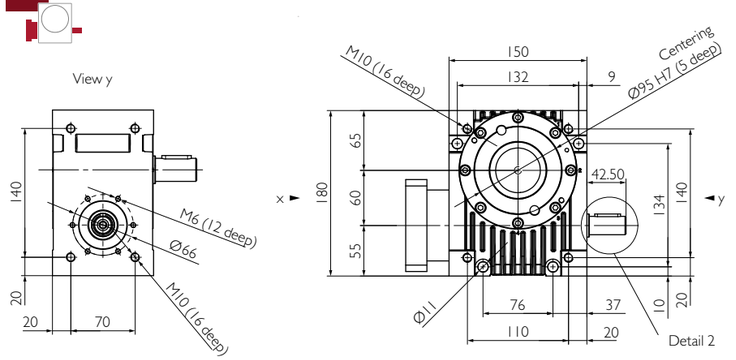
Input

A



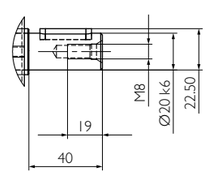
Example HPG 060 A6

B



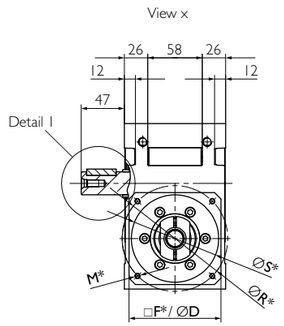
* Motor-specific gearbox dimensions
Ød: Ø motor shaft [mm], 4 ≤ **Ød** ≤ 19
L: Motor shaft length [mm], 20 ≤ **L** ≤ 33

Detail 2

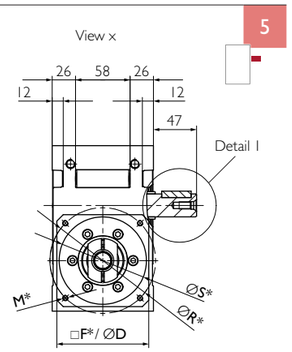


Output

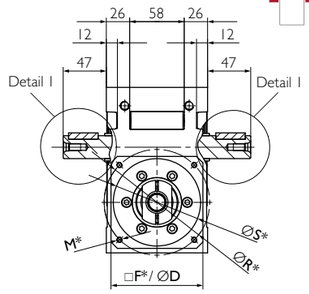
4



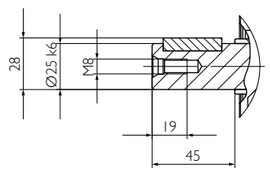
5



6



Detail I

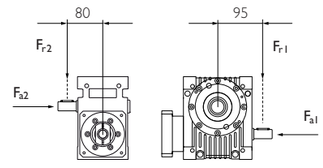


* Motor-specific gearbox dimensions
S: min. 32 [mm], **R**: Pitch circle Ø [mm], **M**: Bore hole Ø or thread [mm], □**F** / Ø**D**: Specify flange [mm]

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}	[Nm]	135	192	219	211	186	215	199	195	195	202	144	209	144
		η	[%]	89	89	88	88	87	84	82	78	74	67	64	54	50
	n_{1N} = 1000 rpm	T_{2N}	[Nm]	107	158	184	180	160	186	173	170	190	185	144	184	144
		η	[%]	90	90	90	89	88	86	84	81	77	70	65	56	53
	n_{1N} = 1500 rpm	T_{2N}	[Nm]	89	135	159	157	140	164	153	151	168	165	144	163	144
		η	[%]	90	91	90	89	89	86	84	81	78	70	65	56	52
	n_{1N} = 3000 rpm	T_{2N}	[Nm]	59	93	113	113	103	121	114	113	126	124	126	123	126
		η	[%]	90	90	90	89	88	86	83	80	77	69	64	55	50
	n_{1N} = 4500 rpm	T_{2N}	[Nm]	44	71	88	89	81	96	91	90	101	99	101	98	101
		η	[%]	89	89	89	88	87	84	82	78	75	67	61	52	47
	n_{1N} = 6000 rpm	T_{2N}	[Nm]	35	58	71	73	67	80	75	75	84	82	84	82	84
		η	[%]	88	88	88	87	85	83	80	75	72	64	58	48	44
Max. acceleration torque		T_{2B}	[Nm]	140	220									150	220	150
Emergency stop torque		T_{2Not}	[Nm]	300										200	300	200
Idling torque[a]		T_{012}	[Nm]	1.45			1.3				1.1					
Max. input speed		n_{1Max}	[rpm]	6000												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<13	<10	<9	<9	<8	<7					<6		
	PR	j_t	[arcmin]	<9	<7	<6	<6	<5	<4.5					<4		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[Nm/arcmin]	2.5	4.8	7.6	8.6	10	11	12.1	13.3	14.5	15.4	15	16	15
Stability at the output		C_{2K}	[Nm/arcmin]	42												
Max. axial force[c) d)] at the output		F_{a2max}	[N]	1300	1700	2600	3600	4400	4100	4500	5100	5300	6500	7300	7500	7500
Max. radial force[c) e)] at the output		F_{r2max}	[N]	1300	1500	2100	2500	2800	2400	2500	2600	2700	3100	3300	3300	3300
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	110	120	170	200	220	190	200	210	220	250	270	270	270
Max. axial force[c) d)] at the input		F_{a1max}	[N]	1700	990	750	1000	1400	1100	1400	1600	1200	1400	1300	1500	1300
Max. radial force[c) f)] at the input		F_{r1max}	[N]	690	510	390	520	720	560	710	760	610	650	620	690	630
Mass moment of inertia[g]	Type 1[h)]	J_1	[10^{-6} kg m^2]	550	304	218	178	157	135	125	117	114	110	109	108	108
	Type 2[i)]	J_1	[10^{-6} kg m^2]	760	515	428	389	367	345	335	328	325	321	320	319	318
Service life		L_h	[h]	25000												
Weight without motor components		m	[kg]	9												
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												

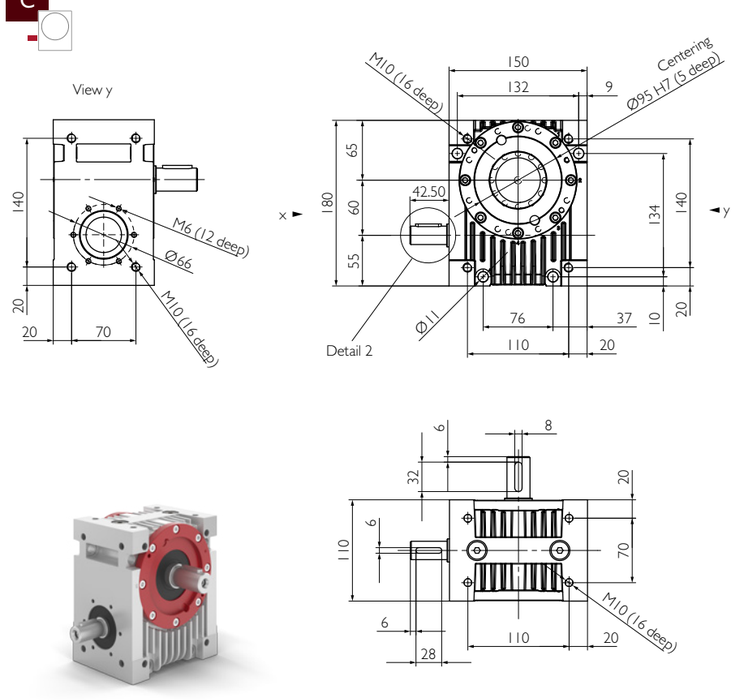
a) approximate, at n_1 = 3000 rpm and operating temperature.
b) Precision grade PS (standard backlash) for classic mechanical engineering applications.
Precision grade PR (reduced backlash) for precise process applications.
c) Bearing forces: Values valid at n_1 = 3000 rpm; ⅔ T_{2N} and duty cycle of 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 80 mm from the middle of the casing.
c) f) at a distance of 95 mm from the middle of the casing.
g) in relation to the input, including coupling.
g) h) Motor shaft diameter Ø**d** from Ø8 to Ø24, calculated at Ø19mm.
g) i) Motor shaft diameter Ø**d** from Ø25 to Ø35, calculated at Ø28mm.

Bearing forces



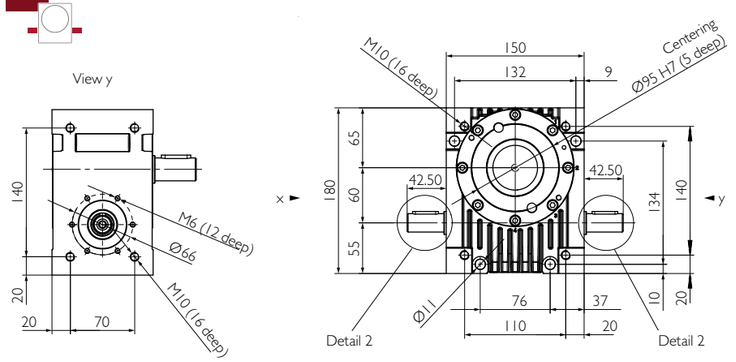
Input

C

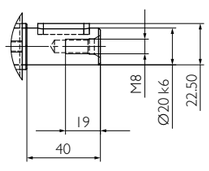


Example HPG 060 C5

D

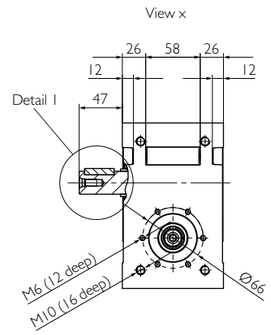


Detail 2

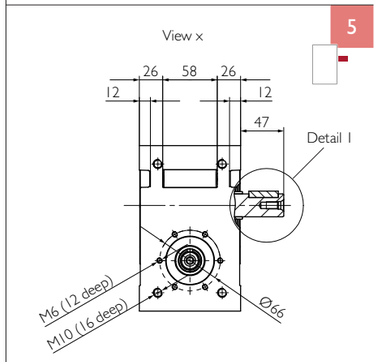


Output

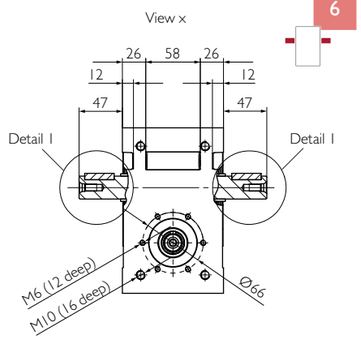
4



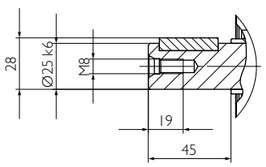
5



6



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]	135	192	219	211	186	215	199	195	195	202	144	209	144
		η	[%]	89	89	88	88	87	84	82	78	74	67	64	54	50
	n_{1N} = 1000 rpm	T_{2N}	[Nm]	107	158	184	180	160	186	173	170	190	185	144	184	144
		η	[%]	90	90	90	89	88	86	84	81	77	70	65	56	53
	n_{1N} = 1500 rpm	T_{2N}	[Nm]	89	135	159	157	140	164	153	151	168	165	144	163	144
		η	[%]	90	91	90	89	89	86	84	81	78	70	65	56	52
	n_{1N} = 3000 rpm	T_{2N}	[Nm]	59	93	113	113	103	121	114	113	126	124	126	123	126
		η	[%]	90	90	90	89	88	86	83	80	77	69	64	55	50
	n_{1N} = 4500 rpm	T_{2N}	[Nm]	44	71	88	89	81	96	91	90	101	99	101	98	101
		η	[%]	89	89	89	88	87	84	82	78	75	67	61	52	47
	n_{1N} = 6000 rpm	T_{2N}	[Nm]	35	58	71	73	67	80	75	75	84	82	84	82	84
		η	[%]	88	88	88	87	85	83	80	75	72	64	58	48	44
Max. acceleration torque		T_{2B}	[Nm]	140	220									150	220	150
Emergency stop torque		T_{2Not}	[Nm]	300										200	300	200
Idling torque[a]		T_{012}	[Nm]	1.45			1.3				1.1					
Max. input speed		n_{1Max}	[rpm]	6000												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<13	<10	<9	<9	<8	<7					<6		
	PR	j_t	[arcmin]	<9	<7	<6	<6	<5	<4.5					<4		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[Nm/arcmin]	2.5	4.8	7.6	8.6	10	11	12.1	13.3	14.5	15.4	15	16	15
Stability at the output		C_{2K}	[Nm/arcmin]	42												
Max. axial force[c)d)] at the output		F_{a2max}	[N]	1300	1700	2600	3600	4400	4100	4500	5100	5300	6500	7300	7500	7500
Max. radial force[c)e)] at the output		F_{r2max}	[N]	1300	1500	2100	2500	2800	2400	2500	2600	2700	3100	3300	3300	3300
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	110	120	170	200	220	190	200	210	220	250	270	270	270
Max. axial force[c)d)] at the input		F_{a1max}	[N]	1700	990	750	1000	1400	1100	1400	1600	1200	1400	1300	1500	1300
Max. radial force[c)f)] at the input		F_{r1max}	[N]	690	510	390	520	720	560	710	760	610	650	620	690	630
Mass moment of inertia[g]		J_1	[10^{-6} kg m^2]	467	221	135	95	74	52	42	34	31	27	26	25	25
Service life		L_h	[h]	25000												
Weight without motor components		m	[kg]	9												
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; ⅔ T_{2N} and duty cycle of 40%.
Consult with Güdel for composite bearing forces, axial and radial forces.

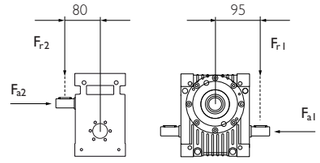
c) d) in relation to shaft center.

c) e) at a distance of 80 mm from the middle of the casing.

c) f) at a distance of 95 mm from the middle of the casing.

g) in relation to the input.

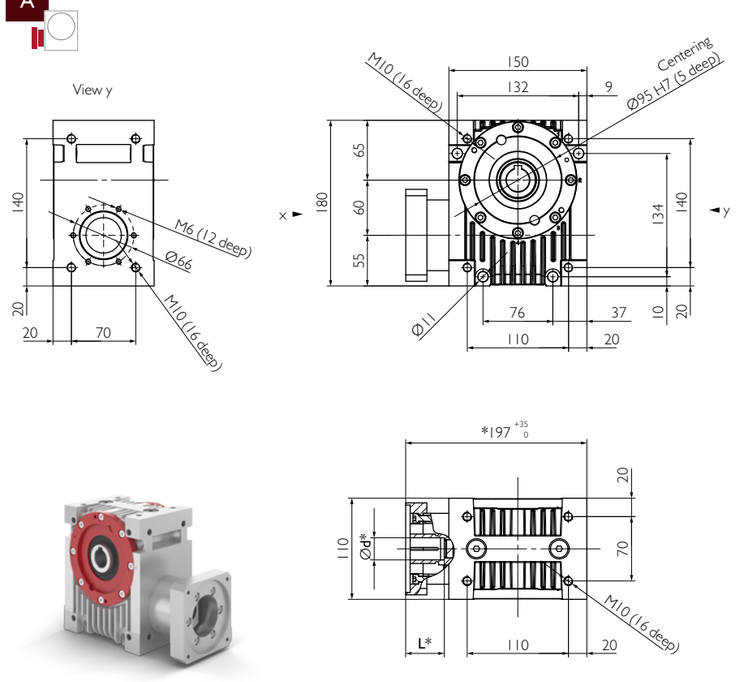
Bearing forces



at the output at the input

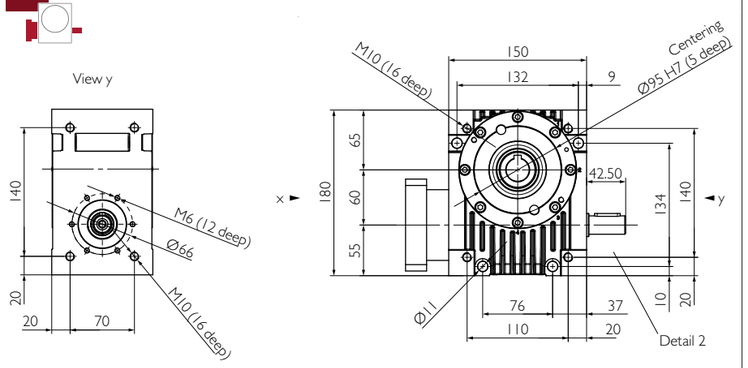
Input

A



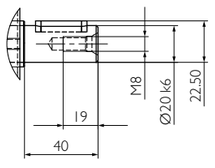
Example HPG 060 A7

B



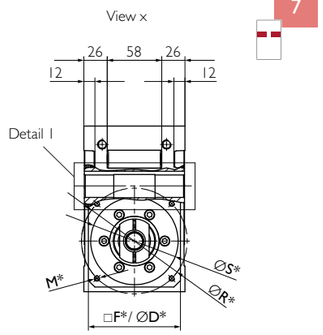
* Motor-specific gearbox dimensions
Ød: Ø motor shaft [mm], 8 ≤ **Ød** ≤ 35
L: Motor shaft length [mm], 25 ≤ **L** ≤ 66

Detail 2

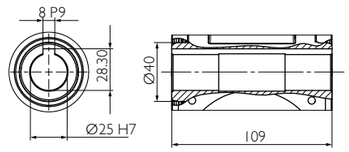


Output

7



Detail 1

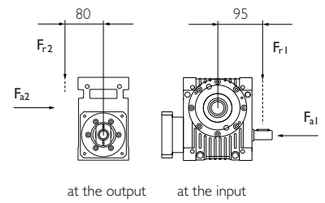


* Motor-specific gearbox dimensions
S: min. 54 [mm], **R**: Pitch circle Ø [mm], **M**: Bore hole Ø or thread [mm], □**F** / Ø**D**: Specify flange [mm]

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}	[Nm]	135	192	219	211	186	215	199	195	195	202	144	209	144
		η	[%]	89	89	88	88	87	84	82	78	74	67	64	54	50
	n_{1N} = 1000 rpm	T_{2N}	[Nm]	107	158	184	180	160	186	173	170	190	185	144	184	144
		η	[%]	90	90	90	89	88	86	84	81	77	70	65	56	53
	n_{1N} = 1500 rpm	T_{2N}	[Nm]	89	135	159	157	140	164	153	151	168	165	144	163	144
		η	[%]	90	91	90	89	89	86	84	81	78	70	65	56	52
	n_{1N} = 3000 rpm	T_{2N}	[Nm]	59	93	113	113	103	121	114	113	126	124	126	123	126
		η	[%]	90	90	90	89	88	86	83	80	77	69	64	55	50
	n_{1N} = 4500 rpm	T_{2N}	[Nm]	44	71	88	89	81	96	91	90	101	99	101	98	101
		η	[%]	89	89	89	88	87	84	82	78	75	67	61	52	47
	n_{1N} = 6000 rpm	T_{2N}	[Nm]	35	58	71	73	67	80	75	75	84	82	84	82	84
		η	[%]	88	88	88	87	85	83	80	75	72	64	58	48	44
Max. acceleration torque		T_{2B}	[Nm]	140	220									150	220	150
Emergency stop torque		T_{2Not}	[Nm]	300										200	300	200
Idling torque[a]		T_{012}	[Nm]	1.45			1.3				1.1					
Max. input speed		n_{1Max}	[rpm]	6000												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<13	<10	<9	<9	<8	<7					<6		
	PR	j_t	[arcmin]	<9	<7	<6	<6	<5	<4.5					<4		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[Nm/arcmin]	2.5	4.8	7.6	8.6	10	11	12.1	13.3	14.5	15.4	15	16	15
Stability at the output		C_{2K}	[Nm/arcmin]	42												
Max. axial force[c)d)] at the output		F_{a2max}	[N]	780	1100	1900	2800	3600	3300	3800	4300	4500	5600	6300	6400	6400
Max. radial force[c)e)] at the output		F_{r2max}	[N]	840	1200	1500	2200	2400	2000	2100	2300	2300	2700	2900	2900	2900
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	67	95	120	170	190	160	170	180	190	220	230	240	230
Max. axial force[c)d)] at the input		F_{a1max}	[N]	1700	990	750	1000	1400	1100	1400	1600	1200	1400	1300	1500	1300
Max. radial force[c)f)] at the input		F_{r1max}	[N]	690	510	390	520	720	560	710	760	610	650	620	690	630
Mass moment of inertia[g]	Type 1[h)]	J_1	[10^{-6} kg m^2]	499	282	205	170	151	132	123	116	114	110	109	108	108
	Type 2[i)]	J_1	[10^{-6}kg m^2]	710	492	416	380	361	342	333	327	324	320	320	318	318
Service life		L_h	[h]	25000												
Weight without motor components		m	[kg]	9												
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												

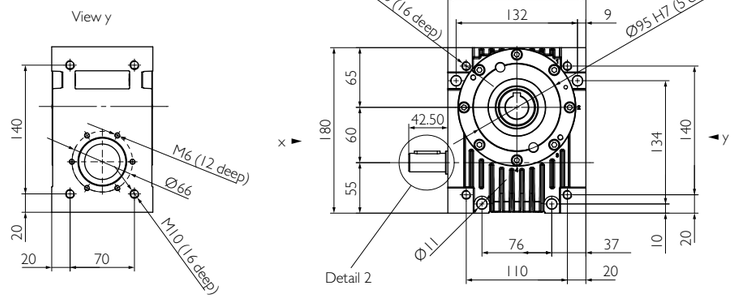
a) approximate, at n_1 = 3000 rpm and operating temperature.
b) Precision grade PS (standard backlash) for classic mechanical engineering applications.
Precision grade PR (reduced backlash) for precise process applications.
c) Bearing forces: Values valid at n_1 = 3000 rpm; ⅔ T_{2N} and duty cycle of 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 80 mm from the middle of the casing.
c) f) at a distance of 95 mm from the middle of the casing.
g) in relation to the input, including coupling.
g) h) Motor shaft diameter Ø**d** from Ø8 to Ø24, calculated at Ø19mm.
g) i) Motor shaft diameter Ø**d** from Ø25 to Ø35, calculated at Ø28mm.

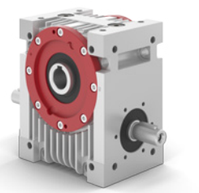
Bearing forces



Input

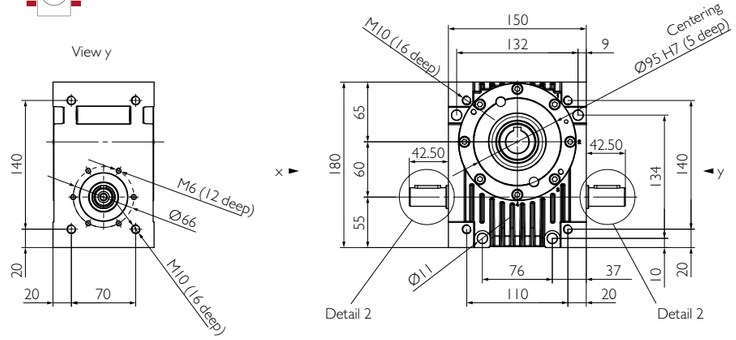
C



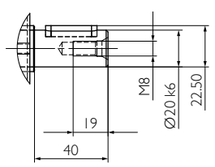


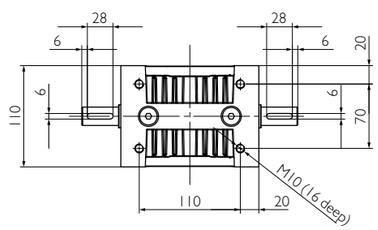
Example HPG 060 D7

D



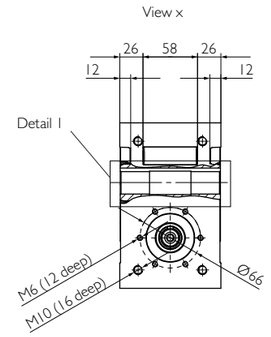
Detail 2



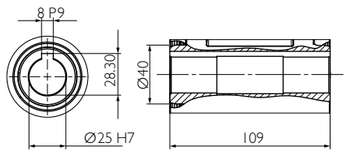


Output

7



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]	135	192	219	211	186	215	199	195	195	202	144	209	144
		η	[%]	89	89	88	88	87	84	82	78	74	67	64	54	50
	n_{1N} = 1000 rpm	T_{2N}	[Nm]	107	158	184	180	160	186	173	170	190	185	144	184	144
		η	[%]	90	90	90	89	88	86	84	81	77	70	65	56	53
	n_{1N} = 1500 rpm	T_{2N}	[Nm]	89	135	159	157	140	164	153	151	168	165	144	163	144
		η	[%]	90	91	90	89	89	86	84	81	78	70	65	56	52
	n_{1N} = 3000 rpm	T_{2N}	[Nm]	59	93	113	113	103	121	114	113	126	124	126	123	126
		η	[%]	90	90	90	89	88	86	83	80	77	69	64	55	50
	n_{1N} = 4500 rpm	T_{2N}	[Nm]	44	71	88	89	81	96	91	90	101	99	101	98	101
		η	[%]	89	89	89	88	87	84	82	78	75	67	61	52	47
	n_{1N} = 6000 rpm	T_{2N}	[Nm]	35	58	71	73	67	80	75	75	84	82	84	82	84
		η	[%]	88	88	88	87	85	83	80	75	72	64	58	48	44
Max. acceleration torque		T_{2B}	[Nm]	140	220									150	220	150
Emergency stop torque		T_{2Not}	[Nm]	300										200	300	200
Idling torque[a]		T_{012}	[Nm]	1.45			1.3				1.1					
Max. input speed		n_{1Max}	[rpm]	6000												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<13	<10	<9	<9	<8	<7					<6		
	PR	j_t	[arcmin]	<9	<7	<6	<6	<5	<4.5					<4		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[Nm/arcmin]	2.5	4.8	7.6	8.6	10	11	12.1	13.3	14.5	15.4	15	16	15
Stability at the output		C_{2K}	[Nm/arcmin]	42												
Max. axial force[c)d)] at the output		F_{a2max}	[N]	780	1100	1900	2800	3600	3300	3800	4300	4500	5600	6300	6400	6400
Max. radial force[c)e)] at the output		F_{r2max}	[N]	840	1200	1500	2200	2400	2000	2100	2300	2300	2700	2900	2900	2900
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	67	95	120	170	190	160	170	180	190	220	230	240	230
Max. axial force[c)d)] at the input		F_{a1max}	[N]	1700	990	750	1000	1400	1100	1400	1600	1200	1400	1300	1500	1300
Max. radial force[c)f)] at the input		F_{r1max}	[N]	690	510	390	520	720	560	710	760	610	650	620	690	630
Mass moment of inertia[g]		J_1	[10^{-6} kg m^2]	416	199	122	87	68	49	40	33	30	27	26	25	25
Service life		L_h	[h]	25000												
Weight without motor components		m	[kg]	8												
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; ⅔ T_{2N} and duty cycle of 40%.
Consult with Güdel for composite bearing forces, axial and radial forces.

