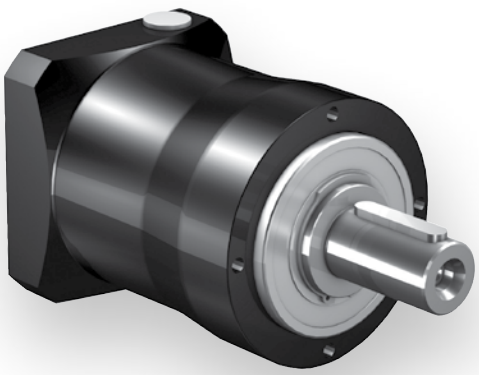
PE Series: INLINE – Shaft Output



STOBER PE Series ServoFit® Precision Planetary Gearheads are available for applications where very low backlash is not important. They are an economical helical tooth planetary, comparable in quality to other STOBER units. The integrated motor adapter creates a more compact solution for tight spaces at a lower cost. Every gearbox is made to order. STOBER will custom whatever you need to fit your application. Contact us today to learn more

Features

- 3:1 to 100:1 ratios
- Integral motor adapter (MAI) makes for a more compact solution, allowing the gearbox to fit into tight spaces
- Helical gearing produces more torque while running quieter compared to spur tooth gearing
- Input coupling design transfers more torque with lower inertia for vibration free operation
- Large motor input option to accept bigger diameter motor shafts so you don't use an oversized gearbox
- Error free motor mounting and quick changeover with toleranced pilot on motor plate
- Low no load running torque, giving you more torque for your application
- Optional food grade grease (Contact STOBER.)
- Build and ship in one day
- Assembled in the USA

General Specifications

Ambient Temperature	0°C to +40°C (104°F) [Unit temperature <90°C Max]
Backlash	≤8 arcmins, see performance overview chart page
Coating	Black (RAL 9005)
Degree of Protection	IP64
Direction of Rotation	Input and output rotate the SAME direction
Efficiency	1 stage 97%; 2 stage 95%
Input RPM	Up to 8,000 RPM
Installation	Requires 10.9 fasteners. See page 328 for more information
Grease	Synthetic grease (NLGI 2)/ Food grease - lubricated for life
Mounting Position	Unrestricted
Warranty	5 Year Limited (2 Years on normal wear items: bearings, seals, etc.)

Comparative Advantages

	MA	MAI	MAL
Length	Standard	Short	Long
Cost	$$	$	$$$
Input Adaptability	Unlimited	Limited	Unlimited

Overview

Selection Options *At-a-Glance*

Using the Selection Data table later in this section, select the PE Series Gearhead with the appropriate performance and design options tailored to your motor choice and exact application requirements. Use the part number guide below as a reference to build a part number for the complete gearhead assembly.

Part Number Examples:

①	②	③	④	⑤	⑥	⑦	⑧	⑨
PE	2	1	1	S	P	R	0030	MA

	Design Option	Part Number Code	Description
①	**Series**	PE	Economical planetary
②	**Size**	2 3 4 5	4 sizes of gearhead
③	**Generation**	1	Version of gearhead
④	**# of Stages**	1 2	One stage for ratios of ≤ 10:1 Two stage for ratios >10:1
⑤	**Housing**	S F	Standard mounting style Optional NEMA output face adapter (see page 105)
⑥	**Output**	P G	Shaft with key Plain shaft (no key)
⑦	**Bearings**	R	Normal
⑧	**Ratio**	0030	Ratios range from 3:1 to 100:1 ((0030=3:1; 0200=20:1; 1000=100:1, etc.)
⑨	**Motor Adapter**	MA MAL MAI	Motor adapter w/standard input* Motor adapter w/large Input* Motor adapter w/integrated input* *See Motor Mounting Plate Option, page 96

Options

Large Input (MAL)

- Accommodates a larger diameter motor shaft without going to a larger size gearbox

NEMA Output Face Adapter

- Shaft remains metric

Integrated Motor Adapter (MAI)

- Compact, one piece coupling design — saves space
- Economically priced
- Designed for the most popular servo motor sizes

Coating Option

Available with a multi-layer, industrial 316 stainless steel epoxy coating (contact factory)

PE Series: INLINE – Shaft Output

PE Series Performance Overview

PE Series performance is dependent on several factors including duty cycle, bearing design, gearhead size and stage configuration, among others. Use the chart below for preliminary evaluation, then use the following performance chart and selection information on the following pages for specific performance sizing and selection.

