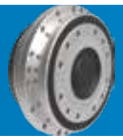
2022
EDITION

HIGH PRECISION

Robotic Gear Reducers



Servo Gear Reducers

Rack & Pinion Systems

Linear Mount Products

Servo Couplings

GAM®

GAM CAN.

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DISCLAIMER

Dimensions and technical information are subject to change without notice We are continuously updating and developing our products and reserve the right to make changes to the dimensions and specifications. For the most up-to date information, please visit www.gamweb.com

Company Overview

GAM is a U.S. company and your complete source for robotic and servo gear reducers, rack and pinion systems, servo couplings, linear mounting kits, and other precision mechanical drive solutions used in motion control and automation technology.

With a wide range of standard products, as well as the engineering expertise and manufacturing capabilities to develop customized solutions, GAM can help with your motion control applications.

U.S. manufacturing, being flexible to meet the needs of customer requests, and great service are what set us apart from the rest.

The GAM Advantage

- Broad range of standard products
- The flexibility to provide custom solutions
- We are great to work with, engineer to engineer

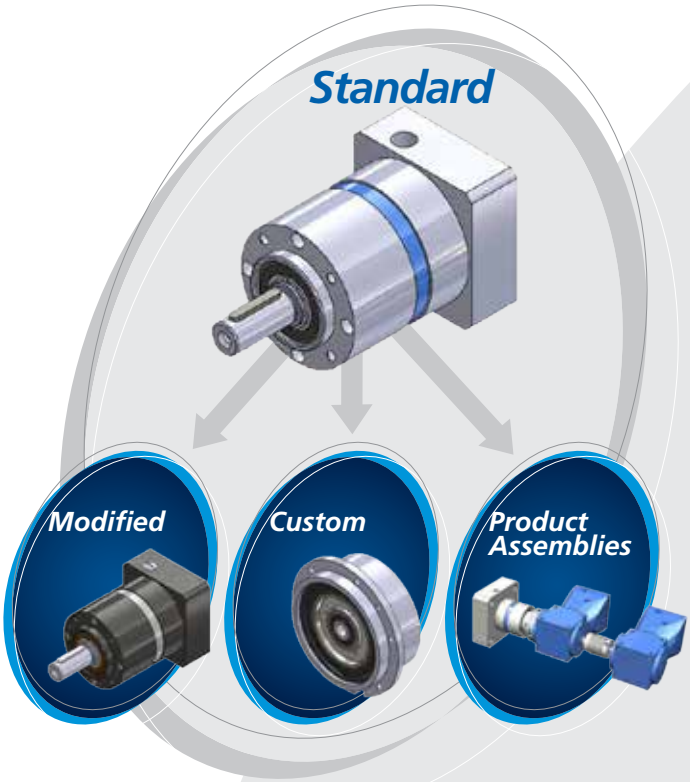
Our Why

Since our founding in 1990, our why, our purpose, is to be passionate about helping our customers, our suppliers, our sales channel, and our employees become more successful. We are a high integrity team of awesome people working together to wow our customers with innovative mechanical solutions for the motion control and automation market.

Our Values

GAM Can! That is our passion. The spirit of our entrepreneurial culture. We live and breathe our core values of *teamwork*, being *action-oriented*, building *long-term relationships*, being *professional* at what we do, and having *fun*.

The GAM Advantage



Find your exact solution at GAM

GAM has one of the broadest product ranges in the market, including products dedicated to the robotics and automation market. Even with such a broad product range, we realize that you may not find a product that meets your exact requirements.

One of our greatest strengths is our ability to modify standard designs, provide completely customized solutions, and integrate product assemblies to meet your specific application requirements. And, because of our flexible manufacturing, we can cost-effectively produce small batches of customized product in short lead-times.

So if you can't find what you are looking for, just ask!

Inline planetary gearbox with spline output shaft. External tie rods reinforce against reversing or shock loads.

Robot 7th axis: Dyna Series right angle hypoid gearbox with additional external bearing support and adjustable pinion shaft length. Eliminates in-house assembly. Just mount and go!

Standard GPL zero-backlash planetary gearbox in custom housing with integrated shrink disk connection. Works with any servo motor and output mounting. Drops in for competitive direct drive motors.

EPL planetary gearbox with custom geared PMK (parallel mounting kit) allows for offset motor and stub shaft to mount an encoder at the output. Drives each wheel of an AGV (automated guided vehicle).

Product Overview

Inline | Right Angle

Highest Precision *(<1 arcmin) - Gear Reducers - Robotics*

GPL Planetary

The GPL is the best performing zero-backlash robotic inline gearbox on the market

- Lowest backlash <0.1 arcmin, 10 times better than other zero-backlash gearboxes
- Vibration free with high positional accuracy for smooth tracking
- Revolutionary design maintains zero backlash over the life of the gearbox, no adjustment needed

- Torsional rigidity up to 1,359 Nm/arcmin with Torque capacity up to 3,000 Nm
- Radial load capacity up to 61,900 N
- Frame sizes from 180 to 330 mm
- Integrated pre-stage and motor mount

GCL Cycloidal

Robotic inline cycloidal gearbox with high impact resistance

- Lowest backlash <1 arcmin
- Impact resistance 5x nominal torque withstands frequent start-stop impact loads
- Torque capacity up to 4,900 Nm

- Frame sizes from 145 to 520 mm
- Integrated pre-stage and motor mount
- Drops in for most popular competitor gearboxes

GSL Strain Wave

Robotic strain wave (harmonic) inline gearbox with zero backlash and high torque density

- Lowest backlash <0.5 arcmin
- High repeatability and positional accuracy for fine positioning

- High reduction ratios in a single stage: 50:1 to 160:1
- High torque density with low inertia
- Torque capacity up to 160 Nm
- Compact, small gearbox with frame sizes from 11 to 40
- Multiple input configurations
- Integrated pre-stage and motor mount
- Drops in for popular competitor gearboxes

High Precision *- Rack & Pinion Systems*

Helical Rack & Pinion Systems

- High precision helical rack for smooth, quiet operation
- ISO Q6 and Q10
- Modules 2 to 4
- Precision pinions designed specifically for GAM gearboxes for optimized linear system performance

PHGH-S
Spline Pinion

PHGH-K
Keyed Pinion

PHGH-W
Welded Flange Pinion

PHGH-B
Bolt-Through Pinion

PHGH-K
Shaft Pinion

Inline Systems

Integrated gearbox-pinion systems

SPH-SP
with PHGH-S Pinion

SPH-FP
with PHGH-W Pinion

EPL-AP
with PHGH-K Pinion

EPL-FP
with PHGH-B Pinion

Right Angle Systems

Integrated gearbox-pinion systems

DS-FP
with PHGH-W Pinion

DS-HP
with PHGH-D Pinion

EPR-AP
with PHGH-K Pinion

EPR-FP
with PHGH-B Pinion

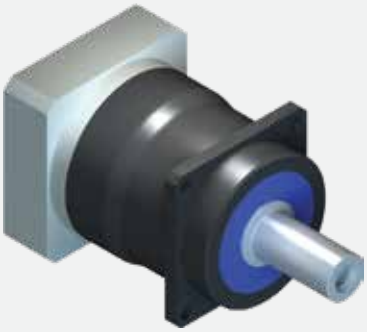
Inline Right Angle

High Precision (1-7 arcmin) - Gear Reducers - Motion Control

SPH Series

High performance inline planetary helical gearbox for demanding applications

- Lowest backlash <1 arcmin
- Torque capacity up to 900 Nm
- Torsional rigidity up to 168 Nm/arcmin
- Radial load capacity up to 20,000 N
- Frame sizes from 50-180 mm



SPH-W
Metric shaft output

SPH-K
Integrated coupling output and lantern-housing

SPH-C
Integrated coupling output

SPH-F
Compact flange output design

Dyna Series

High performance right angle hypoid gearbox for demanding applications

- Lowest backlash <2 arcmin
- Torque capacity up to 1,400 Nm
- Torsional rigidity up to 126 Nm/arcmin
- Radial load capacity up to 20,000 N
- Frame sizes from 55-190 mm

DS-W
Metric shaft output

DS-F
Flange output configuration

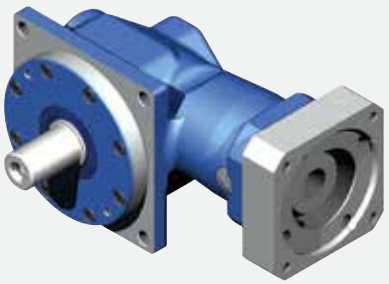
DS-H
Hollow bore output configuration

DS-T
Dual output shaft configuration

Dyna-Lite Series

Performance right angle hypoid gearbox for general applications

- Lowest backlash <6 arcmin
- Torque capacity up to 140 Nm
- Torsional rigidity up to 10 Nm/arcmin
- Radial load capacity up to 7,200 N
- Frame sizes from 55-90 mm



DL-DW
Metric shaft output

DL-DC
Hollow clamp output for direct mount to linear actuators

DL-DH
Hollow bore output with Dyna Series dimensions

DL-PW
Solid shaft output with dimensions that drop-in for many right angle and inline gear reducers

DL-PH
Hollow bore output with dimensions that drop-in for many right angle and inline gear reducers

Inline | Right Angle

Precision (8-15 arcmin) - Gear Reducers - Motion Control

EPL Series

Performance inline planetary gearbox for general applications

- Lowest backlash <8 arcmin
- Torque capacity up to 340 Nm
- Torsional rigidity up to 33 Nm/arcmin
- Radial load capacity up to 8,500 N
- Frame sizes from 50-150 mm
- Stainless Steel SSP-W available in frame sizes 70-120 mm

EPL-W
Metric shaft output

SSP-W
Stainless Steel

EPL-H
Hollow output

EPL-F
Flange output

EPL-A
Metric shaft output

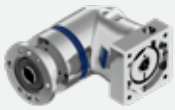
EPL-X
NEMA output

EPR Series

Performance right angle bevel planetary gearbox for general applications

- Lowest backlash <8 arcmin
- Torque capacity up to 340 Nm
- Torsional rigidity up to 33 Nm/arcmin
- Radial load capacity up to 8,500 N
- Frame sizes from 50-150 mm

EPR-W
Metric shaft output



EPR-H
Hollow output

EPR-F
Flange output

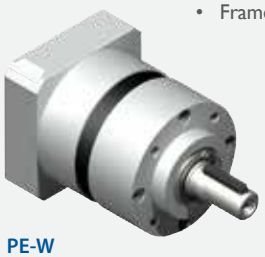
EPR-A
Metric shaft output

EPR-X
NEMA output

PE Series

Basic performance inline planetary gearbox for general applications

- Lowest backlash <8 arcmin
- Torque capacity up to 210 Nm
- Torsional rigidity up to 17 Nm/arcmin
- Radial load capacity up to 2,500 N
- Frame sizes from 50-118 mm



PE-W
Metric shaft output

PE-N
NEMA output

PER Series

Basic performance right angle bevel planetary gearbox for general applications

- Lowest backlash <8 arcmin
- Torque capacity up to 210 Nm
- Torsional rigidity up to 17 Nm/arcmin
- Radial load capacity up to 2,500 N
- Frame sizes from 50-118 mm

PER-W
Metric shaft output

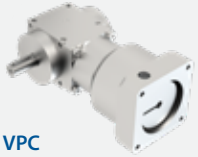
PER-N
NEMA output

Miniature VP Series

High-performance spiral bevel gearboxes for miniature applications, such as medical and semi-conductor, when high performance is required and space is at a premium

- Highest precision, smallest bevel gearbox on the market
- Highest torque density for the size with torque capacity of 1.3-16 Nm
- 90% Efficiency
- Ratios 1:1 to 4:1
- Frame sizes from 27-45 mm

VP
Shaft or hollow output



VPC
with integrated motor mount

V-Series

Performance spiral bevel gearbox for general applications

- Lowest backlash <15 arcmin
- Torque capacity up to 4,640 Nm
- Radial load capacity up to 34,200 N
- Frame sizes from 35-350 mm
- Ratios 1:1 to 6:1
- VC Series ratios up to 100:1 on select models

V-CO
Shaft output / shaft input

VC-W
Shaft output with motor mount

V-D0
Dual shaft output / shaft input (Over 13 shaft configurations available)

Mechanical Drive Solutions

Bellows Couplings

Zero backlash and high stiffness for all motion control applications
Torque capacity up to 4,000 Nm

KM Series

KP Series

KLC Series

KG Series

KR Series

KSS Series

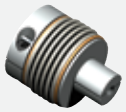
KG-VA Series

KGH Series

KSD Series

KHS Series

KPP Series


KPS Series

Elastomer Couplings

Lower cost alternatives for applications with less precision requirements
Torque capacity up to 2,000 Nm

EKC Series

EKM Series

ESM-A Series

Distance Couplings

Drive shafts with customized lengths up to 20 ft
Torque capacity up to 1,600 Nm

EDC Series

WDS Series

Safety Couplings

Disengage when a specified torque level is reached to protect machine components
Torque capacity up to 9,000 Nm

Direct Drive

SKB-KP Series

SKY-KS Series

SKW-KP Series

SKB-EK Series

SKY-ES Series

Indirect Drive

SKB Series

SKY Series

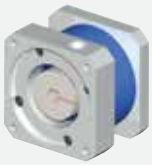
SKW Series

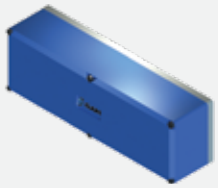
SKX-L Series

SKG Series

Mounting Kits

Connect any motor or gearbox to any actuator
Torque capacity up to 150 Nm


LSK
Inline motor
mounting kit


PMK
Parallel
mounting kit

Robotic Flange Gearboxes

GAM's robotics product line offers every technology option from strain wave (harmonic) and cycloidal to our revolutionary zero-backlash planetary.

GPL Planetary

- The new standard in zero-backlash: ≤6 arcsec - 10x better than other zero-backlash gearboxes
- Integral pre-stage available
- High positional accuracy without vibration for continuous coordinated motion
- See page 12 for more information

GCL Cycloidal

- Backlash ≤1 arcmin
- Impact resistance 5x nominal torque for frequent starts and stops
- Precise point-to-point motion
- Integral pre-stage available
- See page 26 for more information

GSL Strain Wave

- Backlash ≤ 0.5 arcmin
- Strain wave (harmonic) gearing for zero-backlash and high torque
- Simple design in small, lightweight gearbox
- Integral pre-stage available
- See page 40 for more information

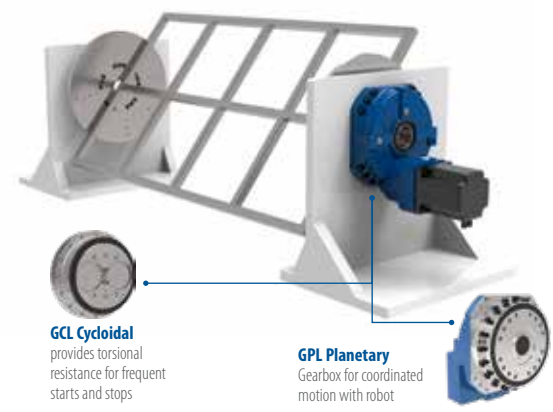
Applications

Choose from our standard products or let us customize a solution for your application. With our flexible manufacturing, we can cost-effectively produce small batches in short lead times.

Articulated Robot with 7th Axis

Automated Guided Vehicle (AGV)

Trunnion



Flange Gearbox Selection Guide

GAM offers a full range gearboxes from planetary servo gearboxes through zero-backlash robotic gearboxes for a wide variety of applications.

INCREASING PRECISION - DECREASING BACKLASH

	Planetary EPL	Helical Planetary SPH	Cycloidal GCL	Strain Wave GSL	Robotic Planetary GPL
Gearbox	Precision Inline for general servo applications	High precision inline for demanding servo applications	Zero-backlash cycloidal Available with integral pre-stage	Zero-backlash strain wave with high torque density and small, lightweight design for easy integration	Zero-backlash planetary with the lowest backlash. Vibration-free for high positional accuracy.
Gearbox Type	Servo	Servo	Zero-Backlash Robotic Flange	Zero-Backlash Robotic Flange	Zero-Backlash Robotic Flange
Features	Easily customizeable	Precision Inline	Impact Resistance 5x nominal torque. Precision positioning and point-to-point motion	Small, lightweight design	Unique, revolutionary design maintains lifetime zero-backlash
Advantages	Shaft, hollow or flange output Very high ratio	Quiet operation	Available with integral pre-stage for higher ratios	Quiet operation Easy integration	Very high precision Quiet operation Smooth, vibration-free motion
Applications	Servo Motion Control	Servo Motion Control	Zero-Backlash, Robotic	Zero-Backlash, Robotic	Zero-Backlash, Robotic
Backlash	≤ 8-20 arcmin	≤ 1 - 3 arcmin	≤1 arcmin	≤0.5 arcmin (≤30 arcsec)	≤0.1 arcmin (≤6 arcsec)
Ratio:	3:1 - 1000:1	3:1 - 1000:1	57:1 - 258:1 Integral pre-stage option for additional ratios	50:1 - 160:1	50:1 - 200:1 Integral pre-stage option for additional ratios
Service Life	30,000 hours	20,000 hours	6000 hours	7000-15,000 hours	20,000 hours

Torque Range (Nm)	Model	Nominal Torque (Nm)	Model	Nominal Torque (Nm)	Model	Nominal Torque (Nm)	Model	Nominal Torque (Nm)	Model	Nominal Torque (Nm)
≤15							GSL-CS-014	12.7		
	EPL-F-047	14					GSL-HS-014	14		
16-25							GSL-HS-017	17		
							GSL-HS-020	20		
							GSL-HS-025	25		
26 - 50	EPL-F-064	42					GSL-HS-032	32		
							GSL-HS-040	40		
							GSL-CS-017	45		
51 - 100	EPL-F-090	100	SPH-F-075	100			GSL-CS-020	56		
101 - 250					GCL-F-020	167	GSL-CS-025	124		
	EPL-F-110	210	SPH-F-100	250			GSL-CS-032	248		
251 - 500	EPL-F-140	340	SPH-F-140	450	GCL-F-040	412			GPL-F-056	445
501 - 1000					GCL-F-080	784			GPL-F-080	770
1001 - 2500					GCL-F-110	1078			GPL-F-112	1165
					GCL-F-160	1565			GPL-F-160	1450
									GPL-F-224	1820
2501 - 5000					GCLC-F-320	3136			GPL-F-300	2690
					GCLC-F-450	4500			GPL-F-400	3505

GPL Series Robotic Planetary Gearboxes

The New Standard in High Precision Gearboxes

GAM's revolutionary **GPL Series Robotic Planetary Gearbox** combines the lowest backlash and high tilting rigidity with vibration-free motion for smooth, controlled motion in robotics and motion control applications.

