

# SureGear<sup>®</sup> Strain Wave Zero Backlash Gearbox

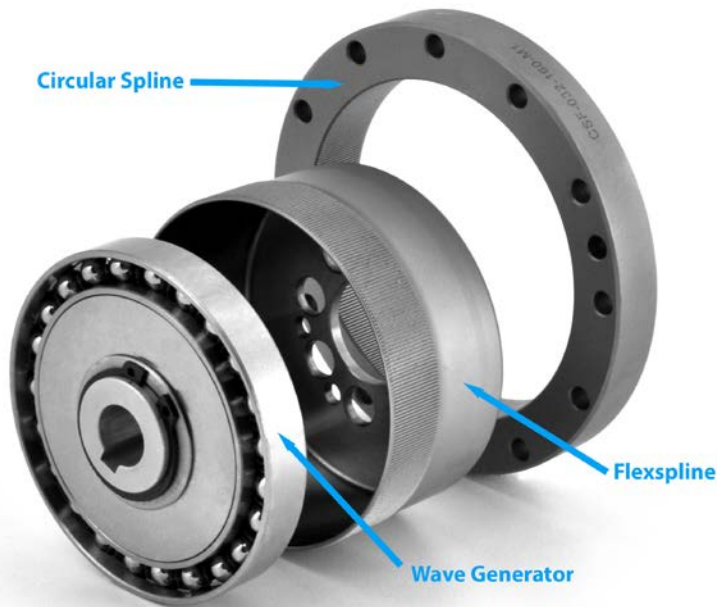


## SureGear<sup>®</sup> Strain Wave Gearboxes – Overview

1. **Stressproof<sup>®</sup> Output Shaft** – provides a minimum 115,000 psi tensile strength, resistance to fatigue and excellent wearability
2. **Output Flange** – has a precision pilot and is available in metric, NEMA 17, 23, & 34 sizes
3. **Double Row Angular Contact Bearing** – provides a precision output with high stiffness, high radial and axial load capacities
4. **Flexspline** – a thin walled external spline that progressively engages with the Circular Spline with a zero backlash tooth mesh
5. **Circular Spline** – precision shaped internal spline, remains stationary and engages the Flexspline
6. **Wave Generator** – precision elliptical ball bearing that turns with the input motor and causes the rotating elliptical wave form on the Flexspline
7. **Sealed Bearing** – a precision bearing axially fixes the input shaft and wave generator positions
8. **Quick Connection Motor Coupling** – a socket head tightened clamping collar provides a reliable and simple motor connection
9. **Input Flange** – factory machined to match your motor dimensions and available in metric and standard NEMA 17, 23, & 34 sizes
10. **Lubrication** – Mobil Beacon 325 grease. The gearbox is sealed and pre-lubricated for its lifetime and does not require a change of lubricant.

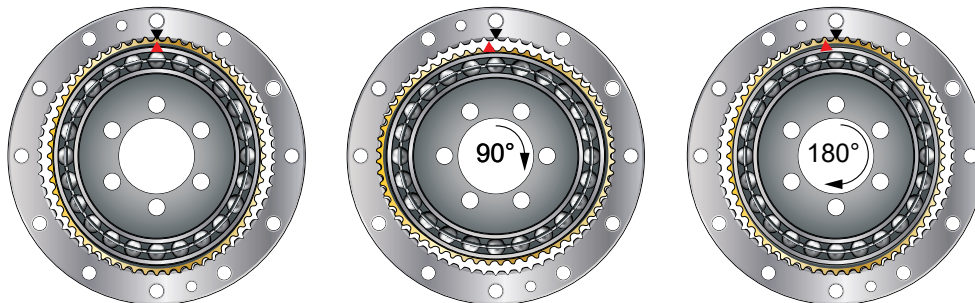
# SureGear<sup>®</sup> Strain Wave Features and Benefits

- Lifetime zero backlash
- Lifetime lubrication
- Lifetime ultra-high repeatability
- Lifetime high positional accuracy
- Single stage, high reduction ratios of 50:1 to 200:1
- Low noise and heat generation
- High efficiency, torsional stiffness and torque-to-weight ratio
- High torque capacity with a large number of teeth sharing load

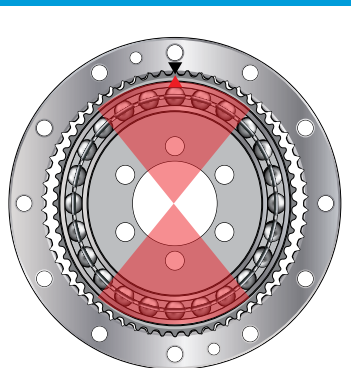


## Harmonic Gearing Tooth Engagement

Tooth engagement between the Flexspline and the Circular Spline takes place at two areas located 180° from each other on the ellipse's major axis. The rotation of the wave generator inside the Flexspline generates relative motion between the two splines.