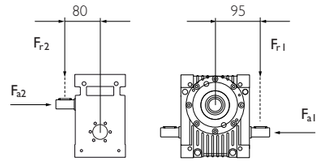
c) d) in relation to shaft center.

c) e) at a distance of 80 mm from the middle of the casing.

c) f) at a distance of 95 mm from the middle of the casing.

g) in relation to the input.

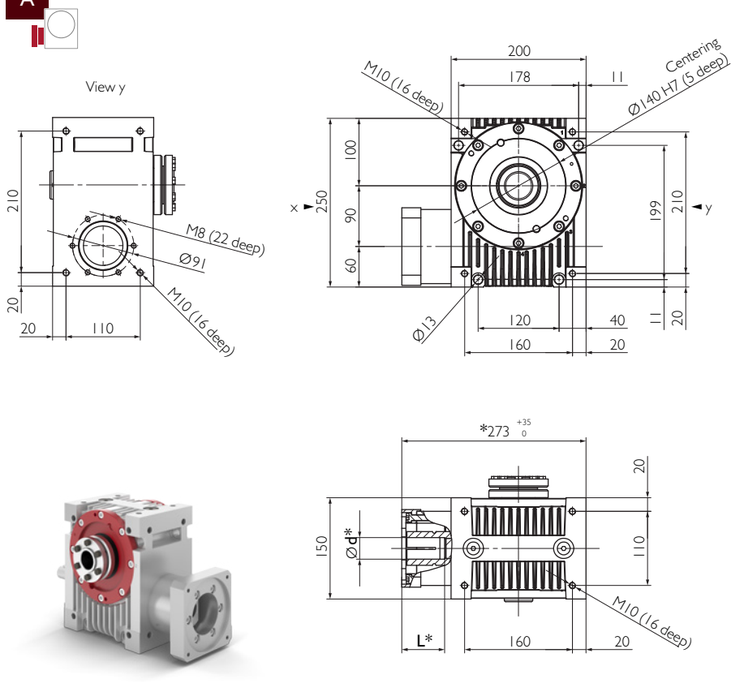
Bearing forces



at the output at the input

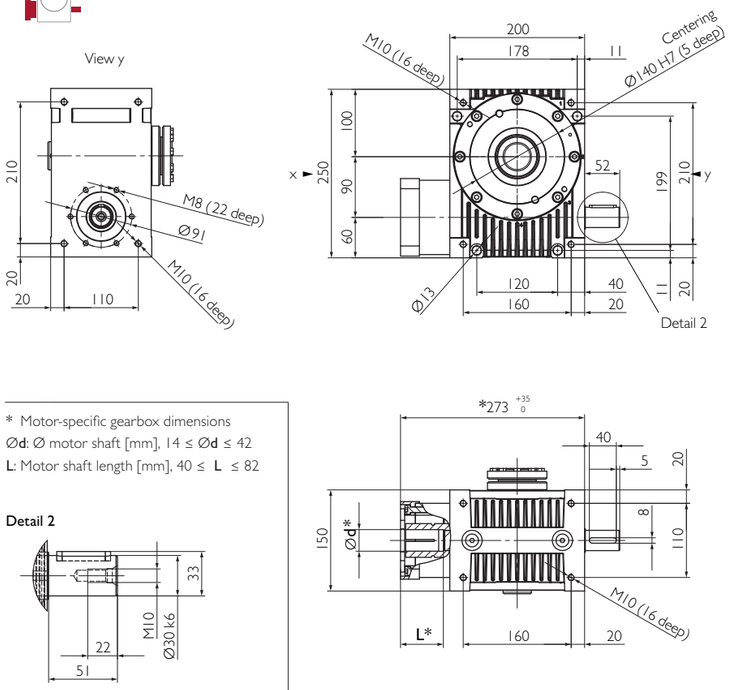
Input

A



Example HPG 090 B1

B

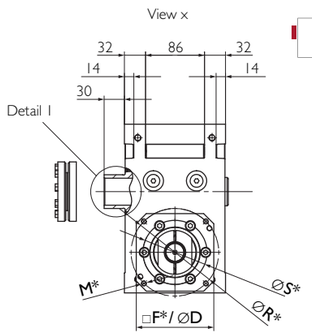


* Motor-specific gearbox dimensions
Ød: Ø motor shaft [mm], 14 ≤ **Ød** ≤ 42
L: Motor shaft length [mm], 40 ≤ **L** ≤ 82

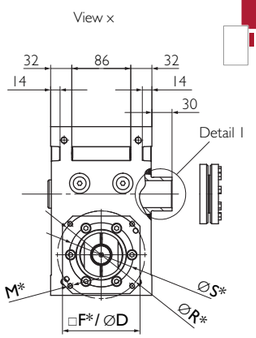
Detail 2

Output

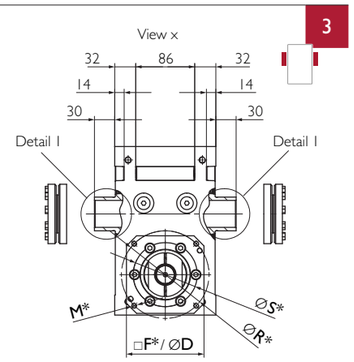
1



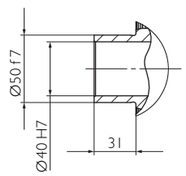
2



3



Detail 1



* Motor-specific gearbox dimensions
S: min. 75 [mm], **R**: Pitch circle Ø [mm], **M**: Bore hole Ø or thread [mm], □**F** / Ø**D**: 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}	[Nm]	469	679	784	761	674	782	726	712	700	727	527	752	527
		η	[%]	92	92	91	91	90	88	87	84	80	74	71	61	50
	n_{1N} = 1000 rpm	T_{2N}	[Nm]	350	528	624	615	551	644	601	592	660	645	527	640	527
		η	[%]	92	92	92	92	91	89	88	85	82	76	72	63	57
	n_{1N} = 1500 rpm	T_{2N}	[Nm]	279	432	518	516	466	547	513	507	565	553	527	550	527
		η	[%]	92	93	92	92	91	90	88	85	83	77	72	64	57
	n_{1N} = 3000 rpm	T_{2N}	[Nm]	174	279	343	348	318	377	356	354	395	388	396	386	396
		η	[%]	92	92	92	92	91	89	88	85	82	76	70	62	55
	n_{1N} = 4500 rpm	T_{2N}	[Nm]	126	206	257	262	241	288	273	272	303	298	305	297	305
		η	[%]	91	92	92	91	90	88	86	83	81	74	68	60	53
Max. acceleration torque		T_{2B}	[Nm]	470	790									530	790	530
Emergency stop torque		T_{2Not}	[Nm]	900										700	900	700
Idling torque[a]		T_{012}	[Nm]	2.8			2.5				2					
Max. input speed		n_{1Max}	[rpm]	4500												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<10	<8	<7	<7	<6	<6					<5		
	PR	j_t	[arcmin]	<6.5	<5	<4.5	<4	<4	<3.5					<3		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[Nm/arcmin]	5.5	10.8	15.9	18.3	20.8	23.3	25.8	28.3	31.3	33.2	32	35	32
Stability at the output		C_{2K}	[Nm/arcmin]	95												
Max. axial force[c)d)] at the output		F_{a2max}	[N]	6200	8200	7800	9200	11000	12000	14000	17000	18000	18000	18000	19000	19000
Max. radial force[c)e)] at the output		F_{r2max}	[N]	5300	6400	5500	5800	6500	6800	7500	8400	8600	8700	8800	8800	8800
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	590	700	600	640	710	750	830	920	940	960	970	970	970
Max. axial force[c)d)] at the input		F_{a1max}	[N]	3100	1600	1100	1700	2800	2000	2700	2900	2300	2500	2700	2600	2800
Max. radial force[c)f)] at the input		F_{r1max}	[N]	1500	910	640	990	1600	1200	1500	1700	1300	1400	1600	1500	1600
Mass moment of inertia[g]	Type 1[h]	J_1	[10^{-5} kg m^2]	383	206	144	116	100	85	78	72	70	67	67	66	65
	Type 2[i]	J_1	[10^{-5} kg m^2]	453	276	214	186	170	155	148	142	140	137	136	136	135
Service life		L_h	[h]	25000												
Weight without motor components		m	[kg]	25												
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														

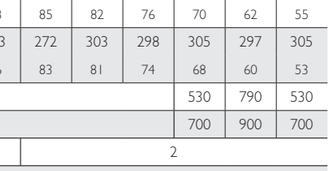
a) approximate, at n_1 = 3000 rpm and operating temperature.

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; ½ 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 110 mm from the middle of the casing.
c) f) at a distance of 125 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 115/i^2.
c) h) Motor shaft diameter **Ød** from Ø14 to Ø35, calculated at Ø24mm.
c) i) Motor shaft diameter **Ød** from Ø36 to Ø42, calculated at Ø38mm.

Bearing forces

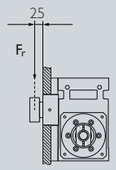


at the output at the input

Package

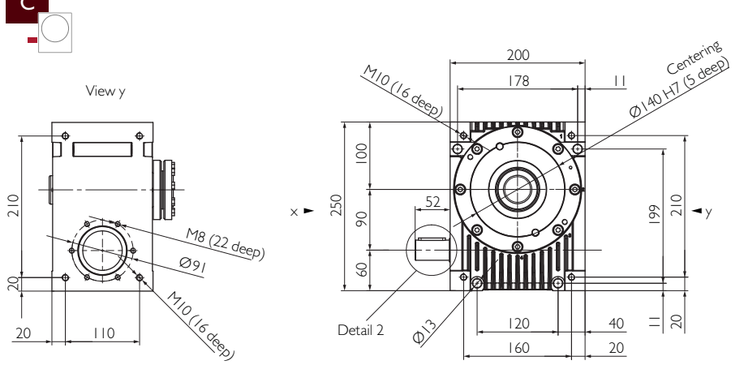
			Output Flange including Bearing & Pinion				
Radial rigidity	C_3	[N/mm]	45000				
Speed	n_{2N}	[rpm]	1500	750	400	150	100
Max. radial force[j]	F_{rmax}	[N]	4800	5900	7200	8800	9700

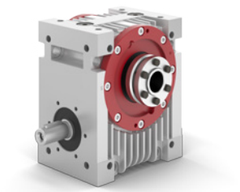
j) Bearing forces: Values valid at duty cycle of 40% at a distance of 25 mm from the end of the bearing.



Input

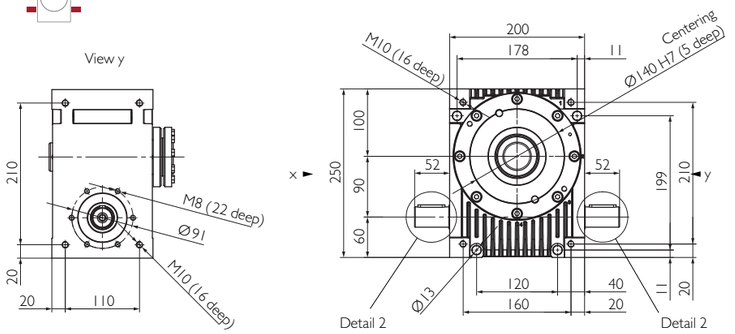
C

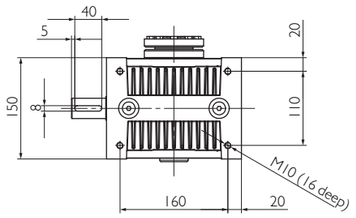


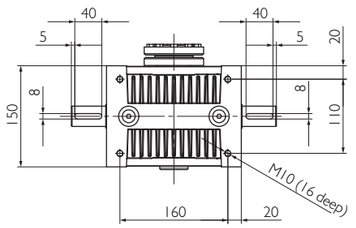


Example HPG 090 C2

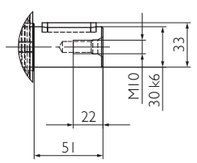
D





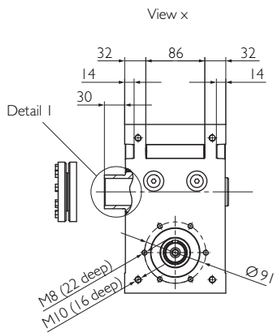


Detail 2

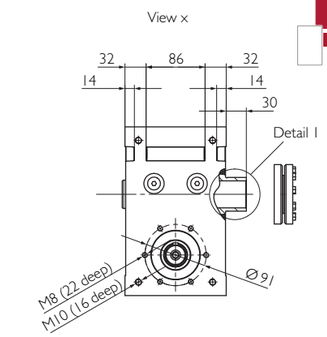


Output

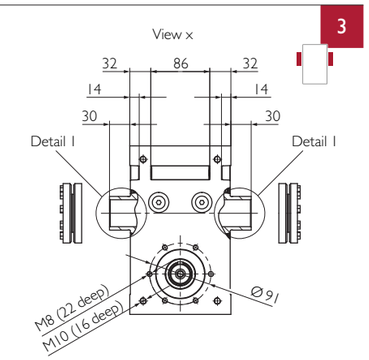
1



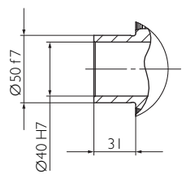
2



3



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]	469	679	784	761	674	782	726	712	700	727	527	752	527
		η	[%]	92	92	91	91	90	88	87	84	80	74	71	61	50
	n_{1N} = 1000 rpm	T_{2N}	[Nm]	350	528	624	615	551	644	601	592	660	645	527	640	527
		η	[%]	92	92	92	92	91	89	88	85	82	76	72	63	57
	n_{1N} = 1500 rpm	T_{2N}	[Nm]	279	432	518	516	466	547	513	507	565	553	527	550	527
		η	[%]	92	93	92	92	91	90	88	85	83	77	72	64	57
	n_{1N} = 3000 rpm	T_{2N}	[Nm]	174	279	343	348	318	377	356	354	395	388	396	386	396
		η	[%]	92	92	92	92	91	89	88	85	82	76	70	62	55
	n_{1N} = 4500 rpm	T_{2N}	[Nm]	126	206	257	262	241	288	273	272	303	298	305	297	305
		η	[%]	91	92	92	91	90	88	86	83	81	74	68	60	53
Max. acceleration torque		T_{2B}	[Nm]	470	790									530	790	530
Emergency stop torque		T_{2not}	[Nm]	900										700	900	700
Idling torque[a]		T_{012}	[Nm]	2.8			2.5				2					
Max. input speed		n_{1Max}	[rpm]	4500												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<10	<8	<7	<7	<6	<6					<5		
	PR	j_t	[arcmin]	<6.5	<5	<4.5	<4	<4	<3.5					<3		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[Nm/arcmin]	5.5	10.8	15.9	18.3	20.8	23.3	25.8	28.3	31.3	33.2	32	35	32
Stability at the output		C_{2K}	[Nm/arcmin]	95												
Max. axial force[c)d)] at the output		F_{a2max}	[N]	6200	8200	7800	9200	11000	12000	14000	17000	18000	18000	18000	19000	19000
Max. radial force[c)e)] at the output		F_{r2max}	[N]	5300	6400	5500	5800	6500	6800	7500	8400	8600	8700	8800	8800	8800
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	590	700	600	640	710	750	830	920	940	960	970	970	970
Max. axial force[c)d)] at the input		F_{a1max}	[N]	3100	1600	1100	1700	2800	2000	2700	2900	2300	2500	2700	2600	2800
Max. radial force[c)f)] at the input		F_{r1max}	[N]	1500	910	640	990	1600	1200	1500	1700	1300	1400	1600	1500	1600
Mass moment of inertia[g)]		J_1	[10^{-5} kg m^2]	336	160	98	70	54	39	32	26	24	21	20	19	19
Service life		L_h	[h]	25000												
Weight without motor components		m	[kg]	23												
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; ½ T_{2N} and duty cycle of 40%.
Consult with Güdel for composite bearing forces, axial and radial forces.

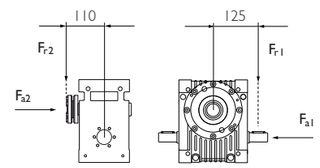
c) d) in relation to shaft center.

c) e) at a distance of 110 mm from the middle of the casing.

c) f) at a distance of 125 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 115/i^2.

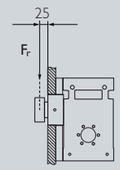
Bearing forces



Package

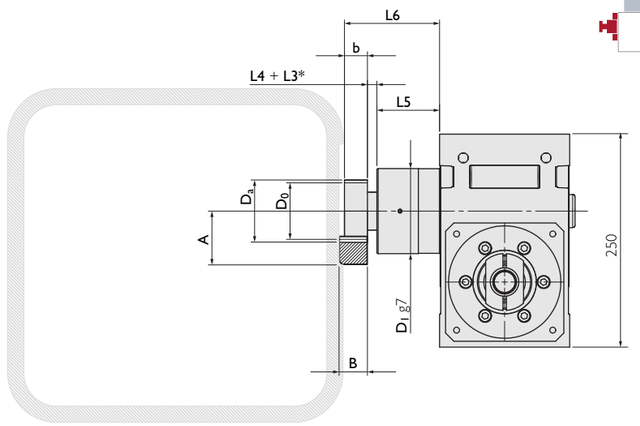
			Output Flange including Bearing & Pinion				
Radial rigidity	C_3	[N/mm]	45000				
Speed	n_{2N}	[rpm]	1500	750	400	150	100
Max. radial force[j)]	F_{rmax}	[N]	4800	5900	7200	8800	9700

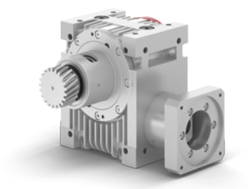
j) Bearing forces: Values valid at duty cycle of 40% at a distance of 25 mm from the end of the bearing.



Output Flange including Bearing & Pinion[a)]

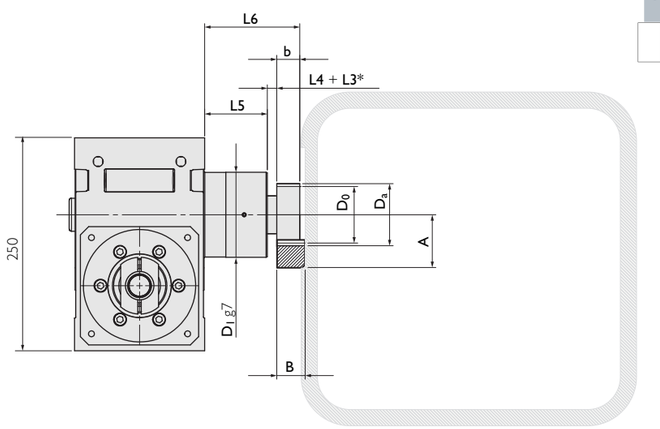
Package





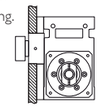
Example HPG 090 C1 Package

Package



a) Output flange in the area of the bearing is provided by the customer. Hole diameter tolerance H8.

* **L3** for additional distance ring.

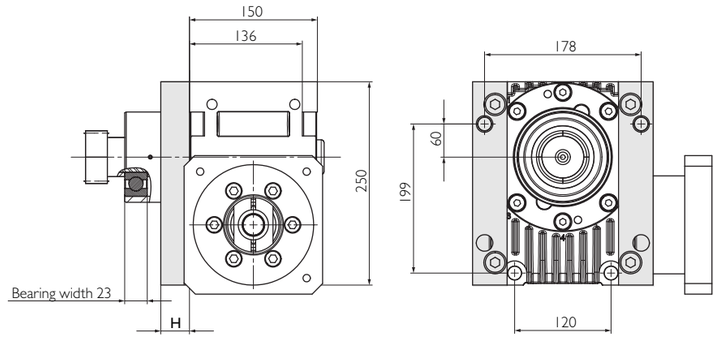


Geometric information

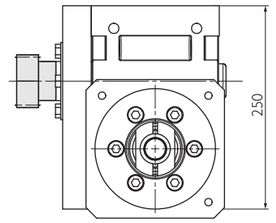
Helical modular pitch	Art. Nr.	m	z	A	b	B	D_a	D_0	D_1	L4	L5	L6
Pinion 1	211420	3	20	57.83	30	29	69.66	63.66	98	12.5	63	105.5
											104.5	147
Pinion 2	211520	4	20	77.44	40	39	92.88	84.88	98	18	63	121
											104.5	162.5

Straight modular pitch	Art. Nr.	m	z	A	b	B	D_a	D_0	D_1	L4	L5	L6
Pinion 3	201420	3	20	56.0	30	29	66.0	60.0	98	12.5	63	105.5
											104.5	147
Pinion 4	201520	4	20	75.0	40	39	88.0	80.0	98	18	63	121
											104.5	162.5

Spacer Elements

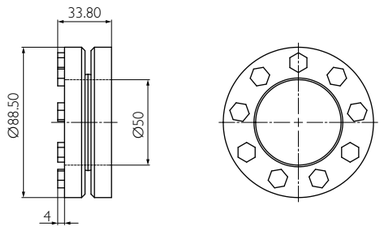


with Pinion special solutions on request



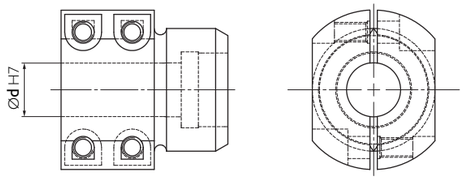
Casing can only be fastened with long screws as per the bore hole pattern.
Screws M12 of length 136mm + **H** + thread depth, tightening torque 50Nm.

Shrink Disc



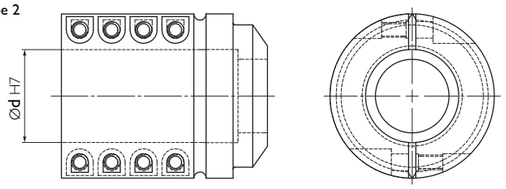
Coupling

Type 1



Motor shaft diameter [mm], 14 ≤ Ø**d** ≤ 35

Type 2



Motor shaft diameter [mm], 36 ≤ Ø**d** ≤ 42

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]	13700	25420	13697	24068
Maximum acceleration torque	T_N	[Nm]	436	1079	411	963

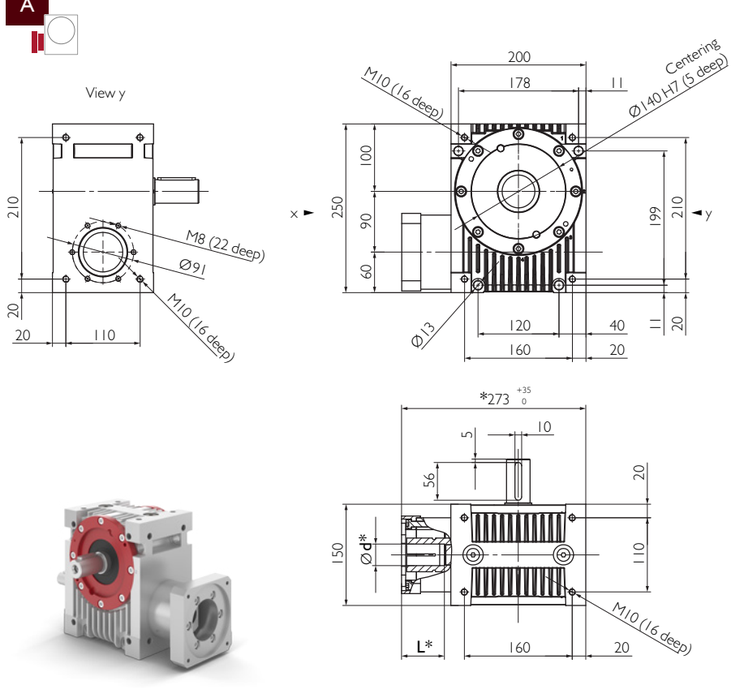
Higher value for rack and pinion taking account of the number of load cycles: 1×10^6 for the rack; 1×10^7 for the pinion. Both in cycle mode.