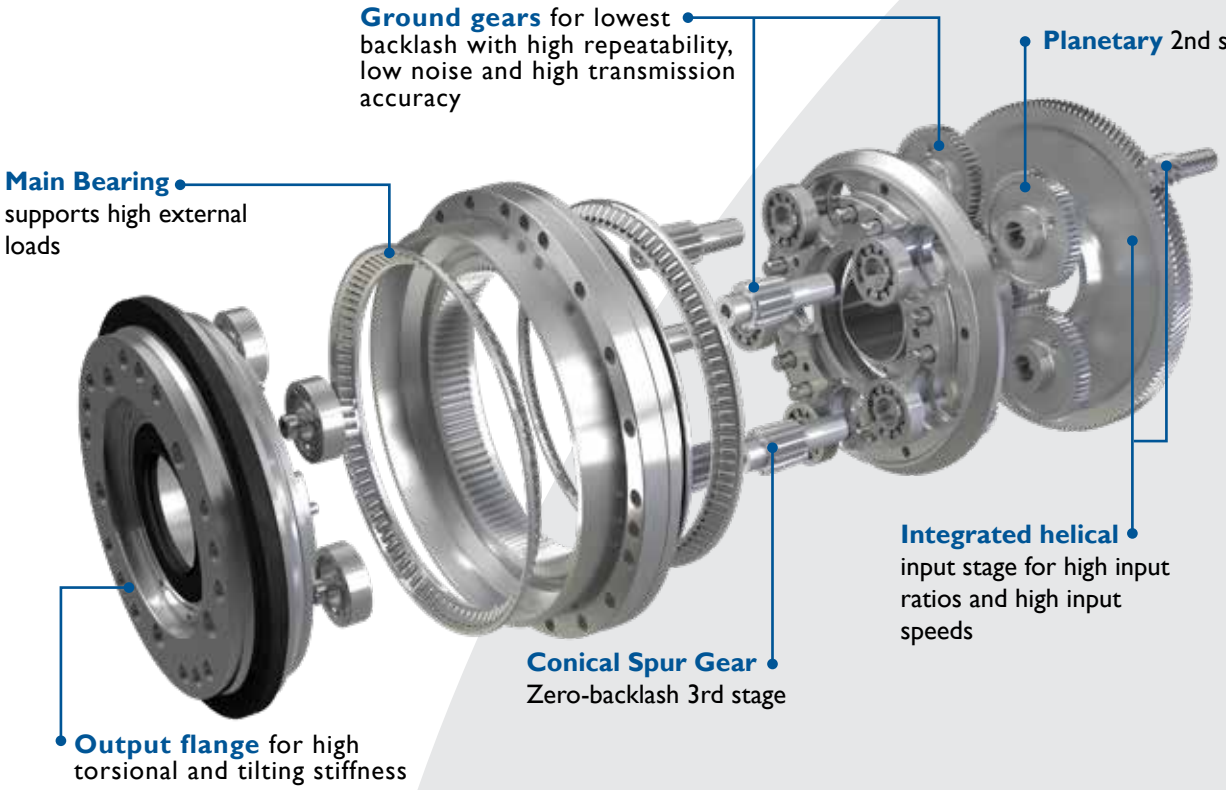
With a backlash less than 6 arcsec, the GPL precision is 10 times better than current zero-backlash gearboxes.

- Backlash ≤ 6 arcsec (0.1 arcmin) for the life of the gearbox
- Best-in-the-market torsional rigidity for ≤ 0.6 arcmin lost motion
- Vibration free motion for precision, smooth path control and positioning
- Patented design guarantees the backlash will not increase over the life time of the gearbox
- High torque density for a smaller, lightweight gearbox
- Seven sizes with nominal output torque of 445 to 3505 Nm and ratios of 50:1 to 200:1
- Flanged solid shaft output or flanged hollow shaft output (up to 75 mm through hole)
- Integrated input and motor adapter ready to mount your motor
- Matches and exceeds the performance of a direct drive motor

With seven sizes, two output options, and ratios up to 200:1, there is a GPL for your application.

Features	Benefits
Zero Backlash ≤ 0.1 arcmin	Highest precision for your application
Lowest lost motion ≤ 0.6 arcmin High torsional rigidity	Superior accuracy even with low torque
Patented self-adjusting backlash system	Constant precision throughout the entire lifetime
High torque density 58-73 Nm/kg	Smaller gearbox, lighter overall system
Fully-loaded life 20,000 operating hours	Longer lifetime, reduced maintenance costs
Efficiency > 90%	Lower power consumption, smaller motor
Quiet < 70 dB	Reduced workplace noise exposure
High output, acceleration and emergency stop torque	More security for your application
Superior tilting and torsional stiffness	Allows precise positioning
Low vibration	High repeatability
Lowest breakaway torque	Better control of the overall system
Standard mineral oil	Reduced lubrication cost
Low operating temperature	Longer component and lubricant life
Low moment of inertia	Excellent dynamic performance
Compact design, low weight	Lighter overall design
Input with Integrated motor adapter and clamp	Ready to mount your motor

Design Features



Superior Performance

The GPL Series provides superior performance compared to cycloidal gearboxes

Feature	GAM Planetary	Cycloidal
Backlash	<0.1 arcmin, remains constant throughout the lifetime of the gearbox , 10x better than cycloidal	Backlash can increase after approximately one year, requiring adjustment
Torque	Torque of the gearbox rated with output speed n2=15 rpm	Some published torques rated for output speed of n2=5 rpm
Service Life	20,000 operating hours	6,000 hours
Efficiency	>90%	>85%
Power Density	Highest power density (Nm/kg) in comparison to other manufacturers' gearboxes	
Duty Cycle	S1 (continuous) duty cycle is possible as the teeth are in contact immediately when operation starts; high input speeds up to 6600 rpm are possible.	Lower input speeds per published catalog values

Industries

The GPL Series is ideal for many industries including:

- Robotics
- Automation
- Packaging Machines
- Machine tool builders
- Printing industry
- Welding Systems
- Medical
- Navigation
- and many more

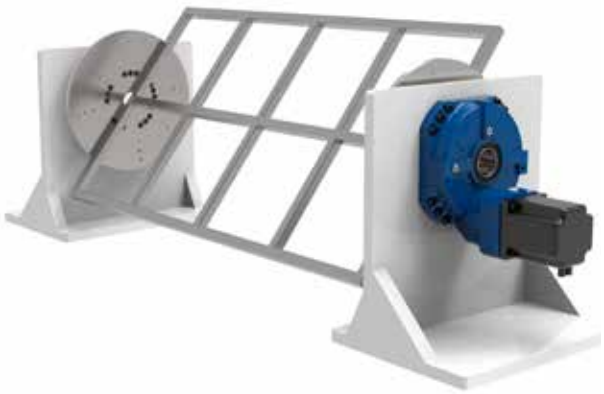
Applications

The GPL Series can be used in a variety of applications where zero-backlash, high tilting and torsional rigidity, and long life are required. With the large output mounting flange, through-hole option, and servo-ready mount, the GPL is ideal for many **robotic** and **motion control** applications:

- Robots
- Handling systems
- Tool changers
- Positioning
- Rack & pinion
- Pick & place
- Turntables
- and many more

Trunnion

The GPL provides vibration-free continuous coordinated motion between the trunnion and robot, allowing operations such as welding while the part is being rotated.



Drop in for DIrect Drive Motors

Standard GPL zero-backlash planetary gearbox in custom housing with integrated shrink disk connection. Works with any servo motor and output mounting. Drops in for competitive direct drive motors.

GPL Series Models

GPL-F
Solid Shaft Output
with Flange

GPL-H
Hollow Shaft Output
with Flange

GPR
GPL with Integral
Right Angle Pre-Stage*

Mass Moment of Inertia at Input

GPL-F		GPL-F-030	GPL-F-056	GPL-F-080	GPL-F-112	GPL-F-160	GPL-F-224	GPL-F-300	GPL-F-400
Mass Moment of Inertia ($kg\ cm^2$)	50:1	0.50	1.01	1.92	3.37	3.37	10.29	16.92	27.87
	63:1	0.36	0.75	1.43	2.52	2.52	7.69	12.64	20.83
	80:1	0.26	0.51	0.96	1.69	3.30	5.16	8.48	13.97
	100:1	0.20	0.35	0.67	1.19	2.31	3.62	5.95	9.80
	125:1	0.15	0.24	0.45	0.80	1.56	2.44	4.01	6.60
	160:1	0.10	0.16	0.31	0.54	1.05	1.64	2.70	4.45
	200:1	0.07	0.12	0.22	0.39	0.76	1.18	1.94	3.20

GPL-H		GPL-H-057	GPL-H-080	GPL-H-112	GPL-H-160	GPL-H-224	GPL-H-300	GPL-H-400
Mass Moment of Inertia (kg cm2)	35.5:1	2.42	5.47	9.63	18.79	29.38	48.31	79.59
	45:1	1.89	3.58	6.31	12.31	19.25	31.65	52.13
	56:1	1.28	2.42	4.26	8.32	13.01	21.39	35.24
	71:1	0.86	1.64	2.89	5.63	8.81	14.49	23.87
	90:1	0.52	0.98	1.73	3.38	5.29	8.70	14.33
	125:1	0.32	0.61	1.08	2.10	3.29	5.40	8.90
	131.5:1	0.27	0.50	-	1.73	-	4.46	-

* Contact GAM for more information

GPL-F Technical Specifications

	Nominal Ratio		GPL-F-030	GPL-F-056	GPL-F-080	GPL-F-112	GPL-F-160	GPL-F-224	GPL-F-300	GPL-F-400
Exact Ratio	50		337183/6630	564788/11745	754/15	325367/6525	354928/6975	3531/70	6338/125	354928/6975
	63		359078/5525	85946/1305	33176/525	227143/3625	3169/50	1584/25	358097/5625	3169/50
	80		376594/4641	116641/1450	57304/735	6139/75	386618/4725	3828/49	186971/2250	34859/450
	100		389731/3978	239421/2465	1508/15	42973/435	15845/162	11880/119	383449/3825	9507/95
	125		402868/3315	3508/29	12818/105	834904/6525	136267/1050	12177/98	129929/1050	72887/600
	160		416005/2652	251699/1595	1508/9	853321/5220	415139/2700	162	434153/2700	224999/1350
	200		424763/2210	153475/783	107068/525	288533/1450	44366/225	2079/10	440491/2250	25352/125
Permanent Output Torque	Nm		300	575	980	1480	1850	2325	3435	4495
Nominal Output Torque[1a]	Nm		235	445	770	1165	1450	1820	2690	3505
Acceleration Torque[1b]	Nm		327	625	1075	1630	2030	2550	3765	4905
Emergency Stop Torque[1c]	Nm		800	1545	2530	3780	4800	6090	8990	11,980
Max. Output Speed[3]	rpm	50:1	118	120	99	100	98	89	79	69
		63:1	92	91	79	80	79	71	63	55
		71:1		-	-	-	-	64	-	-
		80:1	74	75	64	61	61	58	48	45
		100:1	61	62	50	51	51	45	40	35
		125:1	49	50	41	39	39	36	32	29
		160:1	38	38	30	31	33	28	25	21
		200:1	31	31	25	25	25	22	20	17
Permissible Average Input Speed[4]	rpm		4000	4000	3500	3500	3500	3000	2500	2000
Maximum Input Speed[3]	rpm		6000	5771 (50:1) 6000	5000	4986 (50:1) 5000	5000	4500	4000	3500
Permanent Bending Moment[2a]	Nm		580	1070	1280	2410	2750	3060	4800	6080
Emergency Stop Bending Moment Max[1c]	Nm		2650	3645	4345	5910	7800	9280	11,410	13,750
Tilting Stiffness	Nm/arcmin		580	1170	1560	2230	2300	2620	5490	6260
Torsion Stiffness[5]	Nm/arcmin		85	165	260	430	570	680	1130	1350
Max. Axial Force (Static)[2b]	kN		80	152	168	270	292	315	400	535
Max. Radial Force (Static)[2c]	kN		26.5	55	57	85	97	100	140	170
Max. Axial Force (Dynamic)[2b]	kN		16.5	18	18.5	29.5	31	32	42.5	46
Max. Radial Force (Dynamic)[2c]	kN		10.3	11	11.5	18	19	20	26.5	29
Power Density	Nm/kg		31.3	57.8	68.8	73.3	72.9	65.7	71.9	69.7
Weight	kg		10.7	14.1	18.5	27.4	32.3	41.6	60.3	77.7
Angular Transmission Accuracy*	arcsec		≤90	≤70	≤50	≤50	≤50	≤50	≤50	≤50
Backlash*			≤0.1 arcmin							
Lost Motion*			1.5	≤0.6 arcmin						
Efficiency Under Full Load			≥90%							
Service Life			20,000 hours							
Noise			<70 dB							
Lubrication			Mineral Oil							

1a) 12 million times during lifetime
1b) 6 million times during lifetime
1c) 3,000 times during lifetime
2a) Permanent tilting moment for load case Fa =0 and Fr = 0
2b) Max axial force for load case permanent tilting moment = 0 and Fr = 0
2c) Max radial force for load case permanent tilting moment = 0 and Fa = 0
3) Higher input speeds possible
4) At nominal torque and 20°C ambient temperature
5) At 50% to 100% nominal torque

Note: Calculations based on output speed n2 = 15 rpm

** See page 224 for definitions*

GPL-H Technical Specifications

	Nominal	GPL-H-057	GPL-H-080	GPL-H-112	GPL-H-160	GPL-H-224	GPL-H-300	GPL-H-400	GPL-H-500
Exact Ratio	35.5	2422/65	21614/611	25422/725	218327/6188	206719/5733	228342/6409	12544/351	-
	45	15224/325	82012/1833	26537/600	228342/5083	324046/7007	14021/312	504/11	-
	56	26296/455	169882/3055	27429/500	236354/4199	94979/1729	246369/4420	13440/247	-
	71	22836/325	43935/611	28321/400	244366/3315	681614/9555	274411/3757	4592/65	-
	90	5882/65	401273/4277	446/5	250375/2652	698375/7644	20030/221	1176/13	-
	125	4844/39	820120/6721	3122/25	292438/2431	776593/6370	2003/17	4816/39	-
	131.5	97572/715	8787/65	-	294441/2210	-	144216/1105	-	
	150	-	-	-	-	-	-	-	1440628/9711
Permanent Output Torque	Nm	575	980	1480	1850	2325	3435	4495	4685
Nominal Output Torque[1a]	Nm	445	770	1165	1450	1820	2690	3505	3650
Acceleration Torque[1b]	Nm	625	1075	1630	2030	2550	3765	4905	5110
Emergency Stop Torque[1c]	Nm	1545	2530	3780	4800	6090	8990	11, 980	12,480
Max. Output Speed [3]	rpm	120	100	100	100	90	80	70	30
Permissible Average Input Speed [4]	rpm	4000	3500	3500	3500	3000	2500	2000	2000
Maximum Input Speed[3]	rpm	6000	5000	5000	5000	5000	4000	3500	4500
Permanent Bending Moment [2a]	Nm	1070	1280	2410	2750	3060	4800	6080	9750
Emergency Stop Bending Moment Max[1c]	Nm	3645	4345	5910	7800	9280	11,410	13,750	20,000
Tilting Stiffness	Nm/arcmin	1300	2730	3315	3670	4100	8810	10,250	12,500
Torsion Stiffness[5]	Nm/arcmin	185	305	480	690	820	1240	1460	2100
Max. Axial Force (Static)[2b]	kN	152	168	270	292	315	400	535	450
Max. Radial Force (Static)[2c]	kN	55	57	85	97	100	140	170	142
Max. Axial Force (Dynamic)[2b]	kN	18	18.5	29.5	31	32	42.5	46	58
Max. Radial Force (Dynamic)[2c]	kN	11	11.5	18	19	20	26.5	29	37
Power Density	Nm/kg	57.8	68.8	73.3	72.9	65.7	71.9	69.7	68
Weight[6]	kg	14.1	18.5	27.4	32.3	41.6	60.3	77.7	98
Angular Transmission Accuracy*	arcsec	≤70	≤50	≤50	≤50	≤50	≤50	≤50	≤50
Backlash*		≤0.1 arcmin							
Lost Motion*		≤0.6 arcmin							
Efficiency Under Full Load		≥90%							
Service Life		20,000 hours							
Noise		<70 dB							
Lubrication		Mineral Oil							

1a) 12 million times during lifetime
1b) 6 million times during lifetime
1c) 3,000 times during lifetime

2a) Permanent tilting moment for load case Fa =0 and Fr = 0
2b) Max axial force for load case permanent tilting moment = 0 and Fr = 0
2c) Max radial force for load case permanent tilting moment = 0 and Fa = 0

3) At lowest ratio. Higher input speeds possible
4) At nominal torque and 20°C ambient temperature
5) At 50% to 100% nominal torque
6) Weight varies depending on input and ratio

