

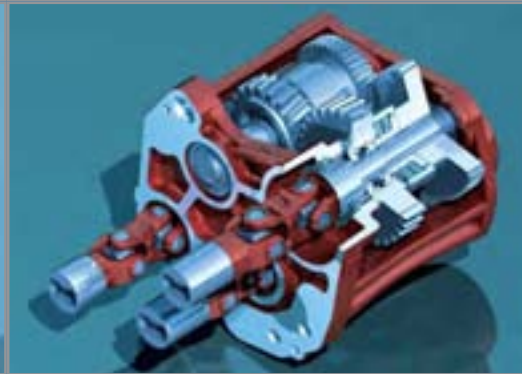


ZF-SERVOPLAN®

Planetary gearboxes

Economy Series PGE

for Servomotors



ZF-Duoplan 2K
Two-speed Gearboxes

ZF-Ecolift
Elevator Gearboxes

ZF-Servoplan PG
Servogearboxes

ZF-Tiratron
Hysteresis Brakes

Customer specific
Gearboxes

Servoplan WT
Right Angle gearboxes



Z F - S e r v o p l a n P G E
S e r v o g e a r b o x e s E c o n o m y

Precision in movement

our company is able to offer you a wide range of machine drives, brakes and clutches for applications in mechanical engineering as well as customer specific drive solutions.

Our development and production activities are focused on servo-assisted drives for automation technology, two-speed drive gearboxes for machine tools as well as customer-specific drives, such as for printing machines, robot applications and elevator gearboxes.

Our innovative standard products range from low backlash servogearboxes (ZF-Servoplan), and robust two-speed gearboxes (ZF-Duoplan) to hysteresis clutches and brakes for non-contact web control (ZF-Tiratron).



The ZF-Servoplan planetary gearbox Economy series has been designed for direct mounting onto servomotors. The available wide range of sizes and the use of a modular system allows the application in almost any field of automation.

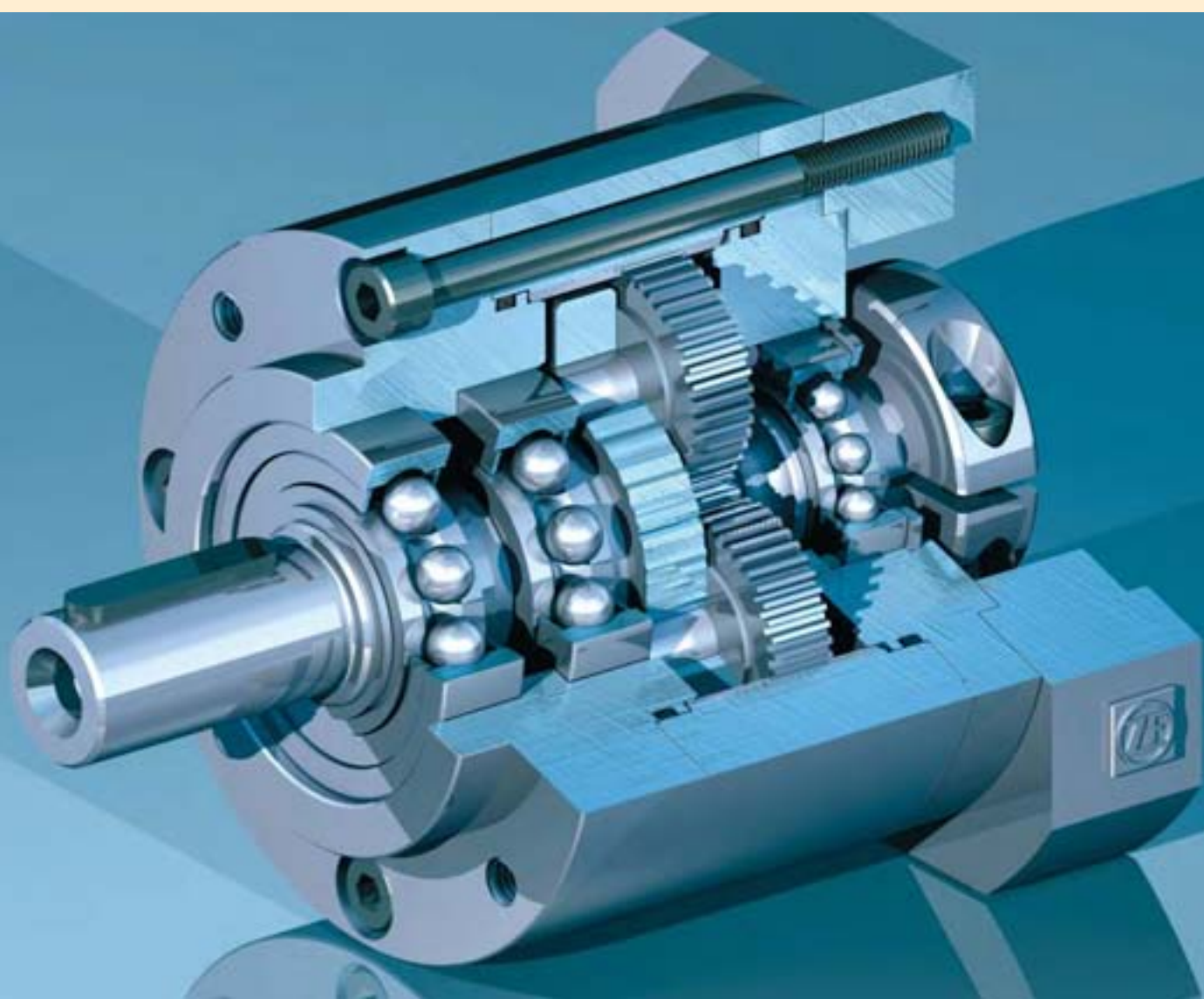
Principle of Operation

The combination of servomotors with ZF-Servoplan planetary gearboxes constitutes a coaxial drive unit. The servomotor output shaft is connected to the sun gear of the gearbox by using a compression coupling. The sun gear drives three planetary gears inside the planetary carrier, which rotate inside the internal ring gear.