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.

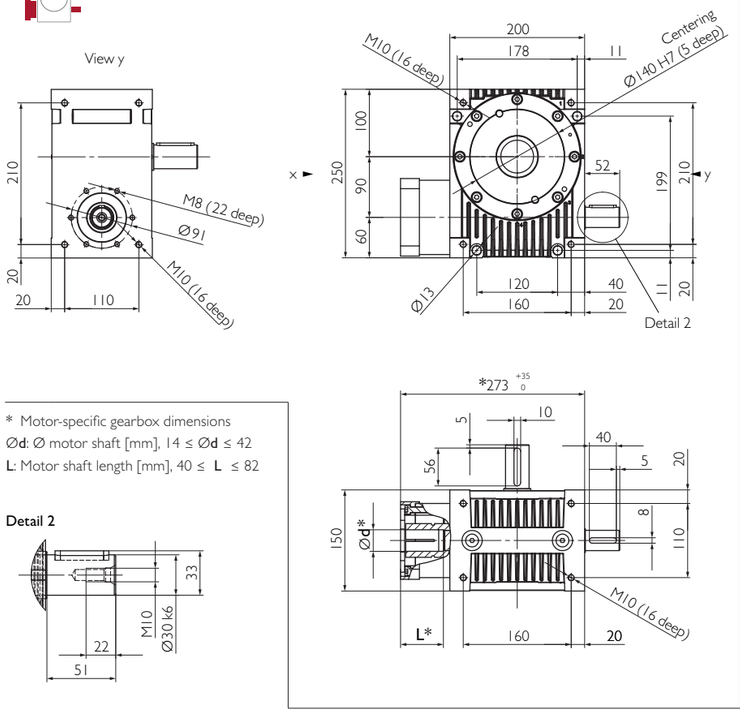
Input

A



Example HPG 090 B4

B

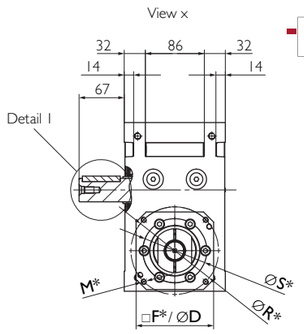


* Motor-specific gearbox dimensions
Ød: Ø motor shaft [mm], 14 ≤ **Ød** ≤ 42
L: Motor shaft length [mm], 40 ≤ **L** ≤ 82

Detail 2

Output

4



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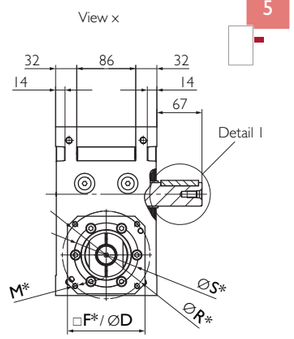

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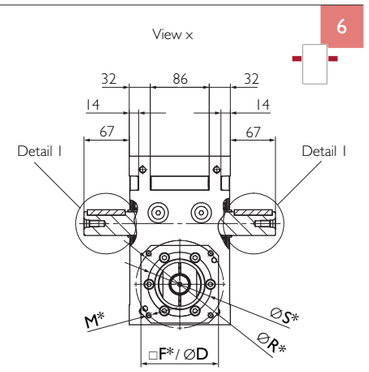
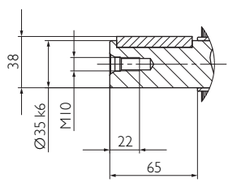


Detail 1



* Motor-specific gearbox dimensions
S: min. 75 [mm], **R**: Pitch circle Ø [mm], **M**: Bore hole Ø or thread [mm], □**F**/Ø**D**: 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}	[Nm]	469	679	784	761	674	782	726	712	700	727	527	752	527
		η	[%]	92	92	91	91	90	88	87	84	80	74	71	61	50
	n_{1N} = 1000 rpm	T_{2N}	[Nm]	350	528	624	615	551	644	601	592	660	645	527	640	527
		η	[%]	92	92	92	92	91	89	88	85	82	76	72	63	57
	n_{1N} = 1500 rpm	T_{2N}	[Nm]	279	432	518	516	466	547	513	507	565	553	527	550	527
		η	[%]	92	93	92	92	91	90	88	85	83	77	72	64	57
	n_{1N} = 3000 rpm	T_{2N}	[Nm]	174	279	343	348	318	377	356	354	395	388	396	386	396
		η	[%]	92	92	92	92	91	89	88	85	82	76	70	62	55
	n_{1N} = 4500 rpm	T_{2N}	[Nm]	126	206	257	262	241	288	273	272	303	298	305	297	305
		η	[%]	91	92	92	91	90	88	86	83	81	74	68	60	53
Max. acceleration torque		T_{2B}	[Nm]	470	790									530	790	530
Emergency stop torque		T_{2Not}	[Nm]	900										700	900	700
Idling torque[a]		T_{012}	[Nm]	2.8			2.5				2					
Max. input speed		n_{1Max}	[rpm]	4500												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<10	<8	<7	<7	<6	<6					<5		
	PR	j_t	[arcmin]	<6.5	<5	<4.5	<4	<4	<3.5					<3		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[Nm/arcmin]	5.5	10.8	15.9	18.3	20.8	23.3	25.8	28.3	31.3	33.2	32	35	32
Stability at the output		C_{2K}	[Nm/arcmin]	73												
Max. axial force[c)d)] at the output		F_{a2max}	[N]	820	1400	1400	2800	4400	5000	6600	8300	8100	8700	9100	9200	9400
Max. radial force[c)e)] at the output		F_{r2max}	[N]	800	930	1000	1400	3000	3100	3700	4200	4300	4400	4500	4500	4600
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	88	100	110	160	330	350	400	460	470	490	500	500	500
Max. axial force[c)d)] at the input		F_{a1max}	[N]	3100	1600	1100	1700	2800	2000	2700	2900	2300	2500	2700	2600	2800
Max. radial force[c)f)] at the input		F_{r1max}	[N]	1500	910	640	990	1600	1200	1500	1700	1300	1400	1600	1500	1600
Mass moment of inertia[g]	Type 1[h]	J_1	[10^{-5} kg m^2]	383	206	144	116	100	85	78	72	70	67	67	66	65
	Type 2[i]	J_1	[10^{-5} kg m^2]	453	276	214	186	170	155	148	142	140	137	136	136	135
Service life		L_h	[h]	25000												
Weight without motor components		m	[kg]	25												
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												

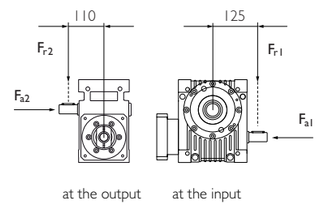
a) approximate, at n_1 = 3000 rpm and operating temperature.

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; ½ 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 110 mm from the middle of the casing.
c) f) at a distance of 125 mm from the middle of the casing.

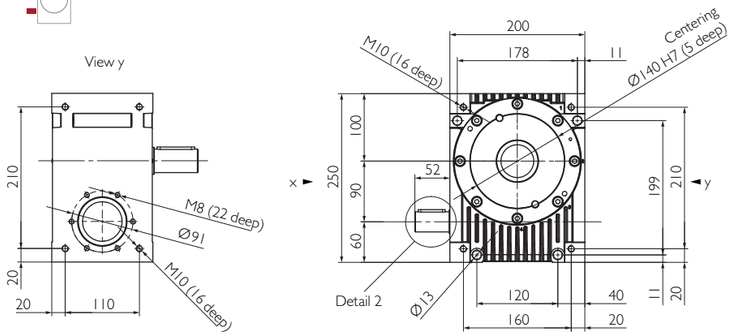
g) in relation to the input, including coupling.
g) h) Motor shaft diameter Ød from Ø14 to Ø35, calculated at Ø24mm.
g) i) Motor shaft diameter Ød from Ø36 to Ø42, calculated at Ø38mm.

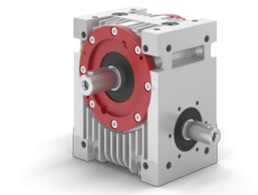
Bearing forces



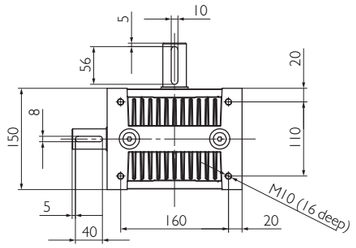
Input

C

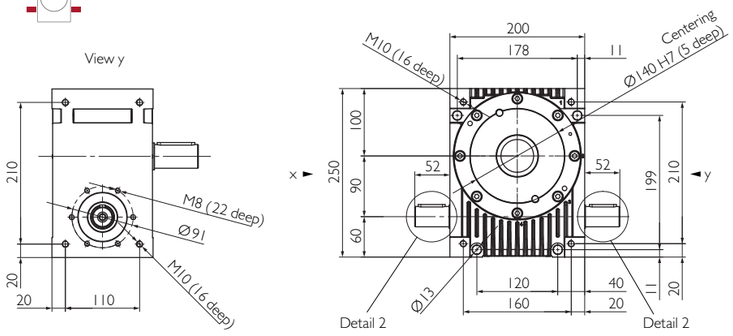


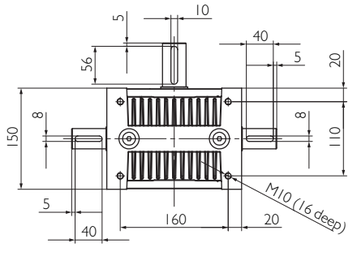


Example HPG 090 C4

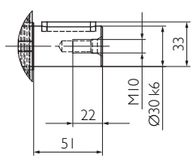


D



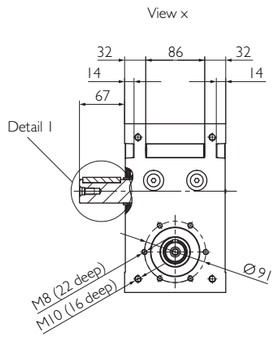


Detail 2



Output

4



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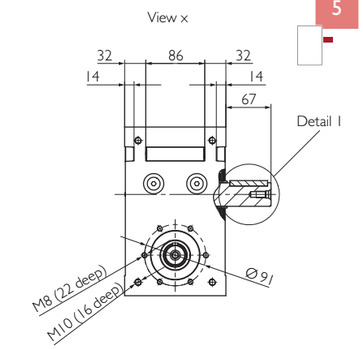

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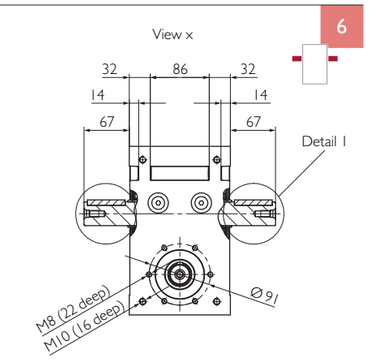
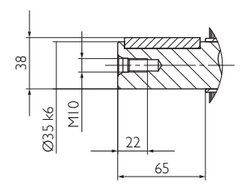


Detail 1



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]	469	679	784	761	674	782	726	712	700	727	527	752	527
		η	[%]	92	92	91	91	90	88	87	84	80	74	71	61	50
	n_{1N} = 1000 rpm	T_{2N}	[Nm]	350	528	624	615	551	644	601	592	660	645	527	640	527
		η	[%]	92	92	92	92	91	89	88	85	82	76	72	63	57
	n_{1N} = 1500 rpm	T_{2N}	[Nm]	279	432	518	516	466	547	513	507	565	553	527	550	527
		η	[%]	92	93	92	92	91	90	88	85	83	77	72	64	57
	n_{1N} = 3000 rpm	T_{2N}	[Nm]	174	279	343	348	318	377	356	354	395	388	396	386	396
		η	[%]	92	92	92	92	91	89	88	85	82	76	70	62	55
	n_{1N} = 4500 rpm	T_{2N}	[Nm]	126	206	257	262	241	288	273	272	303	298	305	297	305
		η	[%]	91	92	92	91	90	88	86	83	81	74	68	60	53
Max. acceleration torque		T_{2B}	[Nm]	470	790									530	790	530
Emergency stop torque		T_{2Not}	[Nm]	900										700	900	700
Idling torque[a]		T_{012}	[Nm]	2.8			2.5				2					
Max. input speed		n_{1Max}	[rpm]	4500												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<10	<8	<7	<7	<6	<6					<5		
	PR	j_t	[arcmin]	<6.5	<5	<4.5	<4	<4	<3.5					<3		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[Nm/arcmin]	5.5	10.8	15.9	18.3	20.8	23.3	25.8	28.3	31.3	33.2	32	35	32
Stability at the output		C_{2K}	[Nm/arcmin]	73												
Max. axial force[c)d)] at the output		F_{a2max}	[N]	820	1400	1400	2800	4400	5000	6600	8300	8100	8700	9100	9200	9400
Max. radial force[c)e)] at the output		F_{r2max}	[N]	800	930	1000	1400	3000	3100	3700	4200	4300	4400	4500	4500	4600
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	88	100	110	160	330	350	400	460	470	490	500	500	500
Max. axial force[c)d)] at the input		F_{a1max}	[N]	3100	1600	1100	1700	2800	2000	2700	2900	2300	2500	2700	2600	2800
Max. radial force[c)f)] at the input		F_{r1max}	[N]	1500	910	640	990	1600	1200	1500	1700	1300	1400	1600	1500	1600
Mass moment of inertia[g]		J_1	[10^{-5} kg m^2]	336	160	98	70	54	39	32	26	24	21	20	19	19
Service life		L_h	[h]	25000												
Weight without motor components		m	[kg]	22												
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; ½ T_{2N} and duty cycle of 40%.
Consult with Güdel for composite bearing forces, axial and radial forces.

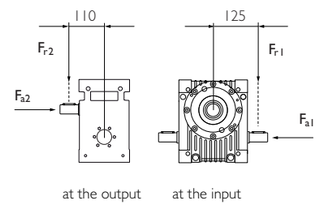
c) d) in relation to shaft center.

c) e) at a distance of 110 mm from the middle of the casing.

c) f) at a distance of 125 mm from the middle of the casing.

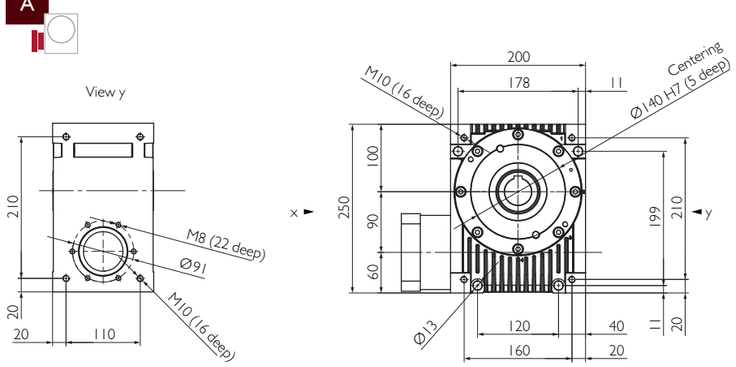
g) in relation to the input.

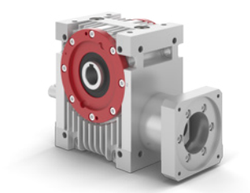
Bearing forces

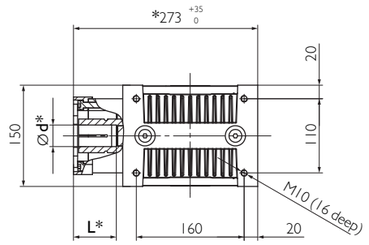


Input

A

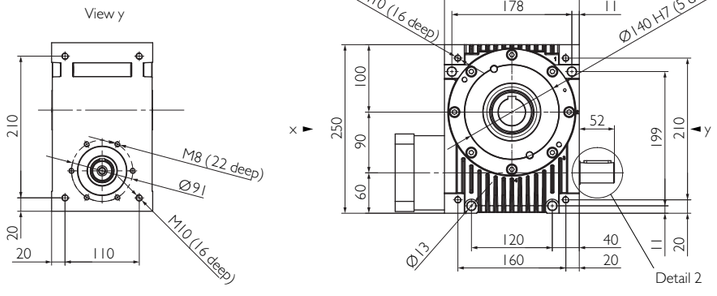


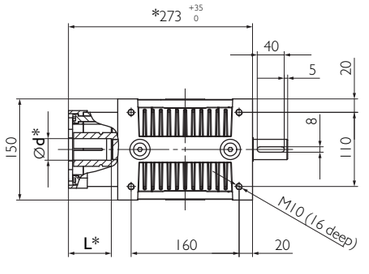




Example HPG 090 B7

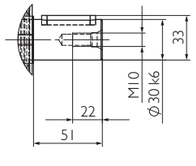
B





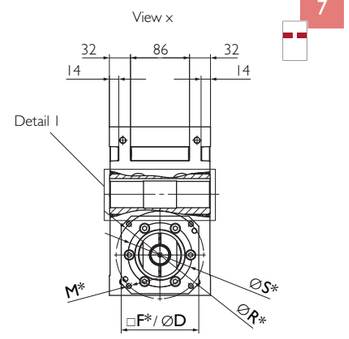
* Motor-specific gearbox dimensions
Ød: Ø motor shaft [mm], 14 ≤ **Ød** ≤ 42
L: Motor shaft length [mm], 40 ≤ **L** ≤ 82

Detail 2

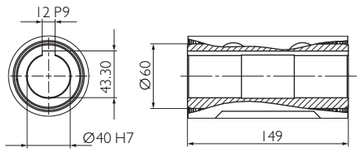


Output

7



Detail 1

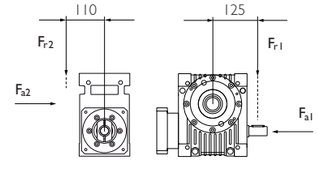


* Motor-specific gearbox dimensions
S: min. 75 [mm], **R:** Pitch circle Ø [mm], **M:** Bore hole Ø or thread [mm], □**F**/Ø**D:** Specify flange [mm]

Ratio	i			2	3	4	5	6	8	10	13.33	16	24	30	47	60
Nominal torque at the output / Efficiency	n_{1N} = 500rpm	T_{2N}	[Nm]	469	679	784	761	674	782	726	712	700	727	527	752	527
		η	[%]	92	92	91	91	90	88	87	84	80	74	71	61	50
	n_{1N} = 1000rpm	T_{2N}	[Nm]	350	528	624	615	551	644	601	592	660	645	527	640	527
		η	[%]	92	92	92	92	91	89	88	85	82	76	72	63	57
	n_{1N} =1500rpm	T_{2N}	[Nm]	279	432	518	516	466	547	513	507	565	553	527	550	527
		η	[%]	92	93	92	92	91	90	88	85	83	77	72	64	57
	n_{1N} = 3000rpm	T_{2N}	[Nm]	174	279	343	348	318	377	356	354	395	388	396	386	396
		η	[%]	92	92	92	92	91	89	88	85	82	76	70	62	55
	n_{1N} = 4500rpm	T_{2N}	[Nm]	126	206	257	262	241	288	273	272	303	298	305	297	305
		η	[%]	91	92	92	91	90	88	86	83	81	74	68	60	53
Max. acceleration torque		T_{2B}	[Nm]	470	790									530	790	530
Emergency stop torque		T_{2Not}	[Nm]	900										700	900	700
Idling torque[a]		T_{012}	[Nm]	2.8			2.5				2					
Max. input speed		n_{1Max}	[rpm]	4500												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<10	<8	<7	<7	<6	<6					<5		
	PR	j_t	[arcmin]	<6.5	<5	<4.5	<4	<4	<3.5					<3		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[Nm/arcmin]	5.5	10.8	15.9	18.3	20.8	23.3	25.8	28.3	31.3	33.2	32	35	32
Stability at the output		C_{2K}	[Nm/arcmin]	95												
Max. axial force[c)d)] at the output		F_{a2max}	[N]	6200	8200	7800	9200	11000	12000	14000	17000	18000	18000	18000	19000	19000
Max. radial force[c)e)] at the output		F_{r2max}	[N]	5300	6400	5500	5800	6500	6800	7500	8400	8600	8700	8800	8800	8800
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	590	700	600	640	710	750	830	920	940	960	970	970	970
Max. axial force[c)d)] at the input		F_{a1max}	[N]	3100	1600	1100	1700	2800	2000	2700	2900	2300	2500	2700	2600	2800
Max. radial force[c)f)] at the input		F_{r1max}	[N]	1500	910	640	990	1600	1200	1500	1700	1300	1400	1600	1500	1600
Mass moment of inertia[g]	Type 1[h)]	J_1	[10^{-5} kg m^2]	354	193	137	111	97	83	77	72	70	67	66	66	65
	Type 2[i)]	J_1	[10^{-5} kg m^2]	424	263	207	181	167	153	147	142	140	137	136	136	135
Service life		L_h	[h]	25000												
Weight without motor components		m	[kg]	25												
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												

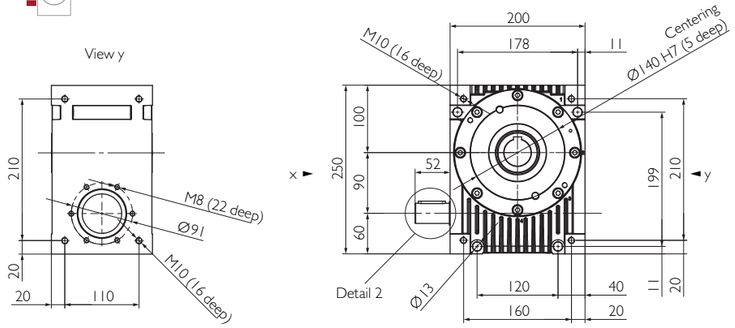
a) approximate, at n_1 = 3000rpm and operating temperature.
b) Precision grade PS (standard backlash) for classic mechanical engineering applications.
Precision grade PR (reduced backlash) for precise process applications.
c) Bearing forces: Values valid at n_1 = 1500rpm; ½ T_{2N} and duty cycle of 40%.
Consult with Güdel for composite bearing forces, axial and radial forces.
c) d) in relation to shaft center.
c) e) at a distance of 110 mm from the middle of the casing.
c) f) at a distance of 125 mm from the middle of the casing.
g) in relation to the input, including coupling.
c) h) Motor shaft diameter Ød from Ø14 to Ø35, calculated at Ø24mm.
c) i) Motor shaft diameter Ød from Ø36 to Ø42, calculated at Ø38mm.