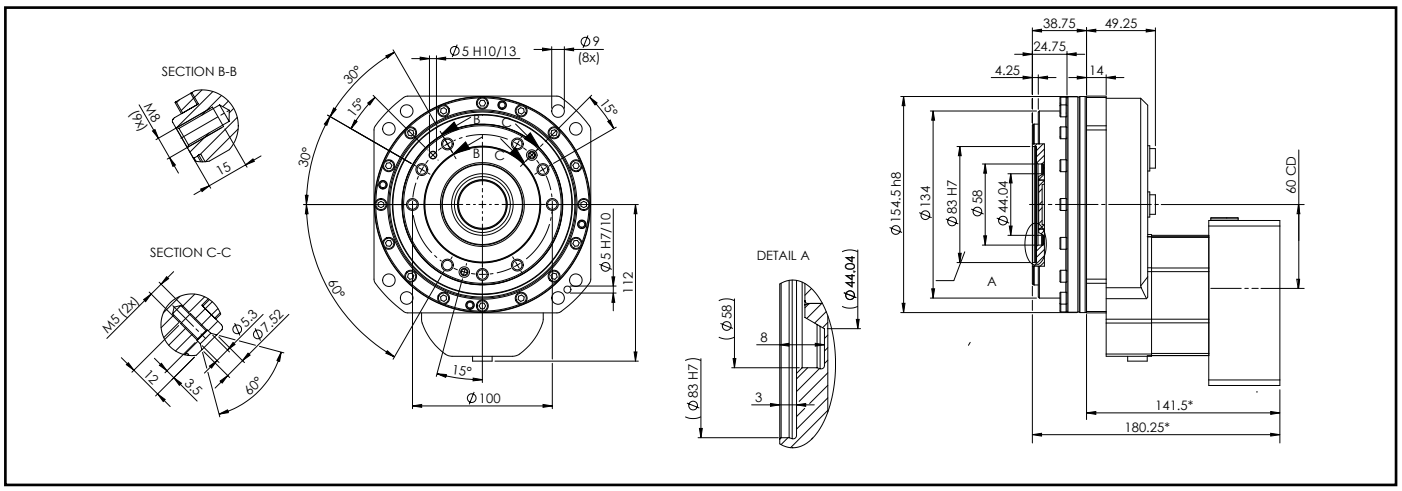
Note: Calculations based on output speed n2 = 15 rpm