We feature a compact design with high power density thanks to equal force distribution among three planetary gears and robust performance due in part to hardened gears.

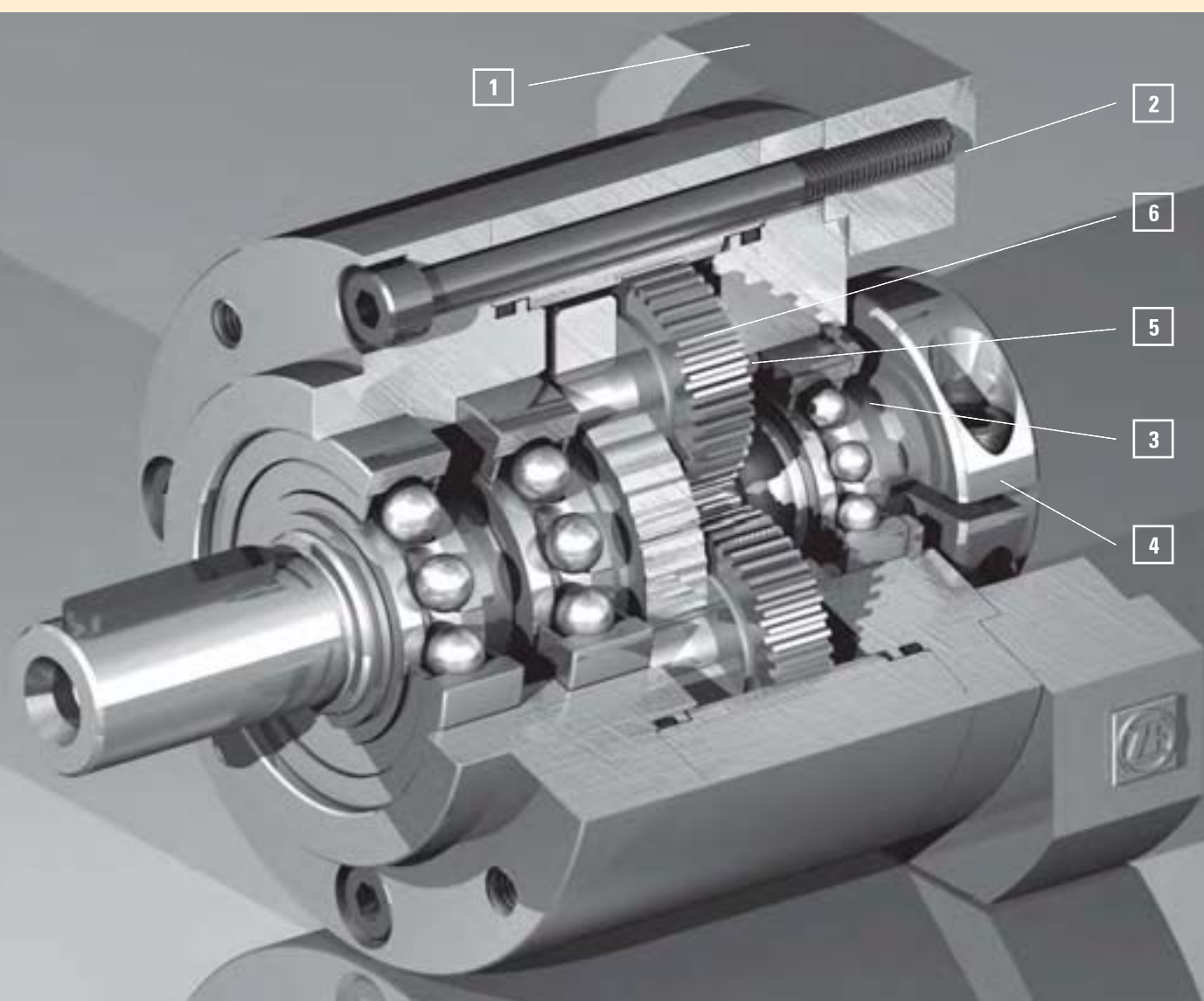
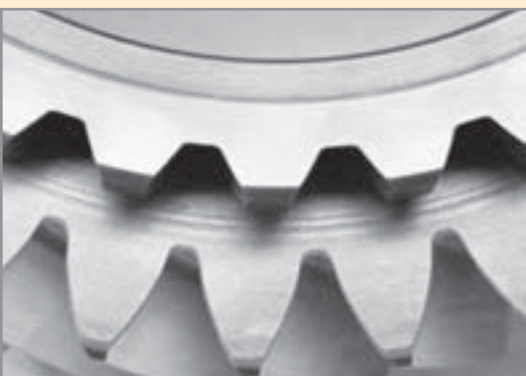


In addition to right angle gearboxes and the Economy Series PGE we also offer planetary gearboxes with low backlash especially for automation and positioning purpose.





