



Precision on the highest level

The PLN series is the standard Neugart inline high precision planetary gearhead for applications with very high precision requirements. Whether high torque density, minimal transmission error, low operating noise, lowest backlash, or exceptional reliability... – the PLN series satisfies all these requirements in every application.



- > Low backlash <3 arcmin (<1 arcmin optional)
- > High output torque – the industry’s highest torque density
- > Precise, easy, and flexible motor mounting (PCS-2 system)
- > Balanced motor pinion
- > High efficiency (up to 98%)
- > Ground and honed gearing
- > 14 ratios 3:1 to 100:1
- > Low noise (<58 dB(A))
- > Consistent quality (ISO 9001 and 14001)
- > Operable in any mounting positions
- > Lifetime lubrication
- > Numerous options



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9	CAD drawings, dimension sheets	www.neugartusa.com
10	Sizing/calculation/selection	NCP Software, free download from the Neugart website

Type-Size		PLN 70	PLN 90	PLN 115	PLN 142	PLN 190	i ⁽¹⁾	Z ⁽²⁾
Nominal (rated continuous duty) Output torque T _{2N} ⁽³⁾⁽⁵⁾	Nm (lbin)	45 (398)	100 (885)	230 (2036)	450 (3983)	1000 (8850)	3	1
		60 (531)	140 (1239)	300 (2655)	600 (5310)	1300 (11505)	4	
		65 (575)	140 (1239)	260 (2301)	750 (6638)	1600 (14160)	5	
		40 (354)	80 (708)	150 (1328)	450 (3983)	1000 (8850)	8	
		27 (239)	60 (531)	125 (1106)	305 (2699)	630 (5576)	10	
		68 (602)	110 (974)	250 (2213)	780 (6903)	1500 (13275)	12	
	2	68 (602)	110 (974)	250 (2213)	780 (6903)	1500 (13275)	15	
		77 (681)	150 (1328)	300 (2655)	1000 (8850)	1800 (15930)	16	
		77 (681)	150 (1328)	300 (2655)	1000 (8850)	1800 (15930)	20	
		65 (575)	140 (1239)	260 (2301)	900 (7965)	1800 (15930)	25	
		77 (681)	150 (1328)	300 (2655)	1000 (8850)	1800 (15930)	32	
		65 (575)	140 (1239)	260 (2301)	900 (7965)	1800 (15930)	40	
		40 (354)	80 (708)	150 (1328)	450 (3983)	1000 (8850)	64	
		27 (239)	60 (531)	125 (1106)	305 (2699)	630 (5576)	100	

Type-Size		PLN 70	PLN 90	PLN 115	PLN 142	PLN 190	i ⁽¹⁾	Z ⁽²⁾
Output torque sustainable 30,000 output shaft rotations ⁽³⁾⁽⁵⁾⁽⁸⁾	Nm (lbin)	72 (637)	160 (1416)	368 (3257)	720 (6372)	1600 (14160)	3	1
		96 (850)	224 (1982)	480 (4248)	960 (8496)	2080 (18408)	4	
		104 (920)	224 (1982)	416 (3682)	1200 (10620)	2560 (22656)	5	
		64 (566)	128 (1133)	240 (2124)	720 (6372)	1600 (14160)	8	
		43 (381)	96 (850)	200 (1770)	488 (4319)	1008 (8921)	10	
	2	109 (965)	176 (1558)	400 (3540)	1248 (11045)	2400 (21240)	12	
		109 (965)	176 (1558)	400 (3540)	1248 (11045)	2400 (21240)	15	
		123 (1089)	240 (2124)	480 (4248)	1600 (14160)	2880 (25488)	16	
		123 (1089)	240 (2124)	480 (4248)	1600 (14160)	2880 (25488)	20	
		104 (920)	224 (1982)	416 (3682)	1440 (12744)	2880 (25488)	25	
		123 (1089)	240 (2124)	480 (4248)	1600 (14160)	2880 (25488)	32	
		104 (920)	224 (1982)	416 (3682)	1440 (12744)	2880 (25488)	40	
		64 (566)	128 (1133)	240 (2124)	720 (6372)	1600 (14160)	64	
		43 (381)	96 (850)	200 (1770)	488 (4319)	1008 (8921)	100	