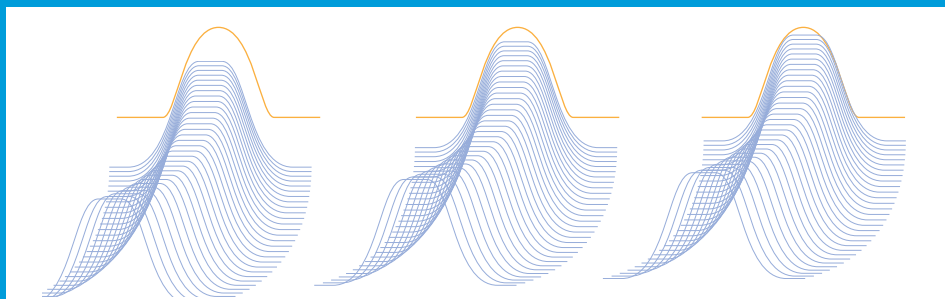


Example: with 100:1 ratio, 100 clockwise input motor rotations results in 1 counterclockwise output rotation.



Tooth Engagement Zones

Characteristically, 30-40 percent of the teeth are engaged dependent upon the ratio, and load is shared amongst many teeth giving the drive its high torque capacity.



# SureGear<sup>®</sup> Strain Wave Zero Backlash Gearbox

## Features

- Lifetime zero backlash
- Fits SureServo<sup>®</sup> SVL-201 and SV2L-201B servo motors and SureStep<sup>®</sup> NEMA17 stepper motors
- Single stage, high reduction ratios from 50 to 100:1
- High output torque in a compact gearbox
- Low noise and heat generation
- High efficiency, torsional stiffness and torque-to-weight ratio

SureGear <sup>®</sup> Strain Wave Gearboxes	
Nominal Input Speed <sup>1</sup>	3000 RPM
Maximum Input Speed <sup>2</sup>	7300 RPM
Maximum Radial Load <sup>3</sup>	1268 N
Maximum Axial Load <sup>4</sup>	870 N
Service Life <sup>5</sup>	25000 hr
Repeatability	±10 arc-sec
Positional Accuracy	±90 arc-sec
Backlash	0 arc-sec
Noise Level	<67 dB(A)
Protection Class	IP64
Permitted Housing Temperature	90°C
Permitted Ambient Temperature	-40°C to 90°C
Torsional Rigidity <sup>6</sup>	2.6 N·m/arc-min
Moment of Inertia	0.047 kgcm <sup>2</sup>
Weight <sup>7</sup>	0.68 kg
Lubrication	Permanent (Mobil Beacon 325 Grease)



**HPGA063-50A1**



**HPGCN17-505M**

1. Input speed at rated output torque for an average life of 25,000 hours
2. The maximum intermittent input speed
3. At key center line, calculated at 100 rpm output speed and nominal output torque
4. At end of output shaft, calculated at 100 rpm output speed and nominal output
5. Average life at nominal load and input speed
6. Torsional rigidity at nominal torque. Typically, stiffness lessens when applied torque reduces.
7. Weight may vary slightly dependent upon adapter options