1. Easy motor mounting with modular adapter flange system.
2. Our input pilot ensures proper gearbox alignment to motor shaft, preventing shortened bearing life due to improper preloading.
3. High flexibility by using proven input coupling system.
4. Motor shaft / gearbox connection with compression coupling, ensuring a slip free and non-wearing power transmission.
5. Integrated axial length compensation system absorbing thermal growth of motor shaft.
6. High efficiency and low running noise thanks to high gearing quality, cageless needle bearings in planetary gears and high-grade lubricant.
7. High torsional rigidity and acceleration torques permitted due to robust design and optimized gearing geometry.
8. Five available gearbox sizes for output torques from 4 to 200 Nm.
9. Available ratios from $i = 3$ to 100 (up to: 1000 on request)
10. Maintenance free with lifetime grease lubrication.
11. For use in any installation position.



Planetary Gearbox, one-stage

Size :

Technical Data :

		Reduction Ratio i :	PGE 12/1	PGE 25/1	PGE 50/1	PGE 100/1	PGE 200/1
Nominal output torque relating to $n_1 = 3000$ [rpm]	T_{2N} [Nm]	3 4 5 7 10 / 9*	- 4 4.5 4.5 4*	13 14 16 15 14	35 45 45 43 35	85 90 110 90 80	160 250 270 270 160
Emergency stop torque ¹⁾	T_{2Not} [Nm]	3 4 5 7 10 / 9*	- 12 13.5 13.5 12*	39 42 48 45 36	96 129 135 129 102	225 240 300 270 180	315 480 480 480 300
Max. acceleration torque ²⁾	T_{2B} [Nm]	3 4 5 7 10 / 9*	- 8 8 8 7*	25 28 32 28 25	70 88 90 86 70	160 180 210 160 160	290 375 405 405 290
Max. input speed	n_{1Max} [rpm]	3, 4, 5, 7 10 / 9*	6 000	6 000	5 000	5 000	3 600
Nominal input speed	n_{1N} [rpm]	3, 4, 5, 7 10 / 9*	3 000	3 000	3 000	3 000	2 600
Backlash	[arcmin]		20	12	10	10	10
Torsional rigidity	C_t [Nm/arcmin]		0.4	1.6	4.8	10	34
Moments of inertia ³⁾	I_1 [kg cm ²]	3 4 5 7 10 9*	0.033 0.031 0.030 0.029	0.128 0.086 0.074 0.064 0.059	0.67 0.49 0.43 0.37 0.34	2.59 1.90 1.61 1.41 1.32	7.50 4.70 3.70 3.00 2.70
Moments of inertia ³⁾	I_1 [kg cm ²]	3 4 5 7 10 9*	0.060 0.058 0.057 0.056	0.367 0.324 0.314 0.304 0.299	1.62 1.44 1.36 1.30 1.27	3.66 2.97 2.68 2.48 2.39	10.60 7.80 6.80 6.10 5.80
Max. axial force	F_A [N]		230	615	1 135	1 980	3 560
Max. radial force ⁴⁾	F_R [N]		155	530	925	1 630	3 120
Lifetime	L_h [h]		20 000	20 000	20 000	20 000	20 000
Efficiency	η		96%	97%	96%	96%	96%
Weight ca.	m [kg]		0.4	1.3	2.6	6	12.5
Operating noise at $n_{an} = 3000$ [rpm]	L_p [dB(A)]		≤ 70	≤ 70	≤ 70	≤ 70	≤ 70
Lubrication:	Lifetime grease lubrication, closed system						
Surface protection	Steel housing, galvanically treated. Aluminum flanges.						
Installation position	Any, including variable orientation.						
Operating temperature	- 10° C to + 90 °C						
Direction of rotation	same as input						
Degree of protection	IP 64						

1) Max. 1000 times during gearbox lifetime.

2) At a maximum of 1000 cycles per hour.

Percentage of the overall running time less than 5 % and duration of the impulse under 0.3 sec.

3) dependent on motor shaft diameter (see D6).

4) Resultant force middle of output shaft at output speed 100 rpm.

* for PGE 12/1 i =9 all others i =10

Printed in bold letters: Shorter delivery time.

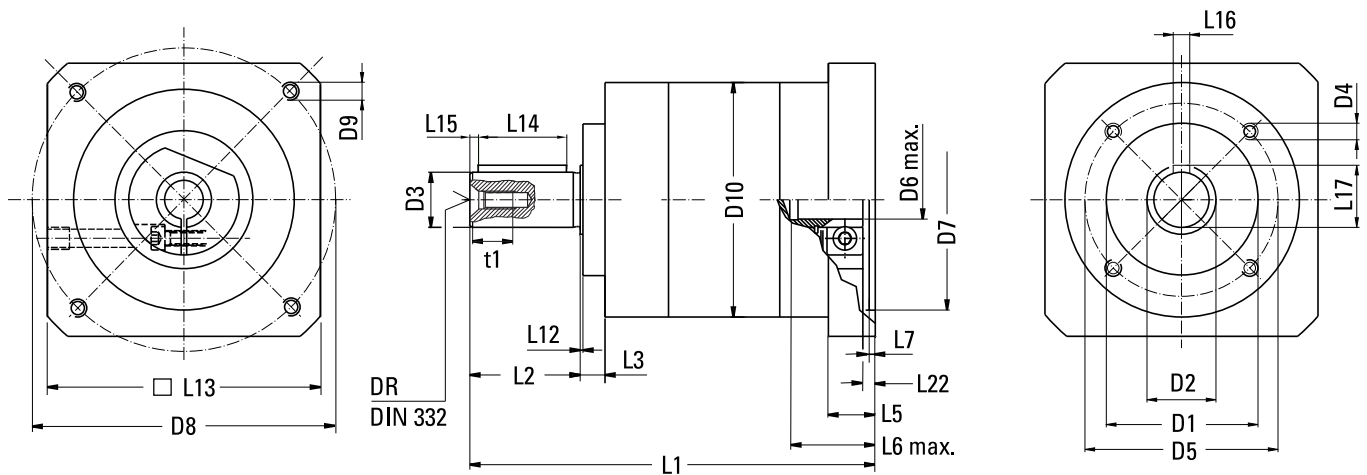
Size:

Dimensions [m m]:

		PGE 12/1	PGE 25/1	PGE 50/1	PGE 100/1	PGE 200/1
DR		DM4	DM5	DM6	DM10	DM16
t1		10	12.5	16	22	36
D1 (h7)		25	40	55	80	110
D2		12	17	25	30	50
D3 (k6)		10	14	20	25	40
D4		M4	M5	M6	M8	M10
D5		33	52	70	100	130
D6*(F6)	min.	3	6	9	14	19
	max.	11	14	19	24	32
D7*,D8*,D9*		Adaptations available for all common servomotors, dimensions are variable				
D10		40	65	85	120	155
L1		95	127.5	161	196	262
L2		23	30	40	50	80
L3		6	9	9	11	15
L5		27	23	28	31	39
L6	min.	14	19	24	27	30
	max.	30	40.5	45	69	78
L7*		3	4	4.5	5.5	6.5
L12		1	1	1	1	1
L13*	min.	40	65	85	120	155
L14		18	25	32	40	70
L15		2	2.5	3	3	5
L16		3	5	6	8	12
L17		11.2	16	22.5	28	43
L22*		3.5	5	5.5	6.5	8.5

*Dimensions depending
on motor.

Please use page 17
for inquiries and orders.



Planetary Gearbox, two-stage

Size:

Technical Data:

		Reduction Ratio i:	PGE 12/2	PGE 25/2	PGE 50/2	PGE 100/2	PGE 200/2
Nominal output torque relating to $n_1 = 3000$ [rpm]	T_{2N} [Nm]	16 20 25 28 35 40 / 49* 50 70 100	5 5 5 5 5 5*	19 19 21 21 21 21 21 17 16	55 55 58 55 58 55 58 50 35	100 100 110 100 110 100 110 95 85	270 270 290 270 290 270 290 290 170
Emergency stop torque ¹⁾	T_{2Not} [Nm]	16 20 25 28 35 40 / 49* 50 70 100	15 15 15 15 15 15* 63 51 42	57 57 63 63 63 63 63 174 105	165 165 174 165 174 165 174 150 105	300 300 330 300 330 300 330 285 186	510 510 510 510 540 510 600 540 390
Max. acceleration torque ²⁾	T_{2B} [Nm]	16 20 25 28 35 40 / 49* 50 70 100	10 10 10 10 10 10* 40 32 29	34 34 40 40 40 40 40 90 70	98 98 105 98 105 98 105 90 70	180 180 210 180 210 180 210 175 160	405 405 435 405 435 405 435 435 310
Max. input speed	n_{1Max} [rpm]	12, 15, 16, 20, 25, 28, 35, 40 / 49*, 50, 70, 100	6 000	6 000	5 000	5 000	3 600
Nominal input speed	n_{1N} [rpm]	12, 15, 16, 20, 25, 28, 35, 40 / 49*, 50, 70, 100	3 000	3 000	3 000	3 000	3 000
Backlash	[arcmin]		25	15	15	15	15
Torsional rigidity	C_t [Nm/arcmin]		0.5	2	6	13	37
Moments of inertia ³⁾	I_1 [kg cm ²]	16 20 25 28 35 40 49* 50 70 100	0.033 0.031 0.031 0.031 0.030 0.030 0.030 0.059 0.059 0.059	0.083 0.072 0.072 0.063 0.063 0.059 0.059 0.059 0.059 0.059	0.48 0.42 0.42 0.37 0.37 0.34 0.34 0.34 0.34 0.34	1.89 1.61 1.60 1.41 1.40 1.33 1.32 1.32 1.32 1.32	3.90 3.30 3.20 3.00 2.90 2.70 2.70 2.70 2.70 2.70
Moments of inertia ³⁾	I_1 [kg cm ²]	16 20 25 28 35 40 49* 50 70 100	0.060 0.058 0.058 0.058 0.057 0.057 0.057 0.299 0.298 0.298	0.321 0.312 0.311 0.303 0.303 0.299 0.299 0.298 0.298 0.298	1.42 1.35 1.35 1.29 1.29 1.26 1.26 1.26 1.26 1.26	2.96 2.68 2.67 2.48 2.47 2.40 2.39 2.39 2.39 2.39	7.00 6.40 6.30 6.10 6.00 5.80 5.80 5.80 5.80 5.80
Max. axial force	F_A [N]		230	615	1 135	1 980	3 560
Max. radial force ⁴⁾	F_R [N]		155	530	925	1 630	3 120
Lifetime	L_h [h]		20 000	20 000	20 000	20 000	20 000
Efficiency	η		94%	94%	94%	94%	94%
Weight ca.	m [kg]		0.5	1.7	3.5	8.6	17
Operating noise at $n_{an} = 3000$ [rpm]	L_p [dB(A)]		≤ 70	≤ 70	≤ 70	≤ 70	≤ 70
Lubrication:	Lifetime grease lubrication, closed system						
Surface protection	Steel housing, galvanically treated. Aluminum flanges.						
Installation position	Any, including variable orientation.						
Operating temperature	- 10° C to + 90 °C						
Direction of rotation	same as input						
Degree of protection	IP 64						

1) Max. 1000 times during gearbox lifetime.

