

# Parker Gearboxes

Planetary Gearheads



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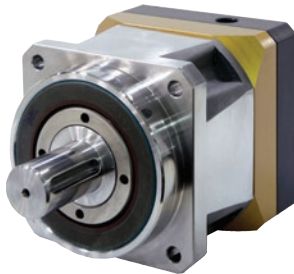
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## Economical Planetary Gearheads - PE



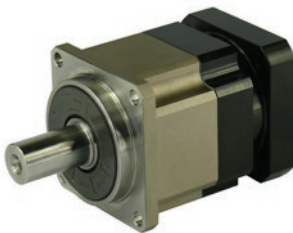
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# Parker Hannifin

## The global leader in motion and control technologies

### A world class player on a local stage

#### Global Product Design

Parker Hannifin has more than 40 years experience in the design and manufacturing of drives, controls, motors and mechanical products. With dedicated global product development teams, Parker draws on industry-leading technological leadership and experience from engineering teams in Europe, North America and Asia.

#### Local Application Expertise

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Dijon, France  
Offenburg, Germany  
Filderstadt, Germany  
Milan, Italy

##### Asia

Wuxi, China  
Jangan, Korea  
Chennai, India

##### North America

Rohnert Park, California  
Irwin, Pennsylvania  
Charlotte, North Carolina  
New Ulm, Minnesota



Offenburg, Germany

#### Local Manufacturing and Support in Europe

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Milan, Italy



Littlehampton, UK



Filderstadt, Germany



Dijon, France

Series	<p style="text-align: center;"><b>PE</b></p> 	<p style="text-align: center;"><b>PS</b></p> 	<p style="text-align: center;"><b>GXA</b></p> 
	page 7	page 17	page 25
	<a href="http://www.parker.com/eme/pe">www.parker.com/eme/pe</a>	<a href="http://www.parker.com/eme/ps">www.parker.com/eme/ps</a>	<a href="http://www.parker.com/eme/gxa">www.parker.com/eme/gxa</a>
Description	Economical Planetary Gearboxes	Precision Helical Planetary Gearboxes	Precision ATEX Planetary Gearboxes
Frame size [mm]	40, 60, 90, 115, 155	60, 90, 115, 142	60, 90, 115, 142, 180, 220
Nominal Output Torque [Nm]	up to 460	up to 430	up to 1800
Radial Load [N]	up to 4600	up to 10 000	up to 50 000
Minimum backlash [arcmin]	< 7	< 3	< 3
Maximum input speed [min <sup>-1</sup> ]	up to 18 000	up to 6000	up to 10 000
Ratio	3 to 64	3 to 100	3 to 100
Torsional rigidity [Nm/arcmin]	0.7 to 52	3 to 50	7 to 225



# Economical Planetary Gearheads - PE

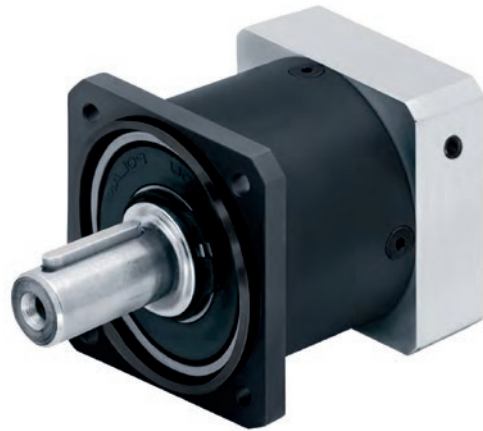
## Overview

### Description

The PE is the perfect economy gearbox. This planetary gearbox was especially designed for all applications where a considerably low backlash is not of vital importance.

### Features

- Excellent price/performance ratio
- Input speeds up to 18000 min<sup>-1</sup>
- Low backlash
- High output torques
- PCS-2 system
- High efficiency (96 %)
- 15 ratios  $i=3...64$
- Low noise
- High quality (ISO 9001)
- Any fitting position possible
- Simple motor fitting
- Lubricated for life
- Direction of rotation equidirectional
- Balanced motor pinion



### Technical Characteristics Overview

Features	Unit	Division
Geometry		Planetary Gearheads
Type		Inline
Drives sizes	[mm]	40, 60, 90, 115, 155
Maximum input speed	[min <sup>-1</sup> ]	up to 18000
Nominal torque	[Nm]	460
Radial force	[N]	up to 4600
Service life	[h]	30 000
Minimum backlash	[arcmin]	< 7

## Layout / Features

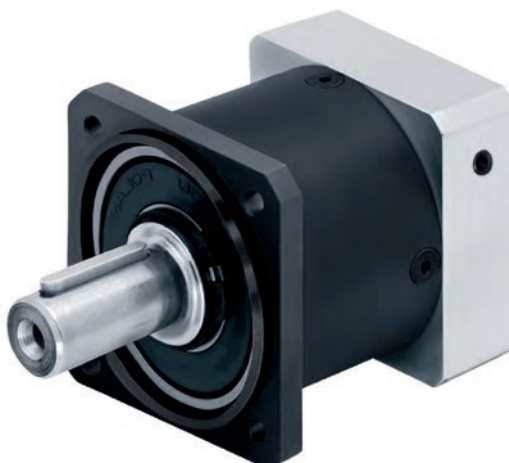
PE2 / PE3

The Economy gearbox with round output flange



PE4 / PE5

The Economy gearbox with square output flange



PE7

Gearbox for high torque applications (in combination with ETH125 electro cylinder)





## Technical Data

Parameter	Unit	Ratio	PE2	PE3	PE4	PE5	PE7	
<b>Nominal torque <math>T_{nom r}</math></b> / <b>Maximum permissible acceleration torque <math>T_{acc r}</math></b> / <b>Emergency stop torque <math>T_{em r}^{(5)}</math></b>  $T_{nom r} / T_{acc r} / T_{em r}^{(5)}$ (1)(2)(3)(4)	[Nm]	1 step	3	11/17.5/22.5	28/45/66	85/136/180	115/184/390	-
			4	15/24/30	38/61/88	115/184/240	155/248/520	460/736/920
			5	14/22/36	40/64/80	110/176/220	195/312/500	445/712/890
			7	8.5/13.5/26	25/40/80	65/104/178	135/216/340	-
			8	6/10/27	18/29/80	50/80/190	120/192/380	-
		2 step	10	5/8/27	15/24/80	38/61/200	95/152/480	210/336/420
			9	16.5/26/33	44/70/88	130/208/260	210/336/500	-
			12	20/32/40	44/70/88	120/192/240	260/416/520	-
			15	18/29/36	44/70/88	110/176/220	230/368/500	-
			16	20/32/40	44/70/88	120/192/240	260/416/520	460/736/920
			20	20/32/40	44/70/88	120/192/240	260/416/520	460/736/920
			25	18/29/36	40/64/80	110/176/220	230/368/500	445/712/890
			32	20/32/40	44/70/88	120/192/240	260/416/520	-
			40	18/29/36	40/64/80	110/176/220	230/368/500	460/736/920
50		-	-	-	445/712/890			
64	7.5/12/27	18/29/80	50/80/190	120/192/380	-			
<b>Nominal drive speed at <math>T_{nom r}</math></b> $N_{nom r}^{(6)}$	[min <sup>-1</sup> ]	3	5000	4500	3400*	3400*	-	
		4	5000	4500	3450*	3500*	1800*	
		5	5000	4500	4000*	3500*	2150*	
		7	5000	4500	4000	3500	-	
		8	5000	4500	4000	3500	-	
		9	5000	4500	4000*	3500*	-	
		10	5000	4500	4000	3500	3000	
		12	5000	4500	4000*	3500*	-	
		15	5000	4500	4000	3500*	-	
		16	5000	4500	4000	3500*	2900*	
20...64	5000	4500	4000	3500	3000 (* for ratio 20,25)			
<b>Maximum mechanical input speed</b> $N_{max r}^{(6)}$	[min <sup>-1</sup> ]	3...64	18 000	13 000	7 000	6 500	5 500	
<b>Maximum radial force</b> $P_{r_{max}}^{(1)(7)}$	[N]		160	340	1 700	2 400	4 600	
<b>Maximum axial force</b> $P_{a_{max}}^{(1)(7)}$	[N]		160	450	2 000	2 100	6 000	
<b>Lifetime</b>	[h]		30 000 (lifetime lubrication)					
<b>Backlash</b>	[arcmin]	(1 step)	< 15	< 10	< 7	< 7	< 8	
		(2 step)	< 19	< 12	< 9	< 9	< 10	

(1) the data refer to an output shaft speed of  $n_2=100 \text{ min}^{-1}$  and application factor  $KA=1$  as well as S1 operating mode for electrical machines and  $T=30 \text{ °C}$

(2) dependent on the respective motor shaft diameter

(3) with keyway: for dynamic loads

(4) permitted for 30 000 revolutions of the output shaft

(5) permitted 1000 times

(6) permitted operating temperatures may not be exceeded.