** See page 224 for definitions*

GPL

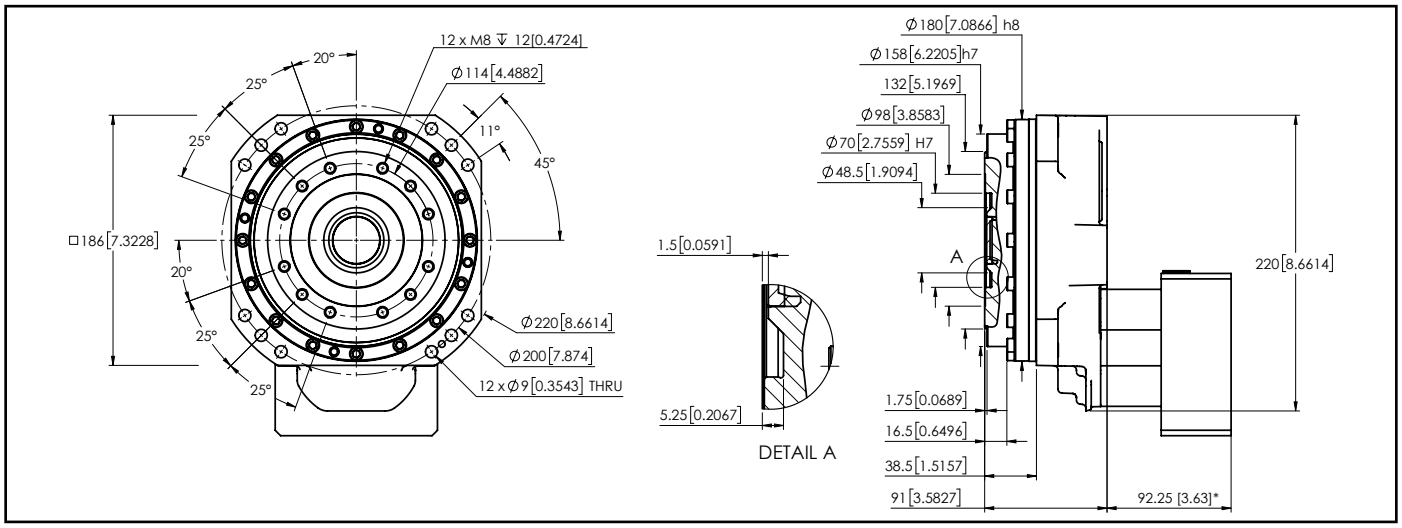
GPL-030/056/057 Dimensions

GPL-F-030



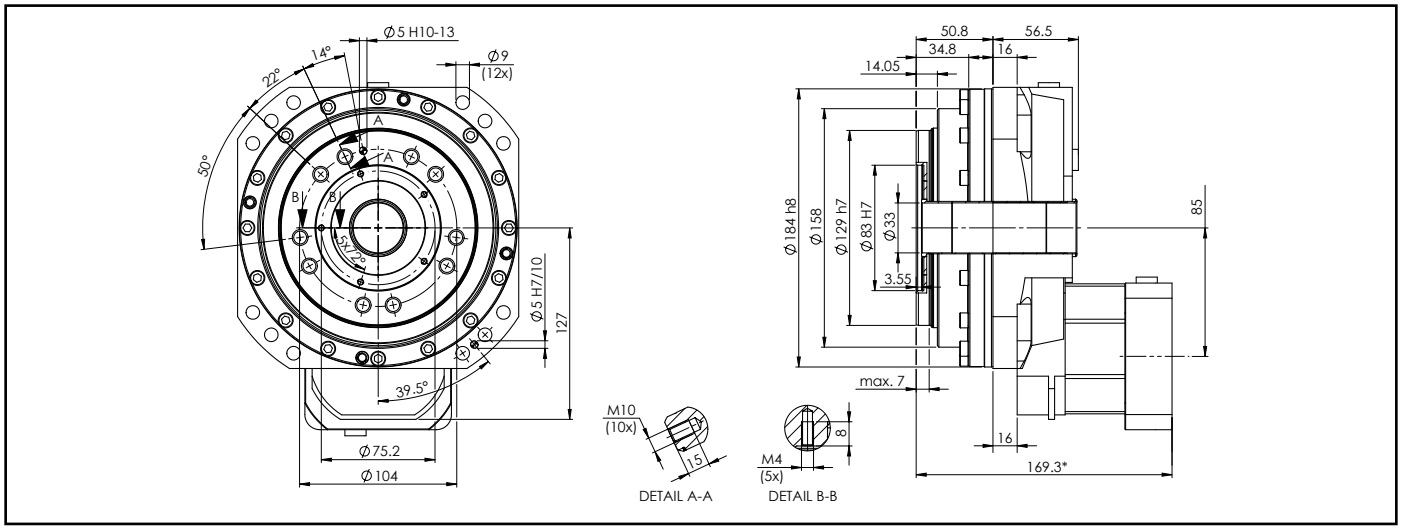
*Dimension may vary depending on motor

GPL-F-056



*Dimension may vary depending on motor

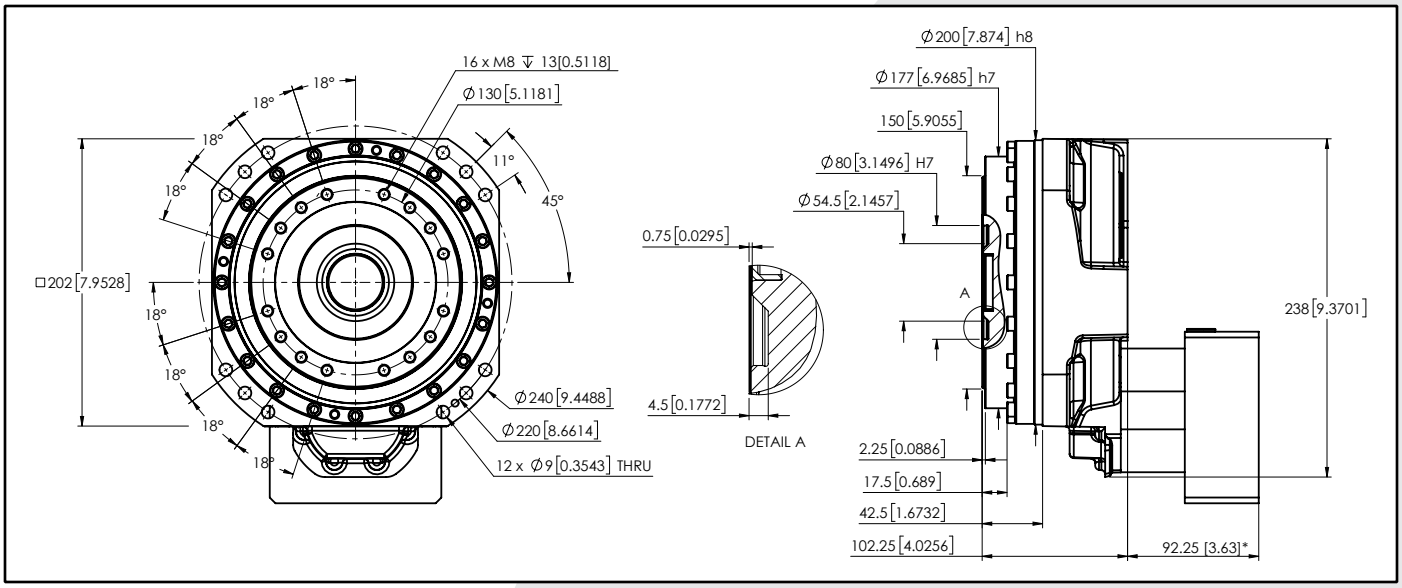
GPL-H-057



*Dimension may vary depending on motor

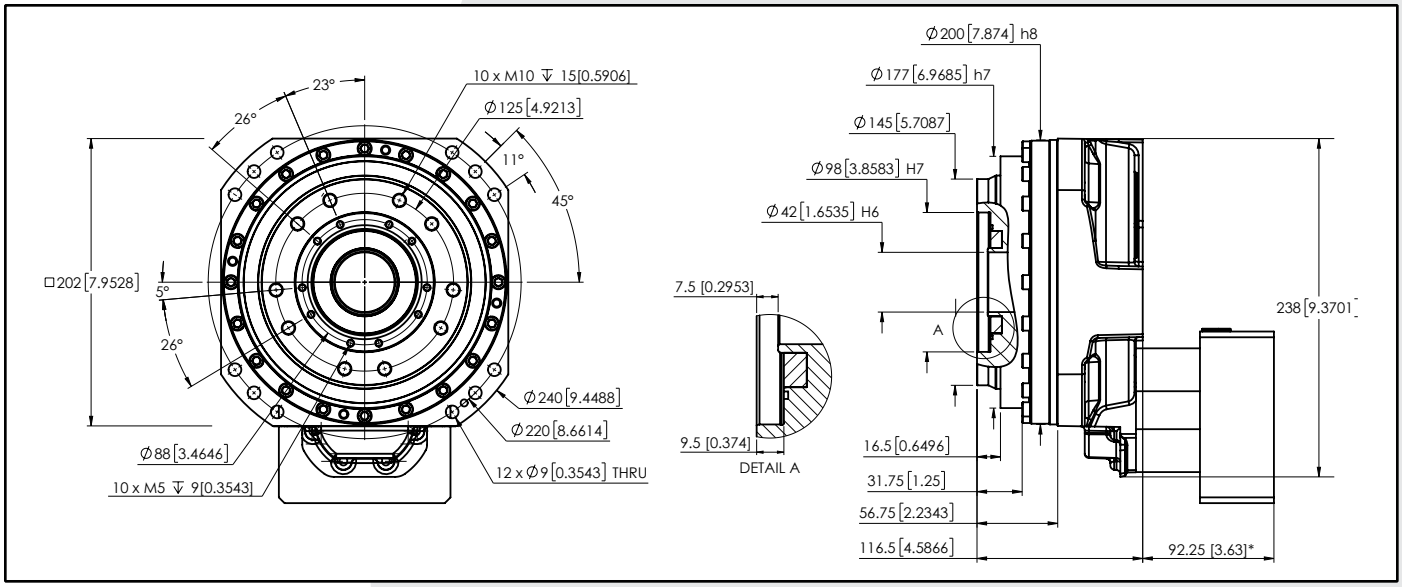
GPL-080 Dimensions

GPL-F-080



*Dimension may vary depending on motor

GPL-H-080

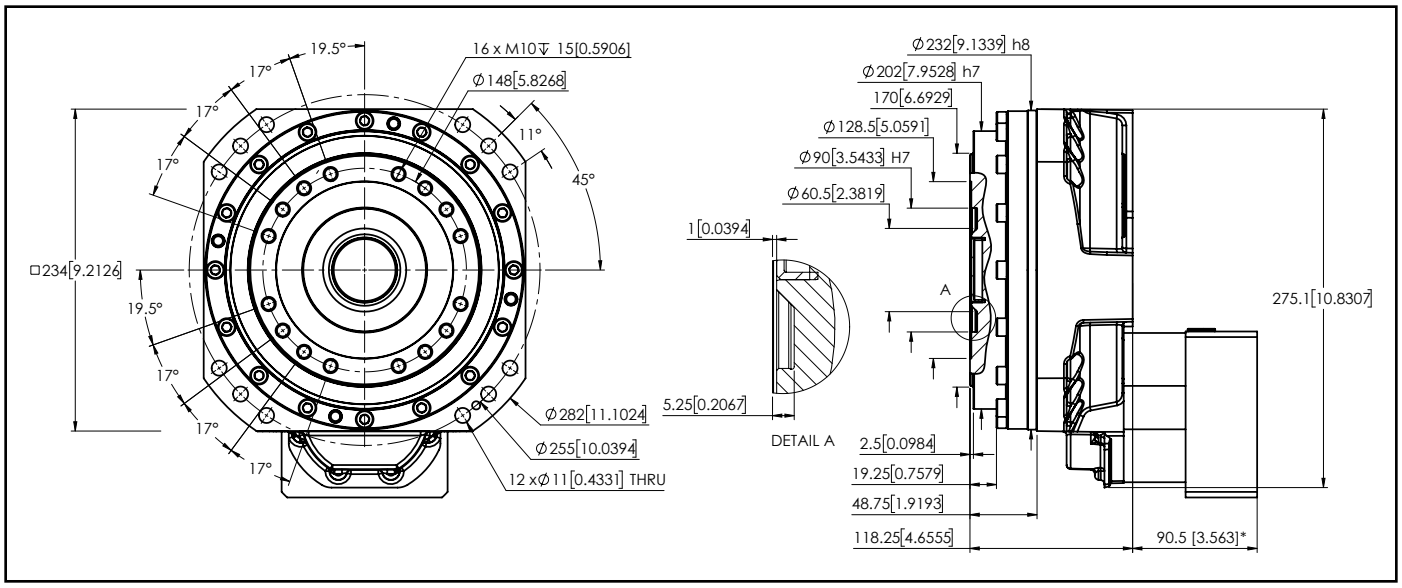


*Dimension may vary depending on motor

GPL

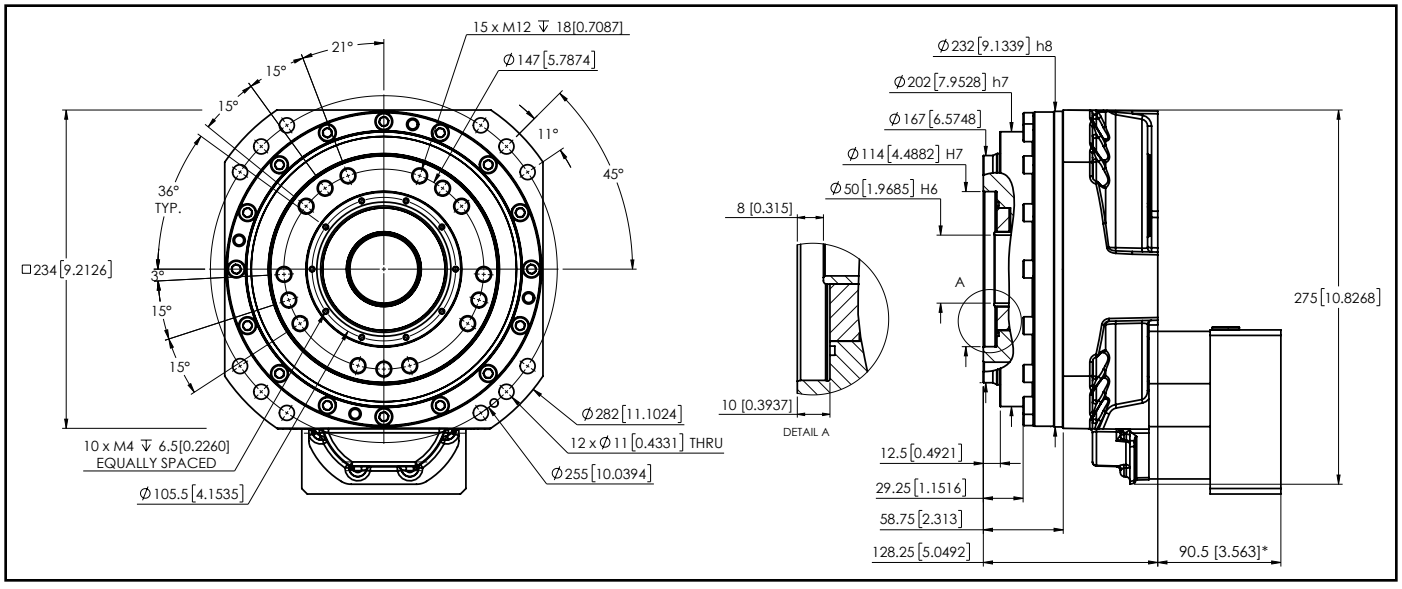
GPL-112 Dimensions

GPL-F-112



*Dimension may vary depending on motor

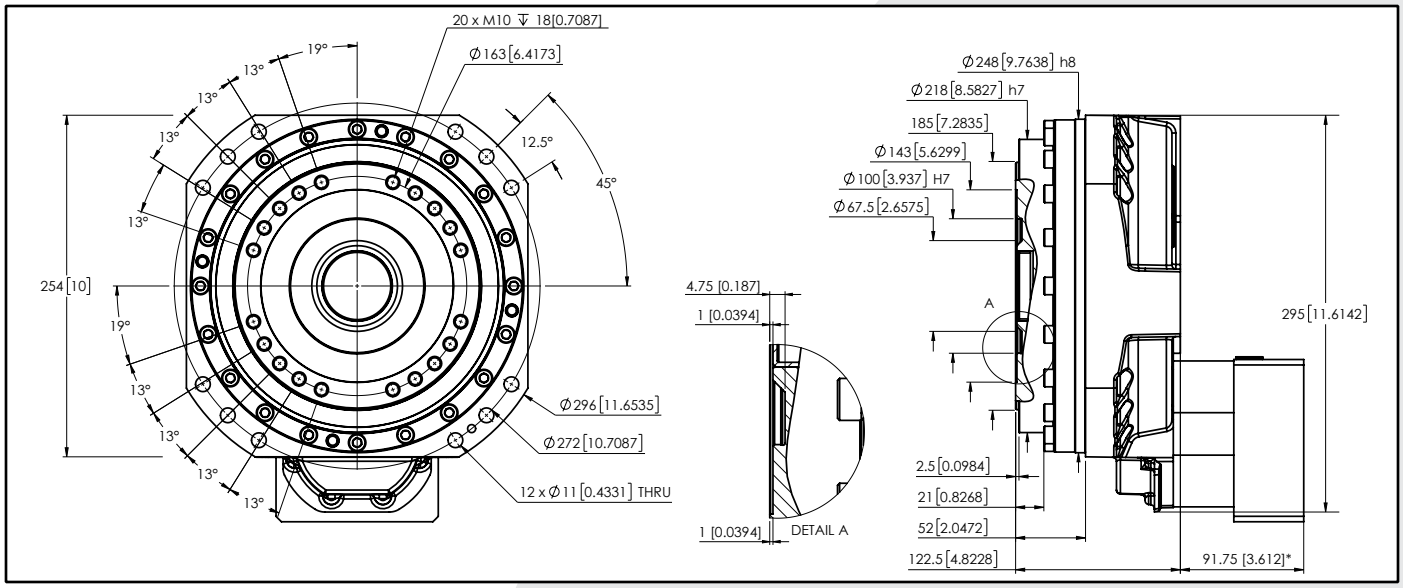
GPL-H-112



*Dimension may vary depending on motor

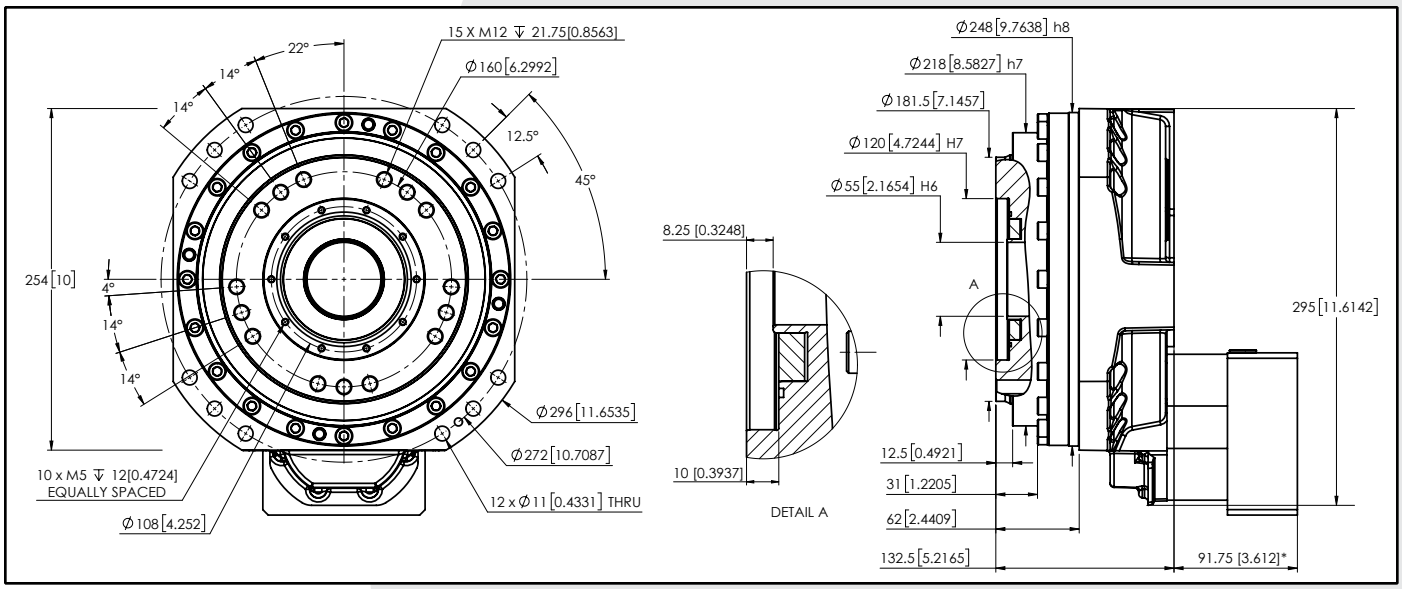
GPL-160 Dimensions

GPL-F-160



*Dimension may vary depending on motor

GPL-H-160

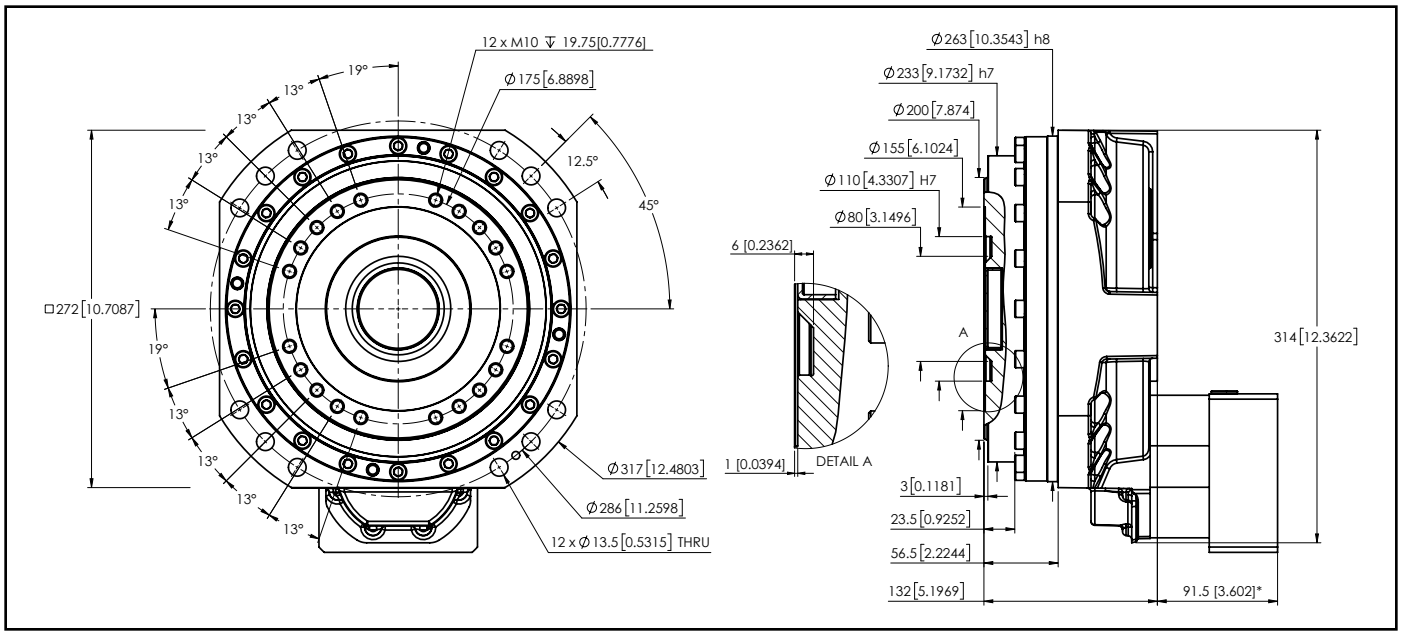


*Dimension may vary depending on motor

GPL

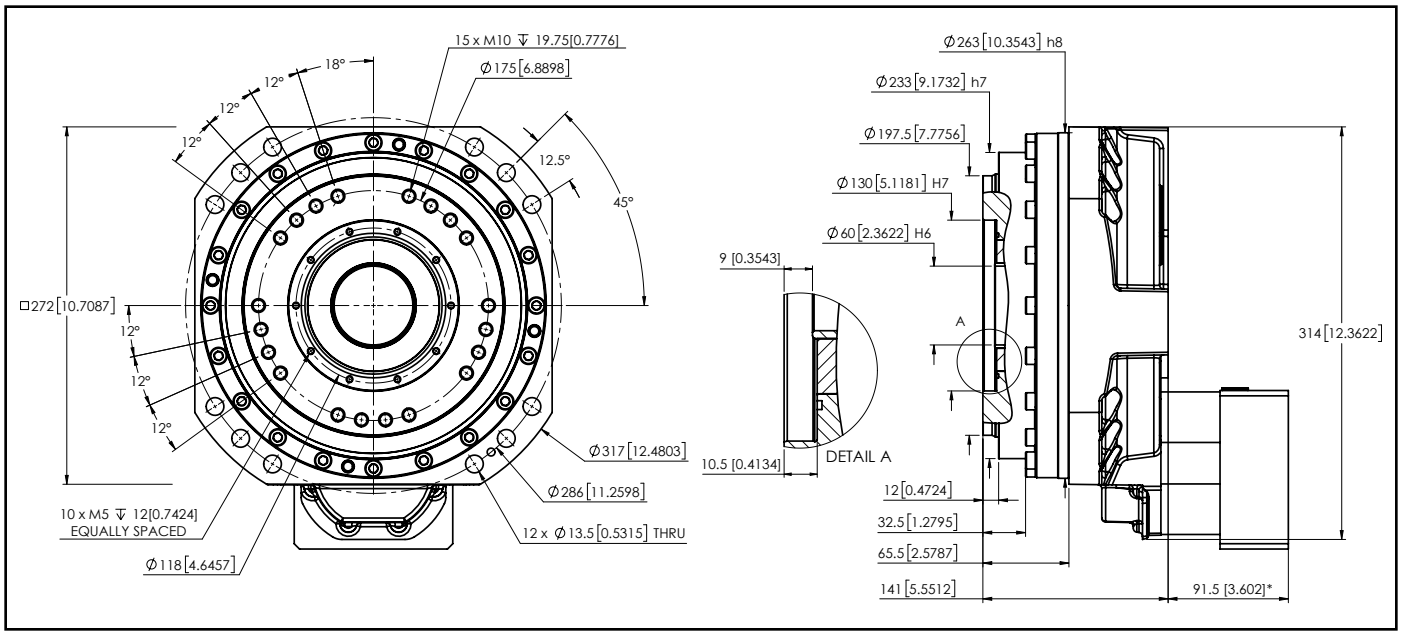
GPL-224 Dimensions

GPL-F-224



*Dimension may vary depending on motor

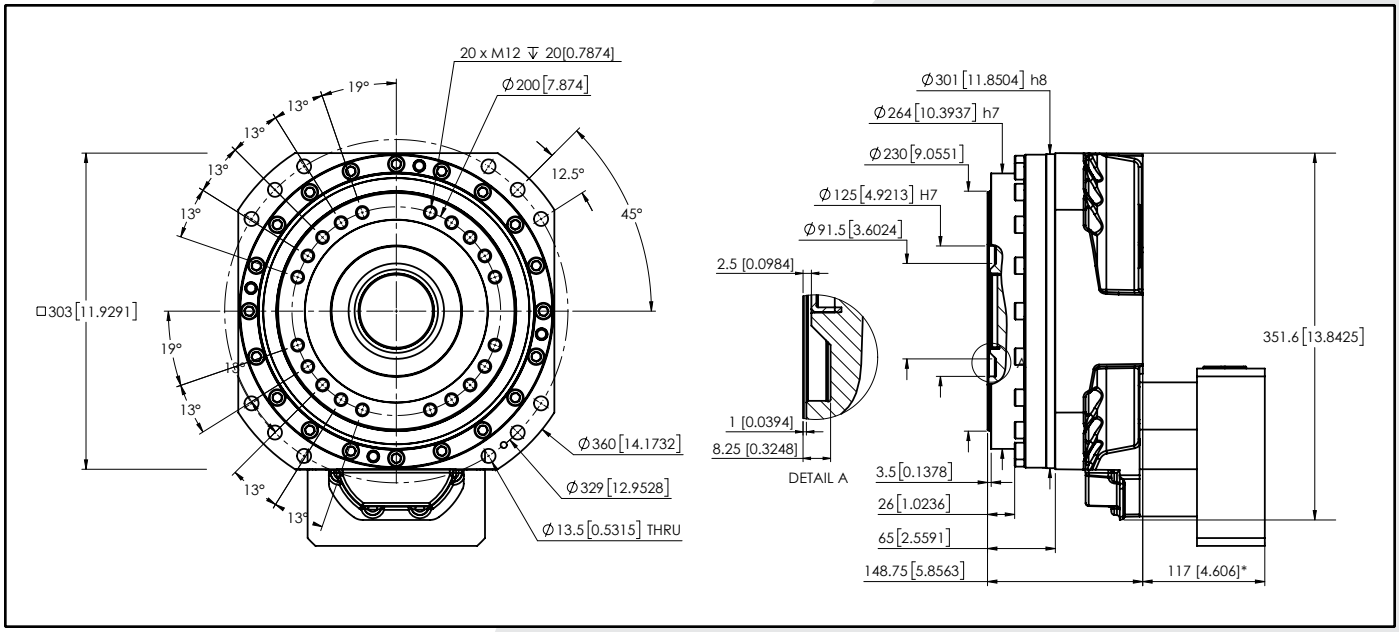
GPL-H-224



*Dimension may vary depending on motor

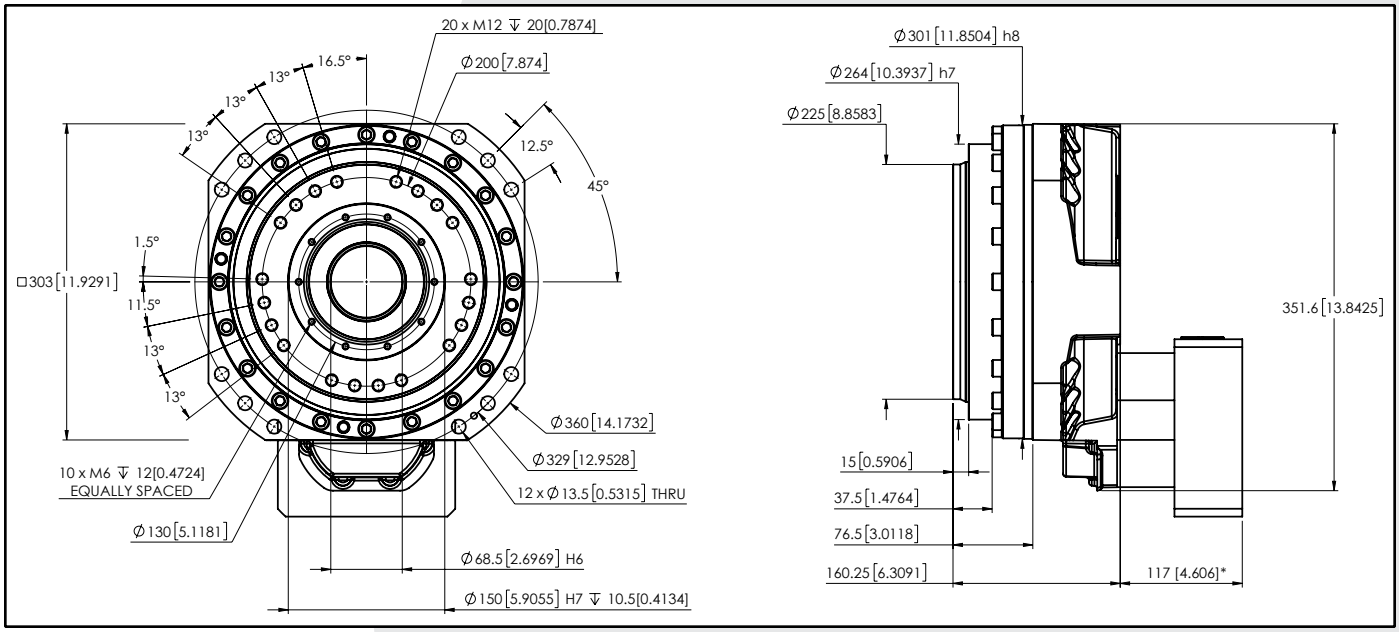
GPL-300 Dimensions

GPL-F-300



*Dimension may vary depending on motor

GPL-H-300

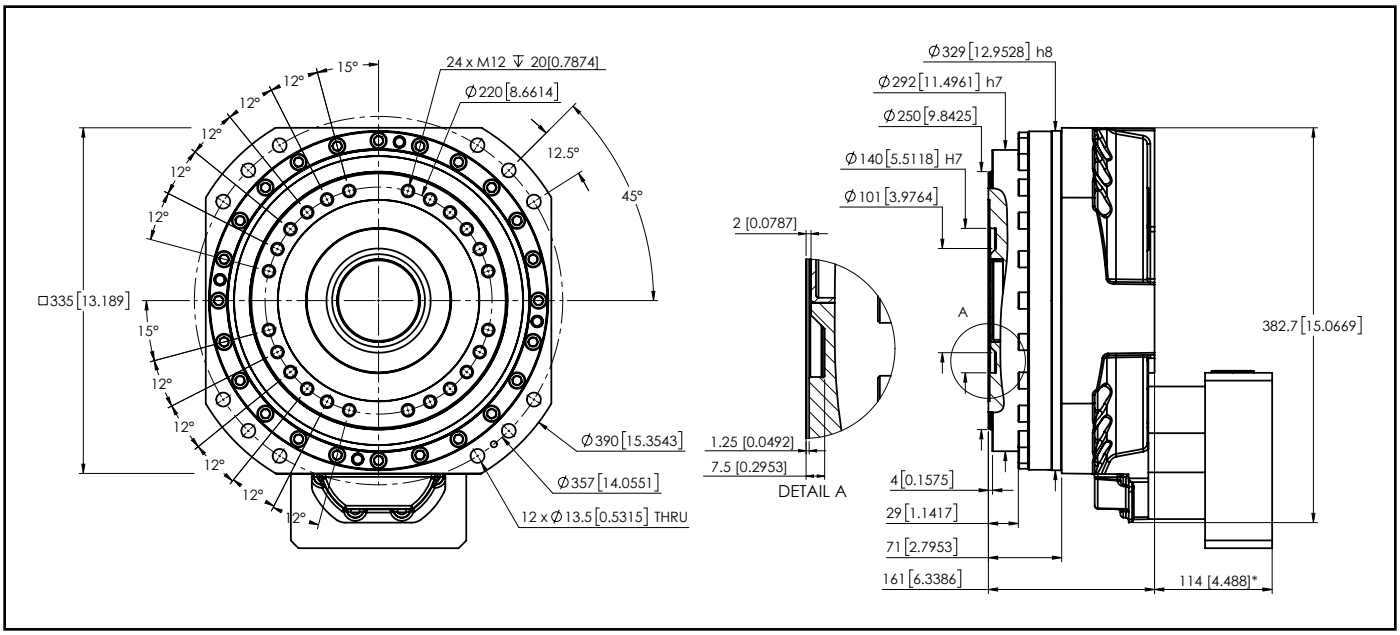


*Dimension may vary depending on motor

GPL

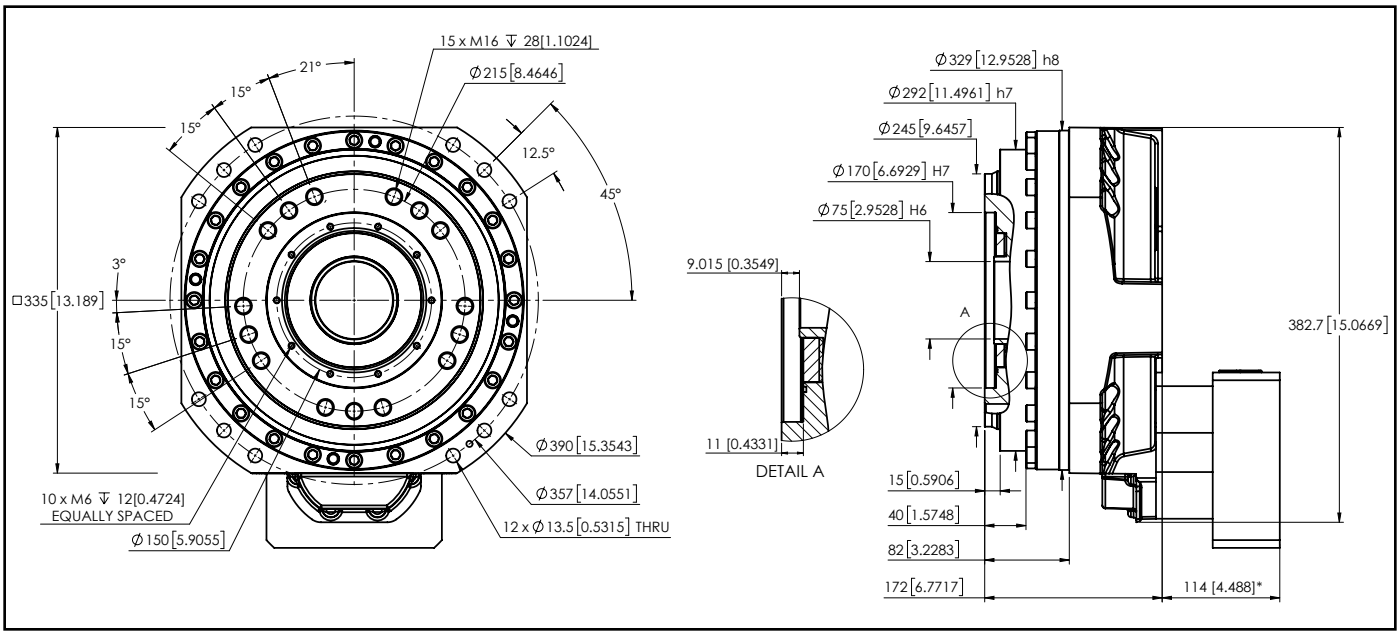
GPL-400 Dimensions

GPL-F-400



*Dimension may vary depending on motor

GPL-H-400

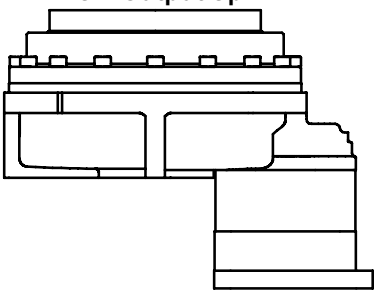


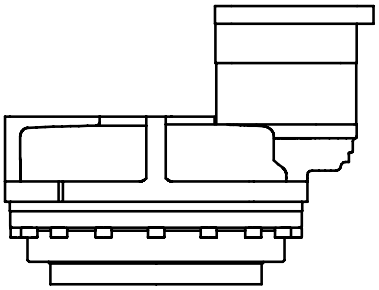
*Dimension may vary depending on motor

GPL Mounting Position

Output Vertical

U = Output Up



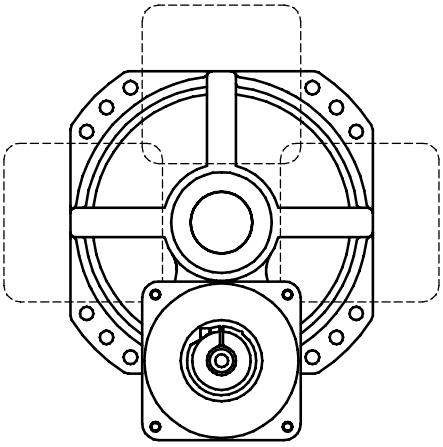


D = Output Down

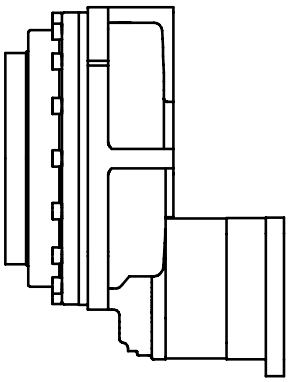
Output Horizontal

N = North/12:00

W = West/9:00



E = East/3:00



S = South/6:00

GPL

TYPE CODES FOR GPL SERIES

Example: GPL - F - 056 - 200S - M0000 - H0000 - C0000

Gearbox Series
GPL = Inline
GPR = Right Angle

Gearbox Style
F = Solid Flange Output
H = Hollow Flange Output

Gearbox Size
056, 080, 112, 160, 224, 300, 400

Ratio
F Style = 050, 063, 080, 100, 125, 160, 200
H Style = 036 (35.5), 045, 056, 071, 090, 125, 132 (131.5)

Mounting Position
Output Vertical:
U = Output Up
D = Output Down
Output Horizontal:
N = Input North/12:00
S = Input South/6:00
E = Input East/3:00
W = Input West/9:00

Motor Code
Assigned by GAM

Output Code
Assigned by GAM

Configuration Code
Assigned by GAM

GCL Series Robotic Cycloidal Gearboxes

GAM's **GCL Series Robotic Cycloidal Gearboxes** provide precise point-to-point motion with zero backlash and high impact resistance. Available with integrated pre-stage and motor adapter customized to your application.

With our value-add manufacturing and engineering collaboration, we can work with you to integrate the GCL cycloidal gearbox into your machines.

Features

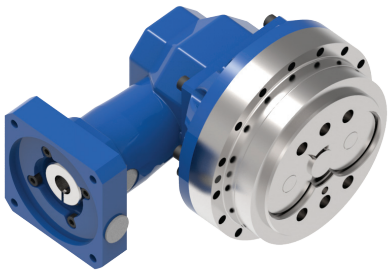
- Backlash of ≤1 arcmin with lost motion of ≤1 arcmin for precise point-to-point motion
- Withstands the frequent start-stop impact loads of industrial robots with impact resistance 5x nominal torque
- Multi-tooth meshing for torsional rigidity
- Flange output in 7 sizes with nominal output torque of 167 to 4410 Nm and ratios of 57:1 to 192.4:1
- Flanged hollow output in 6 sizes (up to 138 mm through hole) with nominal output torque of 490 to 4900 Nm
- Drops in for many competitors' products
- Integrated motor adapter plate ready to mount your motor

Integrated Pre-Stage

GAM provides a complete gearbox, including the integrated pre-stage, ready to mount into your application. A single product with a single part number simplifies ordering.

Pre-Stage options include:

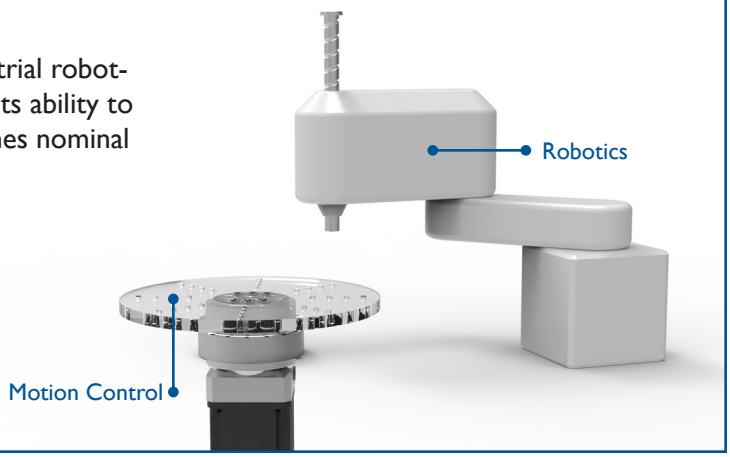
- Right angle turn with additional speed reduction using hypoid gearing for a compact configuration
- Right angle turn in low ratios from 5:1 down to 1:1
- Inline configuration with additional speed reduction



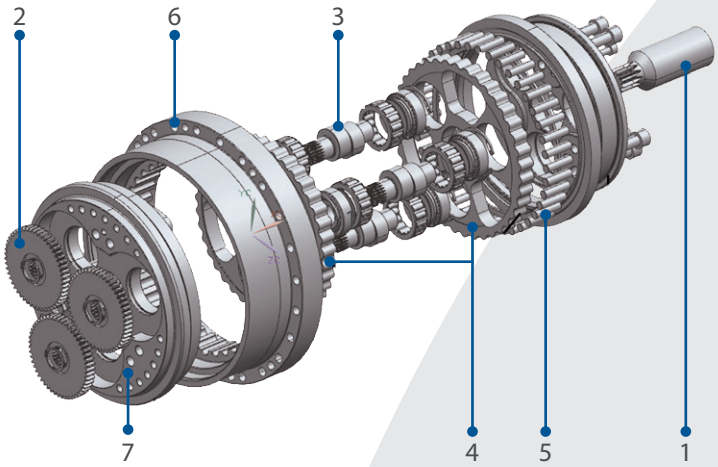
Applications