Gearbox type		PLN	Z ⁽²⁾
Gearbox life at full load	h	20,000	
Gearbox life at 88% nominal torque T _{2N} × 0,88		30,000	
Emergency stop torque ⁽⁶⁾	Nm (lbin)	2 - times T _{2N}	
Efficiency at full load ⁽⁷⁾	%	98	1
		95	2
Min. operating temp. ⁽⁴⁾	°C (°F)	-25 (-13)	
Max. operating temp. ⁽⁴⁾		+90 (194)	
Protection class		IP 65	
Lubrication		lifetime lubrication	
Mounting position		any	
Recommended motor flange / shaft tolerance		DIN 42955-R	

(1) Ratio (i=n_{1 rpm high speed side}/n_{2 rpm low speed side})

(2) Number of gear stages

(3) Values reference output shaft speed n₂=100 rpm, S1= 100% duty cycle, K_A=1 application factor and T=30°C, 86°F ambient temperature

(4) Measured at the middle of the gearbox housing surface

(5) Dependent on the motor shaft diameter

(6) Permissible about 1000 times during the gearbox life

(7) Ratio dependent; based on n₂=100 rpm output shaft speed

(8) Permissible for 30,000 output shaft revolutions; see page 80

Type-Size		PLN 70	PLN 90	PLN 115	PLN 142	PLN 190	Z ⁽²⁾
Standard backlash ⁽⁷⁾	arcmin	<3	<3	<3	<3	<3	1
		<5	<5	<5	<5	<5	2
Optional reduced backlash		<2	< 1	<1	<1	<1	
Fr _{max.} for 20,000 h ⁽³⁾⁽⁴⁾	N (lb)	3200 (720)	5500 (1238)	6000 (1350)	12500 (2813)	21000 (4725)	
Fa _{max.} for 20,000 h ⁽³⁾⁽⁴⁾		4400 (990)	6400 (1440)	8000 (1800)	15000 (3375)	21000 (4725)	
Fr _{max.} for 30,000 h ⁽³⁾⁽⁴⁾		3200 (720)	4800 (1080)	5400 (1215)	11400 (2565)	18000 (4050)	
Fa _{max.} for 30,000 h ⁽³⁾⁽⁴⁾		3900 (878)	5700 (1283)	7000 (1575)	13200 (2970)	18500 (4163)	
Torsional stiffness	Nm /arcmin (lbin /arcmin)	6 (53)	9 (80)	20 (177)	44 (389)	130 (1151)	1
		7 (62)	10 (89)	22 (195)	46 (407)	140 (1239)	2
Weight	kg (lb)	1.9 (4.19)	3.3 (7.28)	6.9 (15.21)	16.0 (35.28)	30.5 (67.25)	1
		2.4 (5.29)	4.2 (9.26)	9.5 (20.95)	20.5 (45.20)	45 (99.23)	2
Running noise ⁽⁵⁾	dB(A)	58	60	65	68	72	
Max. recommended input speed ⁽⁶⁾	min ⁻¹ (rpm)	14000	10000	8500	6500	6000	

Type-Size		PLN 70	PLN 90	PLN 115	PLN 142	PLN 190	i ⁽¹⁾
Recommended max. mean input speed at 50% rated continuous duty torque (S1) rpm ⁽⁶⁾⁽⁷⁾	min ⁻¹ (rpm)	2580	2500	1880	1180	930	3
		2800	2560	1900	1210	940	4
		3100	2990	2410	1240	970	5
		4480	4990	4100	2170	1820	8
		5210	6050	4860	2810	2460	10
		3960	4240	3200	1620	1330	12
		4420	4880	3200	1880	1550	15
		4220	4360	3320	1630	1390	16
		4690	5000	3820	1890	1620	20
		5210	5570	4410	2230	1820	25
		5640	6000	5000	2530	2220	32
		6000	6000	5500	2910	2450	40
		6000	6000	5500	4010	3410	64
6000	6000	5500	4500	3500	100		

