- Zero Backlash
- High Ratio
- Fast Response

Flange/Shaft Output Precision Servo Actuator

Harmonic Drive® TECHNOLOGIES

Harmonic Drive Technologies is the perfect solution for applications that require accurate positioning and precise motion control. The PS series Flange Output (PSF) and Shaft Output (PSS) Servo Actuators combine the zero backlash and high torque of Harmonic Drive gearing with advanced motor technology. The actuators provide superior positional accuracy and an improved torque/inertia ratio for a quick response to meet the increasing demands of precision servo applications.

Features

- Zero Backlash
- High Torque
- Fast Response
- High Precision
- Brushless Motor
- High Overhung Load Capability
- Superior DC Servo System
- Brake Options
- Drive Options

NOTE: All units listed below are standard units. Please contact our factory for custom solutions.

Actuator Specifications

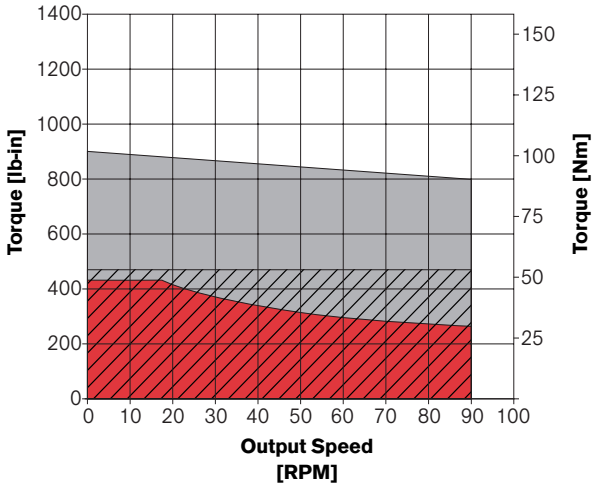
MOTOR GEARBOX	UNIT	PSF-20-050 PSS-20-050	PSF-20-100 PSS-20-100	PSF-25-050 PSS-25-050	PSF-25-100 PSS-25-100	PSF-32-050 PSS-32-050	PSF-32-100 PSS-32-100
Rated Output Power	HP	.29	.14	.48	.24	.80	.48
	W	214	107	360	180	602	358
Rated Output Torque	lb-in	300	300	500	500	843	1004
	Nm	33	35	57	57	95	113
Rated Output Speed	RPM	60	30	60	30	60	30
Maximum Output Speed	RPM	90	45	90	45	90	45
Maximum Continuous Torque	lb-in	425	425	850	900	843	1680
	Nm	51	51	96	101	95	190
Maximum Repeated Torque	lb-in	470	680	820	1390	1700	2900
(acceleration, deceleration)	Nm	53	77	93	157	192	327
Peak Instantaneous Torque	lb-in	880	1200	1300	1600	2000	3500
(emergency stop, etc)	Nm	99	136	146	180	226	395
Torque Constant	lb-in/A	80	67.5	109	159	109	217
(at 25°c)	Nm/A	9	7.6	12.3	17.9	12.3	24.5
Speed Constant	RPM/V	.690	.769	.500	.345	.500	.250
Input Moment of Inertia	lb-in²	.182	.142	.423	.295	.886	.886
	kg-m²	$53x10^{-6}$	$42x10^{-6}$	$124x10^{-6}$	$86.6x10^{-6}$	$260x10^{-6}$	$260x10^{-6}$
Encoder Resolution	P/R	2000	2000	2000	2000	2000	2000
Gear Ratio	1:R	50:1	100:1	50:1	100:1	50:1	100:1

MOTOR							
Winding Resistance Phase to Phase at 25° C	lb	1.32	0.79	.78	1.32	.78	.78
Winding Inductance Phase to Phase	mH	5.1	2.7	6	5.1	6	6
Thermal Resistance*	°C/W	1.3	1.3	.85	1.3	.85	.85