SureGear <sup>®</sup> Strain Wave Gearboxes						
Part Number	<u>HPGA063-50A1</u>	<u>HPGA063-80A1</u>	<u>HPGA063-100A1</u>	<u>HPGCN17-505M</u>	<u>HPGCN17-805M</u>	<u>HPGCN17-1005M</u>
Price	\$1,051.00	\$1,051.00	\$1,051.00	\$1,051.00	\$1,051.00	\$1,051.00
Ratio (actual)	50:1	80:1	100:1	50:1	80:1	100:1
Nominal Output Torque <sup>1</sup>	12 N·m (106 lb-in)		15 N·m (133 lb-in)	12 N·m (106 lb-in)		15 N·m (133 lb-in)
Maximum Output Torque <sup>2</sup>	24 N·m (212 lb-in)		30 N·m (266 lb-in)	24 N·m (212 lb-in)		30 N·m (266 lb-in)
No-Load Starting Torque <sup>3</sup>	5.4 N·cm	3.3 N·cm	3 N·cm	5.4 N·cm	3.3 N·cm	3 N·cm
No-Load Back Driving Torque <sup>4</sup>	2.3 N·m	2.6 N·m	2.7 N·m	2.3 N·m	2.6 N·m	2.7 N·m
Fits	SureServo and SureServo2 SV(2)L-201(B) motors			SureStep NEMA 17 motors		
Drawing Link	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>

1. Rated torque at 3,000 rpm input for an average life of 25,000 hours
2. Exceeding the maximum output torque limit may immediately damage the drive
3. Minimum input torque required to turn the output shaft with no load
4. Minimum torque, if applied to the output shaft, that will cause the unit to back drive

# SureGear<sup>®</sup> Strain Wave Zero Backlash Gearbox

## Features

- Lifetime zero backlash
- Fits SureServo<sup>®</sup> SVL-202, SVL-204, SV2L-202B, and SV2L-204B servo motors and SureStep<sup>®</sup> NEMA23 stepper motors
- Single stage, high reduction ratios from 50 to 160:1
- High output torque in a compact gearbox
- Low noise and heat generation
- High efficiency, torsional stiffness and torque-to-weight ratio

SureGear <sup>®</sup> Strain Wave Gearboxes	
Nominal Input Speed <sup>1</sup>	3000 RPM
Maximum Input Speed <sup>2</sup>	6500 RPM
Maximum Radial Load <sup>3</sup>	2376 N
Maximum Axial Load <sup>4</sup>	1557 N
Service Life <sup>5</sup>	25000 hr
Repeatability	±10 arc-sec
Positional Accuracy	±90 arc-sec
Backlash	0 arc-sec
Noise Level	<67 dB(A)
Protection Class	IP64
Permitted Housing Temperature	90°C
Permitted Ambient Temperature	-40°C to 90°C
Torsional Rigidity <sup>6</sup>	4.5 N·m/arc-min
Moment of Inertia	0.161 kgcm <sup>2</sup>
Weight <sup>7</sup>	1.2 kg
Lubrication	Permanent (Mobil Beacon 325 Grease)



**HPGCN23-5025**



**HPGA073-50A2**

1. Input speed at rated output torque for an average life of 25,000 hours
2. The maximum intermittent input speed
3. At key center line, calculated at 100 rpm output speed and nominal output torque
4. At end of output shaft, calculated at 100 rpm output speed and nominal output
5. Average life at nominal load and input speed
6. Torsional rigidity at nominal torque. Typically, stiffness lessens when applied torque reduces.
7. Weight may vary slightly dependent upon adapter options

SureGear <sup>®</sup> Strain Wave Gearboxes										
Part Number	<a href="#">HPGA073-50A2</a>	<a href="#">HPGA073-80A2</a>	<a href="#">HPGA073-100A2</a>	<a href="#">HPGA073-120A2</a>	<a href="#">HPGA073-160A2</a>	<a href="#">HPGCN23-5025</a>	<a href="#">HPGCN23-8025</a>	<a href="#">HPGCN23-10025</a>	<a href="#">HPGCN23-12025</a>	<a href="#">HPGCN23-16025</a>
Price	\$1,219.00	\$1,219.00	\$1,219.00	\$1,219.00	\$1,219.00	\$1,219.00	\$1,219.00	\$1,219.00	\$1,219.00	\$1,219.00
Ratio (actual)	50:1	80:1	100:1	120:1	160:1	50:1	80:1	100:1	120:1	160:1
Nominal Output Torque <sup>1</sup>	25 N·m (221 lb-in)		30 N·m (266 lb-in)			25 N·m (221 lb-in)		30 N·m (266 lb-in)		
Maximum Output Torque <sup>2</sup>	50 N·m (442 lb-in)		60 N·m (532 lb-in)			50 N·m (442 lb-in)		60 N·m (532 lb-in)		
No-Load Starting Torque <sup>3</sup>	6.2 N·cm	4.6 N·cm	4.3 N·cm	3.3 N·cm	2.3 N·cm	6.2 N·cm	4.6 N·cm	4.3 N·cm	3.3 N·cm	2.3 N·cm
No-Load Back Driving Torque <sup>4</sup>	4 N·m	4.2 N·m	4.5 N·m	6.6 N·m	7 N·m	4 N·m	4.2 N·m	4.5 N·m	6.6 N·m	7 N·m
Fits	SureServo and SureServo2 SV(2)L-202(B) and SV(2)L-204(B) motors					SureStep NEMA 23 motors				
Drawing Link	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>