Type-Size		PLN 70	PLN 90	PLN 115	PLN 142	PLN 190	i ⁽¹⁾
Recommended max. mean input speed at 100% rated continuous duty torque (S1) rpm ⁽⁶⁾⁽⁷⁾	min ⁻¹ (rpm)	2020	1820	1250	800	600	3
		2090	1720	1190	770	580	4
		2300	2030	1560	770	580	5
		3720	3850	3060	1530	1230	8
		4610	4960	3830	2170	1850	10
		2990	3070	2190	1030	830	12
		3410	3580	2190	1220	990	15
		3240	3120	2270	1030	870	16
		3670	3640	2660	1220	1030	20
		4300	4250	3280	1520	1200	25
		4620	4920	3650	1710	1500	32
		5260	5630	4380	2080	1710	40
		6000	6000	5500	3430	2860	64
6000	6000	5500	4300	3500	100		

(1) Ratio ($i = n_{1 \text{ rpm high speed side}} / n_{2 \text{ rpm low speed side}}$)

(2) Number of gear stages

(3) Values reference output shaft speed $n_2 = 100 \text{ rpm}$, $S1 = 100\%$ duty cycle, $K_A = 1$ application factor and $T = 30^\circ\text{C}$, 86°F ambient temperature

(4) Measured at the middle of the gearbox housing surface

(5) Sound pressure level measured 1 m from the gearbox for ratio 5:1 at 3000 input rpm and no load

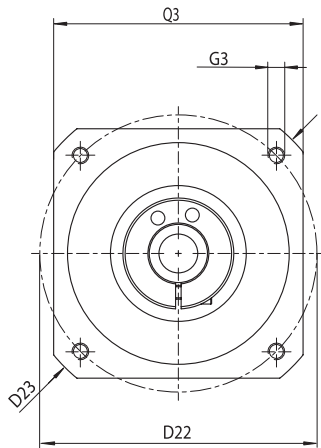
(6) Recommended gearbox operating temperature should not be exceeded, consult Neugart in case higher than listed rpm is required

(7) Exact definition see page 81

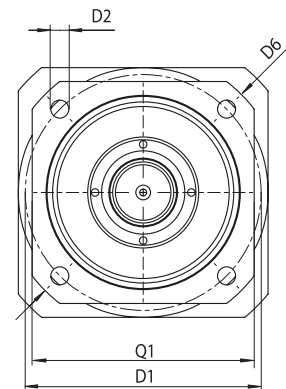
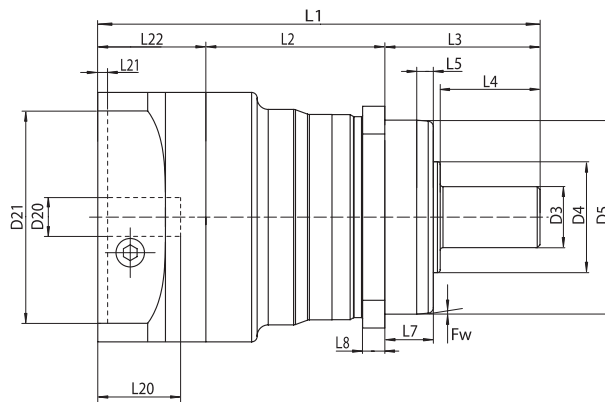
Type-Size		PLN 70	PLN 90	PLN 115	PLN 142	PLN 190	i ⁽¹⁾
Mass moment of inertia ⁽²⁾	kgcm ² (lbin s ² x 10 ⁻⁴)	0.40 (3.54)	1.01 (8.94)	3.14 (27.79)	16.77 (148.41)	54.20 (479.67)	3
		0.32 (2.83)	0.78 (6.90)	2.40 (21.24)	12.16 (107.62)	39.44 (349.04)	4
		0.28 (2.48)	0.68 (6.02)	2.16 (19.12)	10.31 (91.24)	33.38 (295.41)	5
		0.25 (2.21)	0.59 (5.22)	1.93 (17.08)	8.73 (77.26)	27.49 (243.29)	8
		0.25 (2.21)	0.57 (5.04)	1.90 (16.82)	8.35 (73.90)	25.97 (229.83)	10
		0.40 (3.54)	1.02 (9.03)	3.12 (27.61)	16.72 (147.97)	54.30 (480.56)	12
		0.38 (3.36)	0.95 (8.41)	2.95 (26.11)	15.19 (134.43)	52.50 (464.63)	15
		0.35 (3.10)	0.89 (7.88)	2.74 (24.25)	14.52 (128.50)	49.90 (441.62)	16
		0.33 (2.92)	0.82 (7.26)	2.57 (22.74)	13.05 (115.49)	45.03 (398.52)	20
		0.30 (2.66)	0.76 (6.73)	2.38 (21.06)	11.89 (105.23)	40.32 (356.83)	25
		0.32 (2.83)	0.77 (6.81)	2.41 (21.33)	11.94 (105.67)	40.36 (357.19)	32
		0.29 (2.57)	0.70 (6.20)	2.23 (19.74)	10.79 (95.49)	35.68 (315.77)	40
		0.26 (2.30)	0.63 (5.58)	2.03 (17.97)	9.39 (83.10)	30.36 (268.69)	64
		0.25 (2.21)	0.59 (5.22)	1.97 (17.43)	8.76 (77.53)	27.74 (245.50)	100