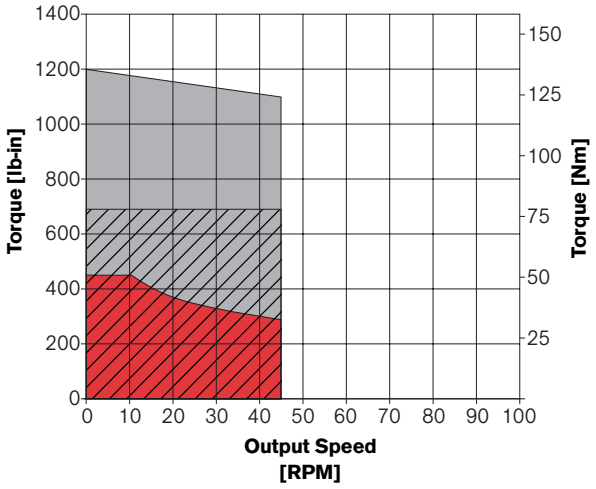
*At 125° winding temperature, in 40° C ambient, with motors mounted on aluminum heatsinks: 25"x8"8".

Performance Curves

PSF/PSS-20-050

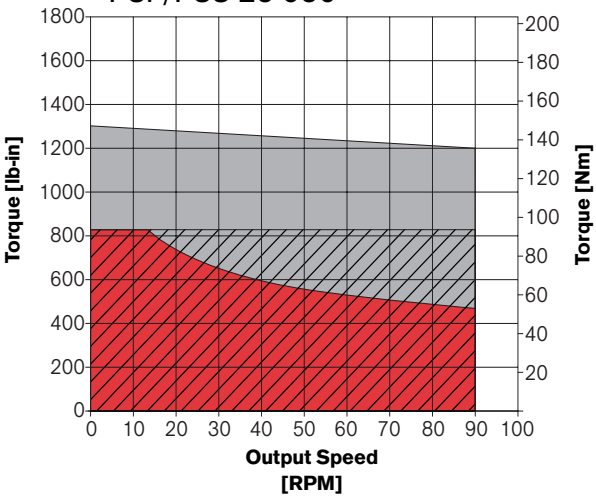


PSF/PSS-20-100

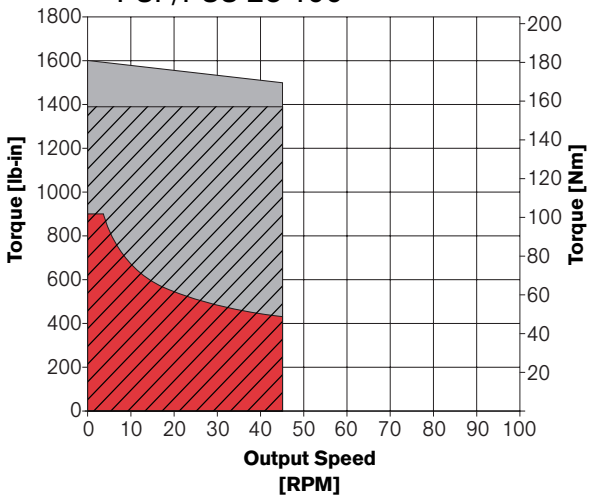


Maximum Continuous Torque

PSF/PSS-25-050



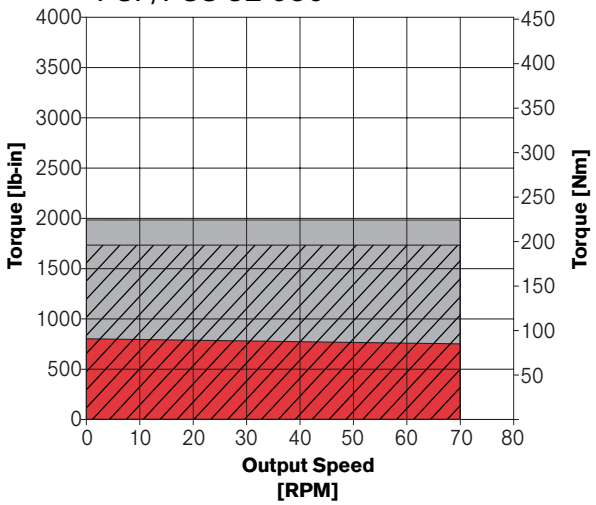
PSF/PSS-25-100