1. Rated torque at 3,000 rpm input for an average life of 25,000 hours
2. Exceeding the maximum output torque limit may immediately damage the drive
3. Minimum input torque required to turn the output shaft with no load
4. Minimum torque, if applied to the output shaft, that will cause the unit to back drive

# SureGear® Strain Wave Zero Backlash Gearbox

## Features

- Lifetime zero backlash
- Fits SureServo® SVL-207 and SV2L-207B servo motors and SureStep® NEMA34 stepper motors
- Single stage, high reduction ratios from 50 to 160:1
- High output torque in a compact gearbox
- Low noise and heat generation
- High efficiency, torsional stiffness and torque-to-weight ratio

SureGear® Strain Wave Gearboxes	
Nominal Input Speed <sup>1</sup>	3000 RPM
Maximum Input Speed <sup>2</sup>	5600 RPM
Maximum Radial Load <sup>3</sup>	2230 N
Maximum Axial Load <sup>4</sup>	3717 N
Service Life <sup>5</sup>	25000 hr
Repeatability	±10 arc-sec
Positional Accuracy	±90 arc-sec
Backlash	0 arc-sec
Noise Level	<67 dB(A)
Protection Class	IP64
Permitted Housing Temperature	90°C
Permitted Ambient Temperature	-40°C to 90°C
Torsional Rigidity <sup>6</sup>	24 N-m/arc-min
Moment of Inertia	0.506 kgcm <sup>2</sup>
Weight <sup>7</sup>	2.6 kg
Lubrication	Permanent (Mobil Beacon 325 Grease)



[HPGCN34-5050](#)



[HPGA088-50A3](#)

1. Input speed at rated output torque for an average life of 25,000 hours
2. The maximum intermittent input speed
3. At key center line, calculated at 100 rpm output speed and nominal output torque
4. At end of output shaft, calculated at 100 rpm output speed and nominal output
5. Average life at nominal load and input speed
6. Torsional rigidity at nominal torque. Typically, stiffness lessens when applied torque reduces.
7. Weight may vary slightly dependent upon adapter options

SureGear® Strain Wave Gearboxes										
Part Number	<a href="#">HPGA088-50A3</a>	<a href="#">HPGA088-80A3</a>	<a href="#">HPGA088-100A3</a>	<a href="#">HPGA088-120A3</a>	<a href="#">HPGA088-160A3</a>	<a href="#">HPGCN34-5050</a>	<a href="#">HPGCN34-8050</a>	<a href="#">HPGCN34-10050</a>	<a href="#">HPGCN34-12050</a>	<a href="#">HPGCN34-16050</a>
Price	\$1,385.00	\$1,385.00	\$1,385.00	\$1,385.00	\$1,385.00	\$1,385.00	\$1,385.00	\$1,385.00	\$1,385.00	\$1,385.00
Ratio (actual)	50:1	80:1	100:1	120:1	160:1	50:1	80:1	100:1	120:1	160:1
Nominal Output Torque <sup>1</sup>	40 N-m (354 lb-in)		50 N-m (443 lb-in)			40 N-m (354 lb-in)		50 N-m (443 lb-in)		
Maximum Output Torque <sup>2</sup>	80 N-m (708 lb-in)		100 N-m (886 lb-in)			80 N-m (708 lb-in)		100 N-m (886 lb-in)		
No-Load Starting Torque <sup>3</sup>	14 N-cm	7 N-cm	7 N-cm	6 N-cm	6 N-cm	14 N-cm	7 N-cm	7 N-cm	6 N-cm	6 N-cm
No-Load Back Driving Torque <sup>4</sup>	7 N-m	7.2 N-m	8.5 N-m	9 N-m	11.3 N-m	7 N-m	7.2 N-m	8.5 N-m	9 N-m	11.3 N-m
Fits	SureServo and SureServo2 SV(2)L-207(B) motors					SureStep NEMA 34 motors				
Drawing Link	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>