(7) referred to the center of the output shaft

\* at 50 %  $T_{nom r}$  and S1

## Technical Characteristics

Parameter	Unit	Ratio	PE2	PE3	PE4	PE5	PE7	
<b>Efficiency at full load</b> <sup>(8)</sup>	%	(1 step)	97					
		(2 step)	95					
<b>Noise level at 3000 min<sup>-1</sup></b> <sup>(9)</sup>	[dB (A)]		58	58	60	65	70	
<b>Torsional stiffness</b> <sup>(9)</sup>	[Nm/arcmin]	(1 step)	0.7 - 1	1.7 - 2.3	5.2 - 7	11.3 - 15.2	38.5 - 52	
		(2 step)	0.8 - 1	1.9 - 2.3	5.7 - 7	12.3 - 15.2	39.5 - 52	
<b>Operating temperature</b> <sup>(10)</sup>	[°C]		-25 ... +90					
<b>Lubrication</b>			Lifetime lubrication					
<b>Orientation</b>			Any					
<b>Direction of Rotation</b>			Same as input					
<b>Product Enclosure Rating</b>			IP54					
<b>Moment of inertia</b> <sup>(11)</sup>	[kgmm <sup>2</sup> ]	1 step	3	3.1	13.5	77	263	-
			4	2.2	9.3	52	179	707.3
			5	1.9	7.8	45	153	604.6
			7	1.8	7.2	42	141	-
			8	1.7	6.5	39	132	-
			10	1.6	6.4	39	130	466.3
		2 step	9	3.0	13.1	74	262	-
			12	2.9	12.7	72	256	-
			15	2.3	7.7	71	253	-
			16	2.2	8.8	50	175	615.6
			20	1.9	7.5	44	150	519.4
			25	1.9	7.5	44	149	514.7
			32	1.7	6.4	39	130	-
			40	1.6	6.4	39	130	445.4
50		-	-	-	975.4			
64	1.6	6.4	39	130	-			
<b>Weight</b>	[kg]	(1 step)		0.9	3.2	6.6	16.5	
		(2 step)		1.1	3.7	8.6	20.5	

<sup>(8)</sup> depends on the ratio

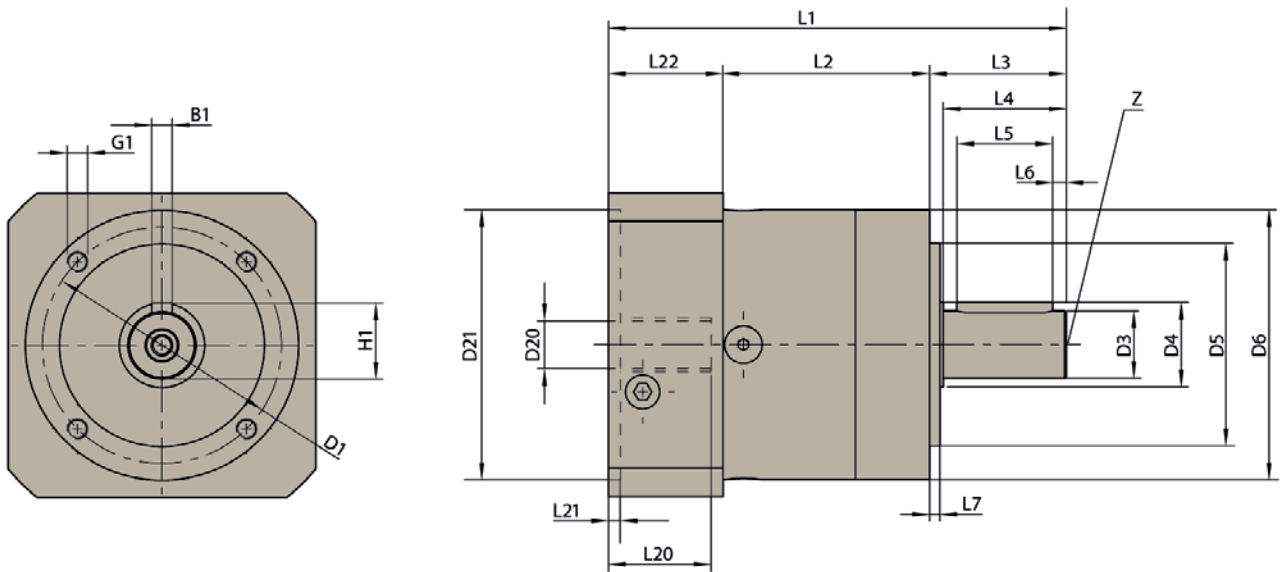
<sup>(9)</sup> Noise level at a distance of 1 m; measured at a drive speed of  $n_1=3000 \text{ min}^{-1}$  without load;  $i=5$

<sup>(10)</sup> referred to the center of the housing surface

<sup>(11)</sup> Inertia refers to the input shaft and to the standard motor shaft diameter D20

# Dimensions

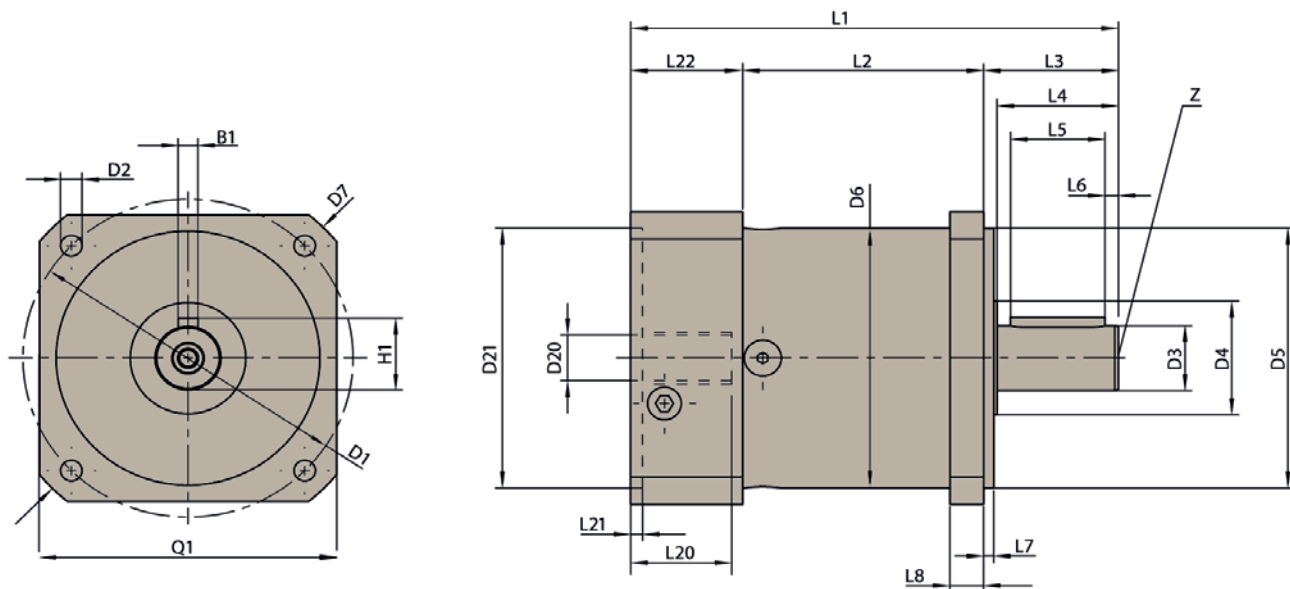
## PE2 / PE3



All dimensions in mm		PE2	PE3	
<b>B1</b>	Keyway DIN 6885 T1	3	5	
<b>D1</b>	Flange bolt circle	34	52	
<b>D2</b>	Mounting bore	-	-	
<b>D3</b>	Shaft diameter	10	14	
<b>D4</b>	Shaft collar	12	17	
<b>D5</b>	Centering	26	40	
<b>D6</b>	Housing diameter	40	60	
<b>D20</b>	Hole	6	9	
<b>D21</b>	Centering diameter for motor	30	40	
<b>G1</b>	Tapped hole x depth	M4x6	M5x8	
<b>H1</b>	Keyway DIN 6885 T1	11.2	16	
<b>L1</b>	Overall length	1 step	93.5	106.5
		2 step	106.5	119
<b>L2</b>	Housing length	1 step	39	47
		2 step	52	59.5
<b>L3</b>	Input shaft end	26	35	
<b>L4</b>	Shaft end to collar	23	30	
<b>L5</b>	Length of keyway	18	25	
<b>L6</b>	Distance to shaft end	2.5	2.5	
<b>L7</b>	Pilot	2	3	
<b>L8</b>	Flange width	-	-	
<b>L22</b>	Motor flange length	28.5	24.5	
<b>Q1</b>	Flange cross section	-	-	
<b>Z</b>	Centering bore DIN332, sheet 2, form DR	M3x9	M5x12	



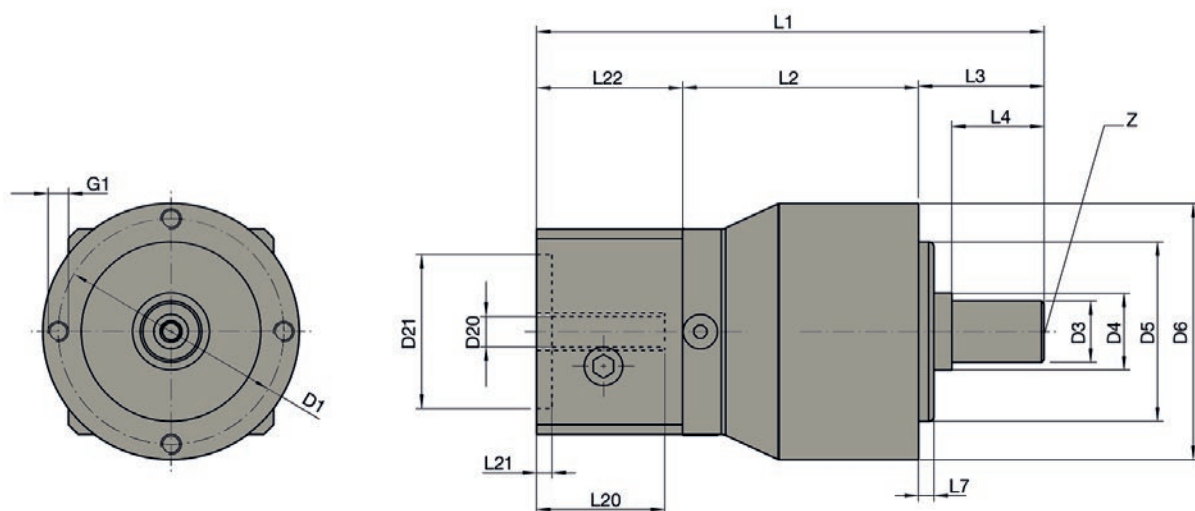
**PE4, PE5**



All dimensions in mm		PE4	PE5	
<b>B1</b>	Keyway DIN 6885 T1	6	8	
<b>D1</b>	Flange bolt circle	100	130	
<b>D2</b>	Mounting bore	6.5	8.5	
<b>D3</b>	Shaft diameter	20	25	
<b>D4</b>	Shaft collar	35	35	
<b>D5</b>	Centering	80	110	
<b>D6</b>	Housing diameter	80	115	
<b>D20</b>	Hole	14	19	
<b>D21</b>	Centering diameter for motor	80	95	
<b>G1</b>	Tapped hole x depth	-	-	
<b>H1</b>	Keyway DIN 6885 T1	22.5	28	
<b>L1</b>	Overall length	1 step	145	201.5
		2 step	162.5	229.5
<b>L2</b>	Housing length	1 step	71.5	99
		2 step	89	127
<b>L3</b>	Input shaft end	40	55	
<b>L4</b>	Shaft end to collar	36	50	
<b>L5</b>	Length of keyway	28	40	
<b>L6</b>	Distance to shaft end	4	5	
<b>L7</b>	Pilot	3	4	
<b>L8</b>	Flange width	10	15	
<b>L22</b>	Motor flange length	33.5	47.5	
<b>Q1</b>	Flange cross section	90	115	
<b>Z</b>	Centering bore DIN332, sheet 2, form DR	M6x16	M10x22	