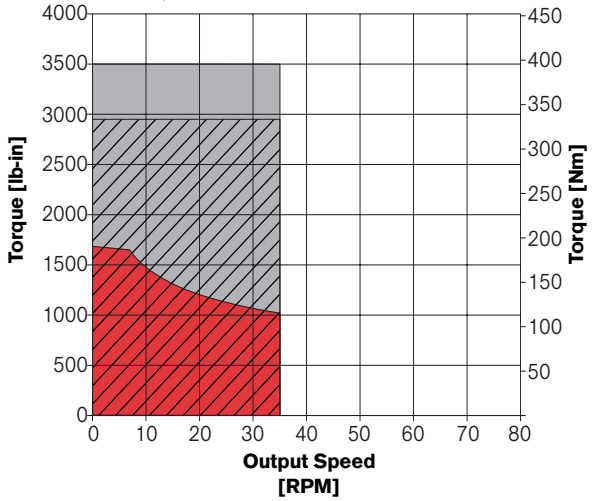
Peak Instantaneous Torque

Maximum Repeated Torque

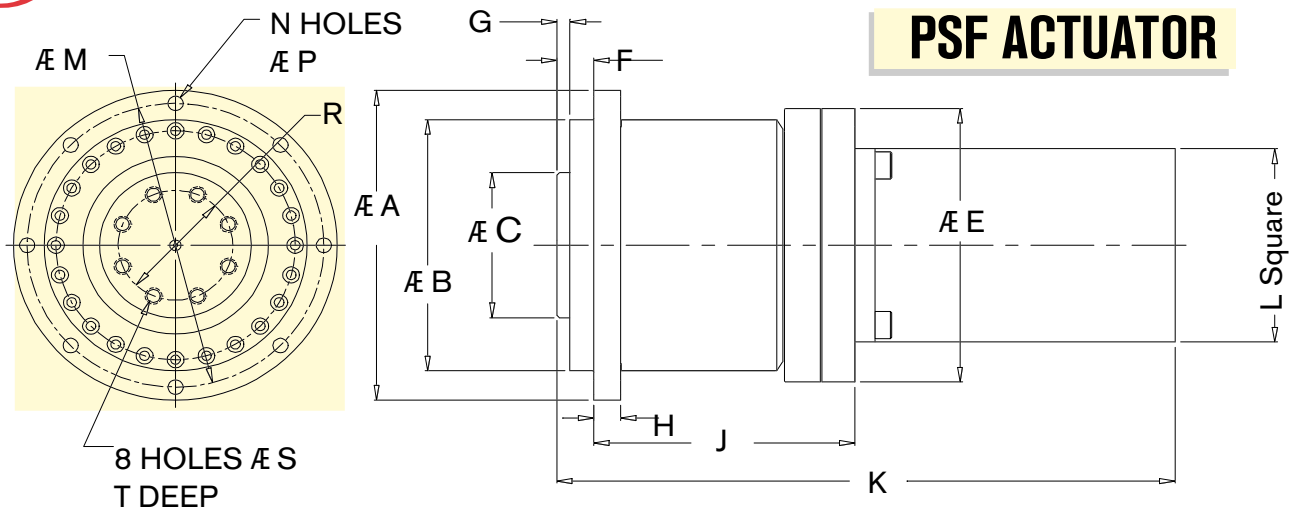
PSF/PSS-32-050



PSF/PSS-32-100



PSF ACTUATOR



	ØA	ØB	ØC	ØE	F	G	H	J	K	L	M	N	P	R	S	T
PSF-20	96	78h7	45h7	85	11	4	8	77	211/183*	60	88	8	4.5	34	M5	10
PSF-25	121	99h7	55h7	113/99*	12	4	10	92	244/227*	80/60*	111	8	5.5	42	M6	12
PSF-32	147	123h7	75h7	123	14	4	9	108	252	80	136	12	6.6	60	M8	12