⁽¹⁾ Ratio ($i = n_1 \text{ rpm high speed side} / n_2 \text{ rpm low speed side}$)

⁽²⁾ The moment of inertia relates to the high speed side (typically motor shaft)



Input side view



Output side view

Type-Size		PLN 70	PLN 90	PLN 115	PLN 142	PLN 190	Z ⁽²⁾
All dimensions in mm							
D1 Flange bolt hole circle		68-75	85	120	165	215	
D2 Mounting bolt hole diameter	4x	5.5	6.5	8.5	11	13.5	
D3 Output shaft diameter	k6	16	22	32	40	55	
D4 Output shaft collar diameter		35	40	45	70	80	
D5 Pilot diameter	g7	60	70	90	130	160	
D6 Output flange diagonal		92	100	140	185	240	
D20 Pinion bore diameter ⁽¹⁾⁽⁴⁾		11	14	19	24	32	
D21 Motor centering pilot diameter ⁽¹⁾		60	80	95	130	180	
D22 Motor matching bolt circle diameter ⁽¹⁾		75	100	115	165	215	
D23 Motor matching adapter diagonal		92	116	145	185	240	
Fw Chamfer angle		5	5	5	5	5	
G3 Mounting hole thread x depth ⁽¹⁾	4x	M5 x 10	M6 x 12	M8 x 16	M10 x 20	M12 x 24	
L1 Overall length ⁽³⁾		137.5	159.5	201	276	310.5	1
		166.5	191.5	241	335	382.5	2
L2 Main-body length		59	64.5	61.5	91.5	116	1
		88	96.5	101.5	150.5	188	2
L3 Output shaft length from mounting face		48	56	88	110	112	
L4 Output shaft length from collar		28	36	58	80	82	
L5 Chamfer length		8	6	8	8	10	
L7 Pilot length		19	17.5	28	28	28	
L8 Flange width		7	8	10	12	15	
L20 Reference motor shaft length ⁽³⁾		23	30	40	50	60	
L21 Motor pilot depth		3	3.5	3.5	4	5	
L22 Reference motor adapter flange width ⁽³⁾		30.5	39	51.5	74.5	82.5	
Q1 Gearbox output flange square		70	80	110	142	190	
Q3 Motor adapter square ⁽¹⁾	□	70	90	115	142	190	

⁽¹⁾ Dimensions reference to the mounted motor-type, see page 12

⁽²⁾ Number of gear stages

⁽³⁾ For longer motor shaft > L20, actual minimal L22 dimension = L22 + (Motor shaft length – L20)