PE7



All dimensions in mm		PE7	
D1	Flange bolt circle	140	
D2	Mounting bore	-	
D3	Shaft diameter	40	
D4	Shaft collar	55	
D5	Centering	120	
D6	Housing diameter	155	
D20	Hole		
D21	Centering diameter for motor		
G1	Tapped hole x depth	M10x20	
L1	Overall length	1 step	
		2 step	
L2	Housing length	1 step	100
		2 step	144.5
L3	Input shaft end	97	
L4	Shaft end to collar	82	
L7	Pilot	8	
L8	Flange width	-	
L22	Motor flange length		
Q1	Flange cross section	-	
Z	Centering bore DIN332, sheet 2, form DR	M16x36	



## Motor Gearhead Combination

	Motor 1	Motor 2	Motor 3	Order Code (Gearhead)	Mounting thread G3
<b>PE2</b>	SMH40			PE2 XXX 10 M 030/046/06/25	M4
<b>PE3</b>	SMH60/B08/09		MH056/B05/09	<b>PE3 XXX 10 M 040/063/09/20</b>	M5
			MH056/B05/11	PE3 XXX 10 M 040/063/11/23	M5
	NX205/NX210			PE3 XXX 10 M 040/063/11/25	M5
	SMH60/B05/11	NX310	MH070/B05/11	<b>PE3 XXX 10 M 060/075/11/23</b>	M5
		MH070/B05/14	PE3 XXX 10 M 060/075/14/30	M5	
	SY56 (NEMA 23)		PE3 XXX 10 M 038/066/06/21	M5	
	SY87 (NEMA 34)		PE3 XXX 10 M 073/098/09/32	M6	
<b>PE4</b>	SMH60/B05/11	NX310	MH070/B05/11	<b>PE4 XXX 10 M 060/075/11/23</b>	M5
	SMH82/B08/14			<b>PE4 XXX 10 M 080/100/14/30</b>	M6
	SMH82/B08/19	NX420/NX430	MH105/B09/19	PE4 XXX 10 M 080/100/19/40	M6
	SMH82/B05/19	SMH100/B05/19	MH105/B05/19	<b>PE4 XXX 10 M 095/115/19/40</b>	M8
	SY107 (NEMA 42)			PE4 XXX 10 M 055/125/15/32	M8
	SY87 (NEMA 34)			PE4 XXX 10 M 073/098/09/32	M6
<b>PE5</b>	MH105/B09/19	NX420/NX430		PE5 XXX 10 M 080/100/19/40	M6
	SMH82/B05/19	SMH100/B05/19	MH105/B05/19	<b>PE5 XXX 10 M 095/115/19/40</b>	M6
	SMH100/B05/24	SMH115/B09/24	MH105/B05/24	PE5 XXX 10 M 095/115/24/50	M8
	SMH115/B07/24	NX620/NX630	MH105/B06/24	PE5 XXX 10 M 110/130/24/50	M8
	SMH115/B05/24		MH145/B05/24	PE5 XXX 10 M 130/165/24/50	M10
<b>PE7</b>	SMH170/B05/38	MH205/B05/38		PE7 XXX 16 M 180/215/38/80	M12

Bold = Preferred motor gearhead combinations

Only for motors with mounting bores (no mounting thread)

Other mounting possibilities available on request (please contact Parker)

# Order Code

## PE Gearheads

	1	2	3	4	5	6	7	8	9
Order example	PE	3	003	10	M	038	063	06	20

<b>1 Gearhead Type</b>	<b>PE</b>	Economy planetary gearbox
<b>2 Gearhead Size</b>	<b>2</b>	PE2
	<b>3</b>	PE3
	<b>4</b>	PE4
	<b>5</b>	PE5
	<b>7</b>	PE7
<b>3 Ratio</b>	<b>003</b>	3
	...	4, 5, 7, 8, 9, 10, 12, 15, 16, 20, 25, 32, 40, 50
	<b>064</b>	64
<b>4 Output shaft</b>	<b>16</b>	without keyway
	<b>10</b>	with keyway (not possible for PE7)
<b>5 Motor connection flange</b>		M
<b>6 Pilot diameter</b>	<b>038</b>	38 mm
	...	
	<b>180</b>	180mm
<b>7 Pilot Center Diameter PCD</b>	<b>063</b>	63 mm
	...	
	<b>215</b>	215 mm
<b>8 Shaft diameter</b>	<b>06</b>	6 mm
	...	
	<b>42</b>	38 mm
<b>9 Motor shaft length</b>	<b>20</b>	20 mm
	...	
	<b>110</b>	110 mm





# Precision Planetary Gearboxes PS Series

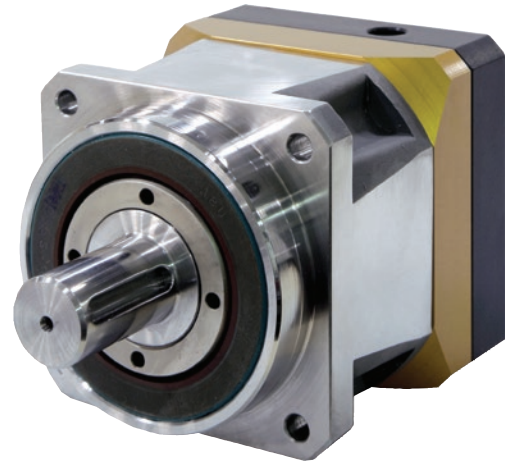
## Overview

### Description

The Helical Planetary Gearboxes incorporate design solutions to provide superior performance for the most demanding high performance applications.

The PS gearboxes incorporate dual angular contact bearings providing higher radial load capacities while maintaining high input speeds. The construction comprise among others, needle bearings to ensure a longer lifetime. An optimized gearing geometry provides the basis for the universal mounting position. Common mounting kits promote quicker deliveries and ease of mounting to any servo motor.

Mounting to any servo motor is as easy as A-B-C (adapter, bushing, collet).



### Features

- **High radial load capacity:**  
Angular contact output bearings
- **Increased service life:**  
Needle bearings
- **Life time lubrication**
- **Mounting Kits:**  
Quicker deliveries and easier mounting
- **High nominal torque and low backlash:**  
Helical planetary gearing
- **High wear resistance:**  
Plasma Nitriding heat treating

### Technical Characteristics - Overview

Series	Unit	PS
<b>Gear geometry</b>		Helical Planetary
<b>Type</b>		In-Line
<b>Frame sizes</b>	[mm]	60, 90, 115, 142
<b>Maximum input speed</b>	[min <sup>-1</sup> ]	up to 6000
<b>Nominal torque</b>	[Nm]	27...430
<b>Max. Radial force</b>	[N]	10 000
<b>Life</b>	[h]	20 000
<b>Backlash</b>	[arcmin]	up to <3

## Technical Characteristics

Parameter	Unit	Ratio <sup>(8)</sup>	PS60	PS90	PS115	PS142
Nominal output torque <sup>(1)</sup> $T_{nom r}$	[Nm]	<b>3</b> , 15, 30	27	76	172	300
		4, <b>5</b> , 7, <b>20</b> , 25, 40, <b>50</b> , 70	37	110	230	430
		<b>10</b> , 100	32	93	205	310
Maximum acceleration torque $T_{acc r}$	[Nm]	<b>3</b> , 15, 30	34	105	225	450
		4, <b>5</b> , 7, <b>20</b> , 25, 40, <b>50</b> , 70	48	123	285	645
		<b>10</b> , 100	37	112	240	465
Emergency stop output torque <sup>(2)</sup> $T_{em r}$	[Nm]	<b>3</b> , 15, 30	80	260	600	1100
		4, <b>5</b> , 7, <b>20</b> , 25, 40, <b>50</b> , 70	70	230	500	970
		<b>10</b> , 100	60	200	430	830
Nominal drive speed $N_{nom r}$	[min <sup>-1</sup> ]	<b>3</b>	3000	2500	2000	1500
		4, <b>5</b>	3500	3000	2500	2000
		7, <b>10</b> , 15	4000	3500	3000	2500
		<b>20</b> , 25, 30	4500	4000	3500	3000
		40, <b>50</b>	4800	4400	3800	3200
		70, 100	5200	4800	4200	3600
Maximum input speed $N_{max r}$ <sup>(3)</sup>	[min <sup>-1</sup> ]	3...100	6000	5500	4500	4000
Maximum radial force $P_{rmax}$ <sup>(4)</sup>	[N]		1650	4800	7500	10000
Maximum axial load $P_{amax}$ <sup>(5)</sup>	[N]		2100	3600	6800	8800
Life	[h]		20 000 (lifetime lubrication)			
Backlash - standard <sup>(6)</sup>	[arcmin]	3...10 (1 step)	<6	<6	<4	<4
		15...100 (2 step)	<8	<8	<6	<6
Backlash - reduced <sup>(6)</sup>	[arcmin]	3...10 (1 step)	<4	<4	<3	<3
		15...100 (2 step)	<6	<6	<5	<5
Efficiency at nominal torque	%	3...10	97	97	97	97
		15...100	94	94	94	94
Noise level at 3000 min <sup>-1</sup> <sup>(7)</sup>	[db]	3...100	<62	<62	<65	<66
Torsional rigidity	[Nm/arcmin]	3...100	3	12	27	50
Operating temperature	[°C]	3...100	-20...90			
Lubrication		3...100	Lifetime lubrication			
Orientation		3...100	any			
Direction of Rotation		3...100	same as input			
Enclosure rating			IP65			
Rotor inertia			see page 20			
Weight	[kg]	3...10	1.3	3.0	7.0	14.0
		15...100	1.7	5.0	10.0	20.0

<sup>(1)</sup> At nominal speed  $N_{nom r}$ .

<sup>(2)</sup> Maximum of 1000 stops.

<sup>(3)</sup> Cycle mode.

<sup>(4)</sup> Max. radial load applied to the center of the shaft at 100 min<sup>-1</sup>

<sup>(5)</sup> Max. axial load at 100 min<sup>-1</sup>.