The GCL is well suited to high-end industrial robotics and motion control applications with its ability to withstand start-stop impact loads five times nominal torque.

- Robotics
- Tool changers
- Positioning
- Turntables
- Pick & Place



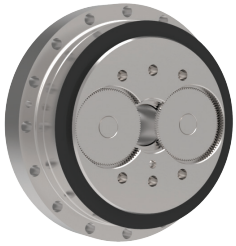
Drive Sequence



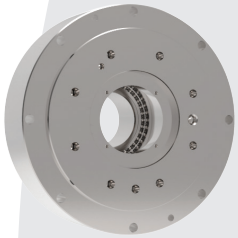
1. Input shaft/pinion
2. Planetary gear
3. Eccentric gearshaft
4. Cycloid gear
5. Pins
6. Pin Housing
7. Output

GCL Series Models

GCLC
Component Gearbox

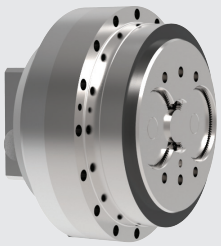


GCLC-F
Solid Flange

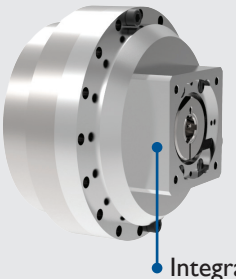


GCLC-H
Hollow Flange

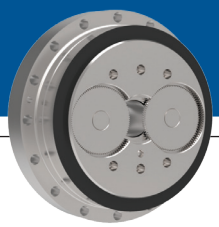
GCL
Gearbox with cover & integrated input



GCL-F
Solid Flange



GCLC-F / GCL-F



GCLC-F / GCL-F	Nominal	020		040		080		110		160		320*		450*	
Ratio | Moment of Inertia	kg cm²	57:1	0.0966	57:1	0.325	57:1	0.816	81:1	0.988	81:1	1.77	81:1	4.83	81:1	8.75
		81:1	0.0607	81:1	0.220	81:1	0.600	111:1	0.696	101:1	1.40	101:1	3.79	101:1	6.91
		105:1	0.0432	105:1	0.163	101:1	0.482	161:1	0.436	129:1	1.06	118.5:1	3.15	129:1	5.20
		121:1	0.0356	121:1	0.137	121:1	0.396	175.28:1	0.389	145:1	0.87	129:1	2.84	153	4.12
		141:1	0.0288	153:1	0.101	153:1	0.298			171:1	0.74	141:1	2.54	171:1	3.61
		161:1	0.0239									153:1	2.20	192.4:1	3.07
												171:1	1.97	201	2.90
												185:1	1.77	210.23	2.71
												201:1	1.60	257.84	2.03
Nominal Output Torque	Nm	167		412		784		1078		1568		3136		4410	
Acceleration Torque	Nm	412		1029		1960		2695		3920		7840		11,025	
Momentary Maximum Allowable Torque (Impact)	Nm	883		2058		3920		5390		7840		15.680		22,050	
Maximum Output Speed	rpm	75		70		70		50		45		35		25	
Allowable Bending Moment	Nm	882		1666		2156		2940		3920		7056		8820	
Momentary Allowable Bending Moment	Nm	1764		3332		4312		5880		7840		14,112		17,640	
Tilting Rigidity	Nm/arcmin	372		931		1176		1470		2940		4900		7448	
Torsion Stiffness	Nm/arcmin	49		108		196		294		392		980		1176	
Power Density	Nm/kg	33.4		45.8		60.3		63.4		60.3		71.3		66.8	
Weight (GCLC-F)	kg	4.7		9.3		13.1		17.4		26.4		44.3		66.4	
Weight (GCL-F)	kg	6.3		11.8		17.3		23.8		34.2		-		-	
Backlash** | Lost Motion**		≤1.0 arcmin | ≤1.0 arcmin													
Angular Transmission Accuracy**		1.0 arcmin													
Service Life		6000 hours													
Lubrication		Molywhite RE00													

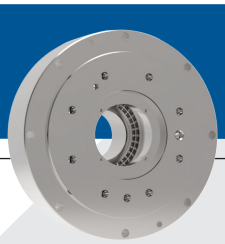
Note: Calculations based on output speed n2 = 15 rpm ** GCLC-F Only* *** See page 224 for definitions*

Output Speed/Nominal Torque Capacity

GCLC-F / GCL-F	Output Speed	020		040		080		110		160		320*		450*	
	RPM	Nm	kW	Nm	kW	Nm	kW	Nm	kW	Nm	kW	Nm	kW	Nm	kW
Nominal Output Torque / Input Power	5	231	0.16	572	0.4	1088	0.76	1499	1.05	2176	11.52	4361	3.04	6135	4.28
	10	188	0.26	465	0.65	885	1.24	1215	1.7	1774	2.48	3538	4.94	4978	6.95
	15	167	0.35	412	0.86	784	1.64	1078	2.26	1568	3.28	3136	6.57	4410	9.24
	20	153	0.43	377	1.05	719	2.01	990	2.76	1441	4.02	2881	8.05	4047	11.3
	25	143	0.50	353	1.23	672	2.35	925	3.23	1343	4.69	2695	9.41	3783	13.2
	30	135	0.57	334	1.40	637	2.67	875	3.67	1274	5.34	2548	10.7		
	40	124	0.70	307	1.71	584	3.26	804	4.49						
	50	115	0.81	287	2.00	546	3.84								
	60	110	0.92	271	2.27	517	4.33								

** GCLC-F Only*

GCLC-H



GCLC-H	Nominal	050	120	200	320	400	500
Base Ratio *		32.54:1	36.75:1	34.86:1	35.61:1	35.61:1	37.34:1
Exact Base Ratio*		1985/61	36.75/1	1499/43	2778/78	2778/78	3099/38
Moment of Inertia (at Center Drive Gear)	kg cm^2	0.3812	1.0037	2.079	4.568	4.611	11.136
Nominal Output Torque	Nm	490	1176	1961	3136	3920	4900
Acceleration Torque	Nm	1225	3675	4900	7840	9800	12250
Momentary Maximum Allowable Torque (Impact)	Nm	2450	7350	9800	15680	19600	24500
Maximum Output Speed	rpm	50	40	30	25	20	20
Allowable Bending Moment	Nm	1764	3920	8820	20580	26460	34300
Momentary Allowable Bending Moment	Nm	3528	7840	17640	39200	52920	78400
Tilting Rigidity	Nm/arcmin	1960	4263	9800	12740	17640	24500
Torsion Stiffness	Nm/arcmin	255	588	980	1960	2548	3430
Power Density	Nm/kg	32.7	56.0	35.0	39.2	35.6	31.8
Weight	kg	14.6	19.5	55.6	79.5	106	154
Backlash** | Lost Motion**		≤1.0 arcmin | ≤1.0 arcmin					
Angular Transmission Accuracy**		1.0 arcmin					
Service Life		6000 hours					