Size/Generation		PE21		PE31		PE41		PE51	
# of Stages		1	2	1	2	1	2	1	2
Permissible Acceleration Torque M_{2BMAX}	Nm	15	15	42	55	100	120	250	310
Output Torque Nom. [1] M_{2NMAX}	Nm	7.5	7.5	23	30	50	65	130	160
Torsional Stiffness C_2	Nm/arcmin	1.4	1.4	4.1	4.2	13	14	33	35
Torsional Backlash [2] $\Delta\varphi$	arcmin	≤10	≤13	≤8	≤10	≤8	≤10	≤8	≤10
Input Speed Max. n_{1MAX}	Continuous Cyclic	4000 8000		4000 6000		3600 6000		3000 5000	
Efficiency (@nom torque)	%	1 Stage = 97; 2 Stage = 95							
Weight	kg lbs	1.3 2.87	1.2 2.65	3.0 6.61	3.0 6.61	5.2 11.46	5.7 12.57	9.9 21.83	10.6 23.37
Noise [3]	dB(A)	≤60	≤60	≤62	≤61	≤64	≤63	≤65	≤64

[1] *Ratings based on input speed (n_1) of 1500 RPM.*

For torque at higher input speeds (M_{2NX}) solve the formula:

$$M_{2NX} = \frac{M_{2N}}{\sqrt[3]{\frac{n_1}{1500}}}$$

where n_1 = Actual Input Speed.

[2] *Tested at 1.5% of nominal torque and recorded on the output side of the gearhead. For lower backlash, contact STOBER technical support.*

[3] *Measurement at one (1) meter distance with input speed (n_1) of 2000 RPM.*

PE Series Motor Mounting Plate Option (Motor information required with Motor Adapter option)

STOBER ServoFit Gearheads fit the motor of your choice with the appropriate motor mounting plate assembled between the motor and the gearhead.

NOTE: When ordering a gearhead:

- Specify the motor manufacturer and part number
- Provide the motor drawing with dimensions, or specify the motor mounting dimensions (per the list shown at right)

For a precise dimension on a specific motor, or for general assistance, we recommend you contact STOBER Technical Support.

Customer Required Dimensions for Properly Sized Motor Mounting Plate

d2 Motor Shaft Diameter (If an adapter bushing is required it will be supplied with the motor plate.)

b6 Pilot Diameter

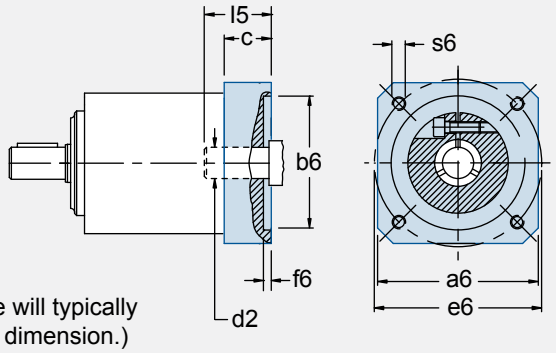
e6 Bolt Circle Diameter

s6 Bolt Diameter

l5 Motor Shaft Length

f6 Pilot Length

a6 Square Flange (Optional – motor plate will typically be made to match this dimension.)



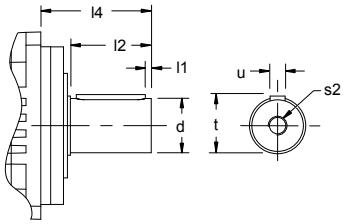
Motor Mounting Plate Dimensions — mm (Gearhead Part Number Specific)	PE211 PE212	PE211...L PE311 PE312	PE311...L PE411 PE412	PE411...L PE511 PE512	PE511...L
Maximum Allowed Motor Shaft Dia. d2	14	19	24	32	38
Minimum Allowed Motor Plate Thickness c*	15	18	21	24	26

** Note that the c motor plate thickness is determined by the motor shaft length. The minimum motor plate thickness is the value listed.*

Overview

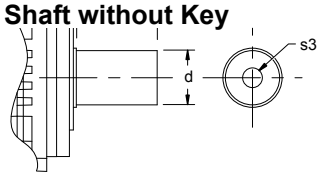
PE Series Output Shaft Options ("P" or "G" designated in part number, for example: PE211S P 0040 MAL)