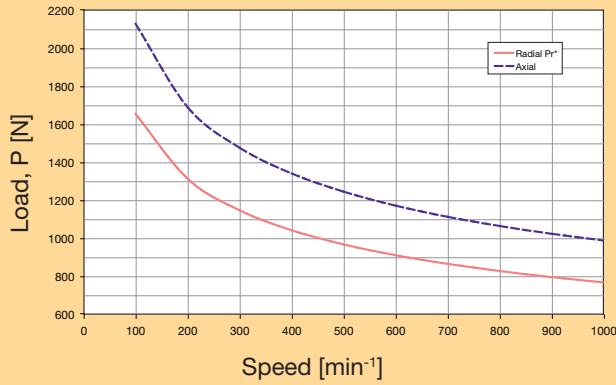
<sup>(6)</sup> Measured at 2 % of rated torque.

<sup>(7)</sup> Measure at 1 m.

<sup>(8)</sup> Gearboxes in bold print - ratios with standard reversing play are on stock. (for PS60 to PS115 only)

# Load on Input Shaft

**PS60**

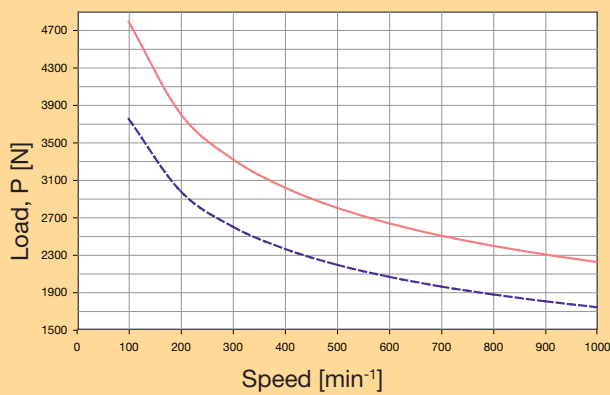


— Radial Pr\*  
- - Axial

Formulas to calculate radial load (Prx) at any distance "X" from the gearbox mounting surface:

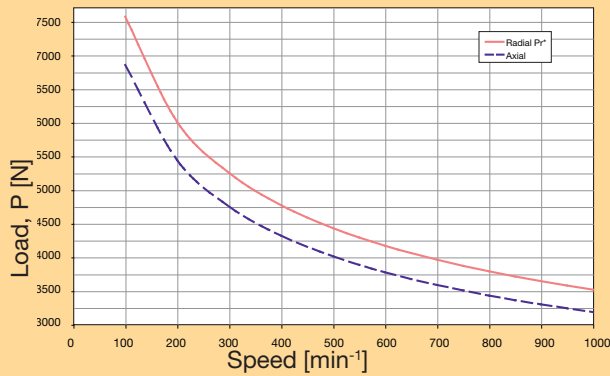
$$Pr_x = Pr * 75 \text{ mm} / (49 \text{ mm} + X)$$

**PS90**



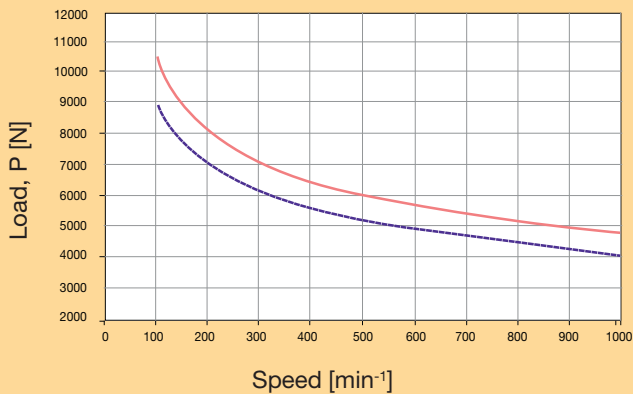
$$Pr_x = Pr * 96 \text{ mm} / (62 \text{ mm} + X)$$

**PS115**



$$Pr_x = Pr * 124 \text{ mm} / (81 \text{ mm} + X)$$

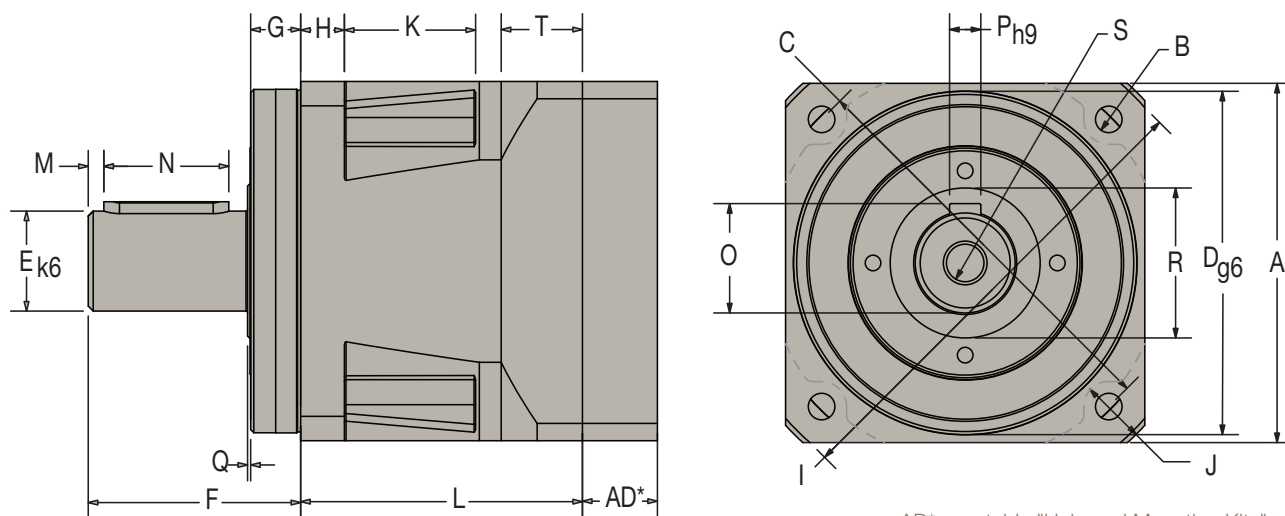
**PS142**



$$Pr_x = Pr * 156 \text{ mm} / (93 + X)$$

\* Radial load applied to center of the shaft.

## Dimensions



AD\*: see table "Universal Mounting Kits"

Frame size	All dimensions in mm	PS60	PS90	PS115	PS142
A	Flange cross section	62	90	115	142
B	Fixing bore	5.5	6.5	8.5	11.0
C	Bolt circle	70	100	130	165
D	Motor pilot Ø	50	80	110	130
E	Drive shaftØ	16	22	32	40
F	Drive shaft length	40	52	68	102
G	Motor pilot depth	11	15	16	20
H	Flange width	8	10	14	15
I	Ø Housing	80	116	152	185
J	Housing recess	5	6.5	7.5	10.0
K	Recess length	24	33	42	45
L1	Length single stage	59.8	69.5	90.2	103.7
L2	Length double stage	94.8	113	143.4	170.7
M	Distance from shaft end	2	3	5	5
N	Keyway length	25	32	40	63
O	Key height	18	24.5	35	43
P	Keyway width	5	6	10	12
Q	Collar height	1	1	1.5	2.5
R	Collar Ø	22	35	50	78
S	Center bore (shaft end)	M5x8	M8x16	M12x25	M16x32
T	Width of flange on output side	20.5	20	26	31

### Universal Mounting Kits

#### Adapter length "AD" dimension

Frame size	Motor shaft length [mm]	Gearbox adapter length [mm]
60	16...35	16.5
	35.1...41	22.5
90	20...40	20
	40.1...48	28.5
115	22...50	24
	50.1...61	35
142	26...62	30
	62.1...82	50

### PS: Rotor Inertia

All rotor inertias refer to the gearbox input

Ratio	Unit	PS60	PS90	PS115	PS142
3	[kgmm <sup>2</sup> ]	25	97	340	1480
4	[kgmm <sup>2</sup> ]	17	67	220	980
5	[kgmm <sup>2</sup> ]	15	51	170	700
7	[kgmm <sup>2</sup> ]	14	41	130	530
10	[kgmm <sup>2</sup> ]	14	37	110	440
15	[kgmm <sup>2</sup> ]	15	52	170	640
20	[kgmm <sup>2</sup> ]	15	51	170	640
25	[kgmm <sup>2</sup> ]	15	51	170	640
30, 40, 50, 70, 100	[kgmm <sup>2</sup> ]	13	37	110	420