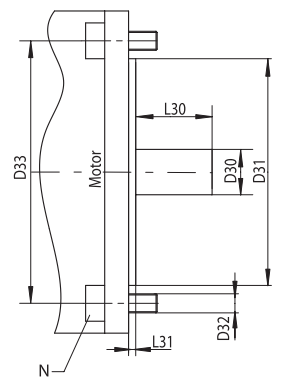
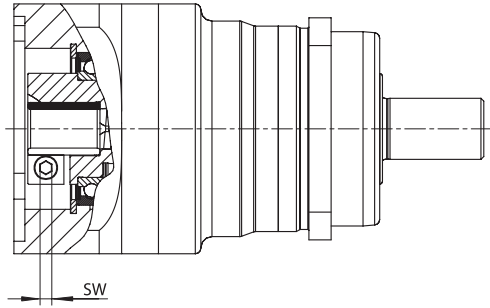
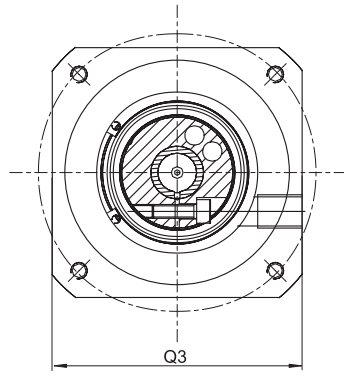
⁽⁴⁾ For shaft fit j6 to k6

OP 2: Motor Mount option

Note: B5 mounting depicted;

B14 motor mounting requires special/custom motor adapter

See page **77** for other options



Type-Size		PLN 70	PLN 90	PLN 115	PLN 142	PLN 190	Z ⁽²⁾
D30 Motor shaft diameter/ Available pinion bores / bushings ⁽¹⁾⁽⁵⁾	mm	8/9/9.525/10/11/12/14/15.87/16/19	9.525/10/11/12/12.7/14/16/15.87/19/22/24	11/12.7/14/15.87/16/19/22/24/28/32/35	19/22/24/28/32/35/38/42	24/28/32/35/38/42/48	
D31 Motor pilot diameter ⁽³⁾		any	any	any	any	any	
D32 Motor bolt hole diameter ⁽³⁾		any	any	any	any	any	
D33 Hole circle diameter ⁽³⁾		any	any	any	any	any	
L30 min. motor shaft length ⁽¹⁾	mm	16 (19 ⁽⁶⁾)	19 (21 ⁽⁷⁾)	21 (26 ⁽⁸⁾)	26 (29 ⁽⁹⁾)	30	
L31 pilot depth		any	any	any	any	any	
N Number of bolt holes		4	4	4	4	4	
Q3 Flange square ⁽¹⁾	□	70	90	115	140	190	
Recommended max. motor weight ⁽⁴⁾	kg (lb)	10 (22.05)	15 (33.08)	34 (74.97)	50 (110.25)	75 (165.38)	
Motor type ⁽¹⁾		B5	B5	B5	B5	B5	
Recommended clamping screw tightening torque	Nm (lbin)	4.5 (40) 9.5 (84)	9.5 (84) 16.5 (146)	16.5 (146) 40 (354)	40 (354) 75 (664)	75 (664)	
SW wrench width	mm	3 4	4 5	5 6	6 8	8	

(1) Other dimensions on inquiry
 (2) Number of gear stages
 (3) Provided that flange dimensions are compatible
 (4) In horizontal and stationary mounting position
 (5) Shaft fit: j6; k6
 (6) D30 > 14 mm
 (7) D30 > 19 mm
 (8) D30 > 24 mm
 (9) D30 > 35mm