*The left dimension represents the 50:1 unit and the right dimension represents the 100:1 unit. (mm)

The output flange of PSF actuators is supported by precision bearings that allow combinations of axial and moment loads.The maximum allowable combination of these external loads are shown in Figure 2. A moment load applied to the output flange will create a deflection as shown in figure 1. It is not recommended to exceed 1.5 arc minutes.

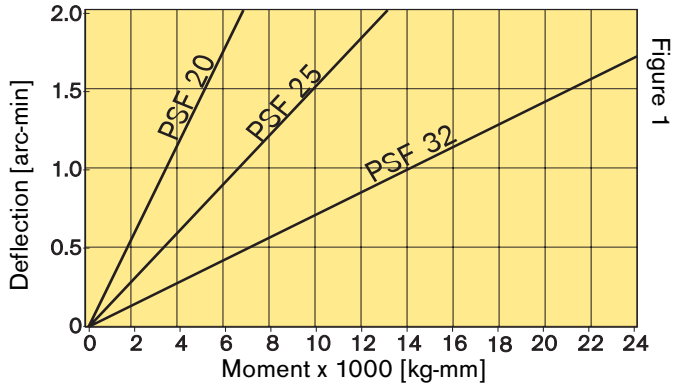


Figure 1

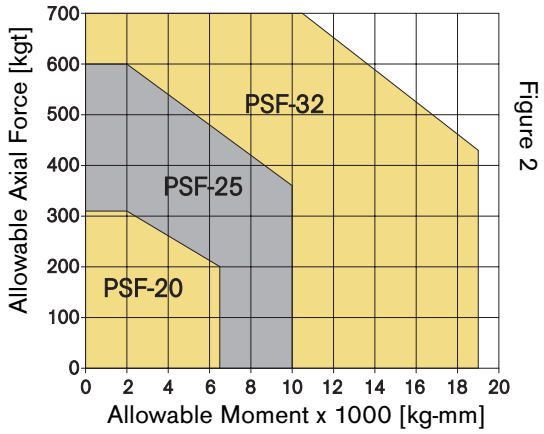
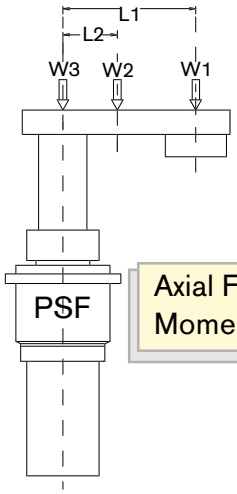
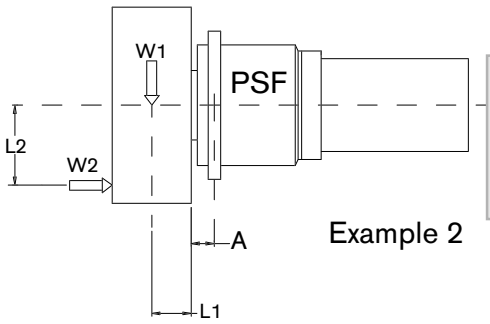


Figure 2



Example 1

Axial ForceFa = $W_1^{kg}+W_2^{kg}+W_3^{kg}+...$
Moment Load = $W_1^{kg}(L_1^{mm}) + W_2^{kg}(L_2^{mm})+...$