## Adapter Flange / Motor - Dimensions (Gear Unit Input Side)

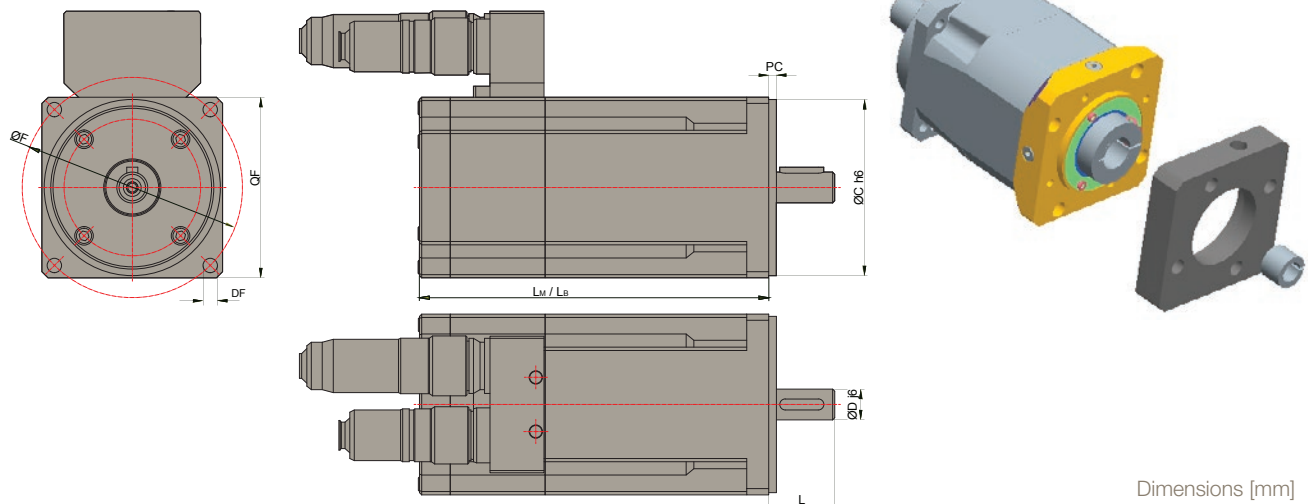
Motor <sup>(1)</sup>	Flange Type	Motor flange	Flange depth	Bolt circle Ø	Bore Ø	Pilot Ø	Pilot depth	Shaft Ø	Shaft length	Adapter flange		
		QF	PC	F	DF	C	S	D	L	Order No.	Fastening thread	AD <sup>(2)</sup> (short)
SM_60,###,##,5,11,S	B5	70	7	75	6	60	2.5	11	23	MU60-001	M5	16.5
M_70,###,##,5,11,S	B5	70	7	75	6	60	2.5	11	23	MU60-001	M5	16.5
NX320		56	8.5	75	5.5	60	2.5	11	23	MU60-001	M5	16.5
M_56,###,##,5,9,S	B5	56	6.5	63	5.5	40	2.5	9	20	MU60-003	M5	16.5
SM_60,###,##,8,9,S	B5	60	7	63	5.5	40	2.5	9	20	MU60-003	M5	16.5
SY56#	Nema23	56.5	4.83	66.67	5.3	38.1	1.6	6.35	25.4	MU60-005	M5	16.5
M_56,###,##,5,11,S	B5	56	6.5	63	5.5	40	2.5	11	23	MU60-254	M5	16.5
NX205/210		56	7.2-18	63	5.5	40	2.5	11	25	MU60-254	M5	16.5
NX110		42.5	6	50	3.2	30	2.5	9	25	MU60-255	M3	16.5
SM_82,###,##,8,14,S	B8	82	10	100	6.5	80	3.5	14	30	MU60-321	M6	16.5
SM_82,###,##,8,14,S	B8	82	10	100	6.5	80	3.5	14	30	MU90-001	M6	20
SM_82,###,##,8,19,S	B8	82	10	100	6.5	80	3.5	19	40	MU90-085	M6	20
NX420/430		91.5	10.5	100	7	80	3	19	40	MU90-085	M6	20
M_105,###,##,5,19,S	B5	105	10	115	9.5	95	3.5	19	40	MU90-088	M9	20
SM_100,###,##,5,19,S	B5	100	10	115	9	95	3.5	19	40	MU90-088	M8	20
SM_115,###,##,8,19,S	B8	115	10	130	9	95	3.5	19	40	MU90-345	M8	20
M_105,###,##,5,24,S	B5	105	10	115	9.5	95	3.5	24	50	MU115-005	M8	24
SM_100,###,##,5,24,S	B5	100	10	115	9	95	3.5	24	50	MU115-005	M8	24
SM_115,###,##,8,19,S	B8	115	10	130	9	95	3.5	19	40	MU115-006	M8	24
M_105,###,##,6,24,S	B6	105	10	130	9	110	3.5	24	50	MU115-010	M8	24
SM_115,###,##,7,24,S	B7	130	10	130	9	110	3.5	24	50	MU115-010	M8	24
NX620/630		121	10.5	130	9	110	3.5	24	50	MU115-010	M8	24
SM_82,###,##,8,14,S	B8	82	10	100	6.5	80	3.5	14	30	MU115-015	M6	24
SM_115,###,##,5,24,S	B5	145	10	165	11	130	3.5	24	50	MU115-026	M10	24
SM_142,###,##,5,24,S	B5	145	10	165	11	130	3.5	24	50	MU115-026	M10	24
SM_82,###,##,5,19,S	B5	100	10	115	9	95	3.5	19	40	MU115-039	M8	24
SM_100,###,##,5,19,S	B5	100	10	115	9	95	3.5	19	40	MU115-039	M8	24
SM_82,###,##,8,19,S	B8	82	10	100	6.5	80	3.5	19	40	MU115-089	M6	24
SM_115,###,##,8,24,S	B8	115	10	130	9	95	3.5	24	50	MU115-257	M8	24
M_105,###,##,9,24,S	B9	96	10	100	7	80	3.5	24	50	MU115-269	M6	24
SM_170,###,##, ,38,S	B5	170	8	215	14	180	4	38	80	MU142-40410	M12	53
MH205,###,##, ,38,S	B5	205	8	215	14	180	4	38	80	MU142-40410	M12	53

For motors not shown in the list please contact Parker

<sup>(1)</sup> MB/SMB: for drives TPDM, SLVDN,

MH/SMH: for drives Compax3, PSD

<sup>(2)</sup> AD: Adapter length (please refer to the "dimensions" chapter)



Dimensions [mm]

# Gearbox Sizing

Parker has prepared the following procedure to provide a quick method for selecting a gearbox.

### 1) Application parameters:

- Acceleration time ( $t_{acc}$ )
- Continuous run time ( $t_{cont}$ )
- Deceleration time ( $t_{dec}$ )
- Dwell time ( $t_{dwell}$ )
- Acceleration torque ( $T_{acc}$ )
- Continuous torque ( $T_{cont}$ )
- Deceleration torque ( $T_{dec}$ )

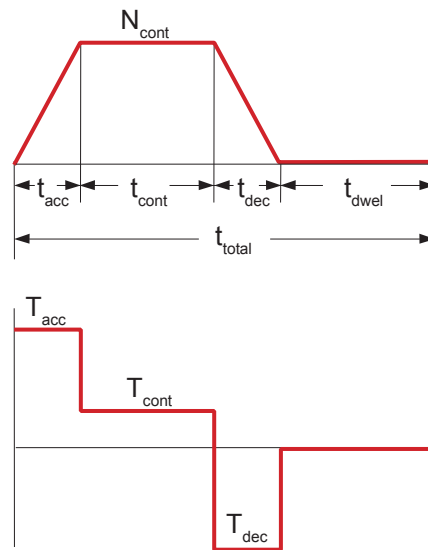
- Application speed ( $N_{cont}$ )
- Transmission ratio ( $i$ )
- Gearbox nominal torque ( $T_{nom r}$ )
- Max. permissible acceleration torque ( $T_{acc r}$ )
- Percentage of acceleration torque vs. continuous cycle time ( $t_{total}$ )
- Max. input speed ( $N_{max r}$ )

### 2) Duty cycle:

$$\text{Duty cycle} = t_{acc} + t_{cont} + t_{dec} / t_{total} \times 100 \%$$

If duty cycle is <60 % and ( $t_{acc} + t_{cont} + t_{dec}$ ) is less than 20 minutes, the motion is considered to be intermittent.

If duty cycle is <60 % and ( $t_{acc} + t_{cont} + t_{dec}$ ) is more than 20 minutes, the motion is considered to be continuous.



### 3) For Cycle mode applies:

Determine  $T_{acc}$  % of ( $T_{acc} + T_{cont} + T_{dec}$ ):  
 $T_{acc} / (T_{acc} + T_{cont} + T_{dec}) \times 100\%$

Define the ratio:  $T_{cont} / T_{acc}$

Use the table to select the load factor K.

Compare Accel/Decel torque to the maximum permissible accel torque of the gearbox  $T_{acc r}$ :  $T_{acc} < T_{acc r} \times K$ , if not, please select a more suitable gearbox.

Compare the required maximum speed to the maximum rated speed of the gearbox.  
 $N_{max} < N_{max r / i}$  (i-gearbox ratio)

Table: Load Factor K

$T_{acc}$ %	$0 < T_{cont} / T_{acc} < 0.25$	$0.25 < T_{cont} / T_{acc} < 0.5$
10-15	1.0	1.0
15-20	1.0	0.95
20-25	0.94	0.89
25-30	0.88	0.84
30-35	0.81	0.79
35-40	0.76	0.75
40-45	0.71	0.70
45-50	0.66	0.66

### 4) For continuous operation applies:

$$T_{nom} < T_{nom r}$$

$$N_{nom} < N_{nom r} / i$$

### 5) Check the Emergency Stop Torque Rating.

### 6) Verify Radial and Axial Shaft Load of the Application for the selected Gearbox.

# Order Code

## PS Gearboxes

	1	2		3		4	5		6
Order example	PS	60	-	003	-	S	2	/	MU60-088

<b>1 Gearbox type</b>		
● PS	Gearbox for in-line mounting	
<b>2</b>		
● 60	Flange 60	
● 90	Flange 90	
● 115	Flange 115	
● 142	Flange 142	
<b>3 Ratio</b>		
003	3	●
004	4	
005	5	●
007	7	
010	10	●
015	15	
020	20	●
025	25	
030	30	
040	40	
050	50	●
070	70	
100	100	
<b>4 Reverse play / orientation</b>		
● S	Standard	
● L	Reduced	
<b>5 Series</b>		
● 2	Gen 2 Gearboxes	

● On stock, short delivery times

PS gearboxes generally come with a keyway

<b>6 Adapter flange / Motor assignment</b>		
● MU60-001	SMH60,###,##,5,11,S MH70,###,##,5,11,S NX3	
● MU60-003	MH56,###,##,5,9,S SMH60,###,##,8,9,S	
● MU60-005	SY56	
● MU60-254	MH56,###,##,5,11,S NX2	
● MU60-255	NX1	
● MU60-321	SMH,###,###,8,14,S	
● MU90-001	SMH82,###,##,8,14,S	
● MU90-085	SMH82,###,##,8,19,S NX4	
● MU90-088	MH105,###,##,5,19,S SMH100,###,##,5,19,S	
● MU90-345	SMH115,###,##,8,19,S	
● MU115-005	MH105,###,##,5,24,S SMH100,###,##,5,24,S	
● MU115-006	SMH115,###,##,8,19,S	
● MU115-010	MH105,###,##,6,24,S SMH115,###,##,7,24,S NX6	
● MU115-015	SMH82,###,##,8,14,S	
● MU115-026	SMH115,###,##,5,24,S SMH142,###,##,5,24,S	
● MU115-039	SMH82,###,##,5,19,S SMH100,###,##,5,19,S	
● MU115-089	SMH82,###,##,8,19,S	
● MU115-257	SMH115,###,##,8,24,S	
● MU115-269	MH105,###,##,9,24,S	
● MU142-40410	SM_170,###,##,38,S MH205,###,##,38,S	
● MUxxx-yyy	Additional motors	





# ATEX Gearboxes GXA Series

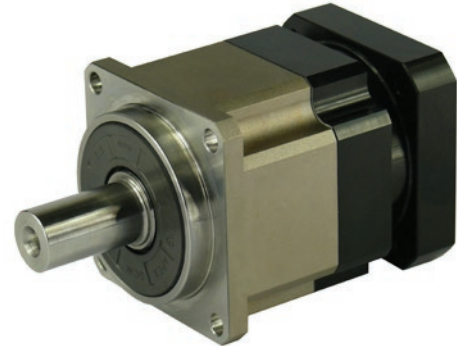
## Overview

### Description

GXA gearbox series has to be associated with the powerful Parker ATEX servomotors ranges for use in hazardous areas. The precision helical gearing design offers smooth and quiet operation for the most demanding high performance applications.