OP 5: Spline type code

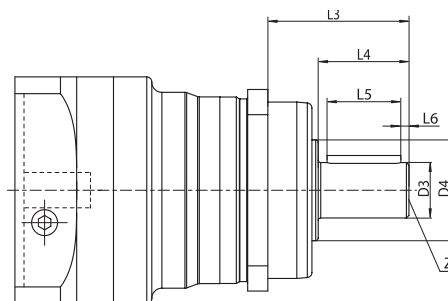
Type-Size	Spline type code	Tooth face width	Z Shaft end bore
PLN 70	DIN 5480 - W 16 x 0.8 x 30 x 18 x 7 m	15	DIN 332 DR M5x12.5
PLN 70-OP14	DIN 5480 - W 19 x 0.8 x 30 x 22 x 7 m	15	DIN 332 DR M6x16
PLN 90	DIN 5480 - W 22 x 0.8 x 30 x 26 x 7 m	21	DIN 332 DR M8x19
PLN 115	DIN 5480 - W 32 x 1.25 x 30 x 24 x 7m	42	DIN 332 DR M12x28
PLN 142	DIN 5480 - W 40 x 1.25 x 30 x 30 x 7m	65	DIN 332 DR M16x35
PLN 190	DIN 5480 - W 55 x 2 x 30 x 26 x 7m	65	DIN 332 DR M20x42

OP 7: Output shaft with key DIN 6885 T1 ⁽¹⁾

Type-Size		PLN 70	PLN 70-OP14	PLN 90	PLN 115	PLN 142	PLN 190
Key type (Height x width x length)		A5 x 5 x 25	A6 x 6 x 20	A6 x 6 x 28	A10 x 8 x 50	A12 x 8 x 65	A16 x 10 x 70
D3 [k6] Output shaft diameter	mm	16	19	22	32	40	55
L4 Output shaft length from collar		28	28	36	58	80	82
L5 Key length		25	20	28	50	65	70
L6 Distance from shaft end		2	4	4	4	8	6
Z Shaft end bore		M5 x 12.5	M6 x 16	M8 x 19	M12 x 28	M16 x 35	M20 x 42
Output torque sustainable 30 000 output shaft rotations ⁽²⁾	Nm (lbin)	77 (681)	77 (681)	150 (1328)	300 (2655)	1000 (8850)	1800 (15930)

OP 8: Special / custom shaft ⁽³⁾⁽⁴⁾

Output shaft diameter	D3	
Output shaft length from collar	L4	
Output shaft length from mounting face	L3	
Key length	L5	
Distance from shaft end	L6	
Key width	B	
Shaft end bore	Z	



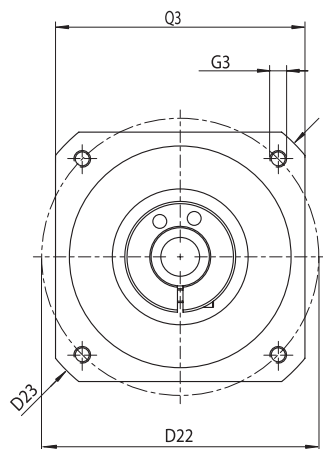
⁽¹⁾ Sketch for variables see OP 8

⁽²⁾ Strength based on unidirectional dynamic load

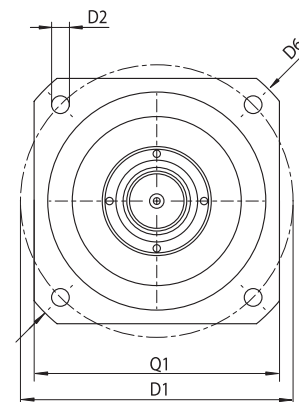
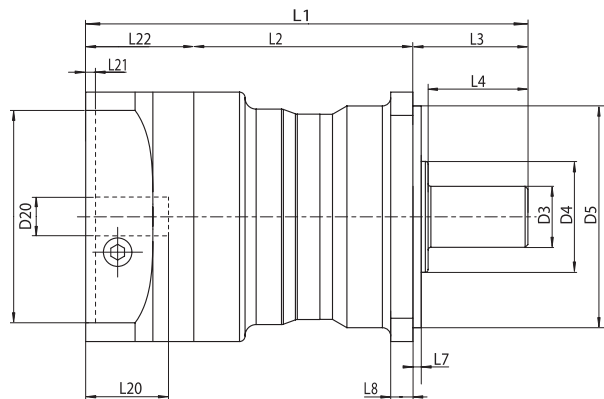
⁽³⁾ Fax page with data or send sketch with your inquiry