P Shaft with Key



Unit	d k6 mm		l1 mm	l2 mm	l4 mm	s2 (1)	t mm	u (2) W x H x L
PE2	12	+0.012/+0.001	2	18	24.5	M4	13.5	A4x4x14
PE3	16	+0.012/+0.001	2	28	36	M5	18.0	A5x5x22
PE4	22	+0.015/+0.002	2	36	46	M8	24.5	A6x6x32
PE5	32	+0.018/+0.002	4	58	70	M12	35.0	A10x8x50

G Shaft without Key



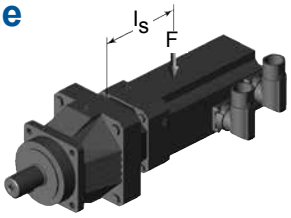
Unit	d k6 mm		l2 mm	l4 mm	s3 (1)
PE2	12	+0.012/+0.001	18	24.5	M4
PE3	16	+0.012/+0.001	28	36	M5
PE4	22	+0.015/+0.002	36	46	M8
PE5	32	+0.018/+0.002	58	70	M12

(1) *The center hole in shafts with keys (Option "P") are machined to DIN 332 T2 shape DR.*

(2) *Feather keys are toleranced according to standard DIN 6885.*

Permissible Motor Tilting Torque

The permissible tilting torque of the motor attached to the gear unit is a result of the static and dynamic load "F" from the motor weight, mass acceleration, and vibration multiplied by the distance from the center of gravity "l_S" of the motor.



$$M_{1k} = F \times l_S \leq M_{1K}$$

M_{1K}	PE211 PE212	PE311 PE312	PE411 PE412	PE511 PE512
Nm	10	20	40	80

PE Permissible Output Shaft Load and Tilting Moments*

Unit	z_2 mm	F_{2A} N	F_{2R} N	M_{2K} Nm
PE211, PE212	8	400	800	13
PE311, PE312	11	800	1600	40
PE411, PE412	13	1900	2400	73
PE511, PE512	16	4000	4600	206

** Refer to illustration and definitions below. During EMERGENCY OFF operation (maximum stops per gearhead = 1000) the permissible values in the table for F_{2A}, F_{2R}, and M_{2K} can be multiplied by a factor of 2. Rating based on output speed (n_2) of 100 RPM. For values at other speeds see below.*

PE Series Load/Life/Speed Calculations

All formulas shown are based on METRIC values

Upper case letters are permissible values. Lower case letters are for existing values.

The permissible load and tilting moment values are based on an output speed of 100 RPM. For higher speeds the following applies, where n_2 is the desired speed:

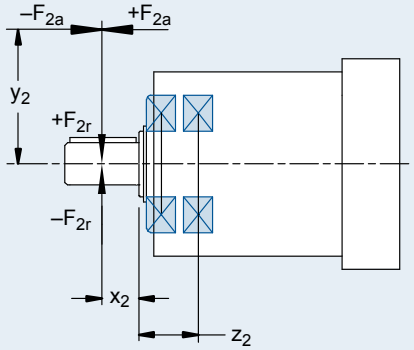
$$F_{2AX} = \frac{F_{2A}}{\sqrt[3]{\frac{n_2}{100}}} \qquad F_{2RX} = \frac{F_{2R}}{\sqrt[3]{\frac{n_2}{100}}} \qquad M_{2KX} = \frac{M_{2K}}{\sqrt[3]{\frac{n_2}{100}}}$$

The application input tilting moment should be determined by the following formula:

$$M_{2A} = \frac{2 \cdot F_{2a} \cdot y_2 + F_{2rb} \cdot (x_2 + z_2)}{1000} \leq M_{2KB}$$

Where:

F_{2a}	Axial Load at Output Shaft	F_{2RB}	Acceleration Permissible Radial Load
F_{2A}	Permissible Axial Load	M_{2K}	Rated Tilting Torque
F_{2r}	Radial Load at Output Shaft	M_{2k}	Equivalent Tilting Load
F_{2R}	Permissible Radial Load	z_2	Distance Factor