The solid uncaged needle roller bearings provides maximum contact points to increase stiffness and generates high output torque.

In addition the unique motor adapter and bushing module system design allows to obtain a compact structure and a quick and easy mounting of any ATEX certified Parker motor.



### Features

- ATEX certify
- Low backlash
- High efficiency
- Easy mounting
- Low noise
- Compact structure
- Helical Gear Design



### Technical Characteristics - Overview

Series	Unit	PS
<b>Gear geometry</b>		Helical Gearing
<b>Type</b>		In-Line
<b>Frame sizes</b>	[mm]	60, 90, 115, 142, 180, 220
<b>Maximum input speed</b>	[min <sup>-1</sup> ]	up to 10 000
<b>Nominal torque</b>	[Nm]	40...1800
<b>Radial force</b>	[N]	up to 50 000
<b>Life</b>	[h]	up to 20 000
<b>Backlash</b>	[arcmin]	up to ≤ 3
<b>Efficiency</b>	[%]	up to ≥ 97 %
<b>Category</b>		Equipment Group II Category 2 in accordance with Directive 2014/34/EU
<b>Harmonized standard</b>		EN 1127-1:2012
<b>Other technical standards &amp; specifications applied</b>		EN 13463-1:2009, EN 13463-5:2013, ISO281:2004, ISO286:2013, DIN3960

## Technical Characteristics

Model No.		Stage	Ratio <sup>1</sup>	GX..R02..	GX..R04..	GX..R06..	GX..R07..	GX..R09..	GX..R10..
Nominal Output Torque $T_{2N}$	[Nm]	1	3	55	130	208	342	588	-
			4	50	140	290	542	1050	-
			5	60	160	330	650	1200	-
			6	55	150	310	600	1100	-
			7	50	140	300	550	1100	-
			8	45	120	260	500	1000	-
			9	40	100	230	450	900	-
			10	40	100	230	450	900	-
		2	15	-	130	208	342	588	-
			20	-	140	290	542	1050	-
			25	-	160	330	650	1200	-
			30	-	150	310	600	1100	-
			35	-	140	300	550	1100	-
			40	-	120	260	500	1000	-
			45	-	100	230	450	900	-
			50	-	160	330	650	1200	-
			60	-	150	310	600	1100	-
			70	-	140	300	550	1100	1800
			80	-	120	260	500	1000	1600
			90	-	100	230	450	900	1500
100	-	100	230	450	900	1500			
Emergency Stop Torque $T_{2NOT}^3$	[Nm]	1,2	3~100	3 times of Nominal Output Torque					
Nominal Input Speed $n_{1N}$	[min <sup>-1</sup> ]	1,2	3~100	5000	4000	4000	3000	3000	2000
Max. Input Speed $n_{1B}$	[min <sup>-1</sup> ]	1,2	3~100	10 000	8000	8000	6000	6000	4000
Standard Backlash	[arcmin]	1	3~10	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5
		2	15~100	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7	≤ 7
Reduced Backlash	[arcmin]	1	3~10	≤ 3	≤ 3	≤ 3	≤ 3	≤ 3	≤ 3
		2	15~100	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5
Torsional Rigidity	[Nm / arcmin]	1,2	3~100	7	14	25	50	145	225
Max. Radial Load $F_{2rB}^2$	[N]	1,2	3~100	1530	3250	6700	9400	14500	50000
Max. Axial Load $F_{2aB}^2$	[N]	1,2	3~100	765	1625	3350	4700	7250	25000
Lifetime	[h]	1,2	3~100	20 000*					
Efficiency	[%]	1	3~10	≥ 97 %					
		2	15~100	≥ 94 %					
Weight	[kg]	1	3~10	1.3	3.7	7.8	14.5	29	48
		2	15~100	1.5	4.1	9	17.5	33	60
Operating Temp	[°C]	1,2	3~100	-10 to 40 °C					
Lubrication				Synthetic grease					
Degree of Gearbox Protection		1,2	3~100	IP65					
Mounting Position		1,2	3~100	All directions					
Noise Level ( $n_1=3000 \text{ min}^{-1}$ , No Load)	[dB(A)]	1,2	3~100	≤ 58	≤ 60	≤ 63	≤ 65	≤ 67	≤ 70

<sup>1</sup> Ratio (i=N in / N out)

<sup>2</sup> Applied to the output shaft center @ 100 min<sup>-1</sup>

<sup>3</sup> Max. acceleration torque  $T_{2B} = 60\%$  of  $T_{2NOT}$

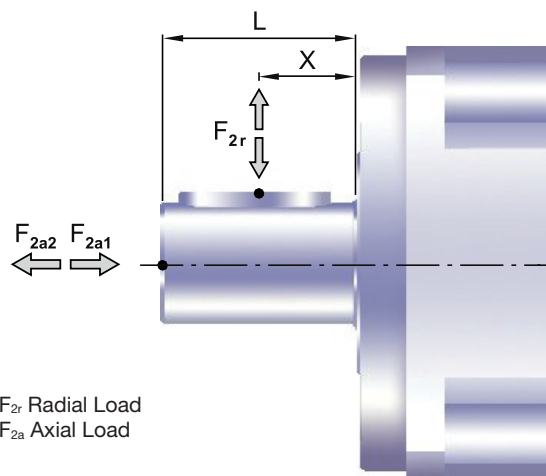
\*S1 service life 10,000 hrs.

## Gearbox Inertia

Model No.	Unit	Stage	Ratio	GX..R02..	GX..R04..	GX..R06..	GX..R07..	GX..R09..	GX..R10..
<b>Mass Moments of inertia J<sub>1</sub></b>	[kgmm <sup>2</sup> ]	1	3	16	61	325	921	2898	-
			4	14	48	274	754	2367	-
			5	13	47	271	742	2329	-
			6	13	45	265	725	2275	-
			7	13	45	262	714	2248	-
			8	13	44	258	707	2259	-
			9	13	44	257	704	2253	-
			10	13	44	257	703	2251	-
		2	15	-	13	47	271	742	-
			20	-	13	47	271	742	-
			25	-	13	47	271	742	-
			30	-	13	47	271	742	-
			35	-	13	47	271	742	-
			40	-	13	47	271	742	-
			45	-	13	47	271	742	-
			50	-	13	44	257	703	-
			60	-	13	44	257	703	-
			70	-	13	44	257	703	2251
			80	-	13	44	257	703	2251
			90	-	13	44	257	703	2251
100	-	13	44	257	703	2251			

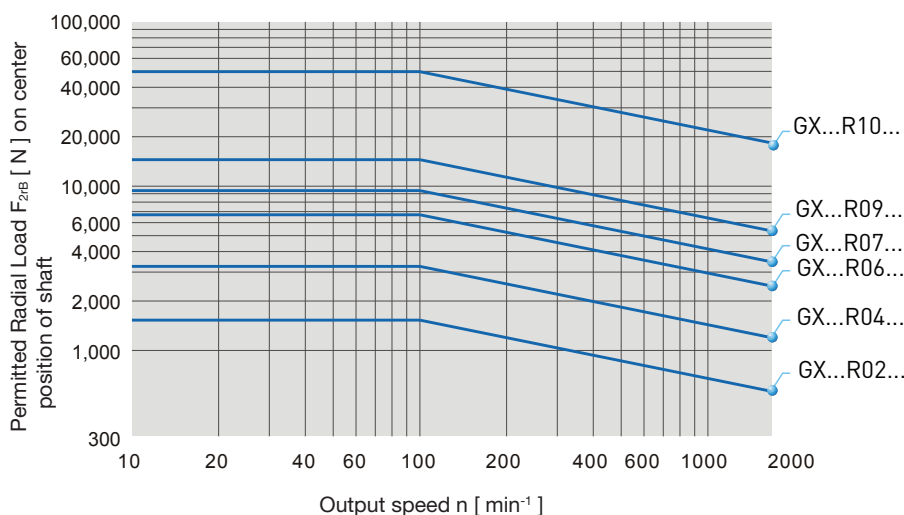
## Permitted radial and axial loads on output shaft of the gearbox

The permitted radial and axial loads on output shaft of the gearbox depend on the design of the gearbox supporting bearings. GXA Series uses the extension straddle oversized ball bearing design. It can take heavy load from both axes.



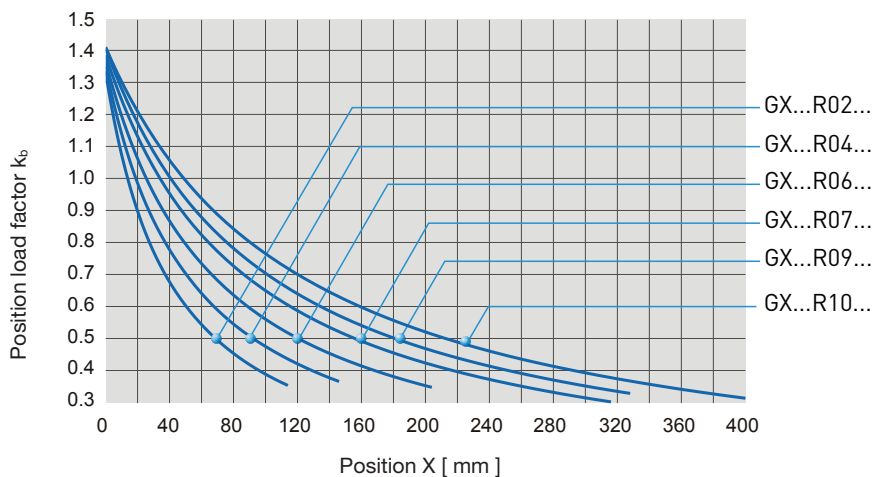
$F_{2r}$  Radial Load  
 $F_{2a}$  Axial Load

If radial force  $F_{2r}$  exert on the center of the output shaft :  $X=1/2 \times L$ .