Note: Calculations based on output speed n2 = 15 rpm

** Base ratio of gearbox, overall ratio determined by input pinion as specified by customer*

*** See page 224 for definitions*

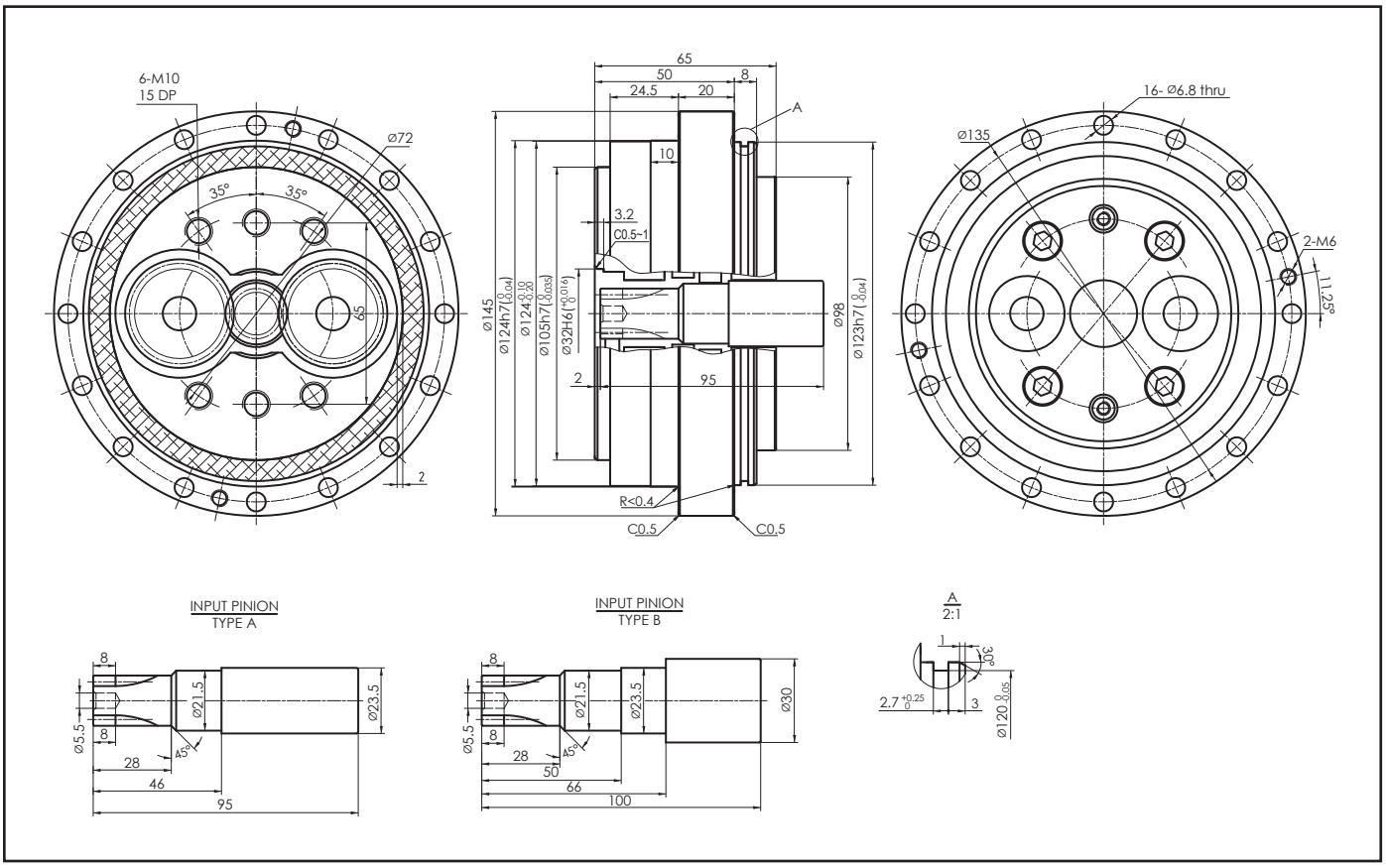
GCL

Output Speed/Nominal Torque Capacity

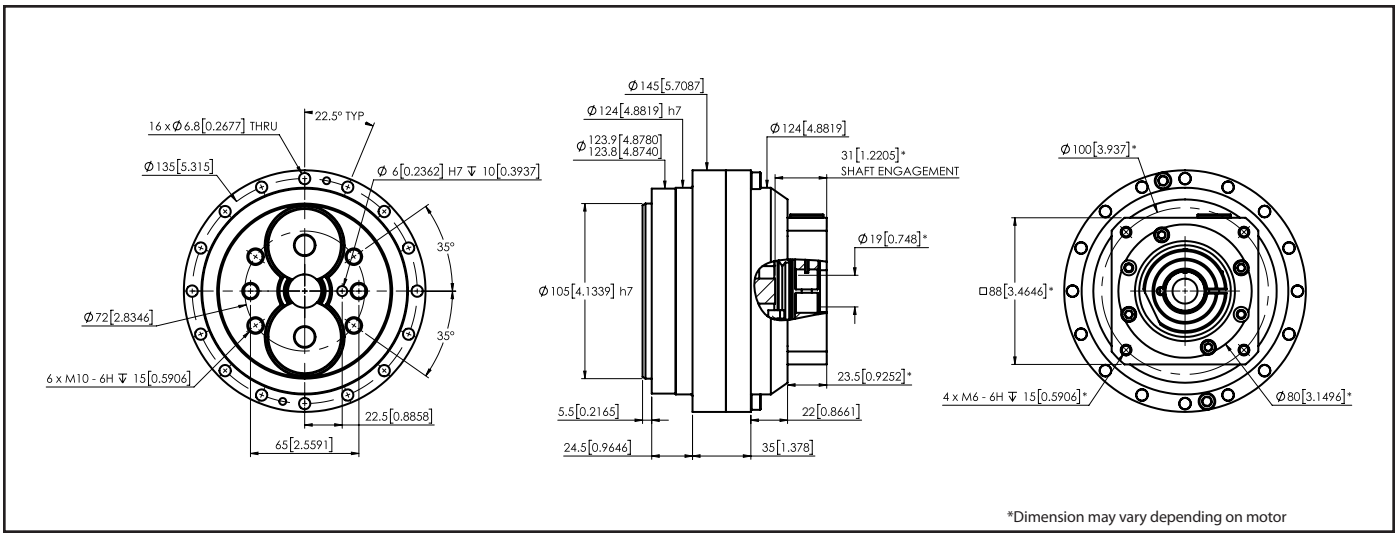
GCLC-H	Output Speed	050		120		200		320		400		500	
	RPM	Nm	kW	Nm	kW	Nm	kW	Nm	kW	Nm	kW	Nm	kW
Nominal Output Torque / Input Power	5	681	0.48	1634	1.14	2724	1.90	4361	3.04	5449	3.79	6811	4.75
	10	554	0.77	1328	1.85	2215	3.09	3538	4.94	4430	6.17	5537	7.73
	15	490	1.03	1176	2.46	1961	4.11	3136	6.57	3920	8.19	4900	10.26
	20	450	1.26	1079	3.00	1803	5.04	2881	8.05	3598	10.02	4489	12.56
	25	420	1.47	1009	3.51	1686	5.88	2690	9.41				
	30	398	1.67	955	3.99	1597	6.69						
	40	366	2.04	846	4.88								
	50	341	2.38										