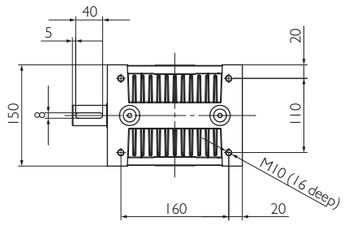
Bearing forces

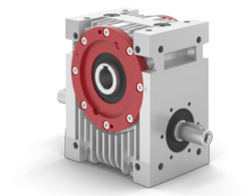


Input

C

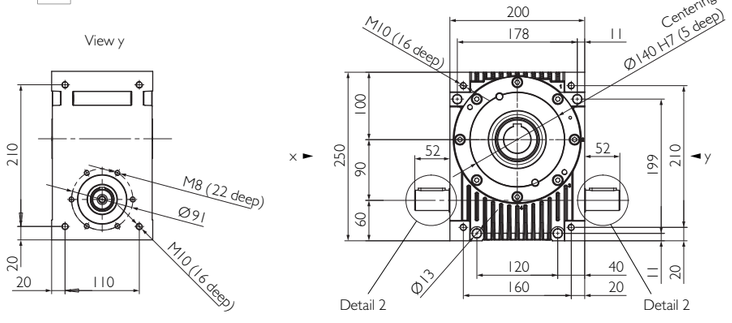


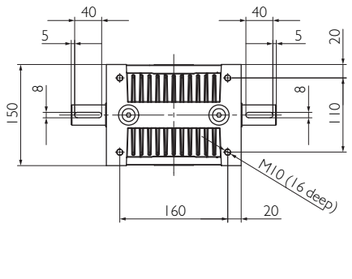




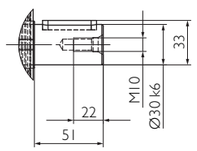
Example HPG 090 D7

D



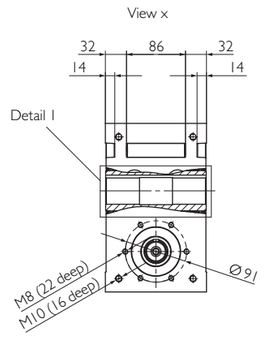


Detail 2

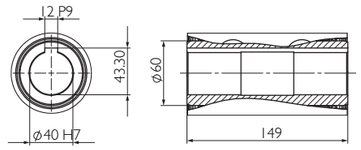


Output

7



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} = 500rpm	T_{2N}	[Nm]	469	679	784	761	674	782	726	712	700	727	527	752	527
		η	[%]	92	92	91	91	90	88	87	84	80	74	71	61	50
	n_{1N} = 1000rpm	T_{2N}	[Nm]	350	528	624	615	551	644	601	592	660	645	527	640	527
		η	[%]	92	92	92	92	91	89	88	85	82	76	72	63	57
	n_{1N} =1500rpm	T_{2N}	[Nm]	279	432	518	516	466	547	513	507	565	553	527	550	527
		η	[%]	92	93	92	92	91	90	88	85	83	77	72	64	57
	n_{1N} = 3000rpm	T_{2N}	[Nm]	174	279	343	348	318	377	356	354	395	388	396	386	396
		η	[%]	92	92	92	92	91	89	88	85	82	76	70	62	55
	n_{1N} = 4500rpm	T_{2N}	[Nm]	126	206	257	262	241	288	273	272	303	298	305	297	305
		η	[%]	91	92	92	91	90	88	86	83	81	74	68	60	53
Max. acceleration torque		T_{2B}	[Nm]	470	790									530	790	530
Emergency stop torque		T_{2not}	[Nm]	900										700	900	700
Idling torque[a]		T_{012}	[Nm]	2.8			2.5				2					
Max. input speed		n_{1Max}	[rpm]	4500												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<10	<8	<7	<7	<6	<6					<5		
	PR	j_t	[arcmin]	<6.5	<5	<4.5	<4	<4	<3.5					<3		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[Nm/arcmin]	5.5	10.8	15.9	18.3	20.8	23.3	25.8	28.3	31.3	33.2	32	35	32
Stability at the output		C_{2K}	[Nm/arcmin]	95												
Max. axial force[c)d)] at the output		F_{a2max}	[N]	6200	8200	7800	9200	11000	12000	14000	17000	18000	18000	18000	19000	19000
Max. radial force[c)e)] at the output		F_{r2max}	[N]	5300	6400	5500	5800	6500	6800	7500	8400	8600	8700	8800	8800	8800
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	590	700	600	640	710	750	830	920	940	960	970	970	970
Max. axial force[c)d)] at the input		F_{a1max}	[N]	3100	1600	1100	1700	2800	2000	2700	2900	2300	2500	2700	2600	2800
Max. radial force[c)f)] at the input		F_{r1max}	[N]	1500	910	640	990	1600	1200	1500	1700	1300	1400	1600	1500	1600
Mass moment of inertia[g)]		J_1	[10^{-5} kg m^2]	308	147	91	65	51	37	30	25	23	21	20	19	19
Service life		L_h	[h]	25000												
Weight without motor components		m	[kg]	22												
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														

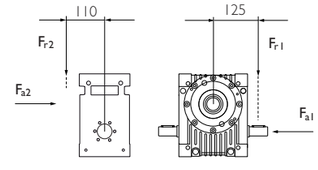
a) approximate, at n_1 = 3000rpm and operating temperature.

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 = 1500rpm; ½ 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 110 mm from the middle of the casing.
c) f) at a distance of 125 mm from the middle of the casing.

g) in relation to the input.

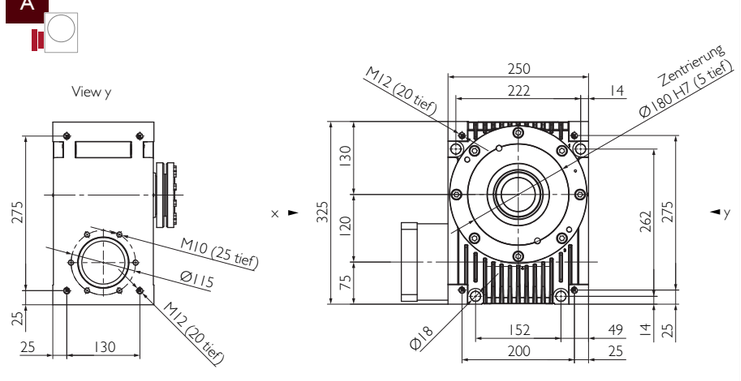
Bearing forces

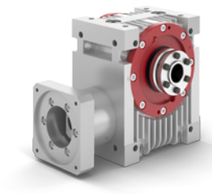


at the output at the input

Input

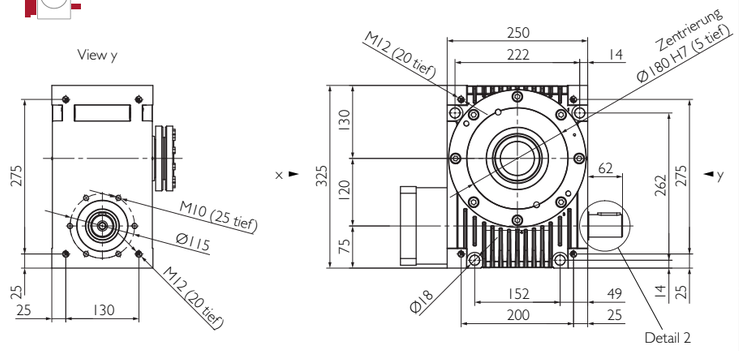
A





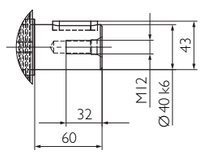
Example HPG 120 A2

B



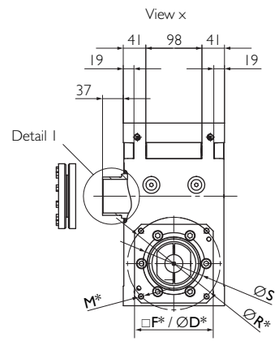
* Motor-specific gearbox dimensions
Ød: Ø motor shaft [mm], 19 ≤ **Ød** ≤ 50
L: Motor shaft length [mm], 35 ≤ **L** ≤ 112

Detail 2

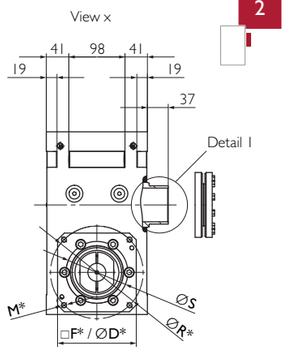


Output

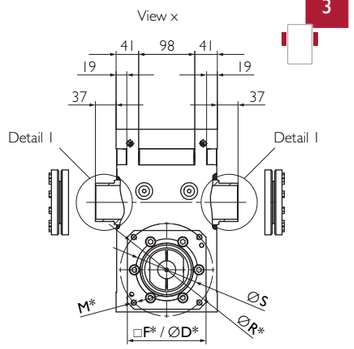
1



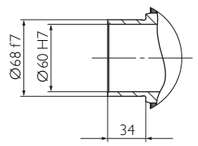
2



3



Detail I



* Motor-specific gearbox dimensions
S: min. 95 [mm], **R**: Pitch circle Ø [mm], **M**: Bore hole Ø or thread [mm], □**F**/Ø**D**: 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} = 500rpm	T_{2N}	[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_{1N} = 1000rpm	T_{2N}	[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_{1N} =1500rpm	T_{2N}	[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_{1N} = 3000rpm	T_{2N}	[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_{1N} = 4500rpm	T_{2N}	[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_{2B}	[Nm]	1200	2040									1400	2040	1400
Emergency stop torque		T_{2Not}	[Nm]	2300										1600	2300	1600
Idling torque[a]		T_{012}	[Nm]	4.5			4				3					
Max. input speed		n_{1Max}	[rpm]	4500												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<8	<7	<6	<6	<5	<5					<4		
	PR	j_t	[arcmin]	<5.5	<4.5	<4	<3.5	<3	<3					<2.5		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[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_{2K}	[Nm/arcmin]	165												
Max. axial force[c) d)] at the output		F_{a2max}	[N]	7000	9600	9500	12000	16000	17000	21000	25000	26000	27000	27000	27000	28000
Max. radial force[c) e)] at the output		F_{r2max}	[N]	7700	8100	7300	8800	9900	10000	12000	13000	13000	14000	14000	14000	14000
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	1000	1100	980	1200	1300	1400	1600	1800	1800	1800	1800	1900	1900
Max. axial force[c) d)] at the input		F_{a1max}	[N]	3600	1800	730	1700	3600	2100	3300	3700	2500	2900	2700	3100	2700
Max. radial force[c) f)] at the input		F_{r1max}	[N]	1900	950	390	930	1900	1200	1800	2000	1300	1600	1400	1700	1500
Mass moment of inertia[g]	Type 1[h]	J_1	[10^{-5} kg m^2]	1473	741	485	366	302	237	208	185	176	164	161	157	157
	Type 2[i]	J_1	[10^{-5} kg m^2]	1596	864	607	489	424	360	331	308	298	287	284	280	279
Service life		L_h	[h]	25000												
Weight without motor components		m	[kg]	52												
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														

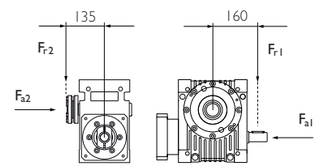
a) approximate, at n_1 = 3000rpm and operating temperature.

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 = 1500rpm; ½ 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/i^2.
g) h) Motor shaft diameter Ø**d** from Ø19 to Ø42, calculated at Ø28mm.
g) i) Motor shaft diameter Ø**d** from Ø43 to Ø50, calculated at Ø48mm.

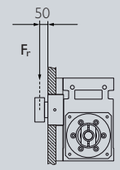
Bearing forces



Package

			Output Flange including Bearing & Pinion				
Radial rigidity	C_3	[N/mm]	47000				
Speed	n_{2N}	[rpm]	1500	750	400	150	100
Max. radial force[j]	F_{rmax}	[N]	11500	13000	17000	21000	24000

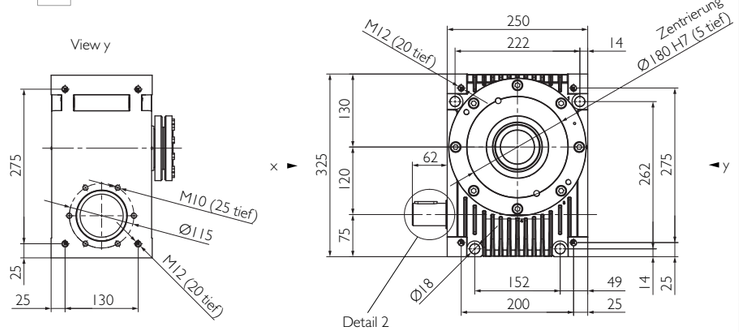
j) Bearing forces: Values valid at duty cycle of 40% at a distance of 50mm from the end of the bearing.

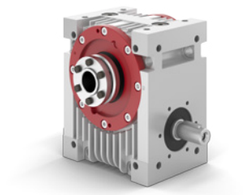


Detailed information about the **Package, Options & Accessories** on pages 88 and 89.

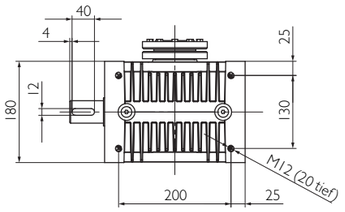
Input

C

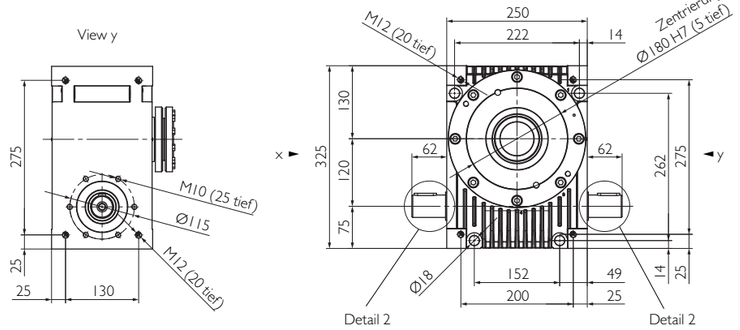


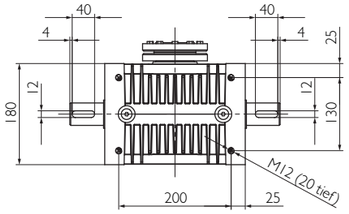


Example HPG Ø80 C1

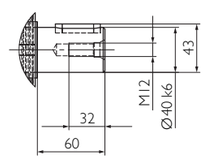


D



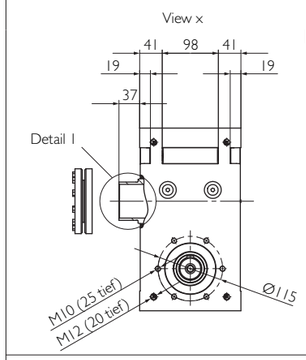


Detail 2

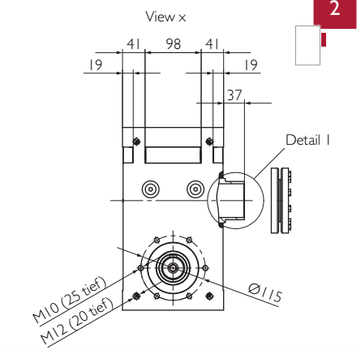


Output

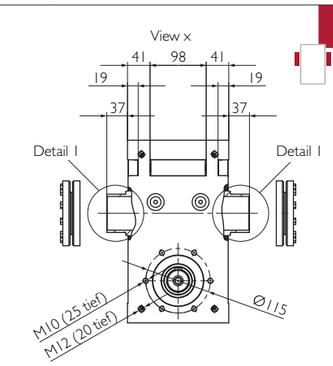
1



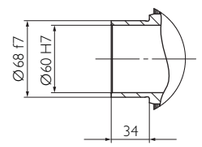
2



3



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]	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_{1N} = 1000 rpm	T_{2N}	[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_{1N} = 1500 rpm	T_{2N}	[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_{1N} = 3000 rpm	T_{2N}	[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_{1N} = 4500 rpm	T_{2N}	[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_{2B}	[Nm]	1200	2040									1400	2040	1400
Emergency stop torque		T_{2not}	[Nm]	2300										1600	2300	1600
Idling torque[a]		T_{012}	[Nm]	4.5			4				3					
Max. input speed		n_{1Max}	[rpm]	4500												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<8	<7	<6	<6	<5	<5					<4		
	PR	j_t	[arcmin]	<5.5	<4.5	<4	<3.5	<3	<3					<2.5		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[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_{2K}	[Nm/arcmin]	165												
Max. axial force[c) d)] at the output		F_{a2max}	[N]	7000	9600	9500	12000	16000	17000	21000	25000	26000	27000	27000	27000	28000
Max. radial force[c) e)] at the output		F_{r2max}	[N]	7700	8100	7300	8800	9900	10000	12000	13000	13000	14000	14000	14000	14000
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	1000	1100	980	1200	1300	1400	1600	1800	1800	1800	1800	1900	1900
Max. axial force[c) d)] at the input		F_{a1max}	[N]	3600	1800	730	1700	3600	2100	3300	3700	2500	2900	2700	3100	2700
Max. radial force[c) f)] at the input		F_{r1max}	[N]	1900	950	390	930	1900	1200	1800	2000	1300	1600	1400	1700	1500
Mass moment of inertia[g)]		J_1	[10^{-5} kg m^2]	1392	660	403	285	220	156	127	103	94	83	80	76	75
Service life		L_h	[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 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; ½ T_{2N} and duty cycle of 40%.
Consult with Güdel for composite bearing forces, axial and radial forces.

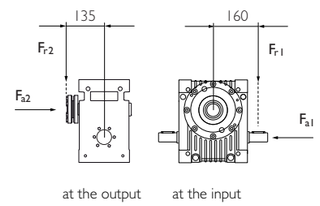
c) d) in relation to shaft center.

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^2.

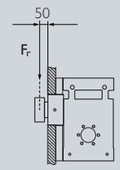
Bearing forces



Package

			Output Flange including Bearing & Pinion				
Radial rigidity	C_3	[N/mm]	47000				
Speed	n_{2N}	[rpm]	1500	750	400	150	100
Max. radial force[j)]	F_{rmax}	[N]	11500	13000	17000	21000	24000

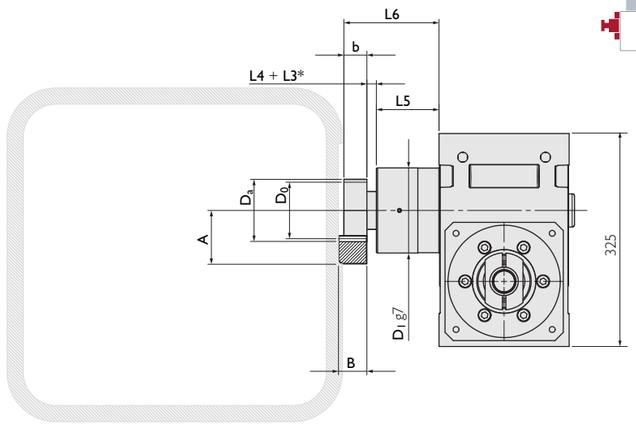
j) Bearing forces: Values valid at duty cycle of 40% at a distance of 50 mm from the end of the bearing.

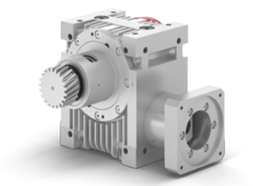


Detailed information about the **Package, Options & Accessories** on pages 88 and 89.

Output Flange including Bearing & Pinion[a)]

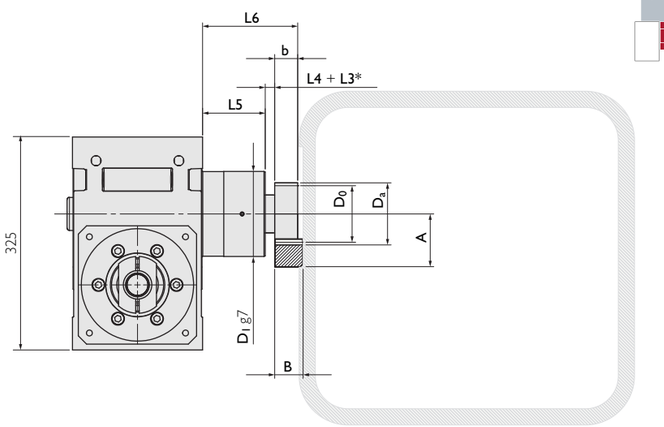
Package





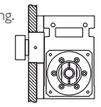
Example HPG 030 C1 Package

Package



a) Output flange in the area of the bearing is provided by the customer. Hole diameter tolerance H8.

* **L3** for additional distance ring.

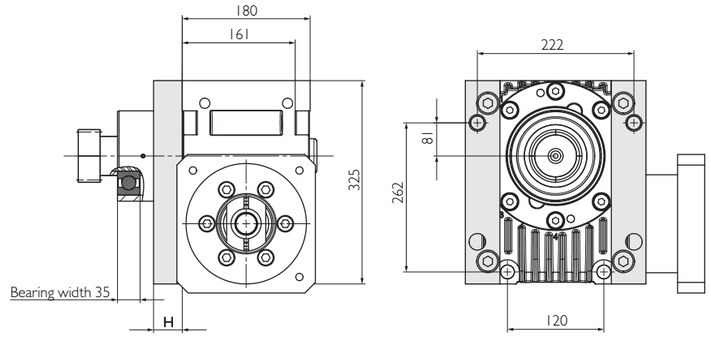


Geometric information

Helical modular pitch	Part. No.	m	z	A	b	B	D_a	D_0	D_1	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

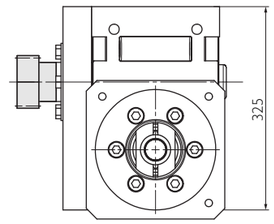
Straight modular pitch	Part. No.	m	z	A	b	B	D_a	D_0	D_1	L4	L5	L6
Pinion 3	201620	5	20	84.0	50	49	110.0	100.0	180	35	123	208
Pinion 4	201720	6	20	103.0	60	60	132.0	120.0	180	35	123	218
Pinion 5	201820	8	20	151.0	80	79	176.0	160.0	180	35	123	238

Spacer Elements

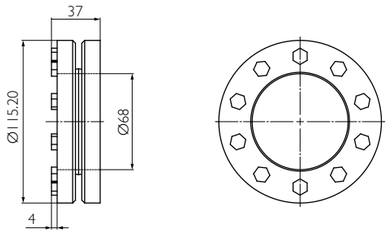


Casing can only be fastened with long screws as per the bore hole pattern.
Screws M16 of length 161mm + **H** + thread depth, tightening torque 120Nm.

with Pinion special solutions on request

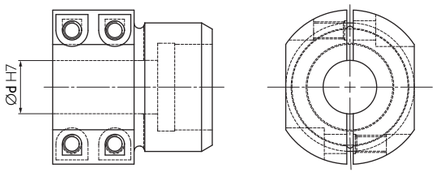


Shrink Disc



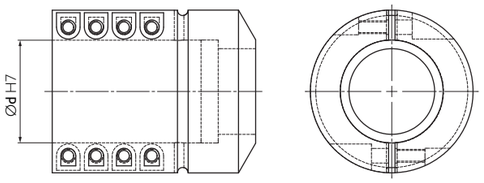
Coupling

Type 1



Motor shaft diameter [mm], 19 ≤ Ø**d** ≤ 42

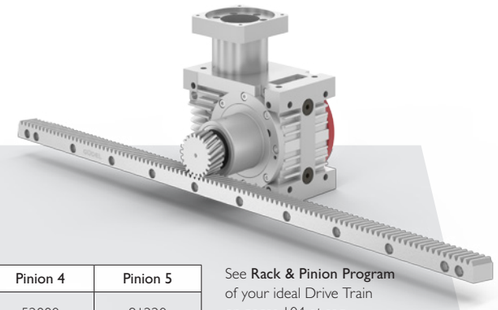
Type 2



Motor shaft diameter [mm], 43 ≤ Ø**d** ≤ 50

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_N	[N]	25420	40680	37317	52880	91220
Maximum acceleration torque	T_N	[Nm]	1079	2158	1866	3173	7298

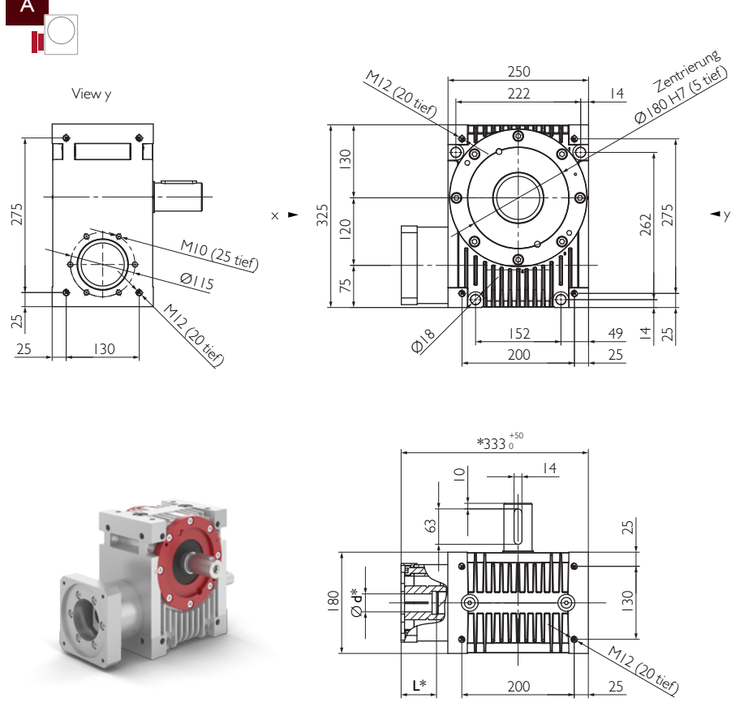
Higher value for rack and pinion taking account of the number of load cycles: 1×10^6 for the rack; 1×10^7 for the pinion. Both in cycle mode.

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.