The permitted radial load is given on left diagram.

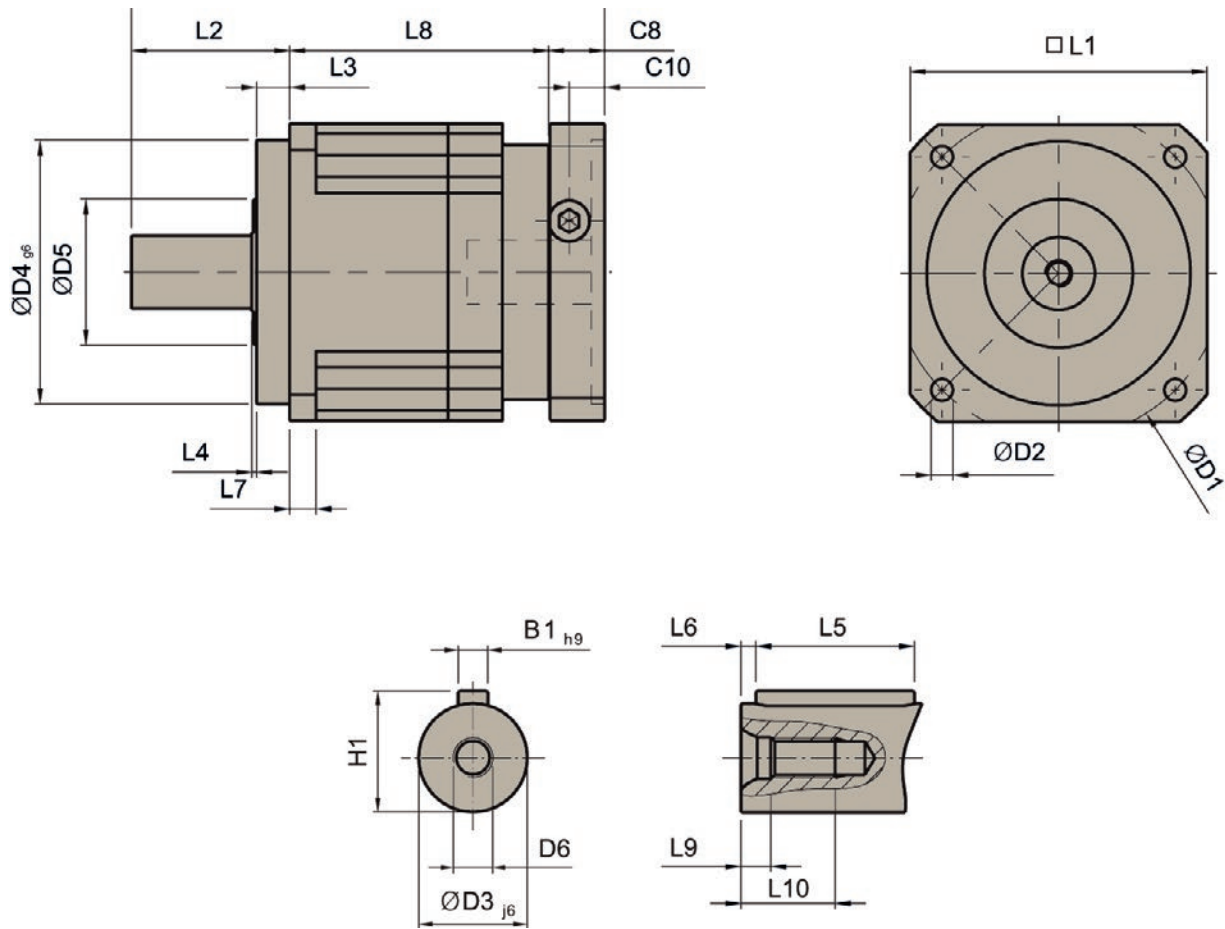
If radial force  $F_{2r}$  not exert on the center of the output shaft :  $X < 1/2 \times L$  or  $X > 1/2 \times L$



The permitted radial load can be calculated by multiplying the current by the position load factor  $k_b$  on the left diagram.

# Dimensions

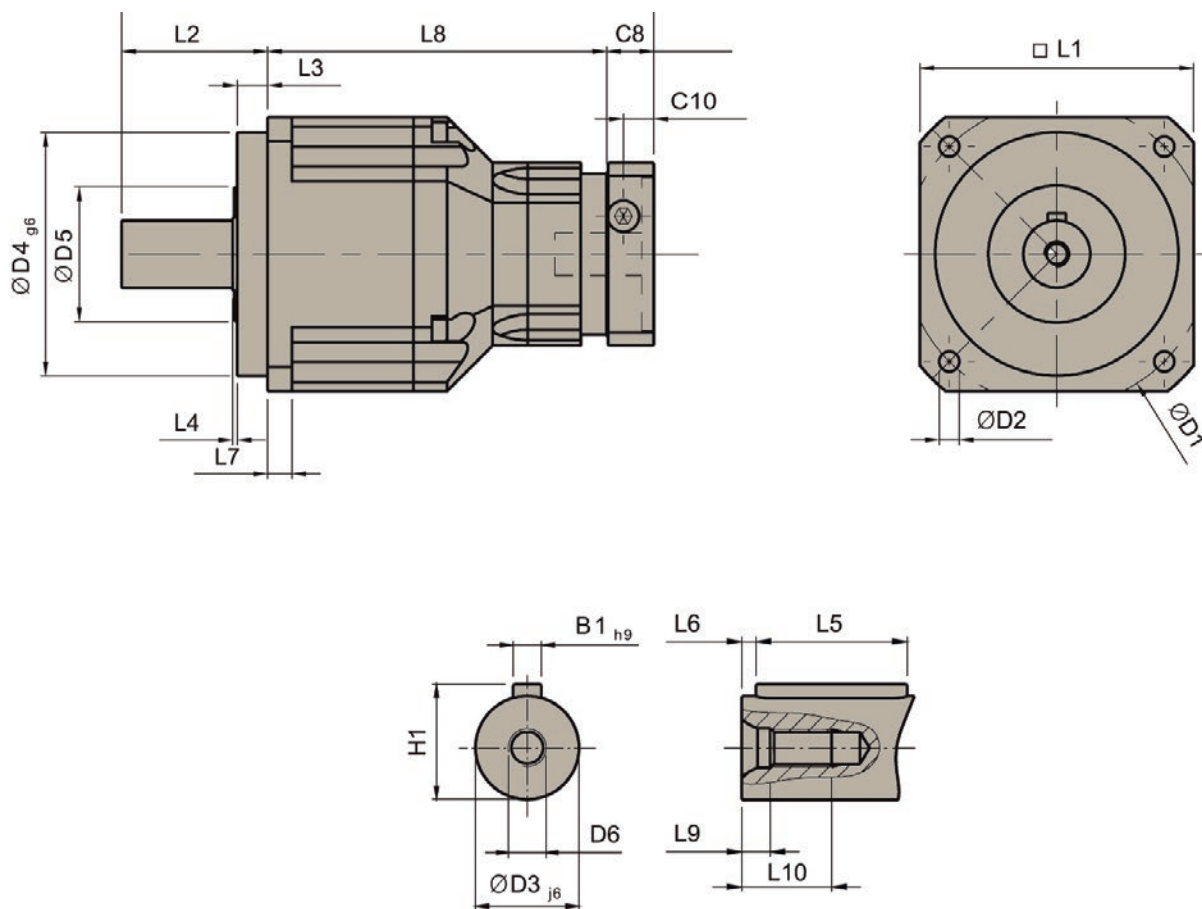
1 Stage - Ratio  $i = 3 - 10$



	GX..R02..	GX..R04..	GX..R06..	GX..R07..	GX..R09..
D1	70	100	130	165	215
D2	5.5	6.6	9	11	13
D3 j6	16	22	32	40	55
D4 g6	50	80	110	130	160
D5	45	65	95	75	95
D6	M5 x 0.8	M8 x 1.25	M12 x 1.75	M16 x 0.8	M20 x 2.5
L1	60	90	115	142	180
L2	37	48	65	97	105
L3	7	10	12	15	20
L4	1.5	1.5	2	3	3
L5	25	32	40	63	70
L6	2	3	5	5	6
L7	6	8	10	12	15
L8	61	78.5	102	119.5	154
L9	4.8	7.2	10	12	15
L10	12.5	19	28	36	42
C8 <sup>3</sup>	19	17	19.5	22.5	29
C10 <sup>3</sup>	13.5	10.75	13	15	20.75
B1 <sub>h9</sub>	5	6	10	12	16
H1	18	24.5	35	43	59

<sup>3</sup>C8-C10 are motor specific dimensions.

2 Stages - Ratio  $i = 15 - 100$



	GX..R04..	GX..R06..	GX..R07..	GX..R09..	GX..R10..
<b>D1</b>	100	130	165	215	250
<b>D2</b>	6.6	9	11	13	17
<b>D3 j6</b>	22	32	40	55	75
<b>D4 g6</b>	80	110	130	160	180
<b>D5</b>	65	95	75	95	115
<b>D6</b>	M8 x 1.25	M12 x 1.75	M16 x 2	M20 x 2.5	M20 x 2.5
<b>L1</b>	90	115	142	180	220
<b>L2</b>	48	65	97	105	138
<b>L3</b>	10	12	15	20	30
<b>L4</b>	1.5	2	3	3	3
<b>L5</b>	32	40	63	70	90
<b>L6</b>	3	5	5	6	7
<b>L7</b>	8	10	12	15	20
<b>L8</b>	111.5	143.5	176	209.5	248
<b>L9</b>	7.2	10	12	15	15
<b>L10</b>	19	28	36	42	42
<b>C8 <sup>4</sup></b>	19	17	19.5	22.5	29
<b>C10 <sup>4</sup></b>	13.5	10.75	13	15	20.75
<b>B1 <sub>h9</sub></b>	6	10	12	16	20
<b>H1</b>	24.5	35	43	59	79.5