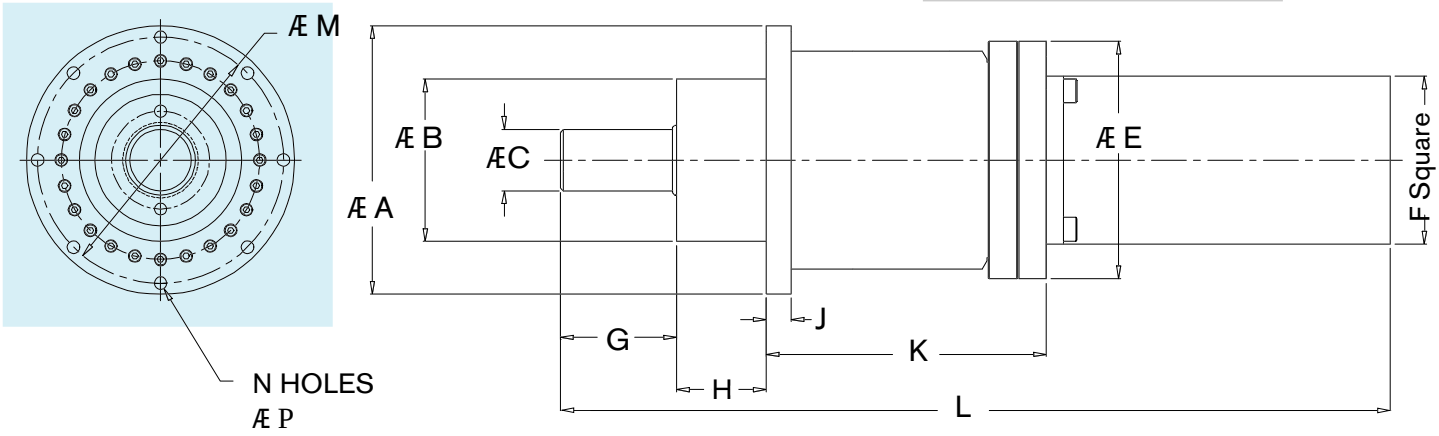


Size	A
20	16.5
25	20.0
32	26.0

Example 2

Axial Force Fa = W_2^{kg}
Moment Load = $W_1^{kg}(L_1^{mm} + A^{mm}) + W_2^{kg}(L_2^{mm})+...$

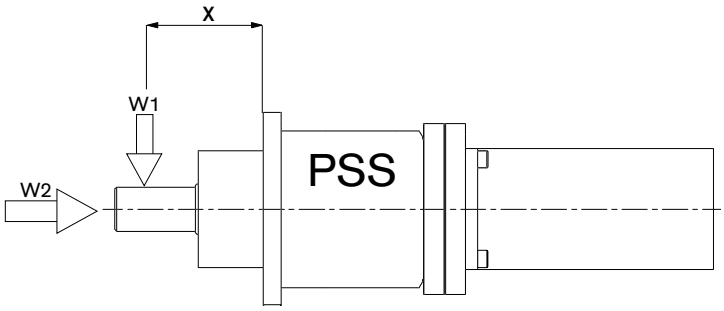
PSS ACTUATOR



	∅A	∅B	∅C	∅E	F	G	H	J	K	L	M	N	∅P
PSS-20	96	58g7	22k6	85	60	41.5	32	9	100	297/269*	88	8	4.5
PSS-25	121	70g7	28k6	113/99*	80/60	51	36	11	118	345/328*	111	8	5.5
PSS-32	145	90g7	32k6	123	80	73.5	40	12	140	416.6	136	12	6.6

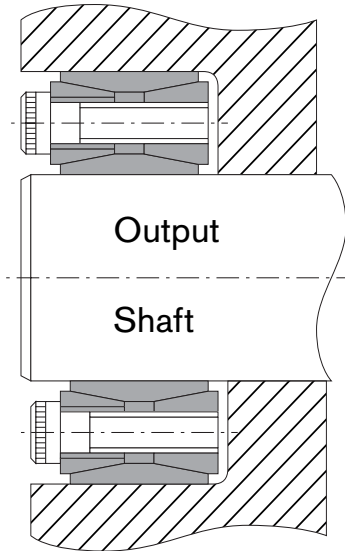
*The left dimension represents the 50:1 unit and the right dimension represents the 100:1 unit. (mm)

The output shaft of the PSS actuator is supported by pre-loaded taper roller bearings to eliminate end float and radial play. The maximum axial and radial loads that can be applied are demonstrated below.