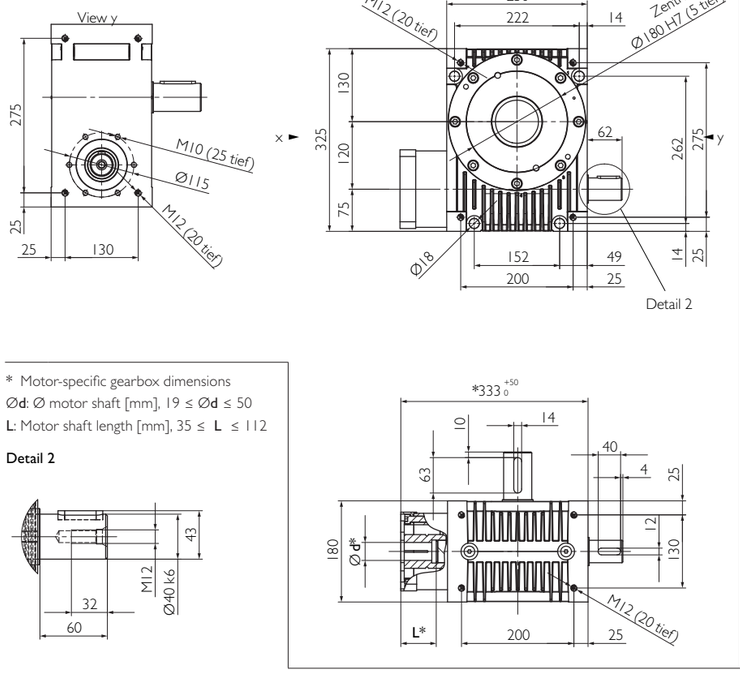
Input

A



Example HPG 120 B5

B

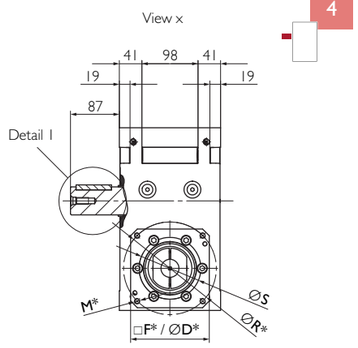


* Motor-specific gearbox dimensions
Ød: Ø motor shaft [mm], 19 ≤ **Ød** ≤ 50
L: Motor shaft length [mm], 35 ≤ **L** ≤ 112

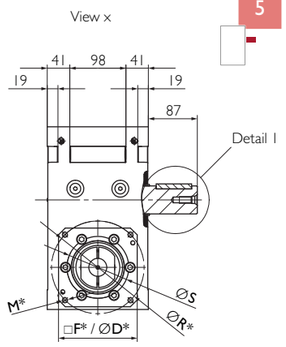
Detail 2

Output

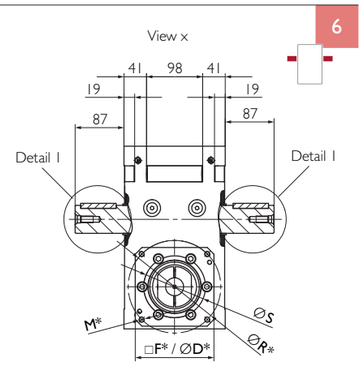
4



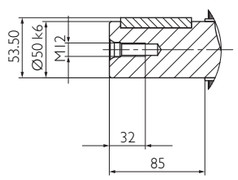
5



6



Detail I



* Motor-specific gearbox dimensions
S: min. 95 [mm], **R**: Pitch circle Ø [mm], **M**: Bore hole Ø or thread [mm], □**F** / Ø**D**: 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}	[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_{1N} = 1000 rpm	T_{2N}	[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_{1N} = 1500 rpm	T_{2N}	[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_{1N} = 3000 rpm	T_{2N}	[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_{1N} = 4500 rpm	T_{2N}	[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_{2B}	[Nm]	1200	2040									1400	2040	1400
Emergency stop torque		T_{2not}	[Nm]	2300										1600	2300	1600
Idling torque[a]		T_{012}	[Nm]	4.5			4				3					
Max. input speed		n_{1Max}	[rpm]	4500												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<8	<7	<6	<6	<5	<5					<4		
	PR	j_t	[arcmin]	<5.5	<4.5	<4	<3.5	<3	<3					<2.5		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[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_{2K}	[Nm/arcmin]	138												
Max. axial force[c) d)] at the output		F_{a2max}	[N]	2400	3900	3600	6200	9100	10000	13000	16000	17000	18000	18000	19000	19000
Max. radial force[c) e)] at the output		F_{r2max}	[N]	2500	2500	2700	3600	6200	6500	7500	8600	8700	9000	9100	9200	9200
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	340	340	360	480	830	880	1000	1200	1200	1200	1200	1200	1200
Max. axial force[c) d)] at the input		F_{a1max}	[N]	3600	1800	730	1700	3600	2100	3300	3700	2500	2900	2700	3100	2700
Max. radial force[c) f)] at the input		F_{r1max}	[N]	1900	950	390	930	1900	1200	1800	2000	1300	1600	1400	1700	1500
Mass moment of inertia[g]	Type 1[h]	J_1	[10^{-5} kg m^2]	1473	741	485	366	302	237	208	185	176	164	161	157	157
	Type 2[i]	J_1	[10^{-5} kg m^2]	1596	864	607	489	424	360	331	308	298	287	284	280	279
Service life		L_h	[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														

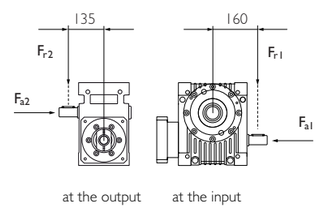
a) approximate, at n_1 = 3000 rpm and operating temperature.

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; ½ 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.

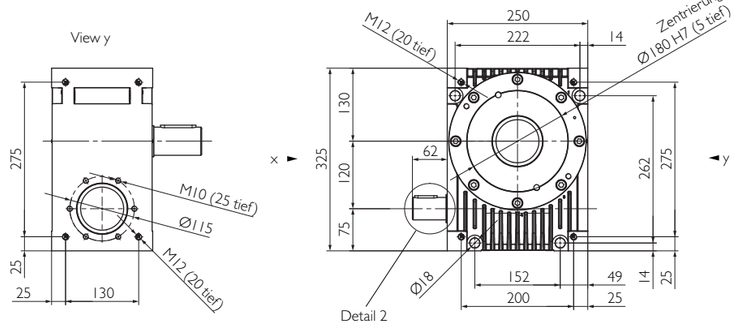
g) in relation to the input, including coupling.
g) h) Motor shaft diameter **Ød** from Ø19 to Ø42, calculated at Ø28mm.
g) i) Motor shaft diameter **Ød** from Ø43 to Ø50, calculated at Ø48mm.

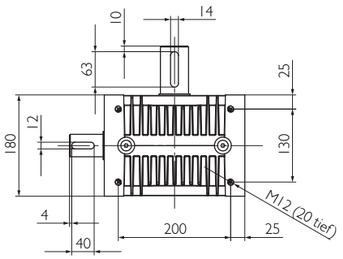
Bearing forces

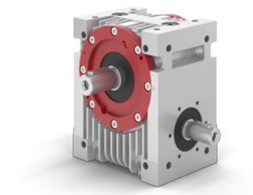


Input

C

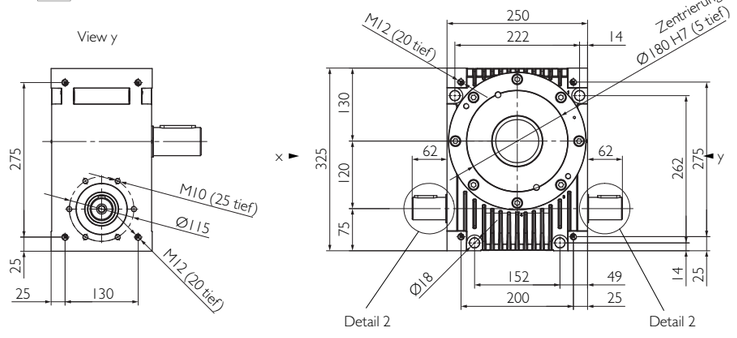


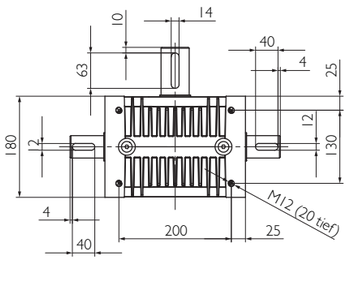




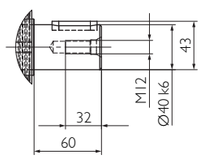
Example HPG 120 C4

D



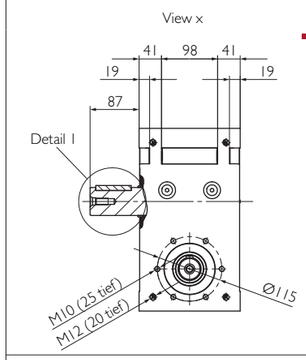


Detail 2

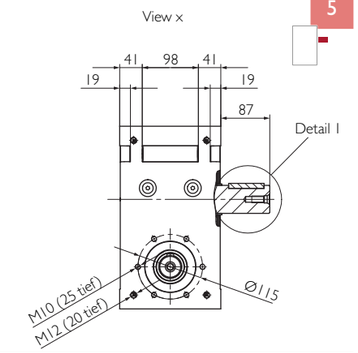


Output

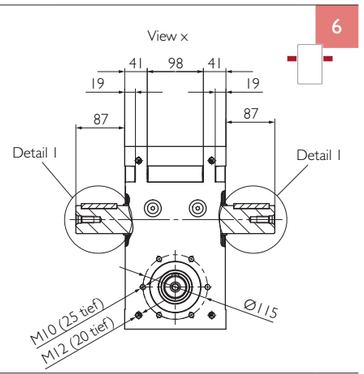
4



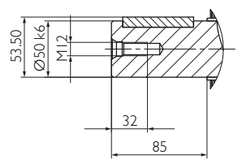
5



6



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} = 500rpm	T_{2N}	[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_{1N} = 1000rpm	T_{2N}	[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_{1N} =1500rpm	T_{2N}	[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_{1N} = 3000rpm	T_{2N}	[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_{1N} = 4500rpm	T_{2N}	[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_{2B}	[Nm]	1200	2040									1400	2040	1400
Emergency stop torque		T_{2not}	[Nm]	2300										1600	2300	1600
Idling torque[a]		T_{012}	[Nm]	4.5			4				3					
Max. input speed		n_{1Max}	[rpm]	4500												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<8	<7	<6	<6	<5	<5					<4		
	PR	j_t	[arcmin]	<5.5	<4.5	<4	<3.5	<3	<3					<2.5		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[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_{2K}	[Nm/arcmin]	138												
Max. axial force[c) d)] at the output		F_{a2max}	[N]	2400	3900	3600	6200	9100	10000	13000	16000	17000	18000	18000	19000	19000
Max. radial force[c) e)] at the output		F_{r2max}	[N]	2500	2500	2700	3600	6200	6500	7500	8600	8700	9000	9100	9200	9200
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	340	340	360	480	830	880	1000	1200	1200	1200	1200	1200	1200
Max. axial force[c) d)] at the input		F_{a1max}	[N]	3600	1800	730	1700	3600	2100	3300	3700	2500	2900	2700	3100	2700
Max. radial force[c) f)] at the input		F_{r1max}	[N]	1900	950	390	930	1900	1200	1800	2000	1300	1600	1400	1700	1500
Mass moment of inertia[g]		J_1	[10^{-5} kg m^2]	1392	660	403	285	220	156	127	103	94	83	80	76	75
Service life		L_h	[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 = 3000rpm 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 = 1500rpm; ½ T_{2N} and duty cycle of 40%.
Consult with Güdel for composite bearing forces, axial and radial forces.

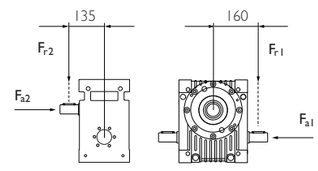
c) d) in relation to shaft center.

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.

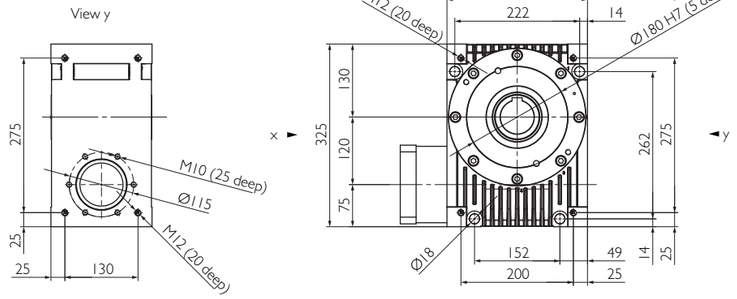
g) in relation to the input.

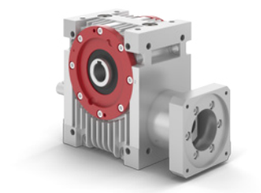
Bearing forces

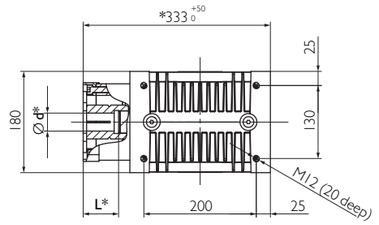


Input

A

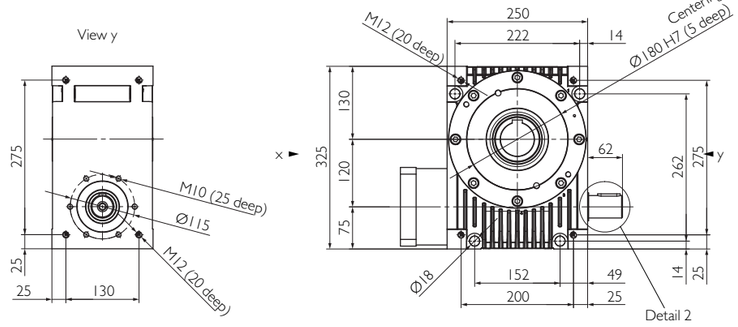






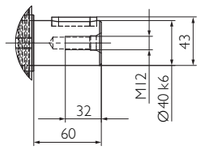
Example HPG 120 A7

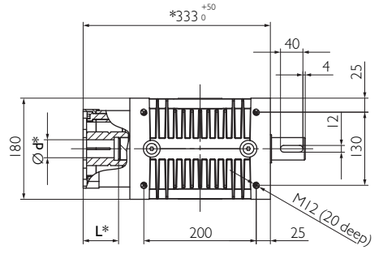
B



* Motor-specific gearbox dimensions
Ød: Ø motor shaft [mm], 19 ≤ **Ød** ≤ 50
L: Motor shaft length [mm], 35 ≤ **L** ≤ 112

Detail 2

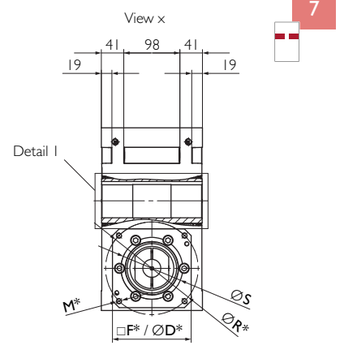




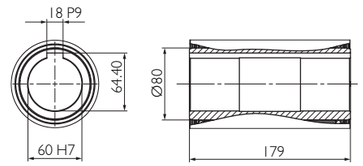
* Motor-specific gearbox dimensions
S: min. 95 [mm], **R:** Pitch circle Ø [mm], **M:** Bore hole Ø or thread [mm], □**F** / Ø**D:** Specify flange [mm]

Output

7



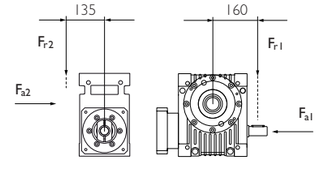
Detail 1



Ratio	i			2	3	4	5	6	8	10	13.33	16	24	30	47	60
Nominal torque at the output Efficiency	n_{1N} = 500rpm	T_{2N}	[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_{1N} = 1000rpm	T_{2N}	[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_{1N} =1500rpm	T_{2N}	[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_{1N} = 3000rpm	T_{2N}	[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_{1N} = 4500rpm	T_{2N}	[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_{2B}	[Nm]	1200	2040									1400	2040	1400
Emergency stop torque		T_{2not}	[Nm]	2300										1600	2300	1600
Idling torque[a]		T_{012}	[Nm]	4.5			4				3					
Max. input speed		n_{1Max}	[rpm]	4500												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<8	<7	<6	<6	<5	<5					<4		
	PR	j_t	[arcmin]	<5.5	<4.5	<4	<3.5	<3	<3					<2.5		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[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_{2K}	[Nm/arcmin]	165												
Max. axial force[c) d)] at the output		F_{a2max}	[N]	7000	9600	9500	12000	16000	17000	21000	25000	26000	27000	27000	27000	28000
Max. radial force[c) e)] at the output		F_{r2max}	[N]	7700	8100	7300	8800	9900	10000	12000	13000	13000	14000	14000	14000	14000
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	1000	1100	980	1200	1300	1400	1600	1800	1800	1800	1800	1900	1900
Max. axial force[c) d)] at the input		F_{a1max}	[N]	3600	1800	730	1700	3600	2100	3300	3700	2500	2900	2700	3100	2700
Max. radial force[c) f)] at the input		F_{r1max}	[N]	1900	950	390	930	1900	1200	1800	2000	1300	1600	1400	1700	1500
Mass moment of inertia[g)]	Type 1[h)]	J_1	[10^{-5} kg m^2]	1388	703	463	352	292	232	204	183	174	164	161	157	156
	Type 2[i)]	J_1	[10^{-5} kg m^2]	1511	826	586	475	415	355	327	306	297	286	283	280	279
Service life		L_h	[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												

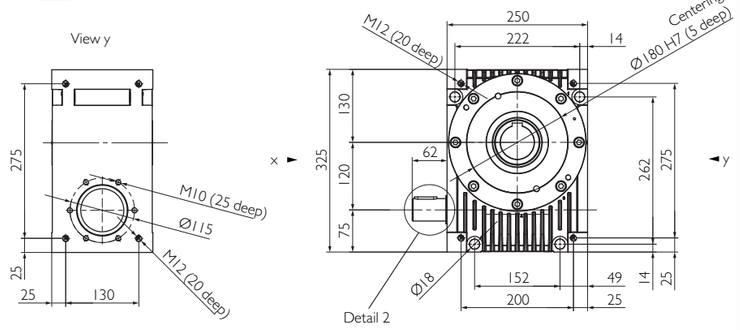
a) approximate, at n_1 = 3000rpm and operating temperature.
b) Precision grade PS (standard backlash) for classic mechanical engineering applications.
Precision grade PR (reduced backlash) for precise process applications.
c) Bearing forces: Values valid at n_1 = 1500rpm; ½ T_{2N} and duty cycle of 40%.
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.
g) h) Motor shaft diameter Ød from Ø19 to Ø42, calculated at Ø28mm.
g) i) Motor shaft diameter Ød from Ø43 to Ø50, calculated at Ø48mm.

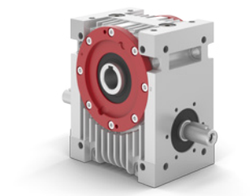
Bearing forces

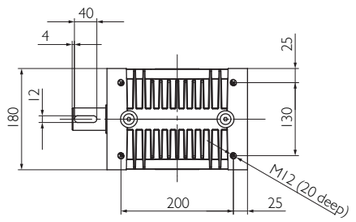


Input

C

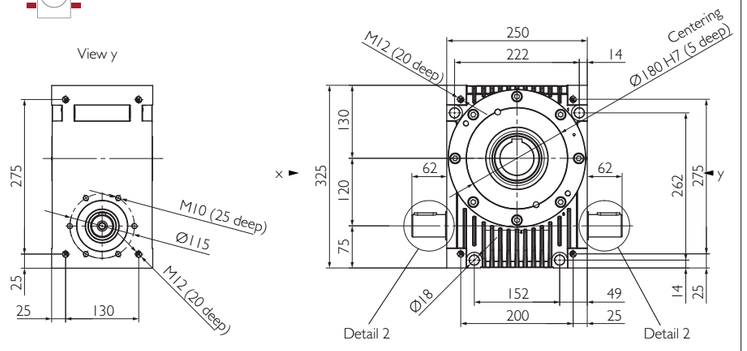




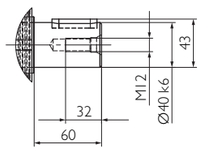


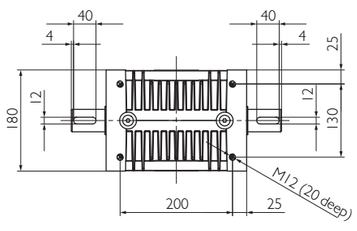
Example HPG 120 D7

D



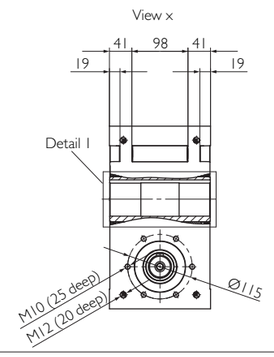
Detail 2



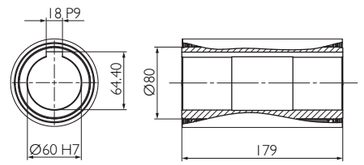


Output

7



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} = 500rpm	T_{2N}	[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_{1N} = 1000rpm	T_{2N}	[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_{1N} =1500rpm	T_{2N}	[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_{1N} = 3000rpm	T_{2N}	[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_{1N} = 4500rpm	T_{2N}	[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_{2B}	[Nm]	1200	2040									1400	2040	1400
Emergency stop torque		T_{2not}	[Nm]	2300										1600	2300	1600
Idling torque[a]		T_{012}	[Nm]	4.5			4				3					
Max. input speed		n_{1Max}	[rpm]	4500												
Max. backlash[b] at the output	PS	j_t	[arcmin]	<8	<7	<6	<6	<5	<5					<4		
	PR	j_t	[arcmin]	<5.5	<4.5	<4	<3.5	<3	<3					<2.5		
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[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_{2K}	[Nm/arcmin]	165												
Max. axial force[c)d)] at the output		F_{a2max}	[N]	7000	9600	9500	12000	16000	17000	21000	25000	26000	27000	27000	27000	28000
Max. radial force[c)e)] at the output		F_{r2max}	[N]	7700	8100	7300	8800	9900	10000	12000	13000	13000	14000	14000	14000	14000
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	1000	1100	980	1200	1300	1400	1600	1800	1800	1800	1800	1900	1900
Max. axial force[c)d)] at the input		F_{a1max}	[N]	3600	1800	730	1700	3600	2100	3300	3700	2500	2900	2700	3100	2700
Max. radial force[c)f)] at the input		F_{r1max}	[N]	1900	950	390	930	1900	1200	1800	2000	1300	1600	1400	1700	1500
Mass moment of inertia[g]		J_1	[10^{-5} kg m^2]	1307	622	382	271	211	151	123	102	93	82	79	76	75
Service life		L_h	[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														

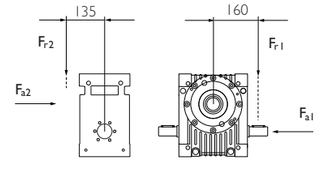
a) approximate, at n_1 = 3000rpm and operating temperature.

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 = 1500rpm; ½ 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.

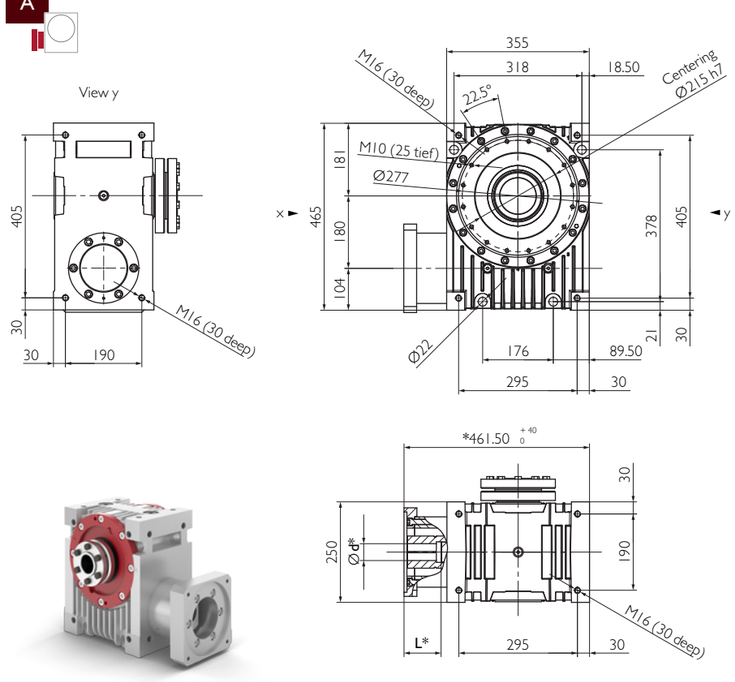
g) in relation to the input.