GCLC-F / GCL-F Gearbox Dimensions

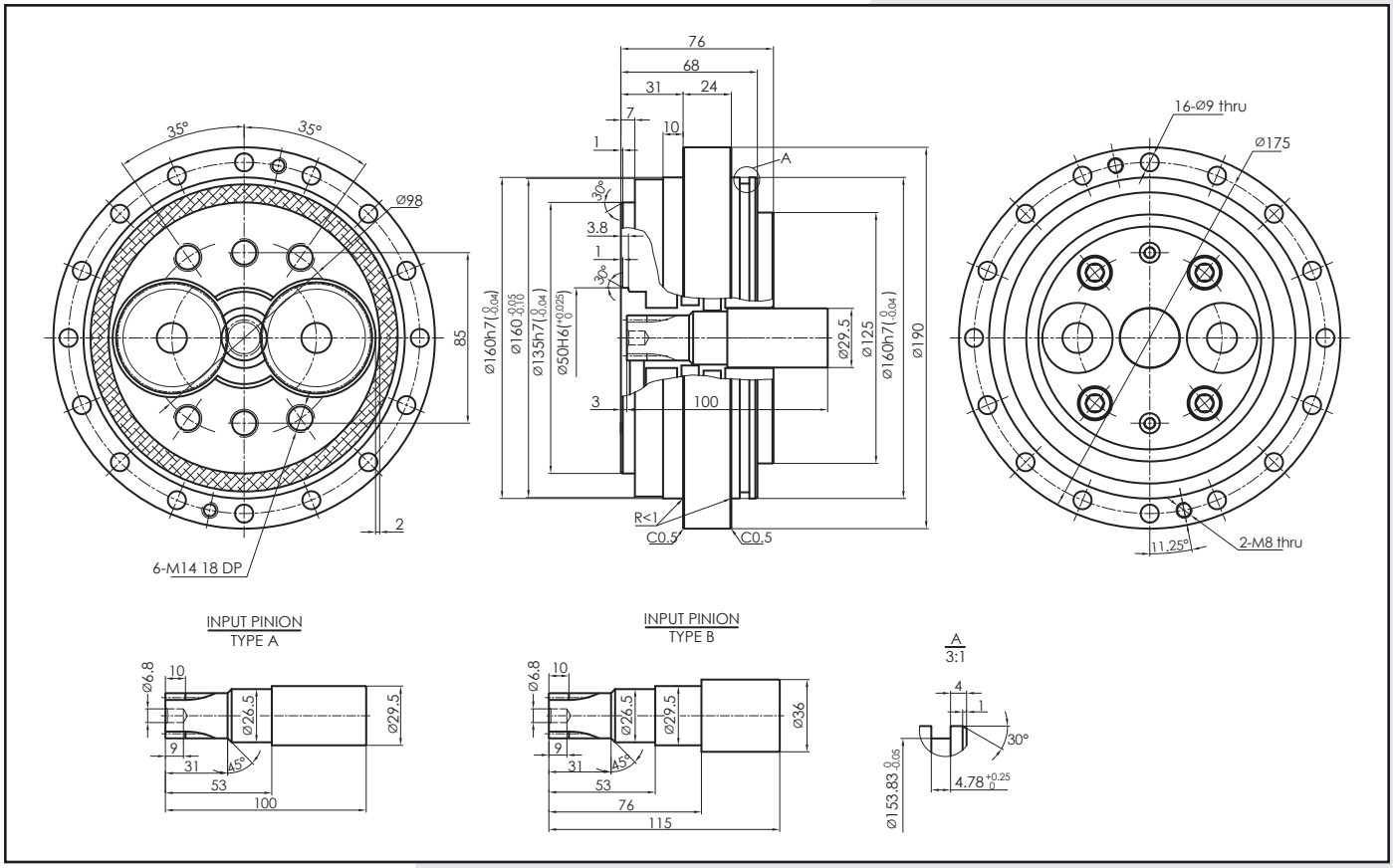
GCLC-F-020



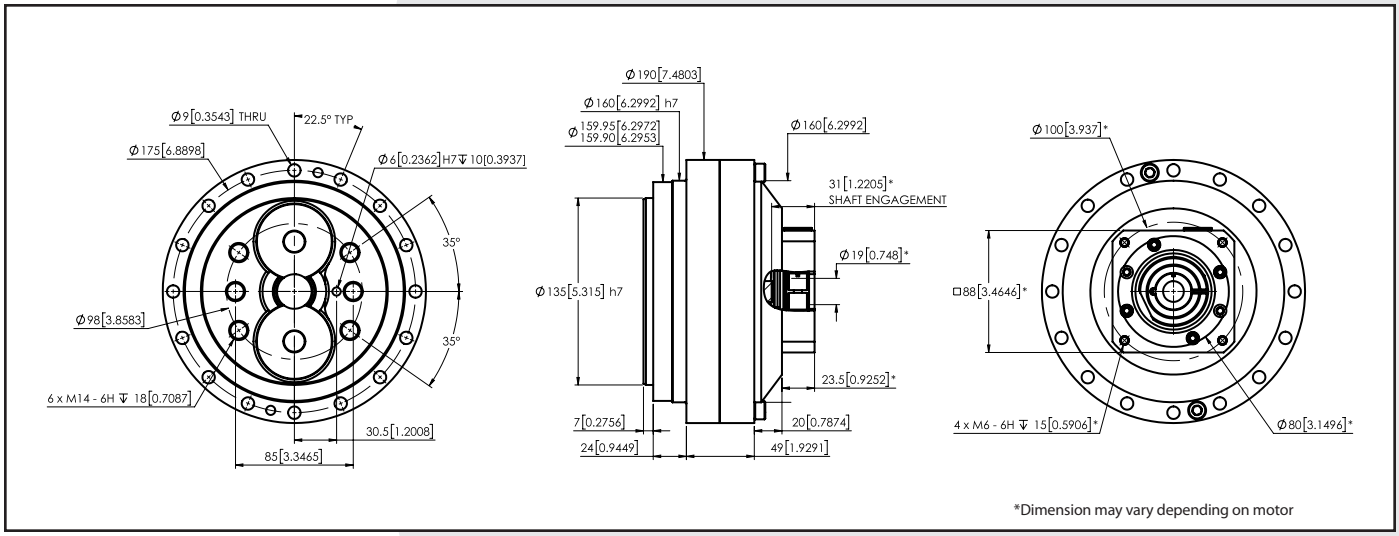
GCL-F-020



GCLC-F-040



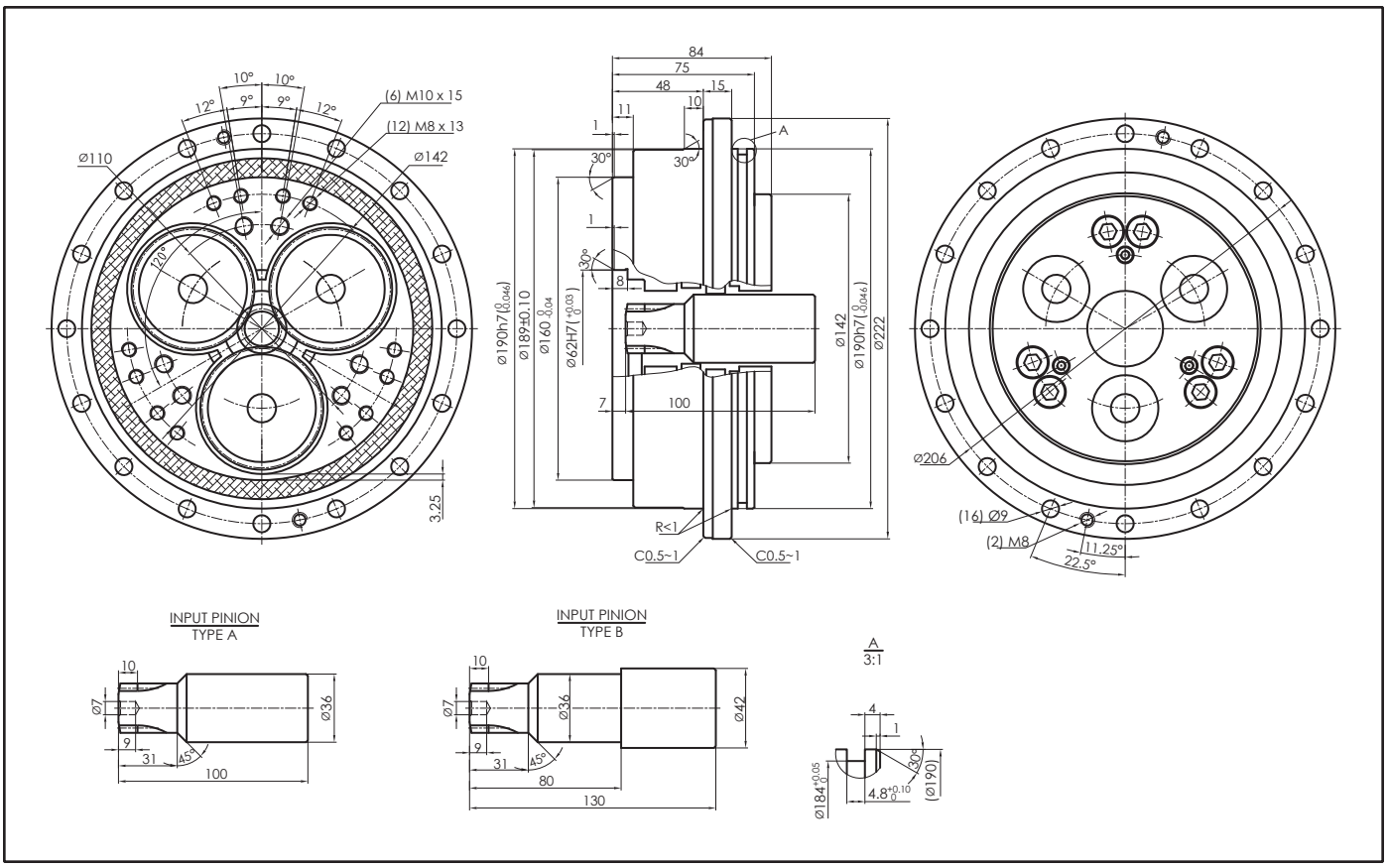
GCL-F-040



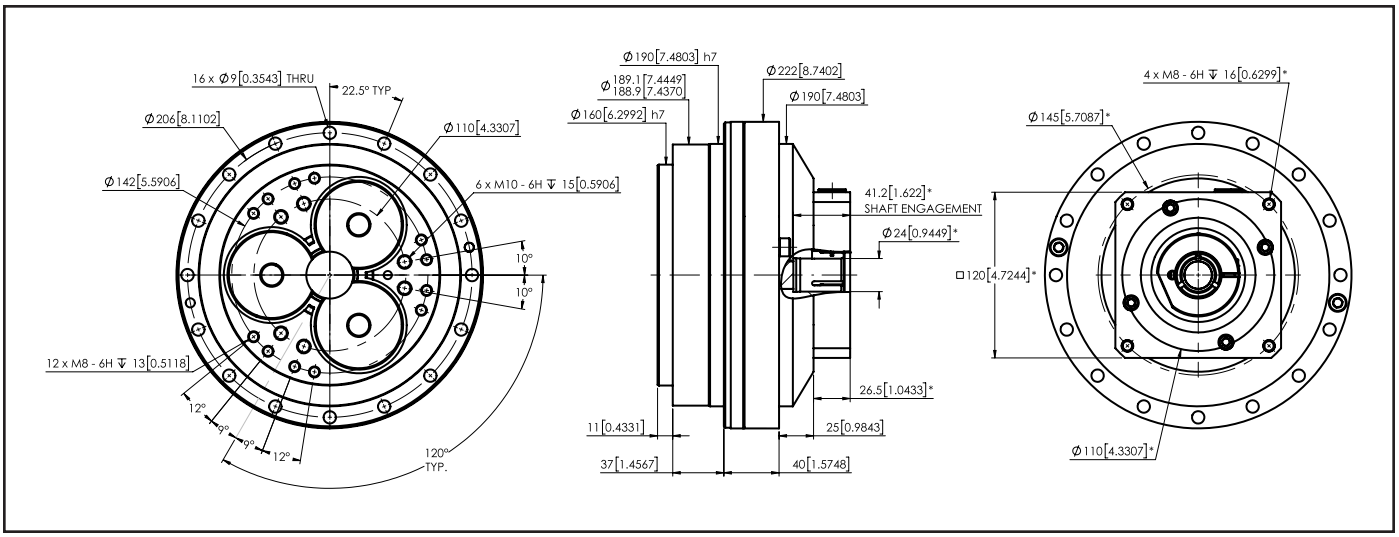
GCL

GCLC-F / GCL-F Gearbox Dimensions

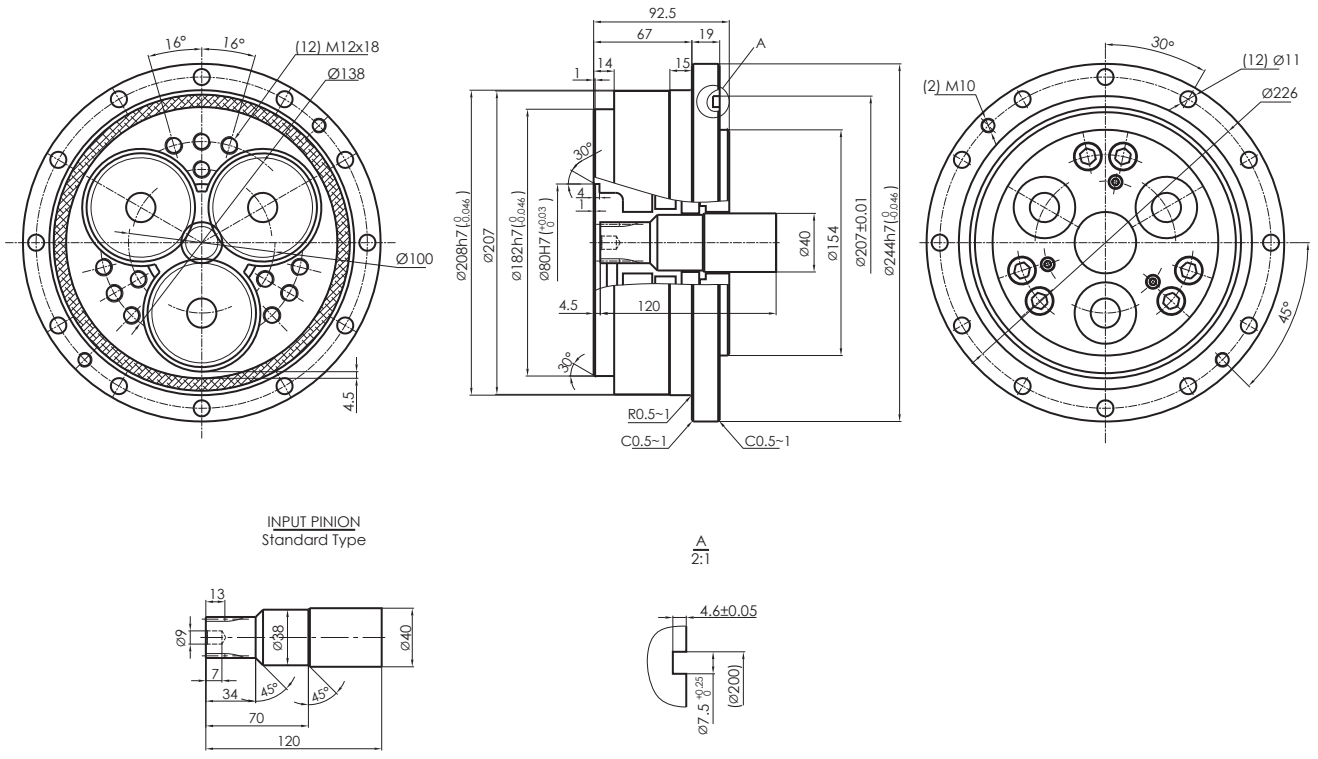
GCLC-F-080



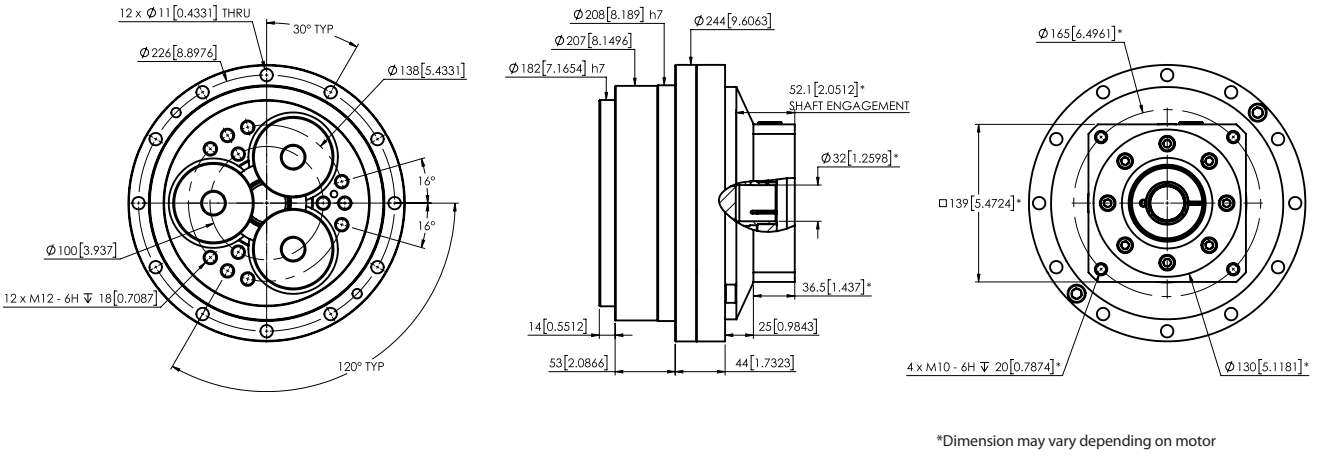
GCL-F-080



GCLC-F-110



GCL-F-110

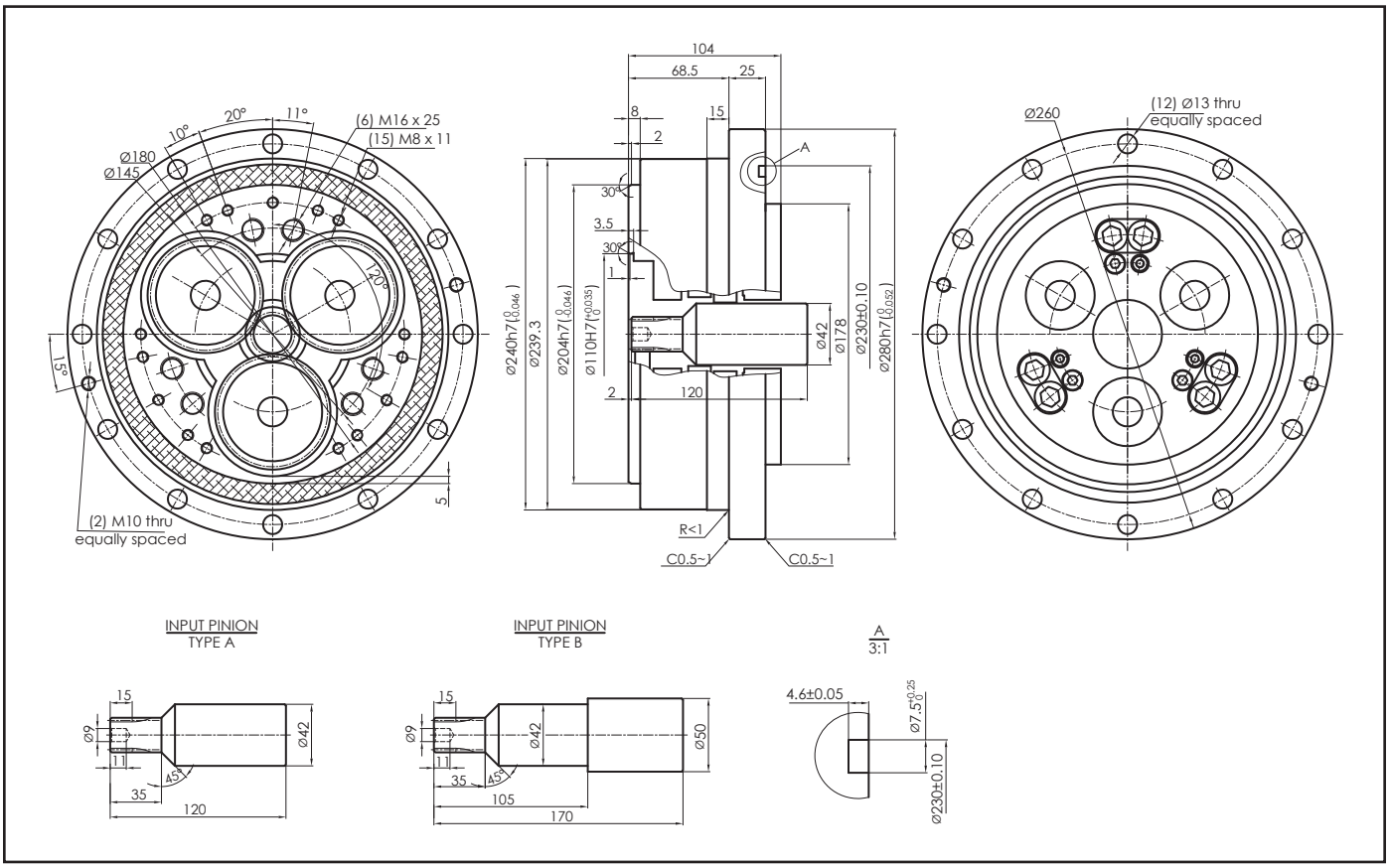


*Dimension may vary depending on motor