PSS	X(mm)	W1(kg)	W2(kg)
20	48	170	170
25	77	380	320
32	90	520	490

PSS output shafts are manufactured from high quality alloy steel of hardness 220 Br. and 70,000 KSI compression strength. Keys and keyways are not recommended for high performance servo applications. Zero backlash friction clamp ring devices that are not affected by reversing or dynamic shock loads should be used. Axial impact loads on the end of the shaft should be avoided.



Standard Drive

GENERAL	
Peak Output Current (Amps)	20
Continuous Output Current (Amps)	10
Continuous Output Power kW	2.0
Continuous Shunt Power	50W
Peak Shunt Power	4.5kW
Continuous Shunt Power External (max)	2.4kW
Peak Shunt Power External (max)	6.0kW
INPUT	
Continuous Input Current (Amps)	19
Input Voltage	100 to 240VAC RMS Nominal
Input Frequency	47-63 Hz
COMMAND SOURCES	
Analog Velocity Input	+/- 10 Volt
Presets	8 Presets, Binary Selection by Digital Inputs
Step and Direction, Step up / Step Down	1 MHz Maximium Frequency Differential or Single Ended Line Drivers
Master Encoder Following	1 MHz Maximium Line Frequency Differential or Single Ended Line Drivers
Digital Serial Commands	Via Serial Port and BRU-Series Host Language
SERIAL COMMUNICATION PORT	
Type	RS-32, Four-Wire RS-485
Baud Rate	1200 to 19,200 Baud
Multiple Drive Addressing	Up to 32 Drives, 10 Using Front Panel Rotary Dip Switch
CONTROL LOOPS	
Modes	Torque, Velocity and Position Control
Type	All Loops Digital
Velocity Loop Bandwidth (maximum)	400 Hz
INPUTS AND OUTPUTS	
Selectable Digital Inputs	4 Optically Isolated, 24 Volt, Active High User-selectable as: Drive Mode Select, Integrator Inhibit, Follower Enable Foward Enable, Reverse Enable, Preset Select, Analog Override
Selectable Digital Outputs	4 Optically Isolated, 24 Volt, Active High UserSelectable as: In Position, Within Position Window, Zero Speed, Within Speed Window, At Speed, CurentLimit, Drive Enable, Bus Charged, Various Fault Indications
Dedicated Digital Inputs	Enable, Fault Reset (Optically Isolated, 24 Volt, ActiveHigh)
Dedicated Relay Outputs	Ready/ not Faulted, Brake Output
Analog Inputs	2 External Analog Current Limits, 0 to 10 Volt
Analog Outputs	2 User Programmable, +/- 10 Volt
Encoder Output	1 MHz Maximum Line Frequency Differential Line Drivers Scalable by 1, 1/2, 1/4, 1/8
Motor Feedback	Incremental Encoder
CONNECTORS	
Serial	9 Pin-D Shell
Control and Feedback	20, 26, and 50 Pin High Density Mini D
Power	Screw Terminal Block
ENVIRONMENTAL	
Storage Temperature	-40°C to 70°C
Operating Temperature	-5°C to 55°C
Humidity	5% to 90%, Non-Condensing
Altitude	1500m / 5000ft.
Vibration	10 to 2000 Hz at 2g
Shock	15 g 11 msec Half Sine

Gearing

Harmonic Drive Gearing with zero backlash and a superior torque-to-weight ratio is used in all PSF / PSS actuators.

Motor

PSF / PSS servo actuators utilize low-inertia with high power density Neodymium magnets for maximum performance and rapid acceleration.