Bearing forces



Input

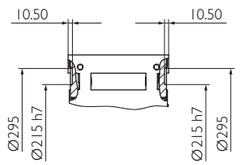
A



Example HPG 120 A1

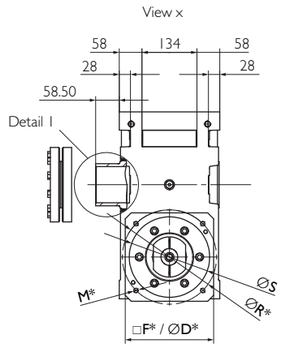
* Motor-specific gearbox dimensions
Ød: Ø motor shaft [mm], 20 ≤ **Ød** ≤ 60
L: Motor shaft length [mm], 60 ≤ **L** ≤ 120

Centering on the Output

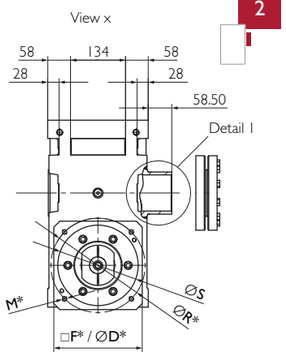


Output

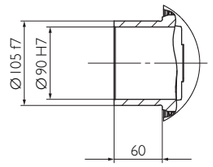
1



2



Detail I

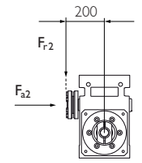


* Motor-specific gearbox dimensions
S: min. 120 [mm], **R:** Pitch circle Ø [mm], **M:** Bore hole Ø or thread [mm], □**F** / Ø**D:** Specify flange [mm]

Ratio	i			6	8	10	13.33	16	24	47
Nominal torque at the output Efficiency	n_{1N} = 500rpm	T_{2N}	[Nm]	5091	5950	5553	5473	6100	5963	5920
		η	[%]	95	94	93	92	90	86	76
	n_{1N} = 1000rpm	T_{2N}	[Nm]	3726	4396	4131	4093	4566	4477	4452
		η	[%]	95	94	94	92	90	87	77
	n_{1N} =1500rpm	T_{2N}	[Nm]	2938	3486	3289	3268	3649	3583	3566
		η	[%]	95	94	94	92	90	87	77
	n_{1N} = 3000rpm	T_{2N}	[Nm]	1798	2150	2041	2037	2277	2241	2234
		η	[%]	95	94	93	91	90	86	76
Max. acceleration torque		T_{2B}	[Nm]	6100						
Emergency stop torque		T_{2Not}	[Nm]	8000						
Idling torque[a]		T_{012}	[Nm]	7.5			5.5			
Max. input speed		n_{1Max}	[rpm]	3000						
Max. backlash[b] at the output	PS	j_t	[arcmin]	<3					<2.5	
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[Nm/arcmin]	292	342	385	425	470	510	540
Stability at the output		C_{2K}	[Nm/arcmin]	500						
Max. axial force[c) d)] at the output		F_{a2max}	[N]	30000	35000	43000	45000	45000	47000	49000
Max. radial force[c) e)] at the output		F_{r2max}	[N]	18000	20000	23000	24000	23000	24000	24000
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	3700	4000	4600	4700	4600	4800	4900
Mass moment of inertia[g)]		J_1	[10^{-5} kg m^2]	2042	1564	1343	1171	1103	1018	967
Service life		L_h	[h]	25000						
Weight without motor components		m	[kg]	145						
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 = 2000rpm and operating temperature.
b) Precision grade PS (standard backlash) for classic mechanical engineering applications.
c) Bearing forces: Values valid at n_1 = 1000rpm; ½ 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 200 mm from the middle of the casing.
g) in relation to the input, including coupling and shrink disc at the output (output 1 & 2),
Coupling: Motor shaft diameter Ø**d** from Ø20 to Ø60, calculated at Ø32mm.

Bearing forces

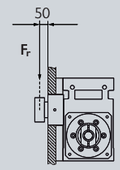


at the output

Package

			Output Flange including Bearing & Pinion		
Radial rigidity	C_3	[N/mm]	80000		
Speed	n_{2N}	[rpm]	400	200	100
Max. radial force[j)]	F_{rmax}	[N]	90000	95000	100000

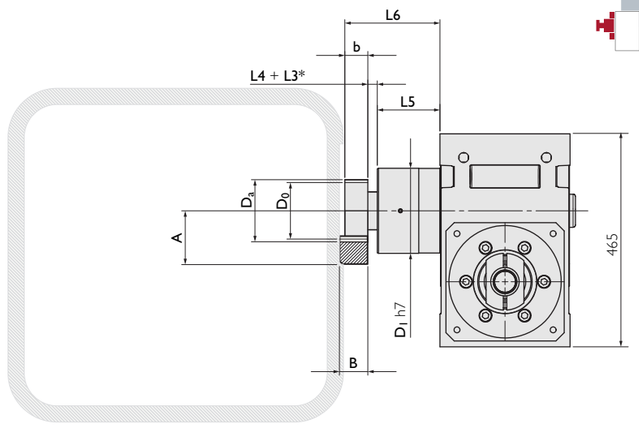
j) Bearing forces: Values valid at duty cycle of 40% at a distance of 50mm from the end of the bearing.

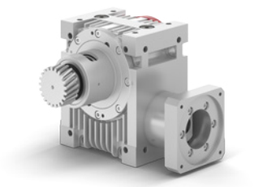


Detailed information about the **Package, Options & Accessories** on pages 100 and 101.

Output Flange including Bearing & Pinion[a)]

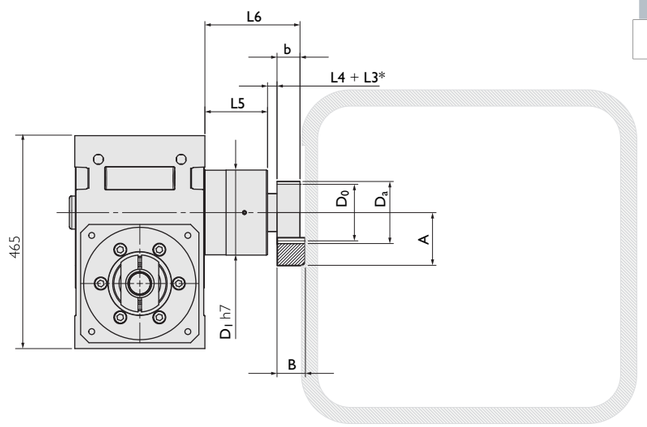
Package





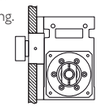
Example HPG 180 C1 Package

Package



a) Output flange in the area of the bearing is provided by the customer. Hole diameter tolerance H8.

* **L3** for additional distance ring.

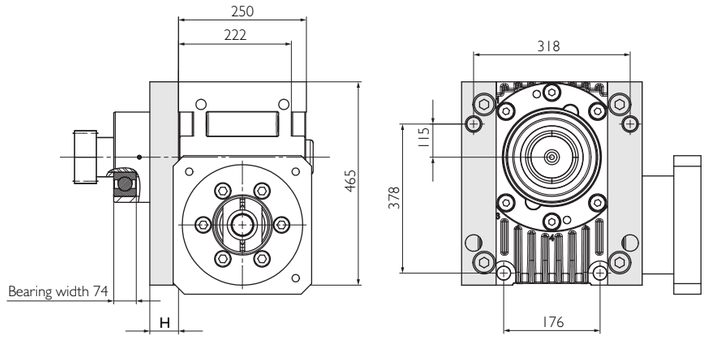


Geometric information

Helical modular pitch	Part. No.	m	z	A	b	B	D_a	D_0	D_1	L4	L5	L6
Pinion 1	211720	6	20	106.66	60	59	139.3	127.32	220	20	160	240
Pinion 2	211820	8	20	155.88	80	79	185.7	169.76	220	35	160	275
Pinion 3	211915	10	15	171.58	100	99	185.2	165.16	220	40	160	300

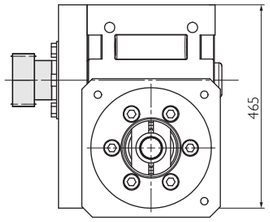
Straight modular pitch	Part. No.	m	z	A	b	B	D_a	D_0	D_1	L4	L5	L6
Pinion 4	201821	8	20	151.0	80	79	176.0	160.0	220	35	160	275
Pinion 5	201916	10	16	172.0	100	99	186.0	166.0	220	40	160	300

Spacer Elements

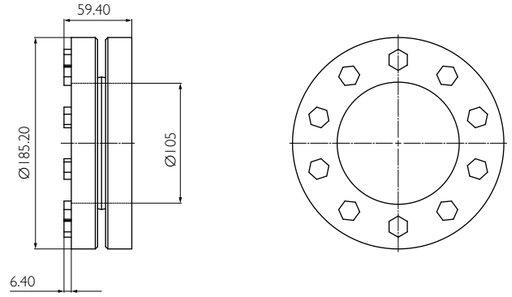


Casing can only be fastened with long screws as per the bore hole pattern.
Screws M20 of length 222mm + **H** + thread depth, tightening torque 240Nm.

with Pinion special solutions on request

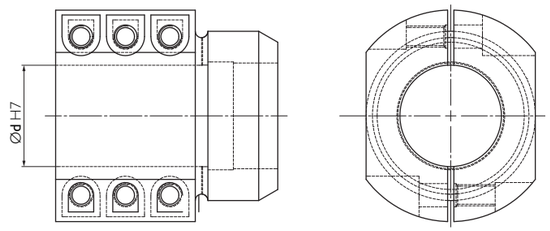


Shrink Disc



Coupling

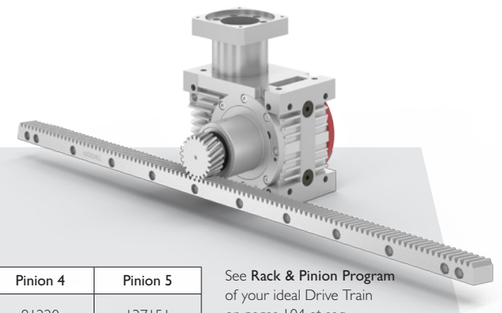
Type 1



Motor shaft diameter [mm], 20 ≤ Ø**d** ≤ 60

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_N	[N]	58870	114380	160516	91220	137151
Maximum acceleration torque	T_N	[Nm]	3748	9709	12773	7298	10972

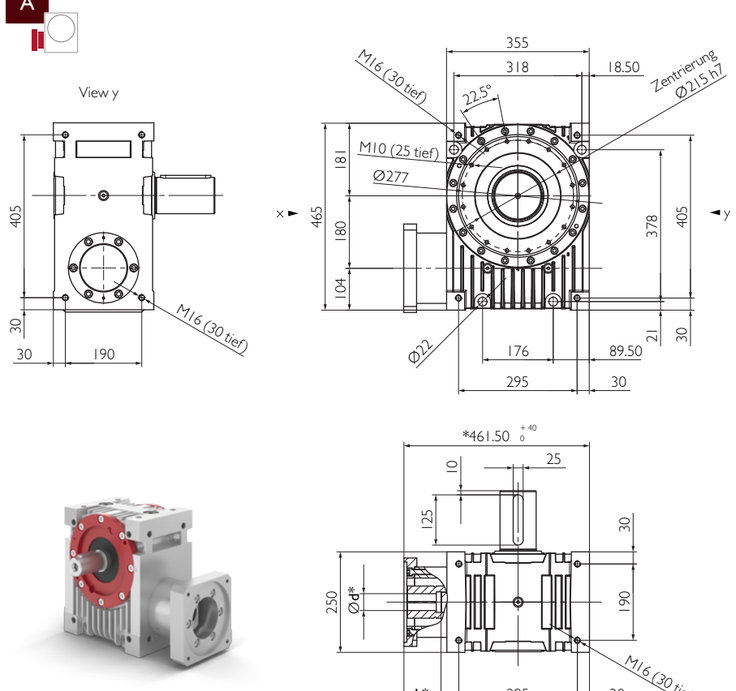
Higher value for rack and pinion taking account of the number of load cycles: 1×10^6 for the rack; 1×10^7 for the pinion. Both in cycle mode.

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.

Input

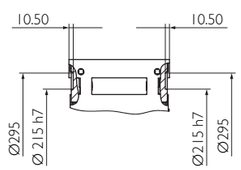
A



Example HPG 180 A4

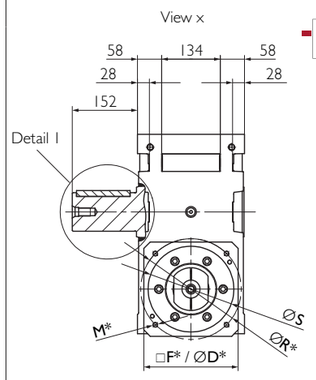
* Motor-specific gearbox dimensions
Ød: Ø motor shaft [mm], 20 ≤ **Ød** ≤ 60
L: Motor shaft length [mm], 60 ≤ **L** ≤ 120

Centering on the Output

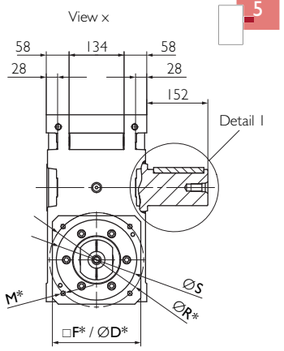


Output

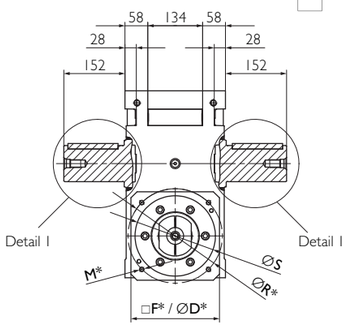
4



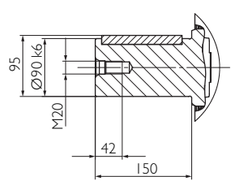
5



6



Detail I

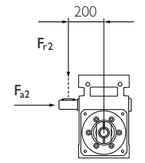


* Motor-specific gearbox dimensions
S: min. 120 [mm], **R:** Pitch circle Ø [mm], **M:** Bore hole Ø or thread [mm], □**F** / Ø**D:** Specify flange [mm]

Ratio	i			6	8	10	13.33	16	24	47
Nominal torque at the output / Efficiency	n_{1N} = 500rpm	T_{2N}	[Nm]	5091	5950	5553	5473	6100	5963	5920
		η	[%]	95	94	93	92	90	86	76
	n_{1N} = 1000rpm	T_{2N}	[Nm]	3726	4396	4131	4093	4566	4477	4452
		η	[%]	95	94	94	92	90	87	77
	n_{1N} =1500rpm	T_{2N}	[Nm]	2938	3486	3289	3268	3649	3583	3566
		η	[%]	95	94	94	92	90	87	77
	n_{1N} = 3000rpm	T_{2N}	[Nm]	1798	2150	2041	2037	2277	2241	2234
		η	[%]	95	94	93	91	90	86	76
Max. acceleration torque		T_{2B}	[Nm]	6100						
Emergency stop torque		T_{2not}	[Nm]	8000						
Idling torque[a]		T_{012}	[Nm]	7.5			5.5			
Max. input speed		n_{1Max}	[rpm]	3000						
Max. backlash[b] at the output	PS	j_t	[arcmin]	<3					<2.5	
Torsional rigidity vom Abtrieb zum Eintrieb		C_{t21}	[Nm/arcmin]	292	342	385	425	470	510	540
Stability at the output		C_{2K}	[Nm/arcmin]	500						
Max. axial force[c) d)] at the output		F_{a2max}	[N]	30000	35000	43000	45000	45000	47000	49000
Max. radial force[c) e)] at the output		F_{r2max}	[N]	18000	20000	23000	24000	23000	24000	24000
Max. overturning torque[c)] at the output		M_{2max}	[Nm]	3700	4000	4600	4700	4600	4800	4900
Mass moment of inertia[g)]		J_1	[10^{-5} kg m^2]	2042	1564	1343	1171	1103	1018	967
Service life		L_h	[h]	25000						
Weight without motor components		m	[kg]	155						
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 = 2000rpm and operating temperature.
b) Precision grade PS (standard backlash) for classic mechanical engineering applications.
c) Bearing forces: Values valid at n_1 = 1000rpm; ½ 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 200 mm from the middle of the casing.
g) in relation to the input, including coupling.
Coupling: Motor shaft diameter Ød from Ø20 to Ø60, calculated at Ø32mm.

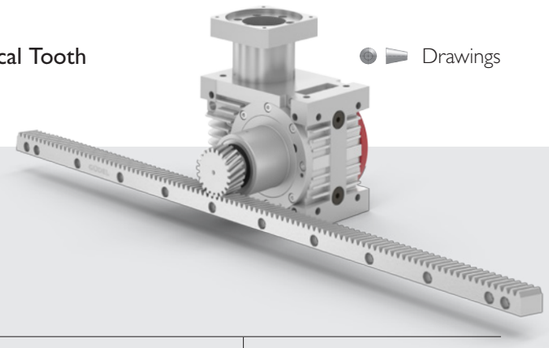
Bearing forces



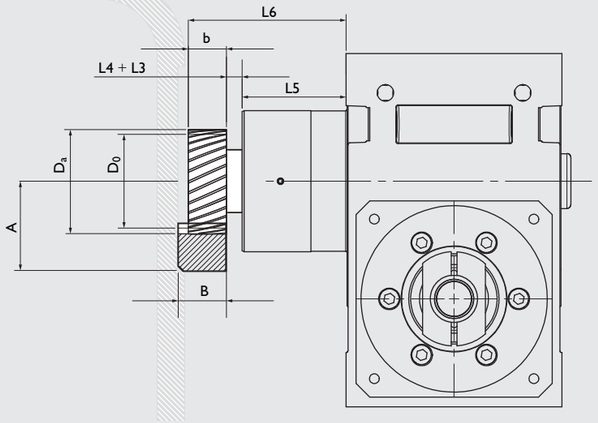
at the output

Rack & Pinon Program

Our Function Package with gearbox,
output flange, pinion and rack by Güdel.



Helical modular pitch



Hardened and ground

Material
16MnCr5 DIN 1.7131
shaft/bore soft

Teeth
pressure angle α = 20°
helical tooth system
helix angle ß = 19° 31'42"
hardened (58^{+4}_{0} HRC)
ground, crowned

Quality
6f24 DIN 3962/63/67

f_p [mm]
Adjacent pitch error
modul m ≤ 3 ; 0.006
modul m > 3 ; 0.008

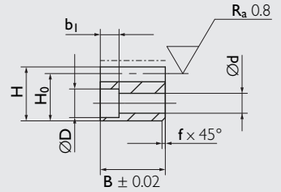
Geometric Information

Size	m	z	A	b	D_a	D_0	L4	L5	L6	M	Part. No.
030	1.5	16	30.68	20	29.36	26.36	4.5	38	62.5	0.14	211116
								43	67.5		
045	1.5	20	33.415	20	34.83	31.83	4.5	43	67.5	0.34	211120
								53	77.5		
	2	16	39.575		39.15	35.15	8	43	71	0.39	211216
								53	81		
060	2	20	43.22	20	46.44	42.44	8	53	81	0.7	211220
								58	86		
								83	111		
	2.5		48.025	25	58.05	53.05		53	86	0.91	211320
								58	91		
								83	116		
	3	16	52.365	30	58.73	52.73		53	91	0.99	211416
								58	96		
								83	121		
090	3	20	57.83	30	69.66	63.66	12.5	63	105.5	2.38	211420
								104.5	147		
	4		77.44	40	92.88	84.88	18	63	121	3.43	211520
								104.5	162.5		
120	4	20	77.44	40	92.88	84.88	14.5	123	177.5	7.89	211521
	5		87.05	50	116.1	106.1	35	123	208	9.96	211620
180	6	20	106.66	60	139.3	127.32	20	160	240	20.7	211720
	8		155.88	80	185.7	169.76	35	160	275	28.2	211820
	10	15	171.58	100	185.2	165.16	40	160	300	31.63	211915

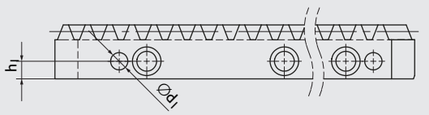
m: modul, z: number of teeth, M: Weight [kg]

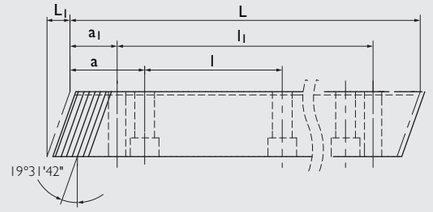
Rack

Helical modular pitch



hardened





Hardened and ground

Material
C45E DIN 1.1191
1.7131 (16MnCr5) on request

Profil
all faces ground

Teeth
pressure angle α = 20°
helical tooth system right
ß = 19° 31'42"
hardened (54^{+4}_{0} HRC)
and ground

Quality
6h23 DIN 3962/63/67

f_p [mm]
Adjacent pitch error
modul m ≤ 3 ; 0.006
modul m > 3 ; 0.008

p_f [mm]
-0.05/-0.2, Tolerance of cut
for continuous mounting

F_{pL} [mm]
Cumulative pitch error,
based on length L

Geometric Information

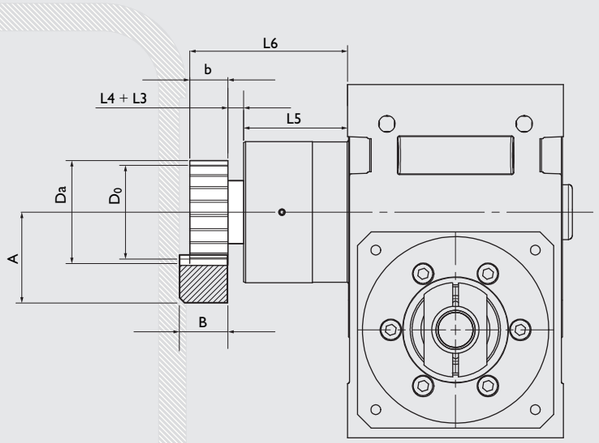
Size	p_t	m	L	L_l	z	B	H	H_0	f+0.5	a	l	h_l	d	D	b_0	a_l	l_l	d_l	F_{pL}	M	Part. No.
30 **45**	5	1.5	500	6.7	100	19	19	17.50 0/-027	2	62.5	125.00	8	7	11	7	31.7	436.6	5.7	0.029	1.3	246012
			1000		200												936.6		0.043	2.6	246013
45 **60**	6.67	2	500	8.5	75	24	24	22.00 0/-027	2	62.5	125.00	8	7	11	7	31.7	436.6	5.7	0.025	2.1	246022
			1000		150												936.6		0.036	4.1	246023
			2000		300												1936.6		0.058	8.2	246024
60	8.33	2.5	500	8.5	60	24	24	21.50 0/-027	2	62.5	125.00	9	7	11	7	31.7	436.6	5.7	0.027	2.0	246032
			1000		120												936.6		0.036	4.1	246033
			2000		240												1936.6		0.053	8.2	246034
60 **90**	10.00	3	500	10.3	50	29	29	26.00 0/-034	2	62.5	125.00	9	10	15	9	35.0	430.0	7.7	0.028	3.0	246042
			1000		100												930.0		0.037	5.9	246043
			2000		200												1930.0		0.054	11.2	246044
90 **120**	13.33	4	506.67	13.8	38	39	39	35.00 0/-034	3	62.5	125.00	12	10	15	9	33.3	433.0	7.7	0.030	5.4	246052
			1000		75												933.4		0.036	10.7	246053
			2000		150												1933.4		0.050	20.5	246054
120	16.67	5	500	17.4	30	49	39	34.00 0/-034	3	62.5	125.00	12	14	20	13	37.5	425.0	11.7	0.028	6.5	246062
			1000		60												925.0		0.034	13.1	246063
			2000		120												1925.0		0.045	24.5	246064
180	20.00	6	500	20.9	25	59	49	43.00 0/-041	3	62.5	125.00	16	18	26	17	37.5	425.0	15.7	0.031	10.0	246072
			1000		50												925.0		0.036	19.9	246073
			2000		100												1925.0		0.046	36.5	246074
180	26.66	8	480	28.0	18	79	79	71.00 0/-041	3	60.0	125.00	25	22	33	21	120.0	240.0	19.7	0.029	22.0	246082
			960		36												720.0		0.033	44.0	246083
			1920		72												168.0		0.040	78.0	246084
180	33.33	10	500	35.1	15	99	99	89.00 0/-041	3	62.5	125.00	32	33	48	32	125.0	250.0	19.7	0.029	34.0	246092
			1000		30												750.0		0.032	68.0	246093

m: modul, z: number of teeth p: pitch, p_t: transvers, M: Weight [kg]

Pinion

Straight modular pitch

Hardened and ground



Material
16MnCr5 DIN 1.7131
shaft/bore soft

Teeth
pressure angle α = 20°
straight teeth
hardened (58^{+4}_{0} HRC)
ground, crowned