The hours of life (L_h) of the unit can be determined by the following formula:

bearing life for duty cycle ≤ 40%

L_h > 10,000 hours if M_{2K}/M_{2A} < 1.25 and > 1

L_h > 20,000 hours if M_{2K}/M_{2A} > 1.25 and > 1.5

bearing life for duty cycle ≥ 40%

$$L_{hA} = L_h \left(\frac{40\%}{\text{Duty Cycle}}\right)$$

PE Series: INLINE – Shaft Output

Exact Ratio (i)	Output Torque: Nominal 1) M_{2N} Nm	Output Torque: Acceleration M_{2B} Nm	Output Torque: Peak 2) M_{2PEAK} Nm	Part Number* (Gearhead + Input)	Maximum Input Speed RPM (n_1): Cont.	Maximum Input Speed RPM (n_1): Cyclic	Motor Shaft Max Ø D^6 mm	Input Inertia 3) J_1 kgcm²	Torsional Stiffness C_2 (per arcmin) Nm
PE2									
4.000	7	14	26	**PE211_0040MA**	4000	8000	>11≤14	0.106	1.4
				PE211_0040MAI			≤14	0.108	
				PE211_0040MAL			>14≤19	0.392	
5.000	7.5	15	26	**PE211_0050MA**	4000	8000	>11≤14	0.102	1.3
				PE211_0050MAI			≤14	0.104	
				PE211_0050MAL			>14≤19	0.387	1.4
7.000	7.5	15	26	**PE211_0070MA**	4000	8000	>11≤14	0.096	1.3
				PE211_0070MAI			≤14	0.086	
				PE211_0070MAL			>14≤19	0.390	
10.000	7	13	22	**PE211_0100MA**	4000	8000	>11≤14	0.094	1.1
				PE211_0100MAI			≤14	0.084	
				PE211_0100MAL			>14≤19	0.388	
16.000	7.5	14	26	**PE212_0160MA**	4000	8000	>11≤14	0.104	1.4
20.000	7.5	15	26	**PE212_0200MA**	4000	8000	>11≤14	0.100	1.3
25.000	7.5	15	26	**PE212_0250MA**	4000	8000	>11≤14	0.100	1.3
28.000	7.5	14	26	**PE212_0280MA**	4000	8000	>11≤14	0.095	1.3
35.000	7.5	15	26	**PE212_0350MA**	4000	8000	>11≤14	0.095	1.3
40.000	7.5	14	26	**PE212_0400MA**	4000	8000	>11≤14	0.093	1.3
50.000	7.5	15	26	**PE212_0500MA**	4000	8000	>11≤14	0.093	1.3
70.000	7.5	15	26	**PE212_0700MA**	4000	8000	>11≤14	0.093	1.3
100.000	7.0	13	22	**PE212_1000MA**	4000	8000	>11≤14	0.093	1.1

1) Based on input speed of 1500 RPM. See page 97 for details on torque calculations.
2) Maximum momentary torque for emergency stops or heavy shock load. (Admissible stops per life of gearhead = 1,000 stops maximum.)
3) Inertia based on maximum input. For lower inertia, using smaller diameter input, contact STOBER.
** MA = Motor Accurate MAI = Motor Adapter Integrated L = Large Input Option*

Selection Data

Exact Ratio (i)	Output Torque			Part Number* (Gearhead + Input)	Maximum Input Speed RPM (n1)		Motor Shaft Max Ø D6	Input Inertia 3)	Torsional Stiffness C2 (per arcmin)
	Nominal 1) M2N	Acceleration M2B	Peak 2) M2PEAK						
	Nm	Nm	Nm		Cont.	Cyclic	mm	J1 kgcm²	Nm
PE3									
3.000	21	40	65	PE311_0030MA	3500	6000	>14≤19	0.503	3.3
				PE311_0030MAI			≤19	0.606	
				PE311_0030MAL			>19≤24	0.990	3.5
4.000	22	42	75	PE311_0040MA	3700	6000	>14≤19	0.445	4.0
				PE311_0040MAI			≤19	0.549	
				PE311_0040MAL			>19≤24	0.932	4.1
5.000	23	40	75	PE311_0050MA	3700	6000	>14≤19	0.446	3.9
				PE311_0050MAI			≤19	0.549	
				PE311_0050MAL			>19≤24	0.933	4.0
7.000	23	40	75	PE311_0070MA	4000	6000	>14≤19	0.397	3.8
				PE311_0070MAI			≤19	0.501	
				PE311_0070MAL			>19≤24	0.884	
10.000	19	37	75	PE311_0100MA	4000	6000	>14≤19	0.389	3.4
				PE311_0100MAI			≤19	0.492	
				PE311_0100MAL			>19≤24	0.876	
12.000	30	55	75	PE312_0120MA	3700	6000	>14≤19	0.485	4.1
				PE312_0120MAI			≤14	0.408	
15.000	23	40	75	PE312_0150MA	3700	6000	>14≤19	0.481	4.0
				PE312_0150MAI			≤14	0.404	
16.000	30	55	75	PE312_0160MA	3700	6000	>14≤19	0.430	4.2
				PE312_0160MAI			≤14	0.353	
20.000	30	55	75	PE312_0200MA	3700	6000	>14≤19	0.436	4.2
				PE312_0200MAI			≤14	0.359	
25.000	23	40	75	PE312_0250MA	3700	6000	>14≤19	0.430	4.0
				PE312_0250MAI			≤14	0.358	
28.000	30	55	75	PE312_0280MA	4000	6000	>14≤19	0.393	4.2
				PE312_0280MAI			≤14	0.316	
35.000	23	40	75	PE312_0350MA	4000	6000	>14≤19	0.392	4.0
				PE312_0350MAI			≤14	0.315	
40.000	30	55	75	PE312_0400MA	4000	6000	>14≤19	0.386	4.1
				PE312_0400MAI			≤14	0.310	
50.000	23	40	75	PE312_0500MA	4000	6000	>14≤19	0.386	4.0
				PE312_0500MAI			≤14	0.309	
70.000	23	40	75	PE312_0700MA	4000	6000	>14≤19	0.386	3.8
				PE312_0700MAI			≤14	0.309	
100.000	20	37	75	PE312_1000MA	4000	6000	>14≤19	0.386	3.4
				PE312_1000MAI			≤14	0.309	