Lubrication

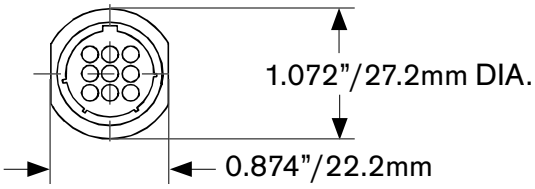
All gearing is lubricated and mounted in a fully sealed housing for minimum maintenance and long life. Special low outgassing or non-lithium greases can be provided for cleanroom or semiconductor applications on request.

Brakes

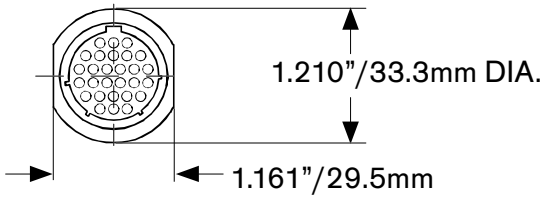
Mounted spring set, magnetic release 24VDC holding brakes can be supplied upon request.

Connector Dimensions

MOTOR POWER CONNECTOR



MOTOR FEEDBACK CONNECTOR



Electrical Connections

Motor Power Connector	
PIN	SIGNAL
1	Phase R
2	Phase S
3	Phase T
4	-
5	Ground
6	-
7	Brake + (1)
8	-
9	Brake - (1)

Motor Feedback Connector			
PIN	SIGNAL	PIN	SIGNAL
1-8	-	17	Hall B +
9	A +	18	Hall B -
10	A -	19	Hall C +
11	B +	20	Hall C -
12	B -	21	-
13	I +	22	-+5 VDC
14	I -	23	COM
15	Hall A +	24	Encoder Case
16	Hall A -	25-28	-

Typical Application Examples

Harmonic Drive Technologies' gearheads and actuators provide the optimum solution to any high precision motion control application.

- Precise Positioning Systems
- Semiconductor equipment
- Robotics
- Index Tables
- Medical Equipment
- Laboratory Equipment
- Print Machine Rollers
- Wafer Handling
- Special Machinery
- Aerospace
- Optical Equipment
- Laser Positioning

Harmonic Drive Technologies has been providing quality motion control products to industry for over 40 years. We offer the practical solution to your motion control requirements. All of our manufacturing is done at our factory in Peabody, Massachusetts and we have a full engineering and support staff on hand to answer any question you may have. Feel free to contact us at 978-532-1800, 978-532-9406 (fax) or by e-mail at info@ harmonic-drive.com.

Harmonic Drive Technologies.....

PSA
Actuators and Gearheads

PSS
Shaft Output
Actuators and Gearheads

PSF
Flange Output
Actuators and Gearheads

Cup, Pa ncake and
Hollow Shaft Component
Gear Sets

Solutions for all your High Precision, Motion Control Requirements.

Harmonic Drive Technologies manufactures, markets and develops zero backlash, high ratio motion control products. Our complete line of products includes component gear sets, housed units, gearheads and actuators to satisfy any motion control requirement. Ratios range from 50:1 to 200:1. Higher ratios and custom configurations are also available. We provide our customers with the cost effective, fast time to market, most reliable motion control products, systems and solutions.

The NEW PS series offers Shaft (PSS) and Flange (PSF) output Servo Actuators and Gearheads and miniature Precision Servo Actuators and gearheads (PSA). Each of these units offers the zero-backlash and high torque synonymous with Harmonic Drive gearing with housings and motors as a solution to any motion control application.

Harmonic Drive Technologies has been supplying motion control products to industry for over 40 years. All of our design and manufacturing is done at our plant in Peabody, Massachusetts and we have a complete engineering and technical sales staff on hand to assist you with any motion control problem you may be confronted with.

Feel free to contact us with any questions you may have. We can be reached by phone 978-532-1800, fax 978-532-9406, e-mail info@harmonic-drive.com or on the World Wide Web at harmonic-drive.com.

Harmonic Drive® TECHNOLOGIES

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