2) At a maximum of 1000 cycles per hour.

Percentage of the overall running time less than 5 % and duration of the impulse under 0.3 sec.

3) dependent on motor shaft diameter (see D6).

4) Resultant force middle of output shaft at output speed 100 rpm.

* for PGE 12/1 i = 49 all others i = 40

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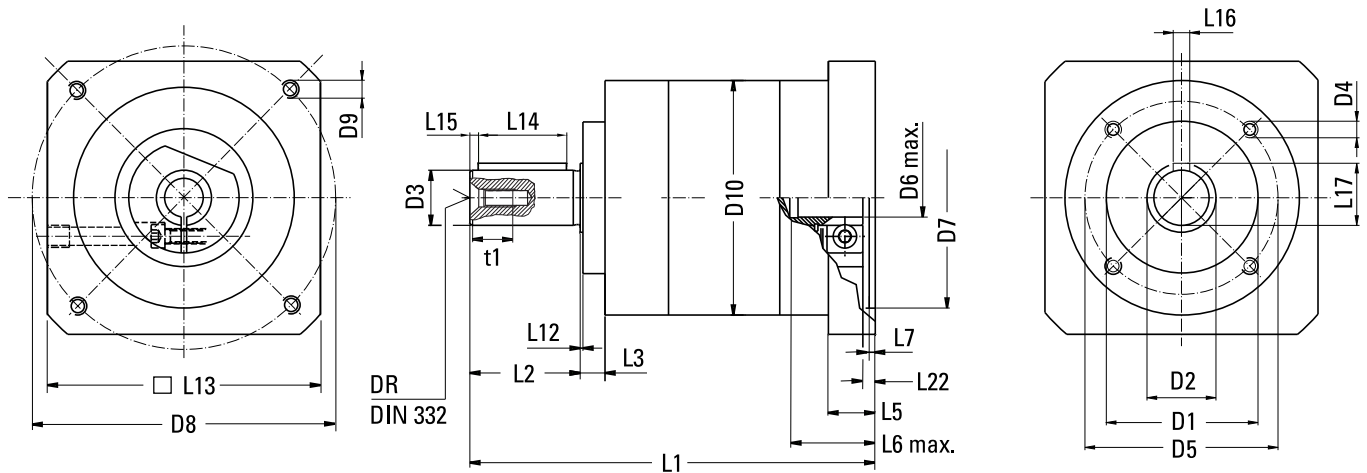
Size:

Dimensions [m m]:

		PGE 12/2	PGE 25/2	PGE 50/2	PGE 100/2	PGE 200/2
DR		DM4	DM5	DM6	DM10	DM16
t1		10	12.5	16	22	36
D1 (h7)		25	40	55	80	110
D2		12	17	25	30	50
D3 (k6)		10	14	20	25	40
D4		M4	M5	M6	M8	M10
D5		33	52	70	100	130
D6*(F6)	min.	3	6	9	14	19
	max.	11	14	19	24	32
D7*,D8*,D9*		Adaptations available for all common servomotors, dimensions are variable				
D10		40	65	85	120	155
L1		111	151.5	192	232	306
L2		23	30	40	50	80
L3		6	9	9	11	15
L5		27	23	28	31	39
L6	min.	14	18	22	28	30
	max.	30	40.5	45	69	78
L7*		3	4	4.5	5.5	6.5
L12		1	1	1	1	1
L13*	min.	40	65	85	120	155
L14		18	25	32	40	70
L15		2.5	2.5	4	5	5
L16		3	5	6	8	12
L17		11.2	16	22.5	28	43
L22*		3.5	4.5	5.5	6.5	8.5

*Dimensions depending
on motor.

Please use page 17
for inquiries and orders.



Size:

- 1) Max. 1000 times during gearbox lifetime.
- 2) At a maximum of 1000 cycles per hour.
Percentage of the overall running time less than 5 % and duration of the impulse under 0.3 sec.
- 3) dependent on motor shaft diameter (see D6).
- 4) Resultant force middle of output shaft at output speed 100 rpm.