1) Based on input speed of 1500 RPM. See page 97 for details on torque calculations.
2) Maximum momentary torque for emergency stops or heavy shock load. (Admissible stops per life of gearhead = 1,000 stops maximum.)
3) Inertia based on maximum input. For lower inertia, using smaller diameter input, contact STOBER.
** MA = Motor Accurate MAI = Motor Adapter Integrated L = Large Input Option*

PE Series: INLINE – Shaft Output

Exact Ratio (i)	Output Torque: Nominal [1] M_{2N} Nm	Output Torque: Acceleration M_{2B} Nm	Output Torque: Peak [2] M_{2PEAK} Nm	Part Number* (Gearhead + Input)	Maximum Input Speed RPM (n_1): Cont.	Maximum Input Speed RPM (n_1): Cyclic	Motor Shaft Max Ø D^6 mm	Input Inertia [3] J_1 kgcm²	Torsional Stiffness C_2 (per arcmin) Nm
PE4									
3.000	45	90	180	PE411_0030MA	3000	5500	>19≤24	1.412	11.7
				PE411_0030MAI			≤19	1.874	
				PE411_0030MAL			>24≤32	3.025	12.1
4.000	50	100	190	PE411_0040MA	3400	6000	>19≤24	1.150	12.8
				PE411_0040MAI			≤19	1.612	
				PE411_0040MAL			>24≤32	2.763	13.0
5.000	50	100	190	PE411_0050MA	3400	6000	>19≤24	1.163	12.2
				PE411_0050MAI			≤19	1.625	
				PE411_0050MAL			>24≤32	2.777	12.4
7.000	50	100	190	PE411_0070MA	3600	6000	>19≤24	0.934	11.5
				PE411_0070MAI			≤19	1.215	
				PE411_0070MAL			>24≤32	2.572	11.6
10.000	45	90	190	PE411_0100MA	3600	6000	>19≤24	0.895	10.1
				PE411_0100MAI			≤19	1.176	
				PE411_0100MAL			>24≤32	2.533	
12.000	65	120	190	PE412_0120MA	3400	5500	>19≤24	1.270	13.4
				PE412_0120MAI			≤19	1.732	
15.000	50	100	190	PE412_0150MA	3400	6000	>19≤24	1.270	12.4
				PE412_0150MAI			≤19	1.732	
16.000	65	120	190	PE412_0160MA	3400	6000	>19≤24	1.070	13.5
				PE412_0160MAI			≤19	1.531	
20.000	65	120	190	PE412_0200MA	3400	6000	>19≤24	1.113	13.5
				PE412_0200MAI			≤19	1.575	
25.000	50	100	190	PE412_0250MA	3400	6000	>19≤24	1.113	12.5
				PE412_0250MAI			≤19	1.575	
28.000	65	120	190	PE412_0280MA	3600	6000	>19≤24	0.911	13.4
				PE412_0280MAI			≤19	1.192	
35.000	50	100	190	PE412_0350MA	3600	6000	>19≤24	0.911	12.4
				PE412_0350MAI			≤19	1.192	
40.000	65	120	190	PE412_0400MA	3600	6000	>19≤24	0.883	13.3
				PE412_0400MAI			≤19	1.164	
50.000	50	100	190	PE412_0500MA	3600	6000	>19≤24	0.883	12.4
				PE412_0500MAI			≤19	1.164	
70.000	50	100	190	PE412_0700MA	3600	6000	>19≤24	0.881	11.6
				PE412_0700MAI			≤19	1.162	
100.000	45	90	190	PE412_1000MA	3600	6000	>19≤24	0.881	10.1
				PE412_1000MAI			≤19	1.162	