Quality
6f24 DIN 3962/63/67

f_p [mm]
Adjacent pitch error
modul m ≤ 3 ; 0.006
modul m > 3 ; 0.008

Geometric Information

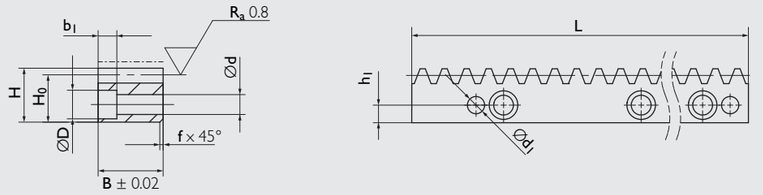
Size	m	z	A	b	D_a	D_0	L4	L5	L6	M	Part. No.
030	1.5	16	29.95	20	27.9	24.9	4.5	38	82.5	0.14	201116
								43	67.5		
045	1.5	20	32.5	20	33.0	30.0	4.5	43	67.5	0.34	201120
								53	77.5		
	2	16	38.6		37.2	33.2	8	43	71	0.37	201216
								53	81		
060	2	20	42.0	20	44.0	40.0	8	53	81	0.68	201220
								58	86		
								83	111		
	2.5		46.0	25	55.0	50.0		53	86	0.86	201320
								58	91		
								83	116		
	3	16	50.9	30	55.8	49.8		53	91	0.93	201416
								58	96		
								83	121		
090	3	20	56.0	30	66.0	60.0	12.5	63	105.5	2.30	201420
								104.5	147		
	4		75.0	40	88.0	80.0	18	63	121	3.24	201520
								104.5	162.5		
120	5	20	84.0	50	110.0	100.0	35	123	208	9.57	201620
	6		103.0	60	132.0	120.0	35		218	11.8	201720
	8		151.0	80	176.0	160.0	35		238	28.31	201820
180	8	20	151.0	80	176.0	160.0	35	160	275	28.31	201821
	10	16	172.0	100	186.0	166.0	40		300	31.78	201916

m: modul, z: number of teeth, M: Weight [kg]

Rack

Straight modular pitch

Hardened and ground



-·-·- hardened

Material
C45E DIN 1.1191
1.7131 (16MnCr5) on request

Profil
all faces ground

Teeth
pressure angle α = 20°
straight tooth system
hardened (54^{+4}_{0} HRC)
and ground

Quality
6h23 DIN 3962/63/67

f_p [mm]
Adjacent pitch error
modul m ≤ 3 ; 0.006
modul m > 3 ; 0.008

p_f [mm]
-0.05/-0.2, Tolerance of cut
for continuous mounting

F_{pL} [mm]
Cumulative pitch error, based on
length L

Geometric Information

Size	p	m	L	z	B	H	H_0	f+0.5	a	l	h_1	d	D	b_1	a_1	l_1	d_1	F_{pL}	M	Part. No.
30	4.712	1.5	499.51	106	19	19	17.50 0/-027	2	62.44	124.88	8	7	11	7	29	441.5	5.7	0.029	1.3	240012
45			999.03	212												941.0		0.043	2.6	240013
45	6.283	2	502.65	80	24	24	22.00 0/-027	2	62.83	125.66	8	7	11	7	31.3	440.1	5.7	0.025	2.1	240022
60			1005.31	160												942.7		0.036	4.2	240023
			2010.62	320												1948.0		0.058	8.0	240024
60	7.854	2.5	502.65	64	24	24	21.50 0/-027	2	62.83	125.66	9	7	11	7	31.3	440.1	5.7	0.027	2.0	240032
			1005.31	128												942.7		0.036	4.1	240033
			2010.62	256												1948.0		0.053	8.0	240034
60	9.425	3	508.94	54	29	29	26.00 0/-034	2	63.62	127.23	9	10	15	9	34.4	440.1	7.7	0.029	3.0	240042
90			1017.88	108												949.1		0.037	6.0	240043
			2035.75	216												1967.0		0.055	11.5	240044
90	12.566	4	502.65	40	39	39	35.00 0/-034	2	62.83	125.66	12	10	15	9	37.5	427.7	7.7	0.030	5.40	240052
			1005.31	80												930.3		0.037	10.8	240053
			2010.62	160												1935.6		0.050	21.0	240054
120	15.708	5	502.65	32	49	39	34.00 0/-034	3	62.83	125.66	12	14	20	13	30.2	442.3	11.7	0.028	6.6	240062
			1005.31	64												944.9		**0.034**	13.1	240063
			2010.62	128												1950.2		0.045	24.7	240064
120	18.850	6	508.94	27	59	49	43.00 0/-041	3	63.62	127.23	16	18	26	17	31.4	446.1	15.7	0.031	10.1	240072
			1017.88	54												955.0		0.036	20.3	240073
			2035.75	108												1973.0		0.047	37.5	240074
120	25.133	8	502.65	20	79	79	71.00 0/-041	3	62.83	125.66	25	22	33	21	26.7	449.3	19.7	0.029	22.1	240082
180			1005.31	40												952.0		0.033	44.3	240083
			2010.62	80												1957.3		0.041	82.5	240084
180	31.416	10	502.65	16	99	99	89.00 0/-041	3	62.83	125.66	32	33	48	32	125.2	252.3	19.7	0.029	34.8	240092
			1005.31	32												755.0		0.032	69.5	240093

m: modul, z: number of teeth p: pitch, p_t: transvers, M: Weight [kg]

Order Reference

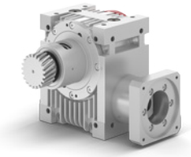
Define the Code of your High Performance Angle Gearbox

Package
(Output Flange including Bearing & Pinion)

Type	Size		Configuration		Ratio		Precision Grades	Centering		Mounting Position		
HPG	060	-	A	I	5	-	PS	0	-	SU	-	Motor

Güdel Pinion		Request of the Output Flange		Assembly		Spacer Elements (optional)
211320	-	86	53	-	-	22

Example
HPG 060-A1-5-PS-0-211320-86-53-22-SU



HPG High Performance Angle Gearbox

030 045 060 090 120 180

Input: **A** B C D

Output: **1** 2 3 4 5 6 7

i = **2** 3 4 5 6 8 10 13.33 16 24 30 47 60

PS Standard circumferential backlash
PR Reduced circumferential backlash *

* PR can not be selected in sizes 030 and 180

0 without
1 at input 1 for configuration C and D
2 at input 2 (input shaft) for configuration B and D
3 for input 1 and 2 for configuration B und D

SS vertical standing worm
SU vertical worm below
SL flat lying worm
SO vertical worm upstairs

Part. No. acc. to catalogue

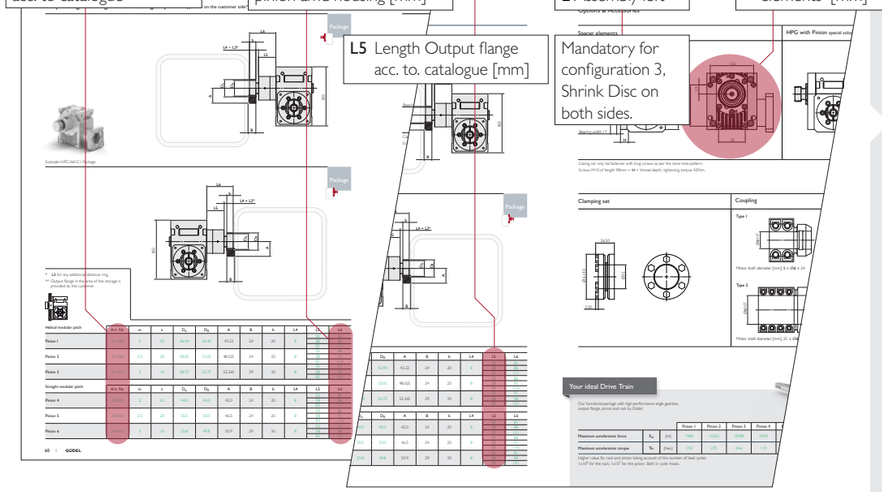
L6 Distance between pinion amd housing [mm]

L5 Length Output flange acc. to. catalogue [mm]

R Assembly right
L Assembly left

Mandatory for configuration 3, Shrink Disc on both sides.

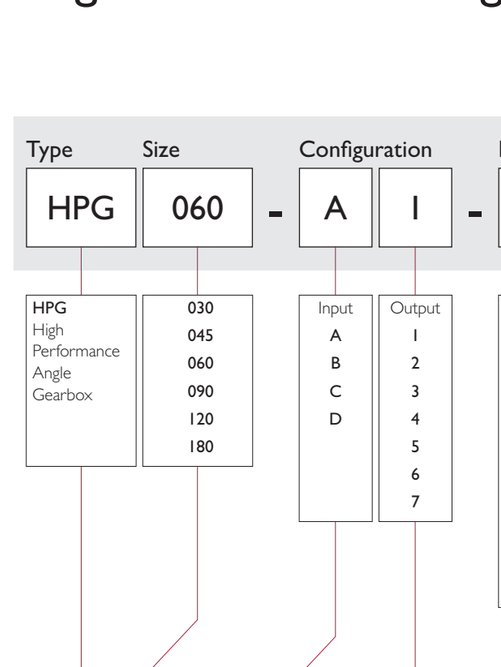
H Heigth of spacer elements [mm]

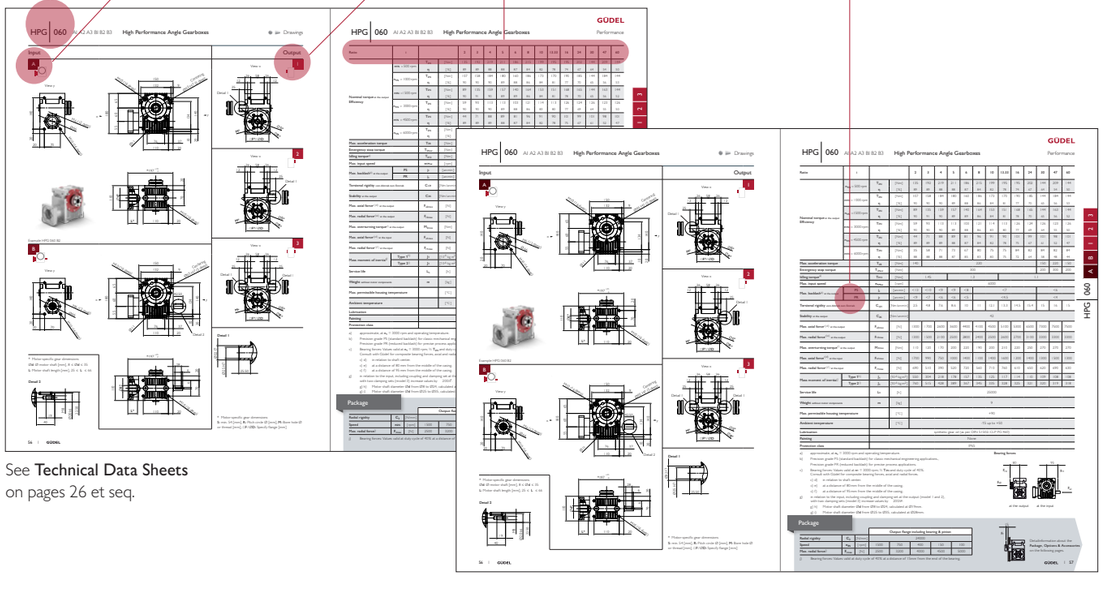


Unless a pinion is required

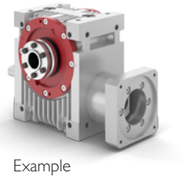
Unless a Package is required (Output Flange including Bearing & Pinion)

Unless no spacer elements are required

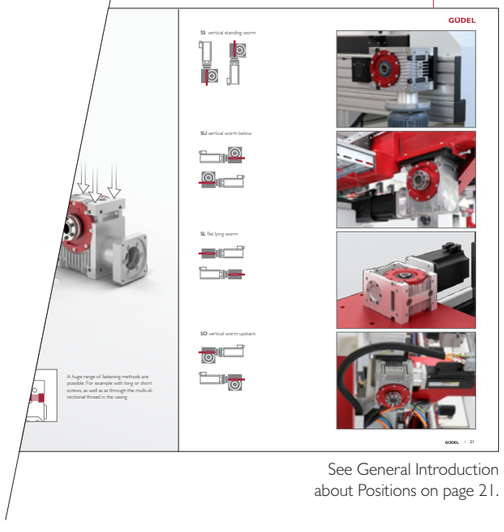




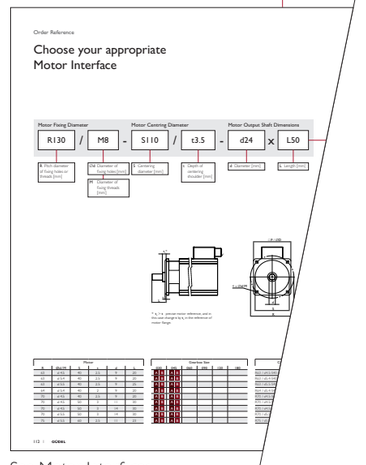
See **Technical Data Sheets** on pages 26 et seq.



Example
HPG 060-A1-5-PS-0-SU



See General Introduction about Positions on page 21.



See Motor Interfaces on pages 112 et seq.

Order Reference

Choose your appropriate Motor Interface

Motor Fixing Diameter		Motor Centring Diameter		Motor Output Shaft Dimensions	
R130	/ M8	- S110	/ t3.5	- d24	x L50

R Pitch diameter of fixing holes or threads [mm]

Ød Diameter of fixing holes [mm]

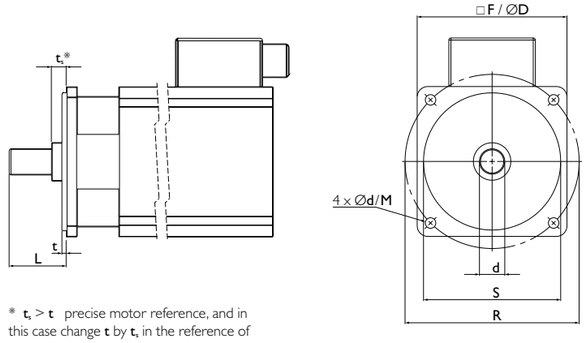
M Diameter of fixing threads [mm]

S Centering diameter [mm]

t Depth of centering shoulder [mm]

d Diameter [mm]

L Length [mm]



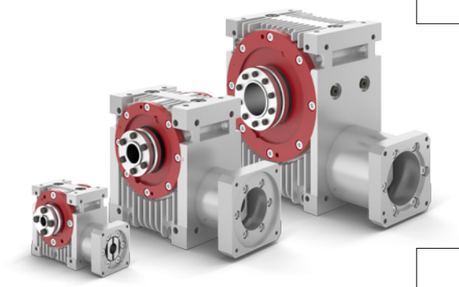
* $t_1 > t$ precise motor reference, and in this case change **t** by t_1 in the reference of motor flange.

Motor						Gearbox Size						Code
R	Ød/M	S	t	d	L	030	045	060	090	120	180	
63	d 4.5	40	2.5	9	20	A B	A B					R63 / d4.5-S40 / t2.5-d9×20
63	d 5.4	40	2.5	9	20	A B	A B					R63 / d5.4-S40 / t2.5-d9×20
63	d 5.5	40	2.5	9	25	A B	A B					R63 / d5.5-S40 / t2.5-d9×25
64	d 5.4	40	2	9	20	A B	A B					R64 / d5.4-S40 / t2-d9×20
70	d 4.5	40	2.5	9	20	A B	A B					R70 / d4.5-S40 / t2.5-d9×20
70	d 4.5	50	3	11	30	A B	A B					R70 / d4.5-S50 / t3-d11×30
70	d 4.5	50	3	14	30	A B	A B					R70 / d4.5-S50 / t3-d14×30
70	d 5.5	50	3	14	30	A B	A B					R70 / d5.5-S50 / t3-d14×30
75	d 5.5	60	2.5	11	23	A B	A B					R75 / d5.5-S60 / t2.5-d11×23

Motor						Gearbox Size						Code
R	Ød/M	S	t	d	L	030	045	060	090	120	180	
75	d 5.5	60	2.5	14	30	A B	A B	A B				R75 / d5.5-S60 / t2.5-d14×30
75	d 5.5	60	3	14	30	A B	A B	A B				R75 / d5.5-S60 / t3-d14×30
75	d 5.8	60	2.5	11	23	A B	A B					R75 / d5.8-S60 / t2.5-d11×23
75	d 6.5	60	3	14	30	A B	A B	A B				R75 / d6.5-S60 / t3-d14×30
90	d 6	70	3	19	35	A B*	A B	A B				R90 / d6-S70 / t3-d19×35
90	d 7	70	3	14	30	A B	A B	A B				R90 / d7-S70 / t3-d14×30
90	d 7	70	3	16	40	A B*	A B	A B				R90 / d7-S70 / t3-d16×40
95	d 6.6	50	2.5	14	30	A B	A B					R95 / d6.6-S50 / t2.5-d14×30
100	d 7	80	3	14	30	A B	A B	A B				R100 / d7-S80 / t3-d14×30
100	d 7	80	3	19	40	A B*	A B	A B	A B			R100 / d7-S80 / t3-d19×40
100	d 6.5	80	2.5	14	30	A B	A B	A B				R100 / d6.5-S80 / t2.5-d14×30
100	d 6.5	80	3	19	40	A B*	A B	A B	A B			R100 / d6.5-S80 / t3-d19×40
100	d 6.6	80	4	10	32	A B	A B*	A B				R100 / d6.6-S80 / t4-d10×32
100	d 6.6	80	5	14	37	A B*	A B*	A B				R100 / d6.6-S80 / t5-d14×37
100	d 6.6	80	5	16	40	A B*	A B*	A B	A B			R100 / d6.6-S80 / t5-d16×40
115	d 9	95	3	19	40		A B	A B	A B	A B		R115 / d9-S95 / t3-d19×40
115	d 7	95	3	24	45		A B	A B	A B	A B		R115 / d7-S95 / t3-d24×45
115	d 10	95	3	19	40		A B	A B	A B	A B		R115 / d10-S95 / t3-d19×40
130	d 9	95	3	19	40		A B	A B	A B	A B		R130 / d9-S95 / t3-d19×40
130	d 9	95	3	24	50		A B	A B	A B	A B		R130 / d9-S95 / t3-d24×50
130	d 9	110	3	24	50		A B	A B	A B	A B		R130 / d9-S110 / t3-d24×50
130	d 9	110	3.5	24	50		A B	A B	A B	A B		R130 / d9-S110 / t3.5-d24×50
130	d 9	110	3.5	19	40		A B	A B	A B	A B		R130 / d9-S110 / t3.5-d19×40
130	M8	110	3.5	19	40		A B	A B	A B	A B	A	R130 / M8-S110 / t3.5-d19×40
130	M8	110	3.5	24	50		A B	A B	A B	A B		R130 / M8-S110 / t3.5-d24×50
130	M8	110	3.5	28	60			A B	A B	A B	A B	R130 / M8-S110 / t3.5-d28×60
130	M8	110	3.5	38	80				A B	A B	A B	R130 / M8-S110 / t3.5-d38×80
145	d 9	110	6	19	55		A B*	A B	A B*	A B*		R145 / d9-S110 / t6-d19×55
145	d 9	110	6	19	58		A B*	A B	A B*	A B*		R145 / d9-S110 / t6-d19×58
145	d 9	110	6	22	58		A B*	A B	A B*	A B*	A B	R145 / d9-S110 / t6-d22×58
145	d 9	110	6	24	58		A B*	A B	A B*	A B*	A B	R145 / d9-S110 / t6-d24×58
145	d 9	110	6	28	63			A B	A B*	A B*	A B	R145 / d9-S110 / t6-d28×63
145	d 10	110	3.5	16	40	A B	A B	A B				R145 / d10-S110 / t3.5-d16×40
145	d 10	110	3.5	19	40	A B	A B	A B	A B			R145 / d10-S110 / t3.5-d19×40
165	d 11	110	4	24	50		A B	A B	A B			R165 / d11-S110 / t4-d24×50
165	d 11	130	3	28	60		A B	A B	A B	A B		R165 / d11-S130 / t3-d28×60
165	d 11	130	3.5	19	28		A B					R165 / d11-S130 / t3.5-d19×28
165	d 11	130	3.5	24	50		A B	A B	A B			R165 / d11-S130 / t3.5-d24×50
165	d 11	130	3.5	32	58		A B	A B	A B	A B		R165 / d11-S130 / t3.5-d32×58
165	d 11	130	4	32	58		A B	A B	A B	A B		R165 / d11-S130 / t4-d32×58
190	d 11	155	3.5	32	60			A B	A B	A B		R190 / d11-S155 / t3.5-d32×60
190	d 11	155	3.5	35	60			A B	A B	A B		R190 / d11-S155 / t3.5-d35×60
200	d 13.5	114.3	3.2	35	79			A B	A B	A B		R200 / d13.5-S114.3 / t3.2-d35×79
200	d 13.5	114.3	3.2	42	113				A B*	A B		R200 / d13.5-S114.3 / t3.2-d42×113
215	d 14	130	4	32	60			A B	A B	A B		R215 / d14-S130 / t4-d32×60
215	d 14	130	4	38	60			A B	A B	A B		R215 / d14-S130 / t4-d38×60
215	d 13	180	4	28	60			A B	A B	A B		R215 / d13-S180 / t4-d28×60
215	d 13	180	4	38	80			A B	A B	A B		R215 / d13-S180 / t4-d38×80
215	d 14	180	4	28	42			A B	A B			R215 / d14-S180 / t4-d28×42
215	d 14	180	4	28	60			A B	A B	A B		R215 / d14-S180 / t4-d28×60
215	d 14	180	4	32	58			A B	A B	A B		R215 / d14-S180 / t4-d32×58
215	d 14	180	4	32	60			A B	A B	A B		R215 / d14-S180 / t4-d32×60
215	d 14	180	4	32	80			A B	A B	A B		R215 / d14-S180 / t4-d32×80
215	d 14	180	4	38	80			A B	A B	A B		R215 / d14-S180 / t4-d38×80
235	d 13.5	200	4	42	116					A B*	A B	R235 / d13.5-S200 / t4-d42×116
265	d 13	230	4	38	80					A B	A B	R265 / d13-S230 / t4-d38×80
265	d 14	230	4	38	80					A B	A B	R265 / d14-S230 / t4-d38×80
265	d 14	230	4	55	110						A B	R265 / d14-S230 / t4-d55×110
300	d 18	250	5	42	110					A B	A B	R300 / d18-S250 / t5-d42×110
300	d 18	250	5	48	82					A B	A B	R300 / d18-S250 / t5-d48×82
300	d 18	250	5	48	110					A B	A B	R300 / d18-S250 / t5-d48×110
300	d 19	250	5	48	110					A B	A B	R300 / d19-S250 / t5-d48×110
350	d 18	300	5	55	110						A B	R350 / d18-S300 / t5-d55×110
350	d 18	300	5	60	110						A B	R350 / d18-S300 / t5-d60×110

* Motorenflansch dicker als üblich.

Calculate your High Performance Angle Gearbox



Define the maximum output speed
n_{2max} [rpm]

Define ratio **i**

$n_{1max} < n_{1Max}$ — no → Select smaller ratio **i**

Define maximum acceleration torque
T_{2b}

$T_{2b} < T_{2B}$ — no → Select larger gearbox

Define the emergency stop torque
T_{2not} [Nm]

$T_{2not} < T_{2Not}$ — no → Select larger gearbox

Define the average nominal output torque
T_{2m} [Nm]

$$T_{2m} = \sqrt[3]{\frac{(|n|/2)\times t_1 \times |T_1|^3 + |n| \times t_2 \times |T_2|^3 + (|n|/2)\times t_3 \times |T_3|^3}{(|n|/2)\times t_1 \times |n| \times t_2 + (|n|/2)\times t_3}}$$

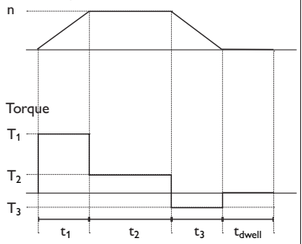
Define the average output speed
n_{1m} [rpm]

$$n_{1m} = \frac{(|n|/2)\times t_1 + |n| \times t_2 \times (|n|/2)\times t_3}{t_1 + t_2 + t_3}$$

Define the duty cycle
ED

$$ED = (t_1 + t_2 + t_3)/(t_1 + t_2 + t_3 + t_{dwell}) \times 100\%$$

Rotation speed



Input	S hock factor f_B
Polynomia	1.0
Standard Servo / Sinus2	1.1
FU / VFD	1.25
AC- Motor	1.4
External Output-shock	1.6

Define the shock factor
f_B

Define the starting frequency factor
f_A

Starting frequency	Starting frequency factor f_A
< 60 / h	0.7
< 360 / h	0.8
< 1200 / h	1.0
< 3600 / h	1.3

	Size					
	030	045	060	090	120	180
n_{1m} < 500 rpm	5.50	3.00	1.70	1.10	1.00	1.00
n_{1m} < 1000 rpm	4.00	2.30	1.40	1.05	1.00	1.00
n_{1m} < 1500 rpm	3.30	2.00	1.30	1.05	1.00	1.00
n_{1m} < 3000 rpm	2.30	1.50	1.15	1.05	1.00	1.00
n_{1m} < 4500 rpm	1.70	1.30	1.05	1.00	1.00	
n_{1m} < 6000 rpm	1.50	1.20	1.00			

Abrasion factor f_P* for high-accuracy applications, otherwise $f_P = 1$.