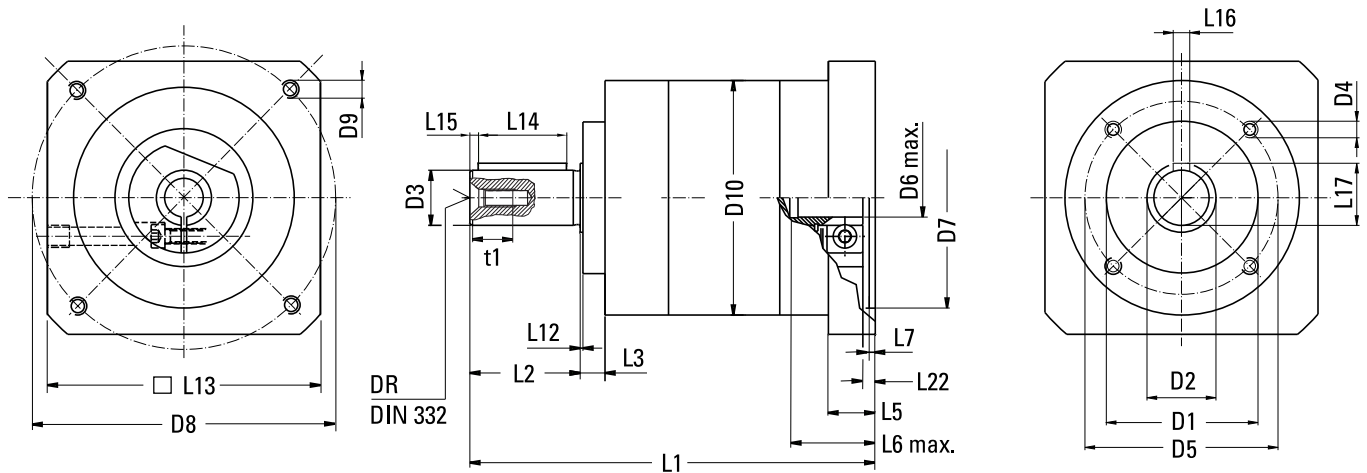
Size:

Dimensions [m m]:

		PGE 12/3	PGE 25/3	PGE 50/3	PGE 100/3	PGE 200/3
DR		DM4	DM5	DM6	DM10	DM16
t1		10	12.5	16	22	36
D1 (h7)		25	40	55	80	110
D2		12	17	25	30	50
D3 (k6)		10	14	20	25	40
D4		M4	M5	M6	M8	M10
D5		33	52	70	100	130
D6*(F6)	min.	3	6	9	14	19
	max.	9	11	14	19	24
D7*,D8*,D9*		Adaptations available for all common servomotors, dimensions are variable				
D10		40	65	85	120	155
L1		122	171	213	256	322
L2		23	30	40	50	80
L3		6	9	9	11	15
L5		22	20	26	31	37
L6	min.	11	14	18	24	26
	max.	30	40.5	45	69	78
L7*		3	4	4.5	5.5	6.5
L12		1	1	1	1	1
L13*	min.	40	65	85	120	155
L14		18	25	32	40	70
L15		2	2.5	3	3	5
L16		3	5	6	8	12
L17		11.2	16	22.5	28	43
L22*		3.5	4.5	5.5	6.5	8.5

*Dimensions depending
on motor.

Please use page 17
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Permitted shaft loads

The permissible axial or radial shaft loads are based on nominal bearing lifetime, see diagrams below.

The application point of the resultant forces is at middle of output shaft. The values for F_R do not take any axial loads into account. For cases with combined axial and radial forces, the force values are reduced.

If the radial force F_R acts on the output shaft outside its centre, the permissible force values are reduced ($x > \frac{L_2}{2}$) or increased ($x < \frac{L_2}{2}$), respectively.

Degree of protection

The degree of protection is defined by the designation IP (International Protection corresponding EN 60529) and two digits. For our gearboxes the designation is IP 64.

The first digit designates the degree of protection against contact (screen protection) and penetration of foreign bodies.

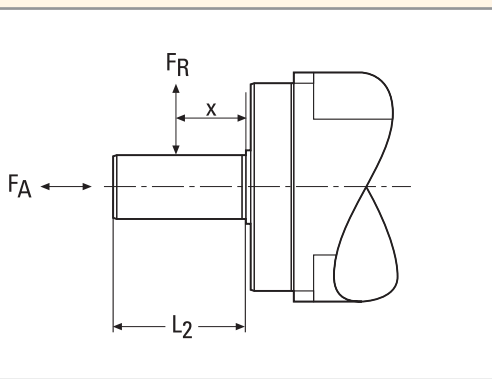
In this instance, the first digit 6 means:

- protection against dust infiltration (dust-tight)
- complete screen protection.

The second digit designates the degree of protection against water.

In this instance, the digit 4 means:

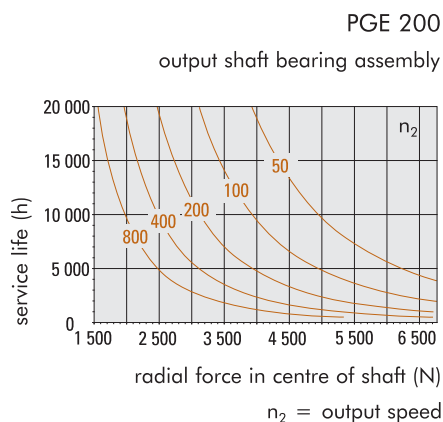
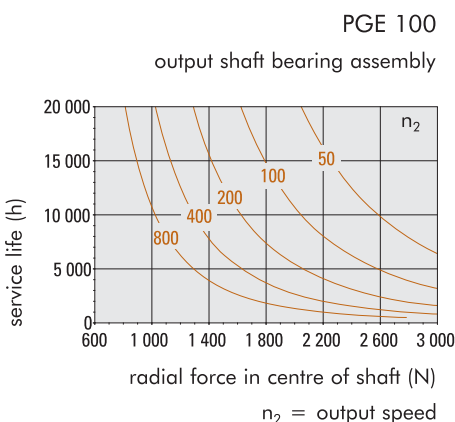
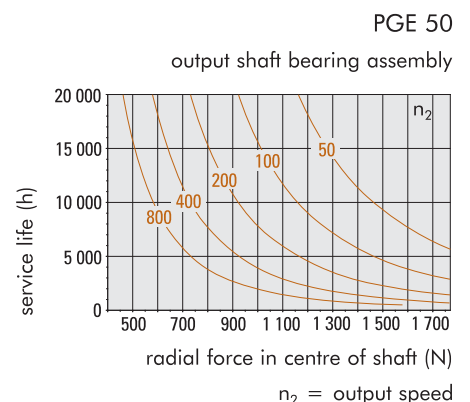
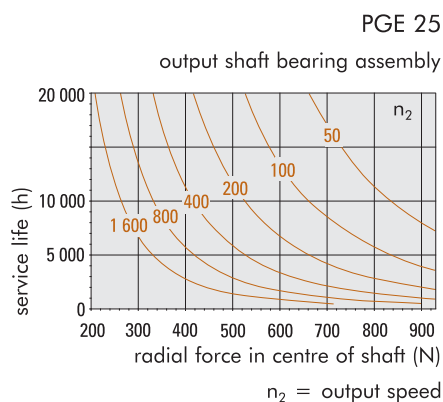
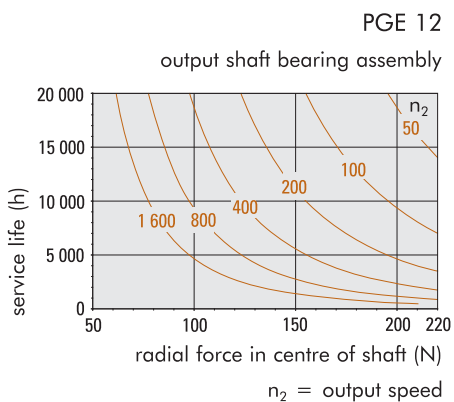
- protection against spray water from all directions.



Force (load) application points on gearbox output shaft

F_A = permitted axial force
 F_R = permitted radial force
 x = distance

Bearing Lifetime in Relation to Output Speed and Radial Force



Gearbox Output Shaft

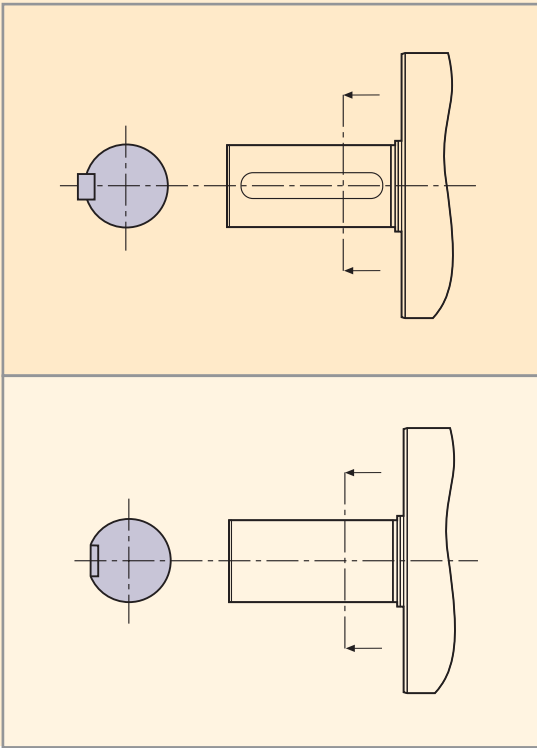
The gearbox output shaft is available in the following designs:

Standard:

Output shaft with key as per DIN 6885 sheet 1 (08.68 issue) for keyed shaft-hub connections. This type of connection is suitable for constant direction, where applications, requirements are not as stringent. This connection type requires additional axial fixing of the hub. A centering bore with thread is provided on the face end of the gearbox output shaft for this purpose (as per DIN 332, sheet 2).

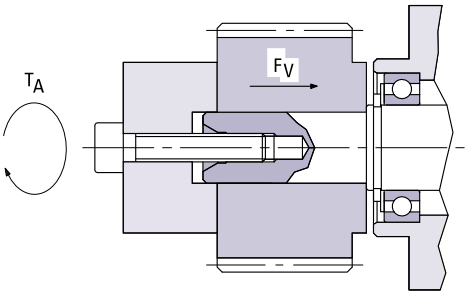
Options: fitted with a half key.

Plain output shaft on special request.



		Size :				
		PGE 12/1 12/2 12/3	PGE 25/1 25/2 25/3	PGE 50/1 50/2 50/3	PGE 100/1 100/2 100/3	PGE 200/1 200/2 200/3
Thread	DIN 332	M4	M5	M6	M10	M16
T _A	[Nm]	3.4	5.5	9.5	46	190
F _V	[kN]	4.1	6.5	9.5	27	74

T_A = Tightening torque
F_V = Pretensioning Force



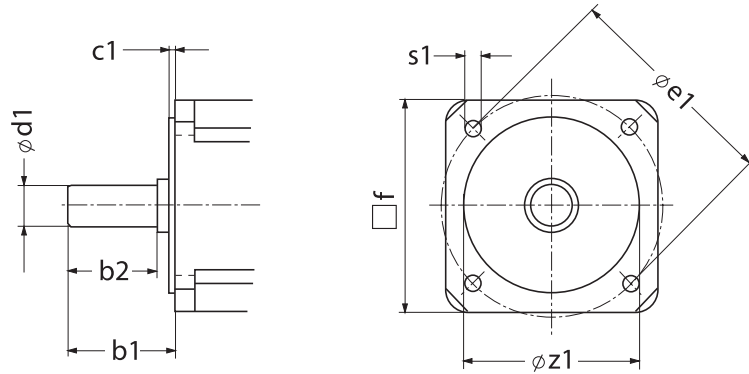
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Quotation Request:

Kindly fill out below questionnaire for speedy processing and send to:

Fax: ++49/(0)7546-918-457 or

E-Mail: info@automation-and-gears.de



Motor data:

Motor manufacturer: _____

Type: _____

Motor shaft diameter d1 [mm]: _____

Flange face distance b1 [mm]: _____

Motor shaft length b2 [mm]: _____

Pilot diameter z1 [mm]: _____

Pcd diameter e1 [mm]: _____

Fixing hole diameter s1 [mm]: _____

Flange square ☐ f [mm] _____

Motor nominal torque [Nm]: _____

Motor maximum torque [Nm]: _____

Gearbox data:

ZF-Servoplan size: _____

PGE- _____

ZF-Servoplan ratio [i]: _____

Keyed output shaft (yes/no): _____

Ordering type code (see page 18): _____

Basis of quotation (batch size): _____

Projected annual volume: _____

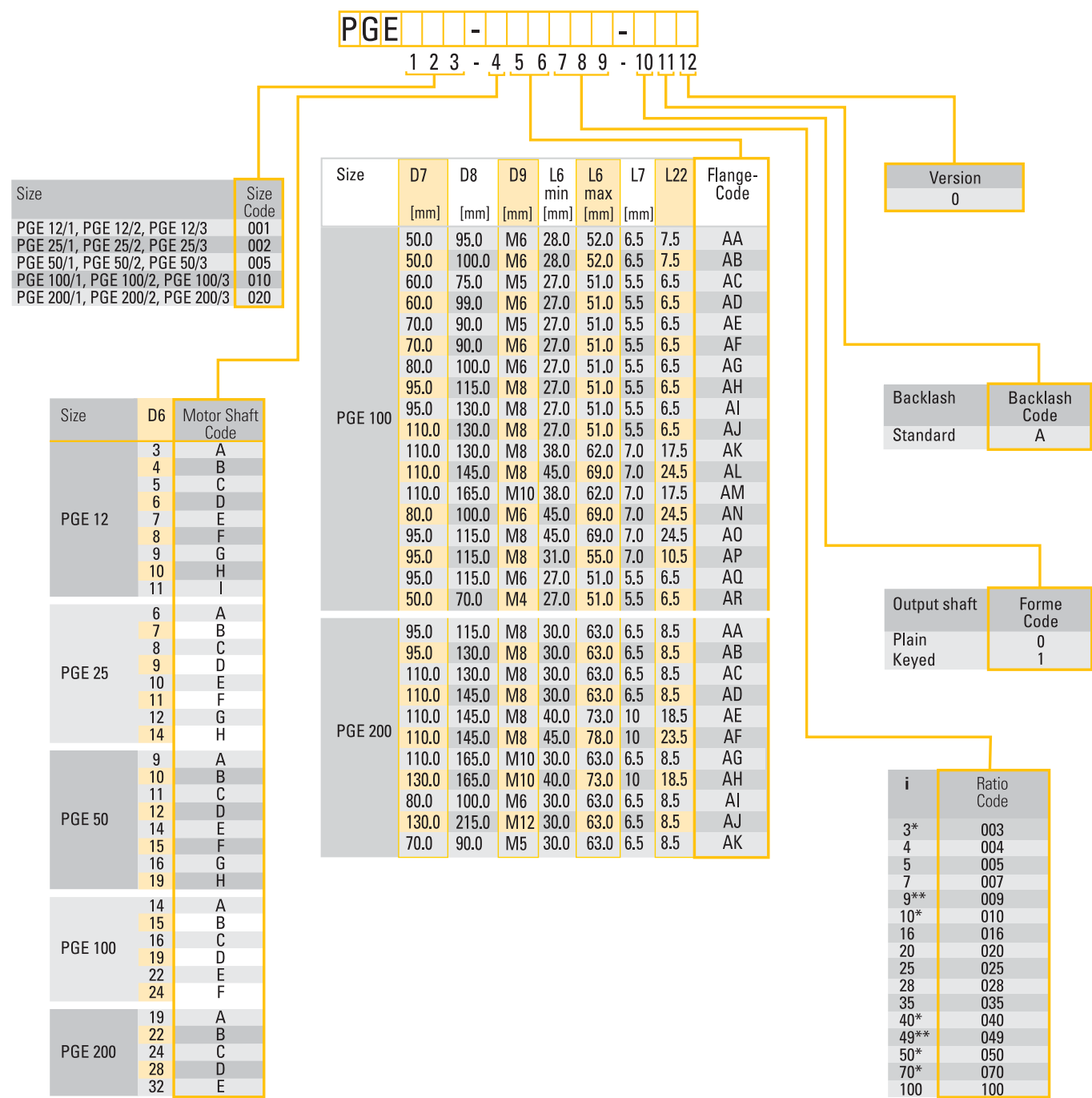
Subject to technical change without notice. For studies,
please request installation drawings; only the data contained therein is binding.
Please refer also to our homepage: www.antriebstechniken.de



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Ordering Type Code



*Not for PGE 12
** Only for PGE 12



marzahlVertrieb

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