[1] *Based on input speed of 1500 RPM. See page 97 for details on torque calculations.*
[2] *Maximum momentary torque for emergency stops or heavy shock load. (Admissible stops per life of gearhead = 1,000 stops maximum.)*
[3] *Inertia based on maximum input. For lower inertia, using smaller diameter input, contact STOBER.*
* *MA = Motor Accurate MAI = Motor Adapter Integrated L = Large Input Option*

Selection Data

Exact Ratio (i)	Output Torque: Nominal [1] M_{2N} Nm	Output Torque: Acceleration M_{2B} Nm	Output Torque: Peak [2] M_{2PEAK} Nm	Part Number* (Gearhead + Input)	Maximum Input Speed RPM (n_1): Cont.	Maximum Input Speed RPM (n_1): Cyclic	Motor Shaft Max Ø D^6 mm	Input Inertia [3] J_1 kgcm²	Torsional Stiffness C_2 (per arcmin) Nm
PE5									
3.000	90	180	392	PE511_0030MA	2500	4500	>24≤32	2.685	29.5
				PE511_0030MAI			≤32	5.172	
				PE511_0030MAL			>32≤38	6.459	31.6
4.000	130	250	400	PE511_0040MA	2600	5000	>24≤32	3.077	31.6
				PE511_0040MAI			≤32	5.564	
				PE511_0040MAL			>32≤38	6.851	32.9
5.000	130	250	400	PE511_0050MA	2600	5000	>24≤32	2.887	31.6
				PE511_0050MAI			≤32	5.373	
				PE511_0050MAL			>32≤38	6.661	32.5
7.000	130	250	400	PE511_0070MA	2800	5000	>24≤32	2.650	29.9
				PE511_0070MAI			≤32	5.190	
				PE511_0070MAL			>32≤38	6.420	30.4
10.000	110	220	400	PE511_0100MA	3000	5000	>24≤32	2.572	26.7
				PE511_0100MAI			≤32	5.112	
				PE511_0100MAL			>32≤38	6.342	26.8
12.000	160	310	480	PE512_0120MA	2500	4500	>24≤32	3.866	34.5
				PE512_0120MAI			≤19	5.172	34.4
15.000	130	250	480	PE512_0150MA	2500	4500	>24≤32	3.843	32.8
				PE512_0150MAI			≤19	5.150	32.7
16.000	160	310	480	PE512_0160MA	2600	5000	>24≤32	3.230	34.6
				PE512_0160MAI			≤19	4.537	
20.000	160	310	480	PE512_0200MA	2600	5000	>24≤32	2.986	34.6
				PE512_0200MAI			≤19	4.293	
25.000	130	250	480	PE512_0250MA	2600	5000	>24≤32	2.978	32.9
				PE512_0250MAI			≤19	4.285	
28.000	160	310	480	PE512_0280MA	2800	5000	>24≤32	2.687	34.5
				PE512_0280MAI			≤19	4.061	
35.000	130	250	480	PE512_0350MA	2800	5000	>24≤32	2.683	32.8
				PE512_0350MAI			≤19	4.057	
40.000	160	310	480	PE512_0400MA	3000	5000	>24≤32	2.590	34.2
				PE512_0400MAI			≤19	3.964	
50.000	130	250	480	PE512_0500MA	3000	5000	>24≤32	2.588	32.6
				PE512_0500MAI			≤19	3.962	
70.000	130	250	480	PE512_0700MA	3000	5000	>24≤32	2.587	30.6
				PE512_0700MAI			≤19	3.961	
100.000	110	220	480	PE512_1000MA	3000	5000	>24≤32	2.586	26.9
				PE512_1000MAI			≤19	3.960	

[1] *Based on input speed of 1500 RPM. See page 97 for details on torque calculations.*
[2] *Maximum momentary torque for emergency stops or heavy shock load. (Admissible stops per life of gearhead = 1,000 stops maximum.)*
[3] *Inertia based on maximum input. For lower inertia, using smaller diameter input, contact STOBER.*
* *MA = Motor Accurate MAI = Motor Adapter Integrated L = Large Input Option*