⁽⁴⁾ On inquiry

OP 14: dimensions for the PLS output



Input side view



Output side view

Type-Size		PLN 70 OP14	PLN 90 OP14	PLN 115 OP14	PLN 142 OP14	PLN 190 OP14	Z ⁽²⁾
All dimensions in mm							
D1 Flange bolt hole circle		75	100	130	165	215	
D2 Mounting bolt hole diameter	4x	5.5	6.5	8.5	11	13.5	
D3 Output shaft diameter	k6	19	22	32	40	55	
D4 Output shaft collar diameter		35	40	45	70	80	
D5 Pilot diameter	h7	60	80	110	130	160	
D6 Output flange diagonal		92	116	145	185	240	
D20 Pinion bore diameter ⁽¹⁾⁽⁴⁾		11	14	19	24	32	
D21 Motor centering pilot diameter ⁽¹⁾		60	80	95	130	180	
D22 Motor matching bolt circle diameter ⁽¹⁾		75	100	115	165	215	
D23 Motor matching adapter diagonal		92	116	145	185	240	
G3 Mounting hole thread x depth ⁽¹⁾	4x	M5 x 10	M6 x 12	M8 x 16	M10 x 20	M12 x 24	
L1 Overall length ⁽³⁾		137.5	159.5	201	276	310.5	1
		166.5	191.5	241	335	382.5	2
L2 Main-body length		75	79	85	114.5	138	1
		104	111	125	173.5	210	2
L3 Output shaft length from mounting face		32	41.5	64.5	87	90	
L4 Output shaft length from collar		28	36	58	80	82	
L7 Pilot length		3	3	4.5	5	6	
L8 Flange width		7	8	10	20	20	
L20 Reference motor shaft length ⁽³⁾		23	30	40	50	60	
L21 Motor pilot depth		3	3.5	3.5	4	5	
L22 Reference motor adapter flange width ⁽³⁾		30.5	39	51.5	74.5	82.5	
Q1 Gearbox output flange square		70	90	115	142	190	
Q3 Motor adapter square ⁽¹⁾	□	70	90	115	142	190	

⁽¹⁾ Dimensions reference to the mounted motor-type, see page 12

⁽²⁾ Number of gear stages

⁽³⁾ For longer motor shaft > L20, actual minimal L22 dimension = L22 + (Motor shaft length - L20)

⁽⁴⁾ For shaft fit j6 to k6

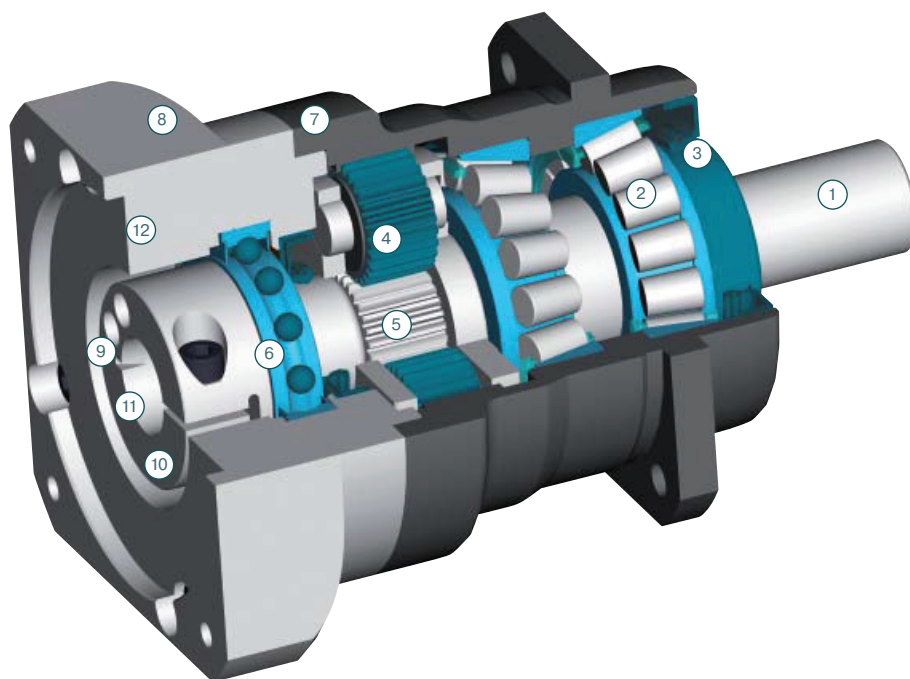
Type-Size		PLN 70 OP14	PLN 90 OP14	PLN 115 OP14	PLN 142 OP14	PLN 190 OP14	i ⁽¹⁾
Recommended max. mean input speed at 50% rated continuous duty torque (S1) rpm ⁽²⁾⁽³⁾	min ⁻¹ (rpm)	2380	2320	1740	1080	850	3
		2580	2370	1760	1100	860	4
		2850	2770	2220	1130	880	5
		4110	4620	3800	1990	1660	8
		4790	5610	4500	2570	2240	10
		3630	3920	2960	1480	1220	12
		4050	4510	2960	1720	1420	15
		3880	4030	3070	1490	1270	16
		4300	4620	3530	1730	1480	20
		4780	5150	4090	2040	1660	25
		5160	5980	4610	2310	2030	32
		5600	6000	5220	2660	2240	40
		6000	6000	5500	3680	3130	64
6000	6000	5500	4300	3500	100		