4. C8-C10 are motor specific dimensions.

## Gearbox Combinations

	Ratio	Motor Size				
		EX3 / EY3	EX4 / EY4	EX6 / EY6	EX8 / EY8	
1 stage	3	GXA3N003R0201	GXA4N003R0401	GXA6N003R0601	GXA8N003R0701	
	4	GXA3N004R0201	GXA4N004R0401	GXA6N004R0601	GXA8N004R0701	
	5	GXA3N005R0201	GXA4N005R0401	GXA6N005R0601	GXA8N005R0701	
	6	GXA3N006R0201	GXA4N006R0401	GXA6N006R0601	GXA8N006R0701	
	7	GXA3N007R0201	GXA4N007R0401	GXA6N007R0601	GXA8N007R0701	
	8	GXA3N008R0201	GXA4N008R0401	GXA6N008R0601	GXA8N008R0701	
	9	GXA3N009R0201	GXA4N009R0401	GXA6N009R0601	GXA8N009R0701	
	10	GXA3N010R0201	GXA4N010R0401	GXA6N010R0601	GXA8N010R0701	
2 stages	15	GXA3N015R0401	GXA4N015R0601	GXA6N015R0701	GXA8N015R0901	
	20	GXA3N020R0401	GXA4N020R0601	GXA6N020R0701	GXA8N020R0901	
	25	GXA3N025R0401	GXA4N025R0601	GXA6N025R0701	GXA8N025R0901	
	30	GXA3N030R0401	GXA4N030R0601	GXA6N030R0701	GXA8N030R0901	
	35	GXA3N035R0401	GXA4N035R0601	GXA6N035R0701	GXA8N035R0901	
	40	GXA3N040R0401	GXA4N040R0601	GXA6N040R0701	GXA8N040R0901	
	45	GXA3N045R0401	GXA4N045R0601	GXA6N045R0701	GXA8N045R0901	
	50	GXA3N050R0401	GXA4N050R0601	GXA6N050R0701	GXA8N050R0901	
	60	GXA3N060R0401	GXA4N060R0601	GXA6N060R0701	GXA8N060R0901	
	70			GXA4N070R0601		GXA8N070R0901
		GXA3N070R0401	GXA4N070R0701	GXA6N070R0701	GXA8N070R1001	
	80	GXA3N080R0401	GXA4N080R0601	GXA6N080R0701	GXA8N080R0901	
			GXA4N080R0701		GXA8N080R1001	
	90	GXA3N090R0401	GXA4N090R0601	GXA6N090R0701	GXA8N090R0901	
			GXA4N090R0701		GXA8N090R1001	
	100	GXA3N100R0401	GXA4N100R0601	GXA6N100R0701		
		GXA4N100R0701		GXA8N100R1001		

Motor gearhead possible combination with torque limitation, please consult us at [EM-motion@parker.com](mailto:EM-motion@parker.com)

# Order Code

## GXA Gearboxes

	1	2	3	4	5	6	7
Order example	<b>GX</b>	<b>A</b>	<b>3</b>	<b>N</b>	<b>005</b>	<b>R060</b>	<b>0</b>

<b>1 Gearbox Series</b>	<b>GX</b>	Gearbox for in-line mounting
<b>2 Gearbox Type</b>	<b>A</b>	ATEX version
<b>3 Motor size association *</b>	<b>3</b>	EX3, EY3 (60/75/11/23)
	<b>4</b>	EX4, EY4 (80/100/19/40)
	<b>6</b>	EX6, EY6 (110/130/24/50)
	<b>8</b>	EX8, EY8 (130/165/32/58)
<b>4 Backlash</b>	<b>N</b>	Normal
	<b>R</b>	Reduced
<b>5 Ratio</b>	<b>3 to 10</b>	for GXA 1 stage
	<b>15 to 100</b>	for GXA 2 stages
<b>6 Gearbox Size *</b>	<b>R020</b>	Size 60
	<b>R040</b>	Size 90
	<b>R060</b>	Size 115
	<b>R070</b>	Size 142
	<b>R090</b>	Size 180
	<b>R100</b>	Size 220
<b>7 Shaft</b>	<b>0</b>	Smooth shaft
	<b>1</b>	Keyed shaft

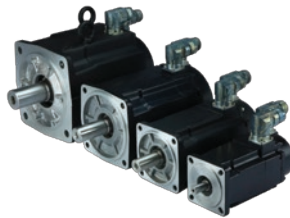
\* To find out about possible combinations please refer to the table on page 31.

## Explosion proof servo motor

**EX Series - Zone 1**  
[www.parker.com/eme/ex](http://www.parker.com/eme/ex)



**EY Series - Zone 2**  
[www.parker.com/eme/ey](http://www.parker.com/eme/ey)











# Parker's Motion & Control Technologies

At Parker, we're guided by a relentless drive to help our customers become more productive and achieve higher levels of profitability by engineering the best systems for their requirements. It means looking at customer applications from many angles to find new ways to create value. Whatever the motion and control technology need, Parker has the experience, breadth of product and global reach to consistently deliver. No company knows more about motion and control technology than Parker. For further info call 00800 27 27 5374



## Aerospace Key Markets

Aftermarket services  
Commercial transports  
Engines  
General & business aviation  
Helicopters  
Launch vehicles  
Military aircraft  
Missiles  
Power generation  
Regional transports  
Unmanned aerial vehicles

## Key Products

Control systems & actuation products  
Engine systems & components  
Fluid conveyance systems & components  
Fluid metering, delivery & atomization devices  
Fuel systems & components  
Fuel tank inerting systems  
Hydraulic systems & components  
Thermal management  
Wheels & brakes



## Climate Control Key Markets

Agriculture  
Air conditioning  
Construction Machinery  
Food & beverage  
Industrial machinery  
Life sciences  
Oil & gas  
Precision cooling  
Process  
Refrigeration  
Transportation

## Key Products

Accumulators  
Advanced actuators  
CO<sub>2</sub> controls  
Electronic controllers  
Filter driers  
Hand shut-off valves  
Heat exchangers  
Hose & fittings  
Pressure regulating valves  
Refrigerant distributors  
Safety relief valves  
Smart pumps  
Solenoid valves  
Thermostatic expansion valves



## Electromechanical Key Markets

Aerospace  
Factory automation  
Life science & medical  
Machine tools  
Packaging machinery  
Paper machinery  
Plastics machinery & converting  
Primary metals  
Semiconductor & electronics  
Textile  
Wire & cable

## Key Products

AC/DC drives & systems  
Electric actuators, gantry robots & slides  
Electrohydraulic actuation systems  
Electromechanical actuation systems  
Human machine interface  
Linear motors  
Stepper motors, servo motors, drives & controls  
Structural extrusions



## Filtration Key Markets

Aerospace  
Food & beverage  
Industrial plant & equipment  
Life sciences  
Marine  
Mobile equipment  
Oil & gas  
Power generation & renewable energy  
Process  
Transportation  
Water Purification

## Key Products

Analytical gas generators  
Compressed air filters & dryers  
Engine air, coolant, fuel & oil filtration systems  
Fluid condition monitoring systems  
Hydraulic & lubrication filters  
Hydrogen, nitrogen & zero air generators  
Instrumentation filters  
Membrane & fiber filters  
Microfiltration  
Sterile air filtration  
Water desalination & purification filters & systems



## Fluid & Gas Handling Key Markets

Aerial lift  
Agriculture  
Bulk chemical handling  
Construction machinery  
Food & beverage  
Fuel & gas delivery  
Industrial machinery  
Life sciences  
Marine  
Mining  
Mobile  
Oil & gas  
Renewable energy  
Transportation

## Key Products

Check valves  
Connectors for low pressure fluid conveyance  
Deep sea umbilicals  
Diagnostic equipment  
Hose couplings  
Industrial hose  
Mooring systems & power cables  
PTFE hose & tubing  
Quick couplings  
Rubber & thermoplastic hose  
Tube fittings & adapters  
Tubing & plastic fittings



## Hydraulics Key Markets

Aerial lift  
Agriculture  
Alternative energy  
Construction machinery  
Forestry  
Industrial machinery  
Machine tools  
Marine  
Material handling  
Mining  
Oil & gas  
Power generation  
Refuse vehicles  
Renewable energy  
Truck hydraulics  
Turf equipment

## Key Products

Accumulators  
Cartridge valves  
Electrohydraulic actuators  
Human machine interfaces  
Hybrid drives  
Hydraulic cylinders  
Hydraulic motors & pumps  
Hydraulic systems  
Hydraulic valves & controls  
Hydrostatic steering  
Integrated hydraulic circuits  
Power take-offs  
Power units  
Rotary actuators  
Sensors



## Pneumatics Key Markets

Aerospace  
Conveyor & material handling  
Factory automation  
Life science & medical  
Machine tools  
Packaging machinery  
Transportation & automotive

## Key Products

Air preparation  
Brass fittings & valves  
Manifolds  
Pneumatic accessories  
Pneumatic actuators & grippers  
Pneumatic valves & controls  
Quick disconnects  
Rotary actuators  
Rubber & thermoplastic hose & couplings  
Structural extrusions  
Thermoplastic tubing & fittings  
Vacuum generators, cups & sensors



## Process Control Key Markets

Alternative fuels  
Biopharmaceuticals  
Chemical & refining  
Food & beverage  
Marine & shipbuilding  
Medical & dental  
Microelectronics  
Nuclear Power  
Offshore oil exploration  
Oil & gas  
Pharmaceuticals  
Power generation  
Pulp & paper  
Steel  
Water/wastewater

## Key Products

Analytical Instruments  
Analytical sample conditioning products & systems  
Chemical injection fittings & valves  
Fluoropolymer chemical delivery fittings, valves & pumps  
High purity gas delivery fittings, valves, regulators & digital flow controllers  
Industrial mass flow meters/ controllers  
Permanent no-weld tube fittings  
Precision industrial regulators & flow controllers  
Process control double block & bleeds  
Process control fittings, valves, regulators & manifold valves



## Sealing & Shielding Key Markets

Aerospace  
Chemical processing  
Consumer  
Fluid power  
General industrial  
Information technology  
Life sciences  
Microelectronics  
Military  
Oil & gas  
Power generation  
Renewable energy  
Telecommunications  
Transportation

## Key Products

Dynamic seals  
Elastomeric o-rings  
Electro-medical instrument design & assembly  
EMI shielding  
Extruded & precision-cut, fabricated elastomeric seals  
High temperature metal seals  
Homogeneous & inserted elastomeric shapes  
Medical device fabrication & assembly  
Metal & plastic retained composite seals  
Shielded optical windows  
Silicone tubing & extrusions  
Thermal management  
Vibration dampening

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