Define the abrasion factor
f_P

Define the duty factor
f_{ED}

Duty cycle	Duty service factor f_{ED}
< 25%	0.7
< 40%	1.0
< 60%	1.2
< 70%	1.3
< 80%	1.4
< 100%	1.8

	Size					
	030	045	060	090	120	180
n_{1m} < 500 rpm	0.40	0.40	0.40	0.60	0.80	0.90
n_{1m} < 1000 rpm	0.40	0.40	0.45	0.70	0.90	1.10[a]
n_{1m} < 1500 rpm	0.40	0.40	0.55	0.80	1.20	1.30[a]
n_{1m} < 3000 rpm	0.40	0.40	0.70	0.95[a]	2.00[a]	2.40[b]
n_{1m} < 4500 rpm	0.40	0.40	0.70	1.00[a]	2.80[a]	
n_{1m} < 6000 rpm	0.40	0.40	0.75			

a) Maximum duty cycle 80%
b) Maximum duty cycle 60%

Define the **temperature factor** (ambient air)
f_U

Ambient temperature	Temperature factor f_U
< 10°C	0.85
< 20°C	1.0
< 30°C	1.2
< 40°C	1.5
< 50°C	1.9

Define the **temperature factor**
f_T

$T_{2mech} = T_{2m} \times f_B \times f_A \times f_P$*

$T_{2mech} < T_{2N}$ — no → Select a larger gearbox

$T_{2therm} = T_{2m} \times f_{ED} \times f_T \times f_U$

$T_{2therm} < T_{2N}$ — no → Select a larger gearbox

Transmittable torque of the coupling [Nm]

Motor shaft diameter Ød [mm]	Size 030	045	060	090	120	180
8	3.5					
9	3.9	6.8				
10	4.3	7.6	17.5			
11	4.8	8.3	19.2			
14	6.1	10.6	24.5	44.9		
16	6.9	12.1	28.0	51.3		
19	8.2	14.4	33.2	61.0	61.0	
22		19.1	38.4	70.6	70.6	168
24		20.8	41.9	77.0	77.0	183
28			42.3	89.8	89.8	214
32			48.4	103	103	244
35			52.9	112	112	267
38				133	122	290
42				147	135	321
48					168	367
55						420
60						458

Compare the tightening hub and the motor shaft diameter Ø**d**

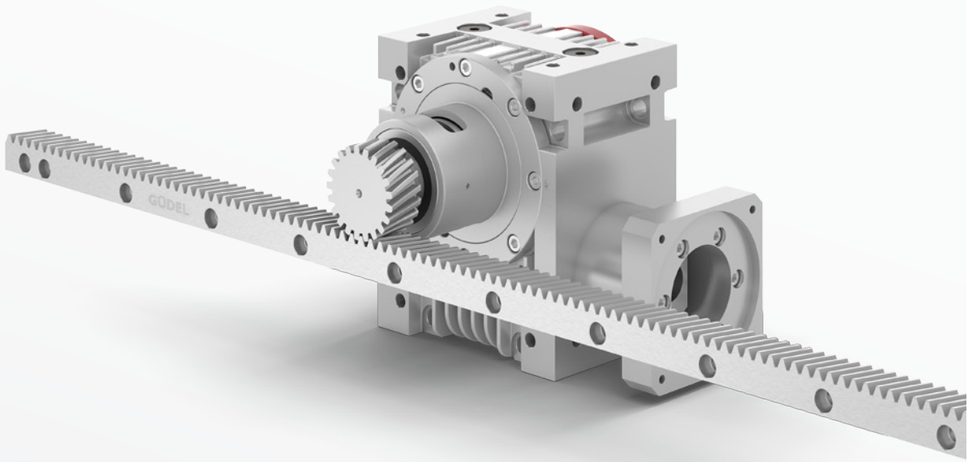
Compare the motor shaft length **L** with the min./ max. steps

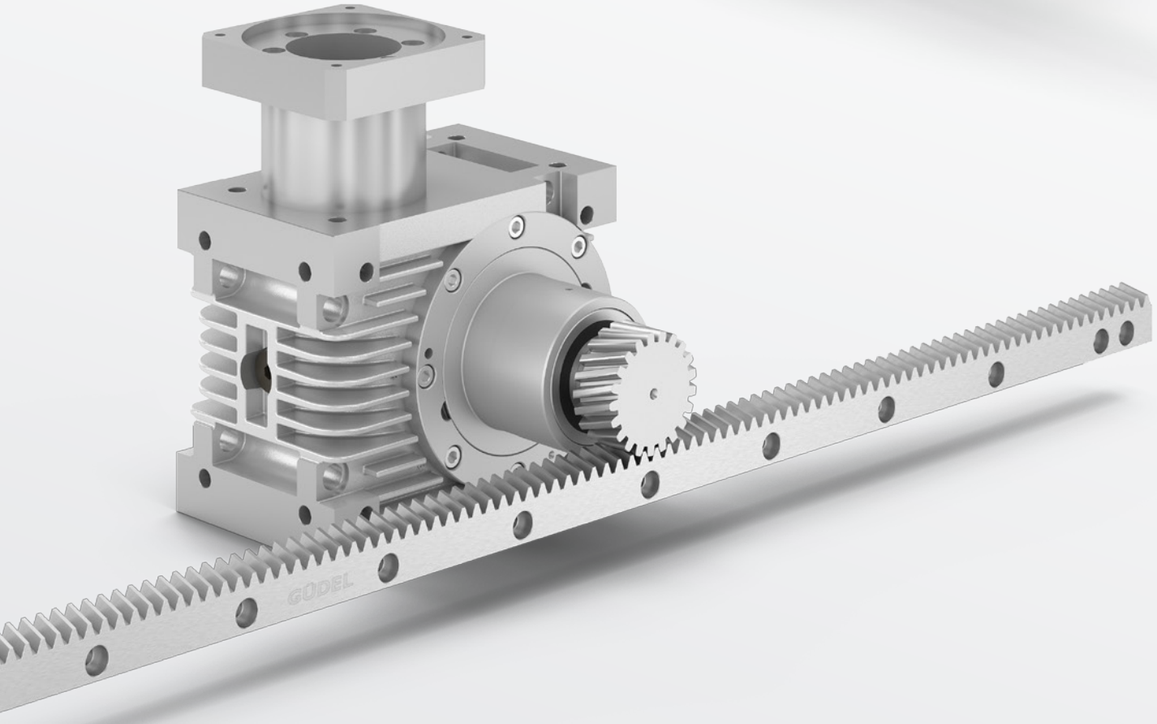
$T_{2maxmot} < T_{coupling}$ — no → Limit the motor current

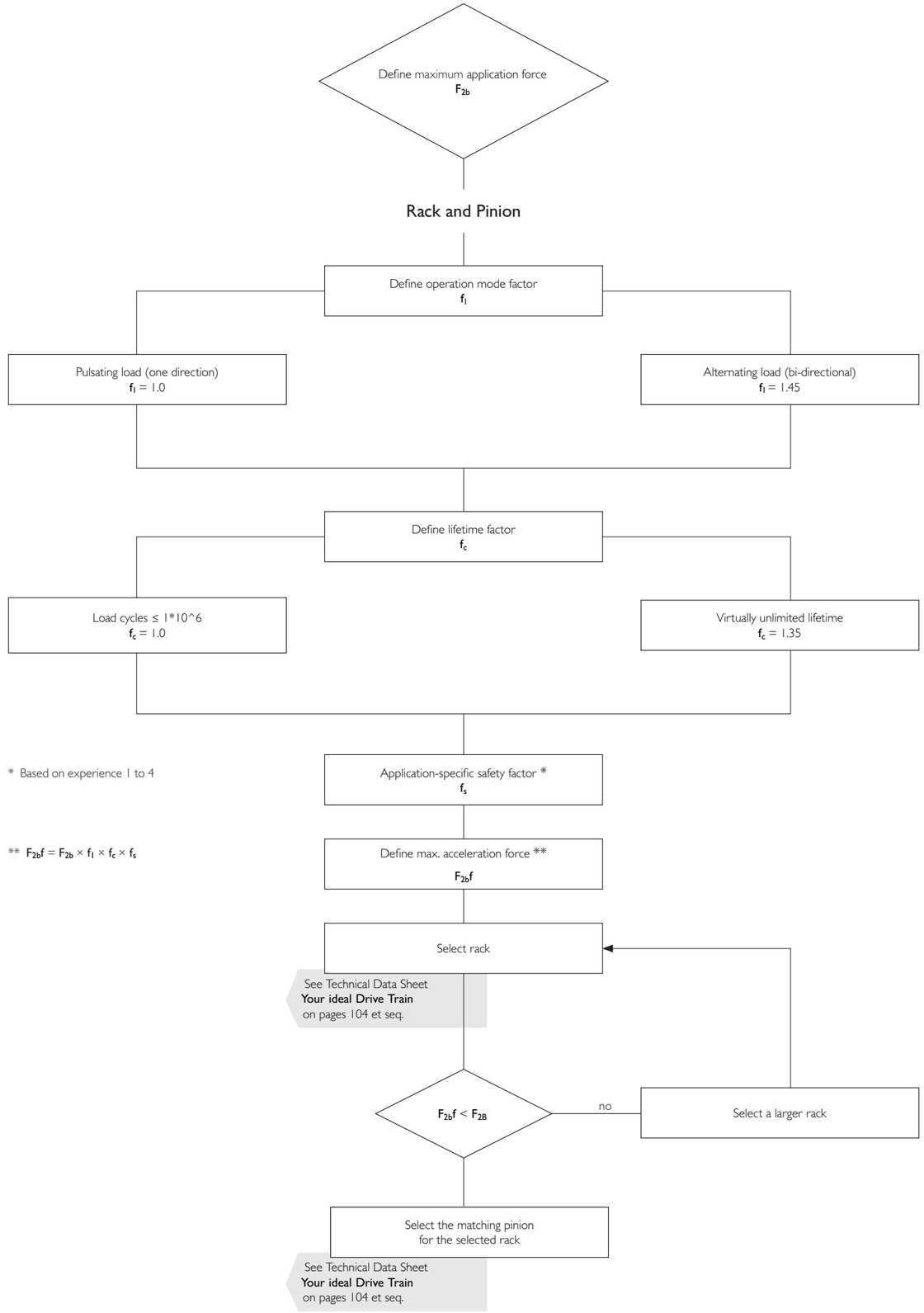
$T_{2maxmot} < T_{2B}$ — no

HPG Gearbox design finished

Find your ideal Drive Train

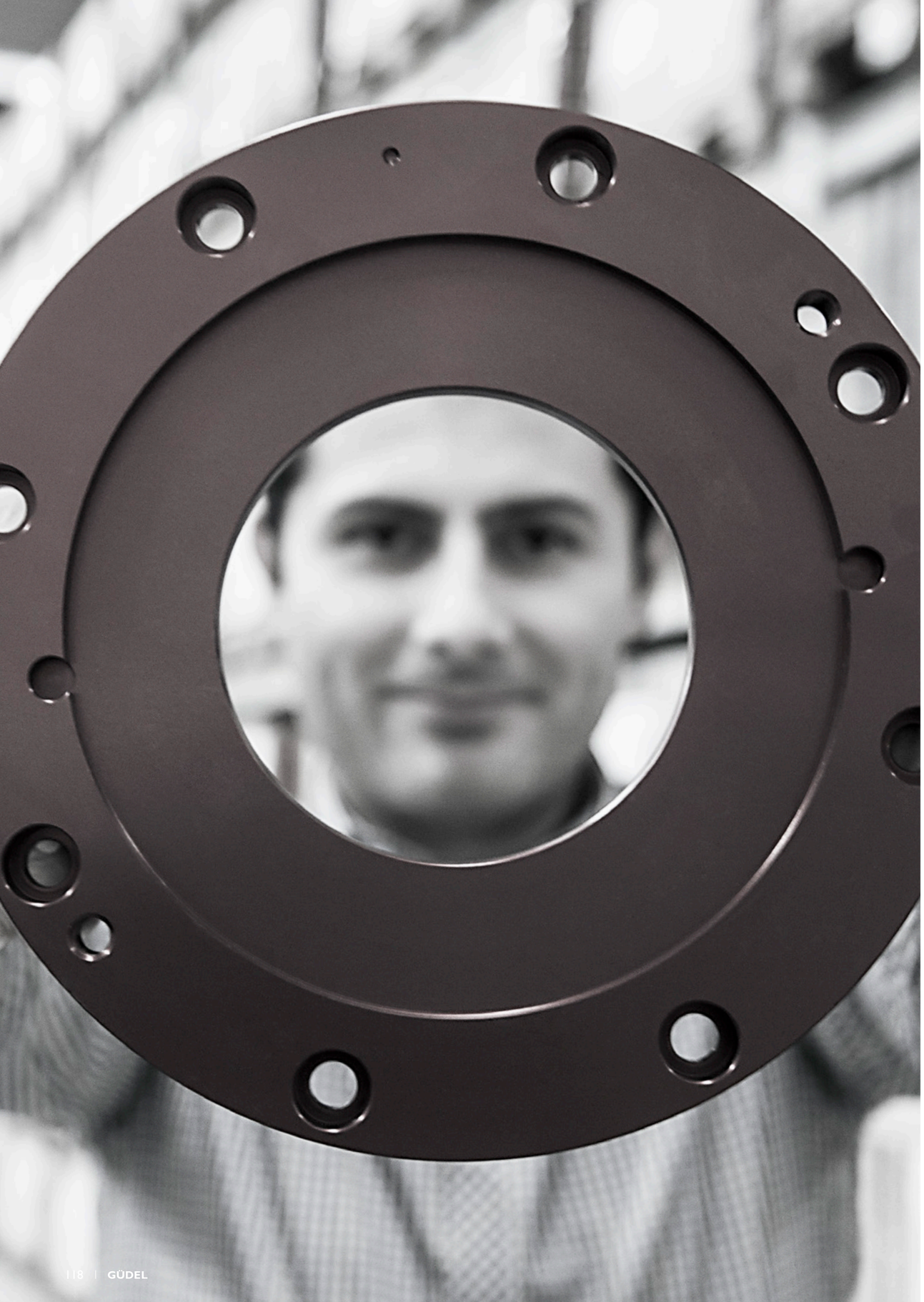






* Based on experience 1 to 4

** $F_{2b}f = F_{2b} \times f_l \times f_c \times f_s$



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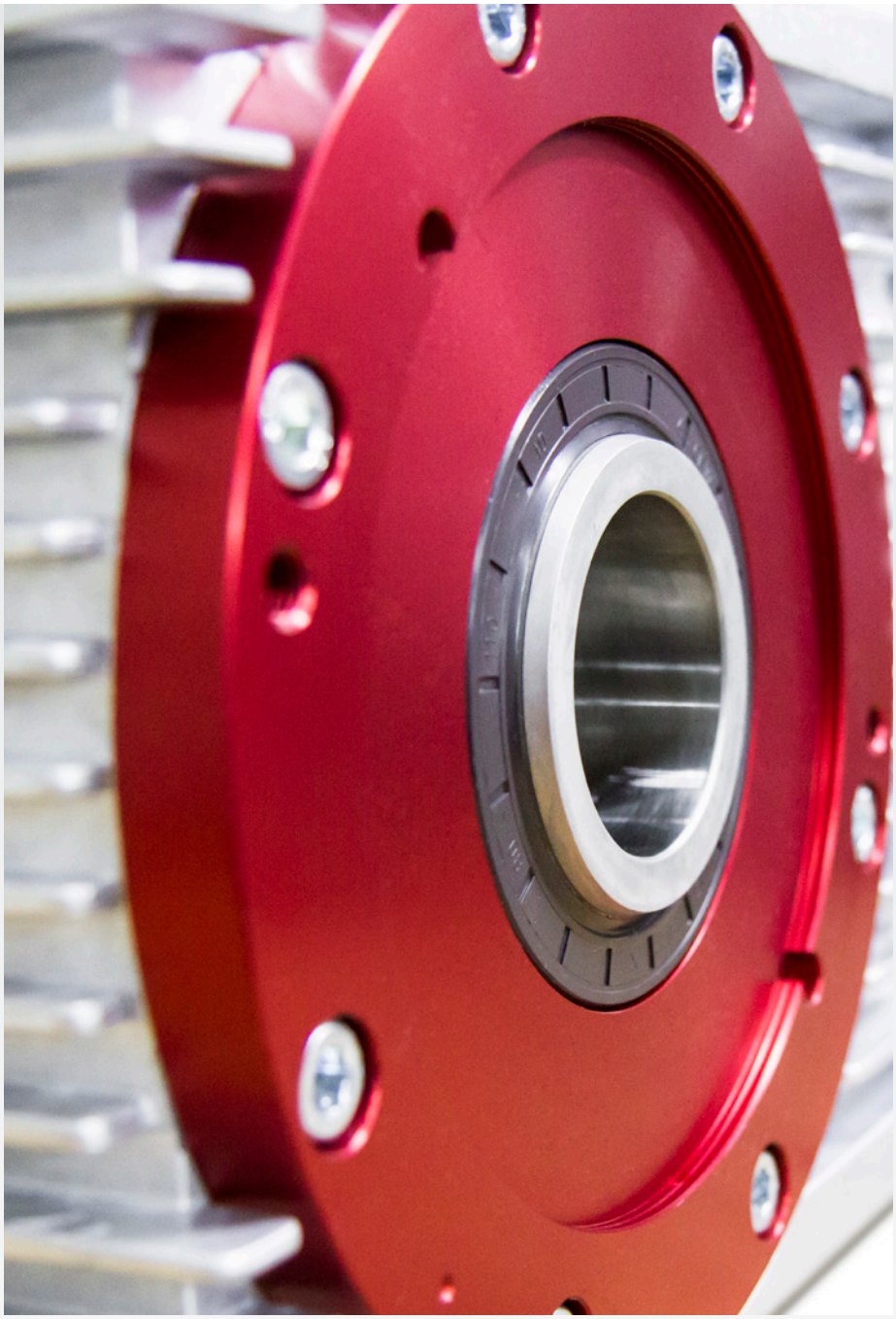

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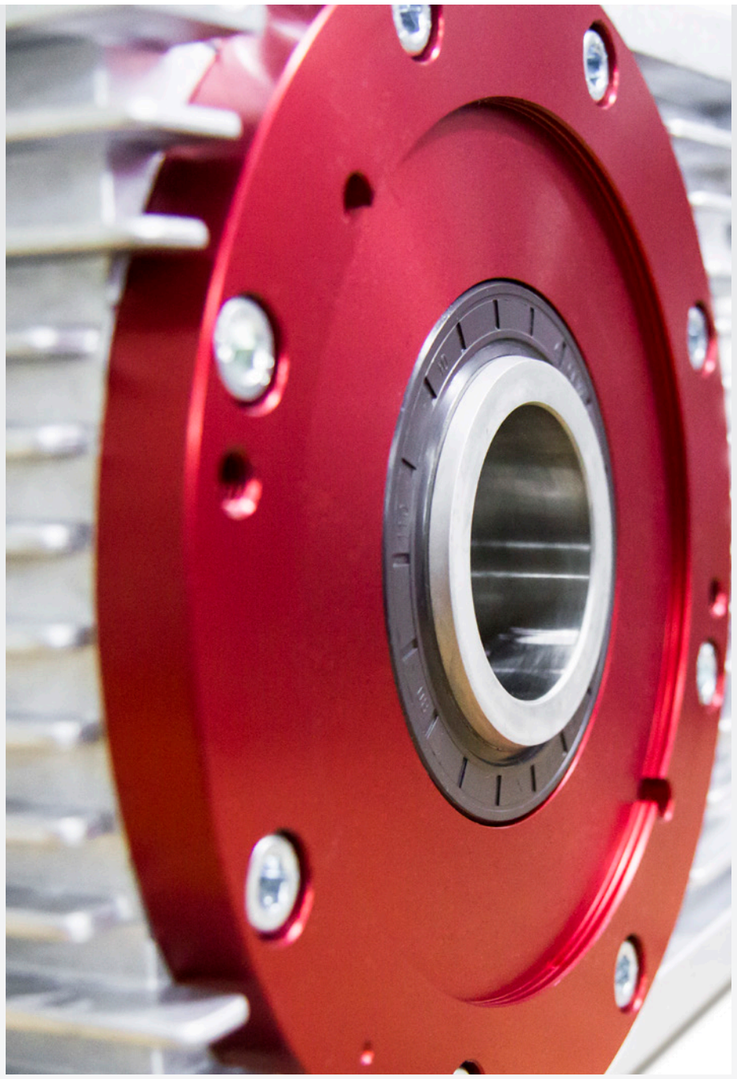

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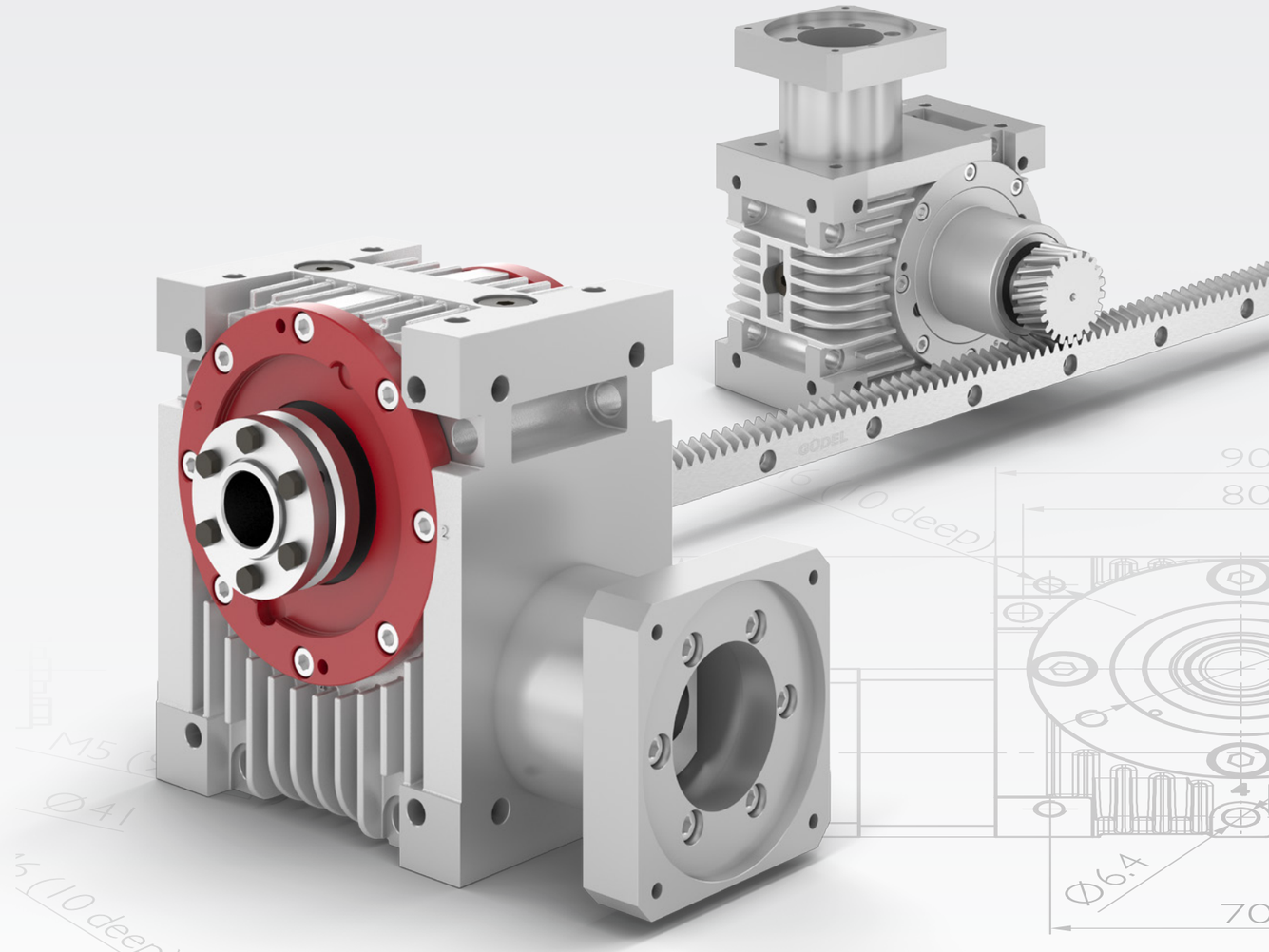
High Performance
Angle Gearboxes



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