1. Rated torque at 3,000 rpm input for an average life of 25,000 hours
2. Exceeding the maximum output torque limit may immediately damage the drive
3. Minimum input torque required to turn the output shaft with no load
4. Minimum torque, if applied to the output shaft, that will cause the unit to back drive

# SureGear<sup>®</sup> Strain Wave Zero Backlash Gearbox

## Features

- Lifetime zero backlash
- Fits SureServo<sup>®</sup> SVL-210, SVM-210, and SV2L-210B servo motors
- Single stage, high reduction ratios from 50 to 200:1
- High output torque in a compact gearbox
- Low noise and heat generation
- High efficiency, torsional stiffness and torque-to-weight ratio

SureGear <sup>®</sup> Strain Wave Gearboxes	
Nominal Input Speed <sup>1</sup>	3000 RPM
Maximum Input Speed <sup>2</sup>	4800 RPM
Maximum Radial Load <sup>3</sup>	6012 N
Maximum Axial Load <sup>4</sup>	3985 N
Service Life <sup>5</sup>	25000 hr
Repeatability	±10 arc-sec
Positional Accuracy	±90 arc-sec
Backlash	0 arc-sec
Noise Level	<67 dB(A)
Protection Class	IP64
Permitted Housing Temperature	90°C
Permitted Ambient Temperature	-40°C to 90°C
Torsional Rigidity <sup>6</sup>	32 N·m/arc-min
Moment of Inertia	2.12 kgcm <sup>2</sup>
Weight <sup>7</sup>	6.3 kg
Lubrication	Permanent (Mobil Beacon 325 Grease)



**HPGA116-50A5**



**HPGA116-50A4**

1. Input speed at rated output torque for an average life of 25,000 hours
2. The maximum intermittent input speed
3. At key center line, calculated at 100 rpm output speed and nominal output torque
4. At end of output shaft, calculated at 100 rpm output speed and nominal output
5. Average life at nominal load and input speed
6. Torsional rigidity at nominal torque. Typically, stiffness lessens when applied torque reduces.
7. Weight may vary slightly dependent upon adapter options

SureGear <sup>®</sup> Strain Wave Gearboxes												
Part Number	HPGA116-50A4	HPGA116-80A4	HPGA116-100A4	HPGA116-135A4	HPGA116-160A4	HPGA116-200A4	HPGA116-50A5	HPGA116-80A5	HPGA116-100A5	HPGA116-135A5	HPGA116-160A5	HPGA116-200A5
Price	\$1,654.00	\$1,654.00	\$1,654.00	\$1,654.00	\$1,654.00	\$1,654.00	\$1,654.00	\$1,654.00	\$1,654.00	\$1,654.00	\$1,654.00	\$1,654.00
Ratio (actual)	50:1	80:1	100:1	135:1	160:1	200:1	50:1	80:1	100:1	135:1	160:1	200:1
Nominal Output Torque <sup>1</sup>	100 N·m (885 lb-in)		120 N·m (1062 lb-in)				100 N·m (885 lb-in)		120 N·m (1062 lb-in)			
Maximum Output Torque <sup>2</sup>	200 N·m (1770 lb-in)		240 N·m (2124 lb-in)				200 N·m (1770 lb-in)		240 N·m (2124 lb-in)			
No-Load Starting Torque <sup>3</sup>	38 N·cm	18 N·cm	16 N·cm	14 N·cm	12 N·cm	11 N·cm	38 N·cm	18 N·cm	16 N·cm	14 N·cm	12 N·cm	11 N·cm
No-Load Back Driving Torque <sup>4</sup>	11 N·m	14 N·m	15 N·m	20 N·m	21 N·m	22 N·m	11 N·m	14 N·m	15 N·m	20 N·m	21 N·m	22 N·m
Fits	SureServo and SureServo2 SV(2)L-210(B) motors						SureServo SVM-210(B) motors					
Drawing Link	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF

1. Rated torque at 3,000 rpm input for an average life of 25,000 hours
2. Exceeding the maximum output torque limit may immediately damage the drive
3. Minimum input torque required to turn the output shaft with no load
4. Minimum torque, if applied to the output shaft, that will cause the unit to back drive