Type-Size		PLN 70 OP14	PLN 90 OP14	PLN 115 OP14	PLN 142 OP14	PLN 190 OP14	i ⁽¹⁾
Recommended max. mean input speed at 100% rated continuous duty torque (S1) rpm ⁽²⁾⁽³⁾	min ⁻¹ (rpm)	1850	1680	1160	730	540	3
		1910	1590	1100	710	520	4
		2110	1870	1440	700	520	5
		3410	3560	2820	1400	1120	8
		4230	4580	3540	1980	1690	10
		2730	2820	2020	940	760	12
		3110	3290	2020	1120	900	15
		2960	2870	2090	940	790	16
		3350	3340	2450	1110	940	20
		3940	3910	3020	1380	1090	25
		4230	4520	3350	1550	1360	32
		4810	5180	4030	1900	1560	40
		5910	6000	5500	3140	2610	64
6000	6000	5500	3940	3400	100		

⁽¹⁾ Ratio ($i = n_{1 \text{ rpm high speed side}} / n_{2 \text{ rpm low speed side}}$)

⁽²⁾ Recommended gearbox operating temperature should not be exceeded, consult Neugart in case higher than listed rpm is required

⁽³⁾ Exact definition see page 81



- 1** Output shaft
Made of high-strength high quality steel for high shaft reliability
- 2** Output shaft bearing
Large high precision preloaded taper roller bearings for zero clearance
- 3** Shaft seal ring
Dedicated double lip seal, keeps the lubricant in, and the external contaminant out; IP 65
- 4** Planet gears
Precision zero helix angle gear with optimized profile modifications and crowning; case hardened and hard finished by honing
- 5** Sun gear
Precision machined optimized gear profile, case hardened and honed for high loadability, low running noise, minimum wear, and consistent backlash
- 6** Sun gear bearing
High speed ball bearings in floating arrangement, eliminating thrust loads from thermal expansion, and yet providing exact positioning for easy mounting
- 7** Housing with integrated ring gear
Ring gear is case hardened and precision honed for high loadability, minimum wear, consistent backlash
- 8** Motor matching adapter plate
Matches the gear head with virtually any servo motor; made of aluminum for enhanced thermal conductivity
- 9** Clamping ring
Balanced ring, suitable for high rpm, made of steel to allow high clamping forces for safe torque transfer
- 10** Clamping screw
High strength steel screw with special low pitch thread to generate a high clamping force
- 11** PCS System
Patented multiple closed slot Precision Clamping System – most reliable advanced system available today
- 12** Assembly bore
Access bore for the clamping screw

for your notes



Lined area for taking notes, consisting of 25 horizontal lines.