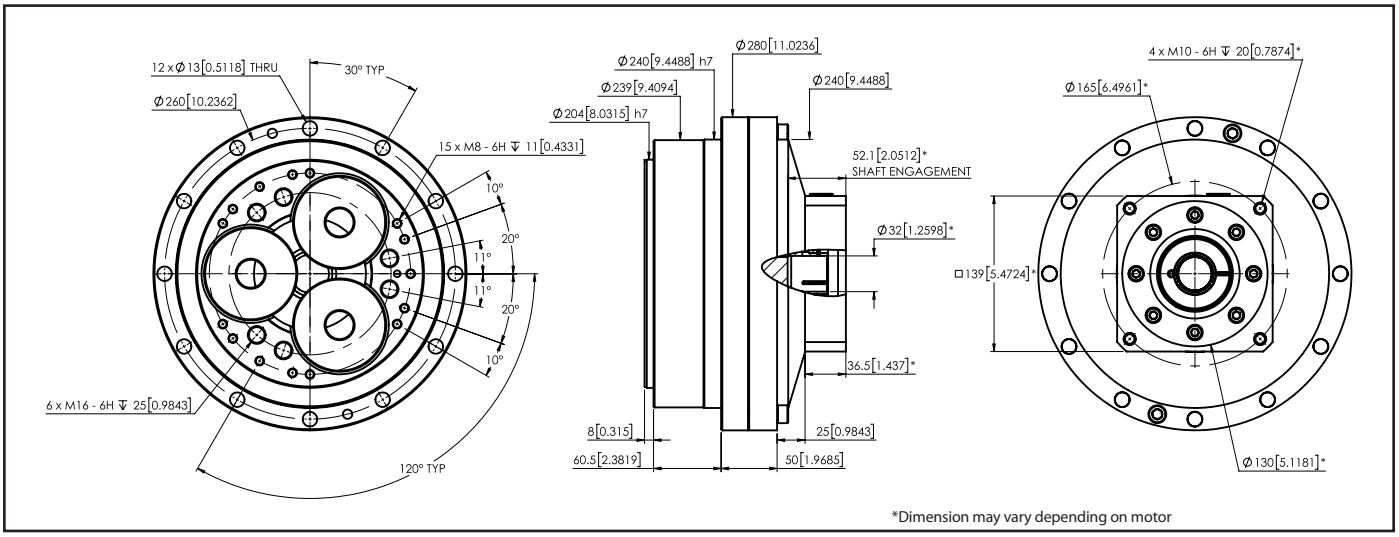
GCL

GCLC-F / GCL-F Gearbox Dimensions

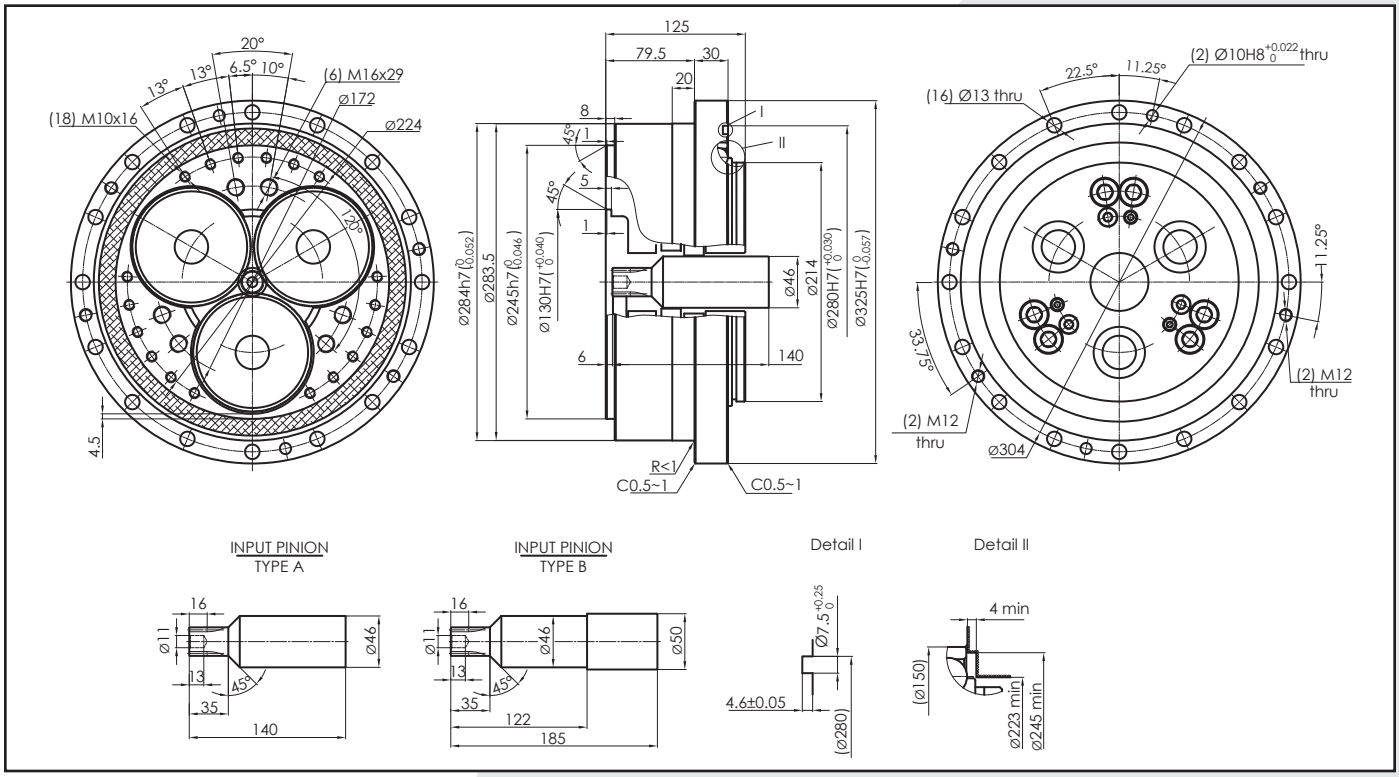
GCLC-F-160



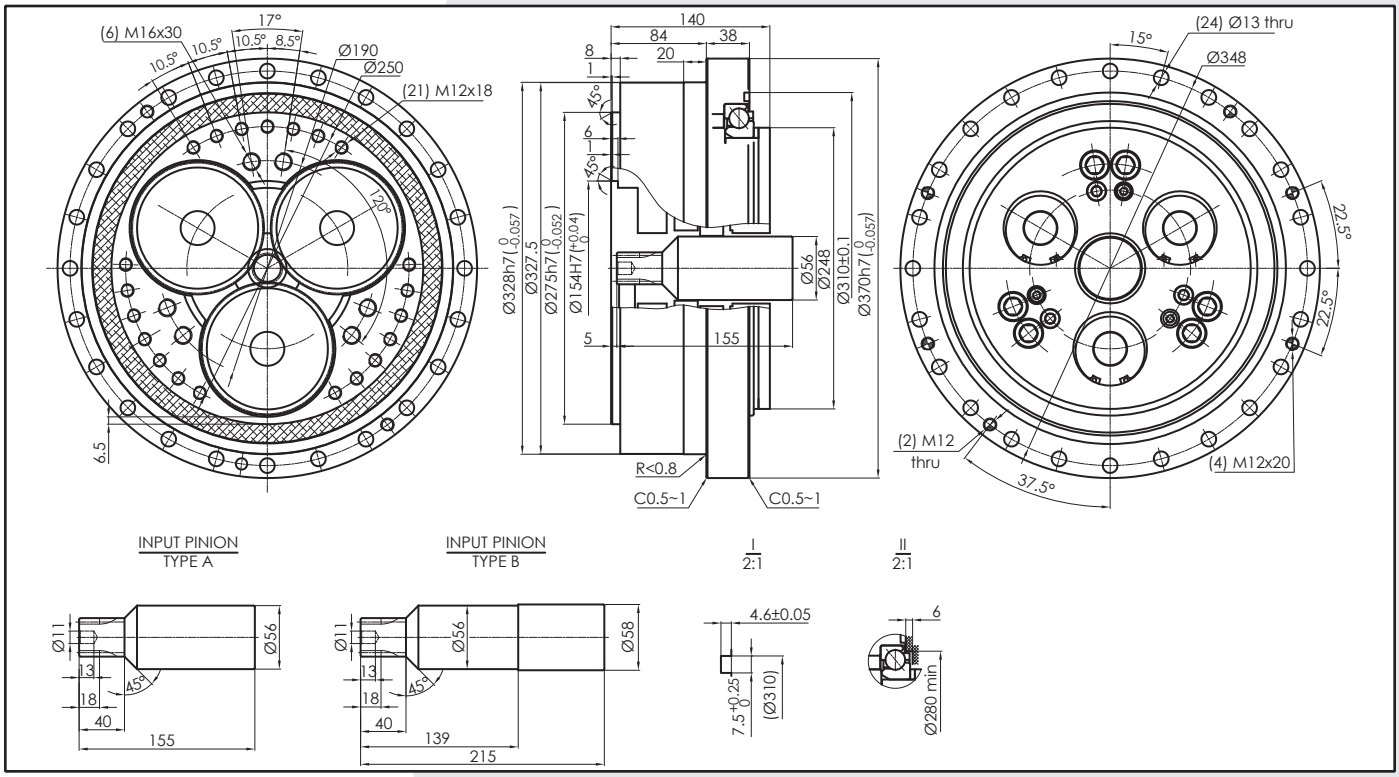
GCL-F-160



GCLC-F-320



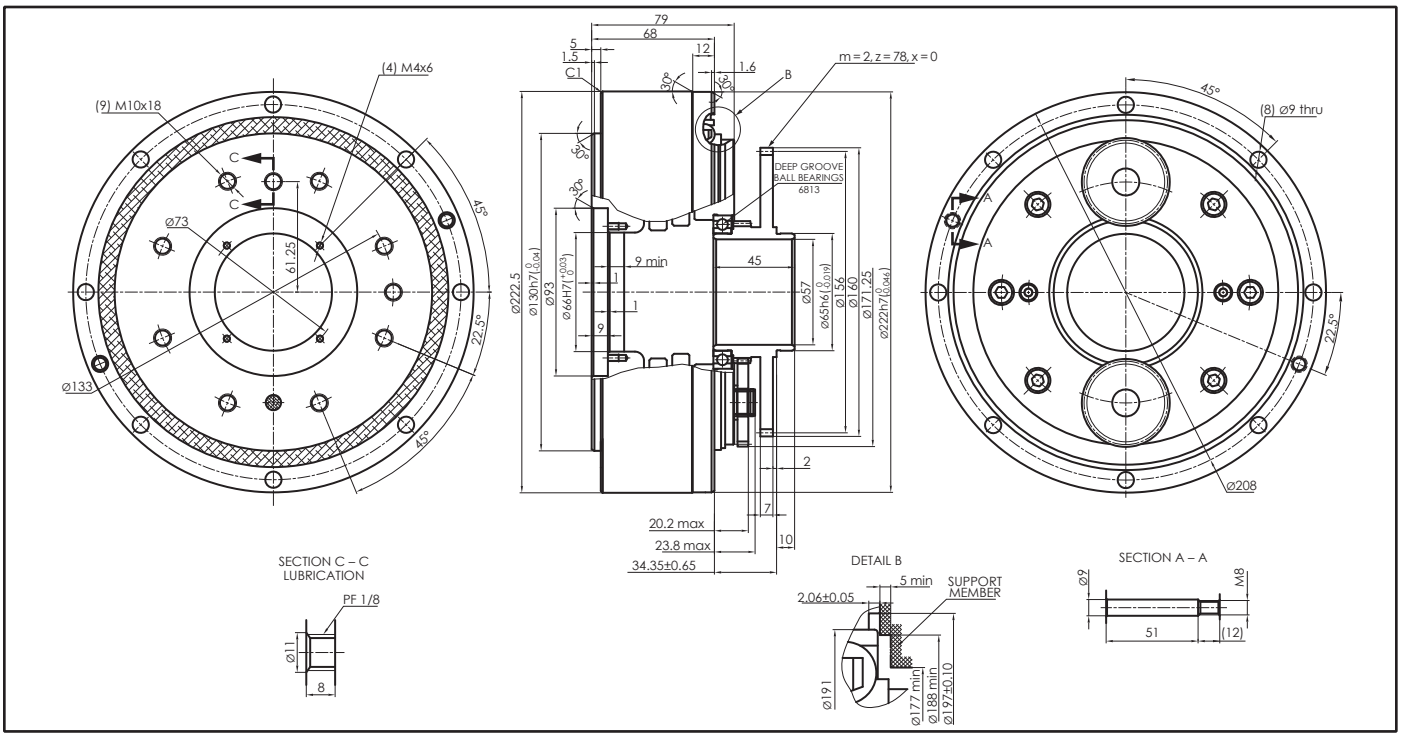
GCLC-F-450



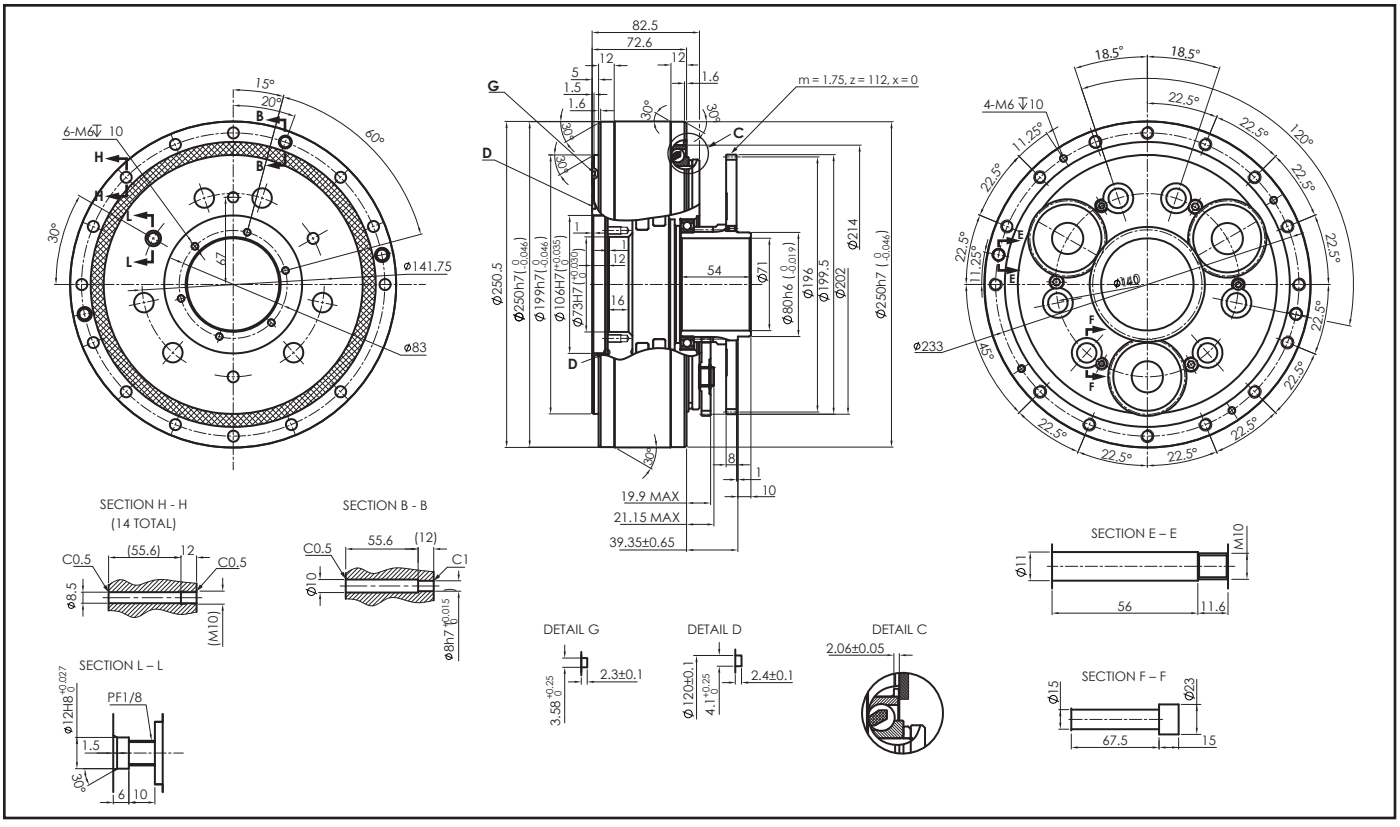
GCL

GCL-H Gearbox Dimensions

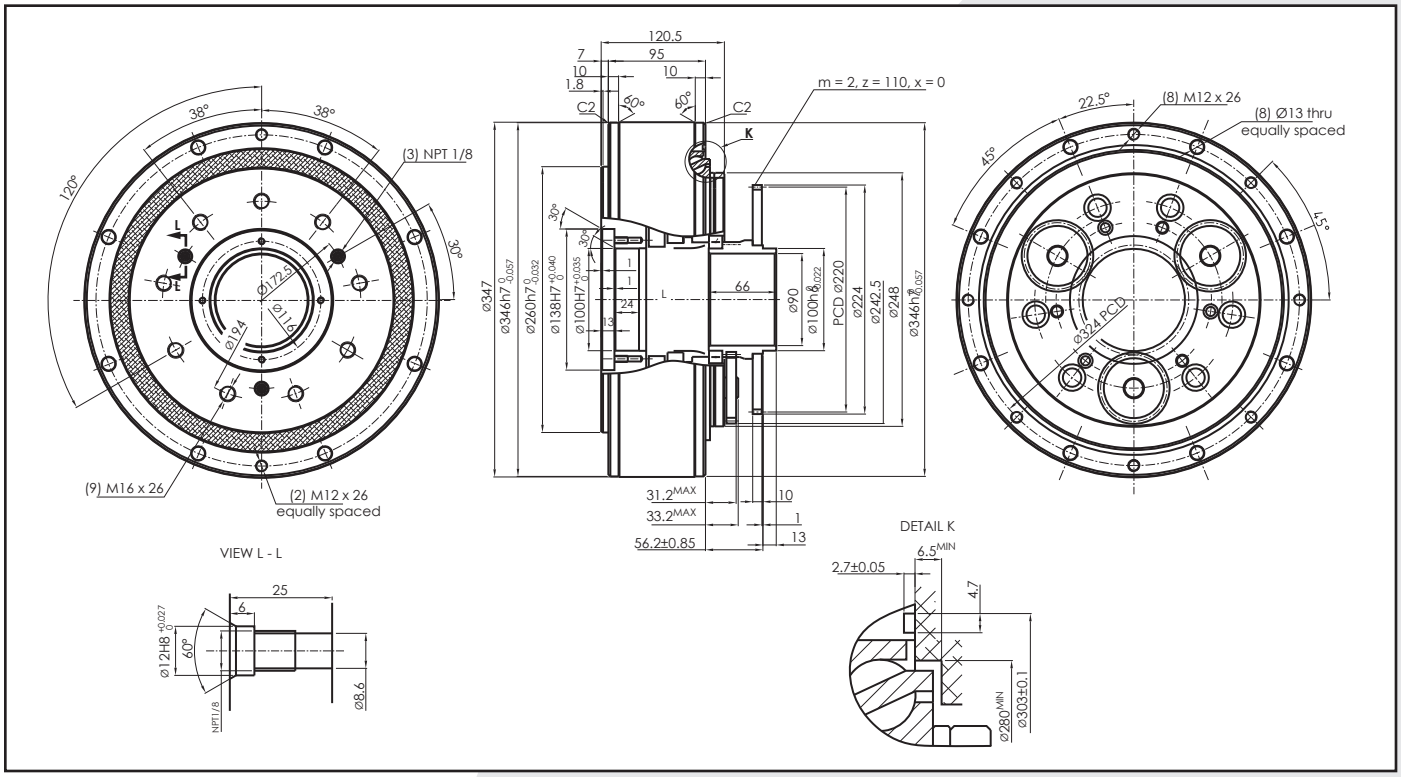
GCLC-H-050



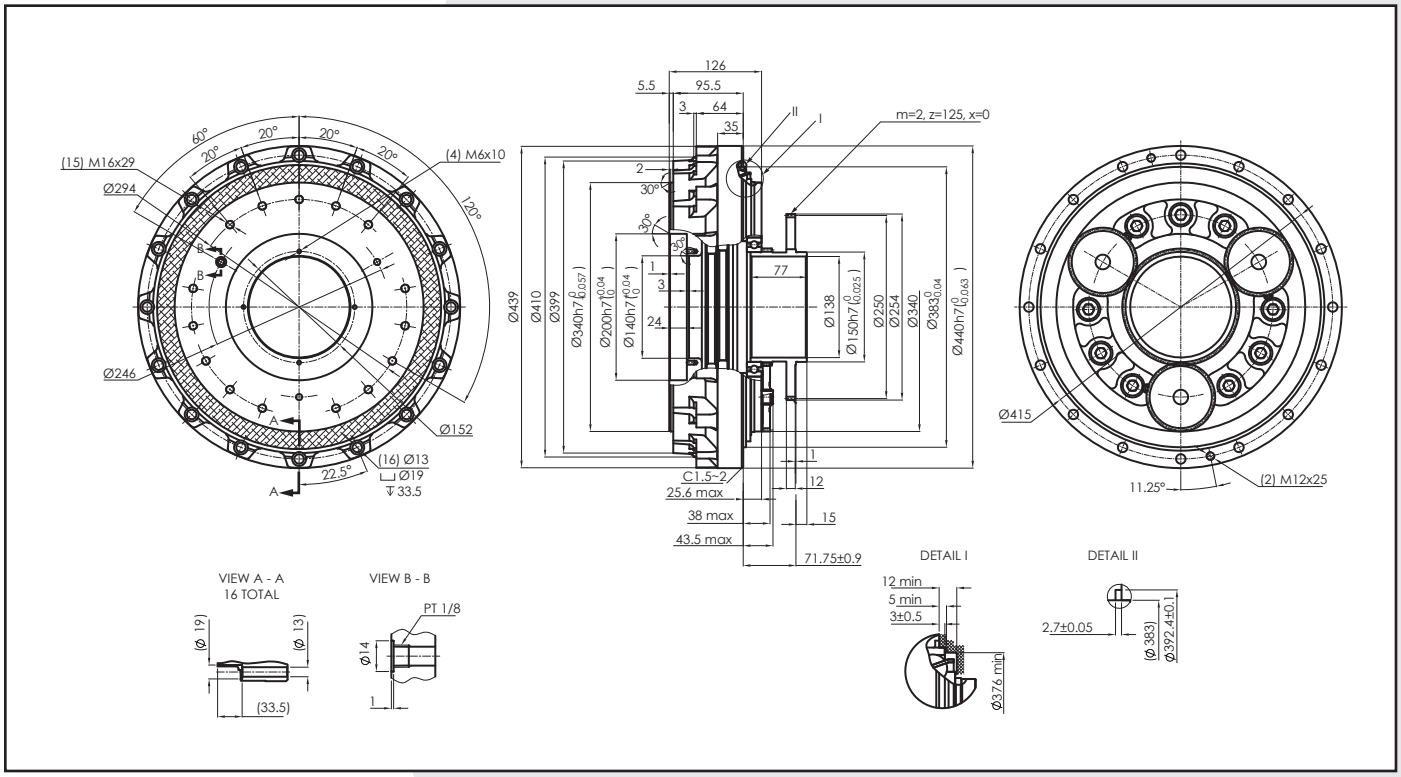
GCLC-H-120



GCLC-H-200

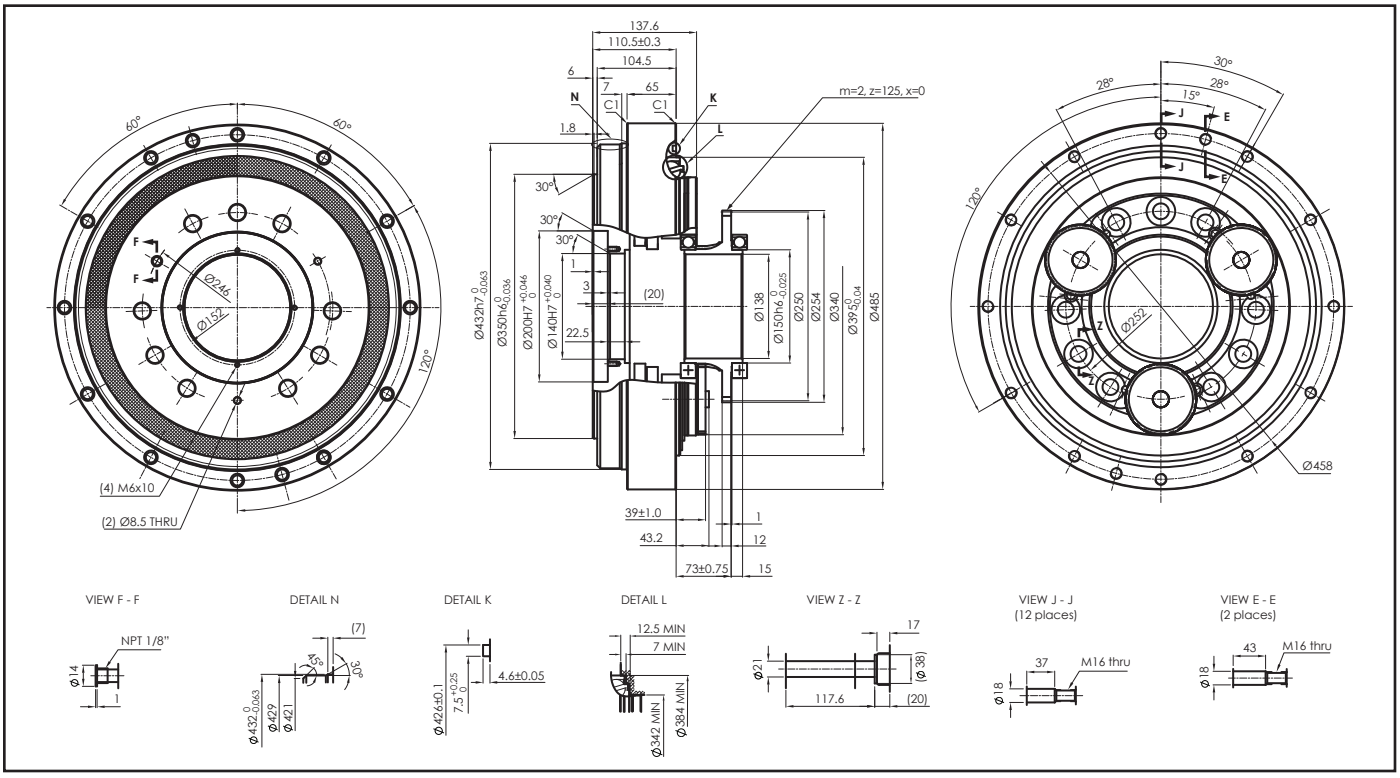


GCLC-H-320

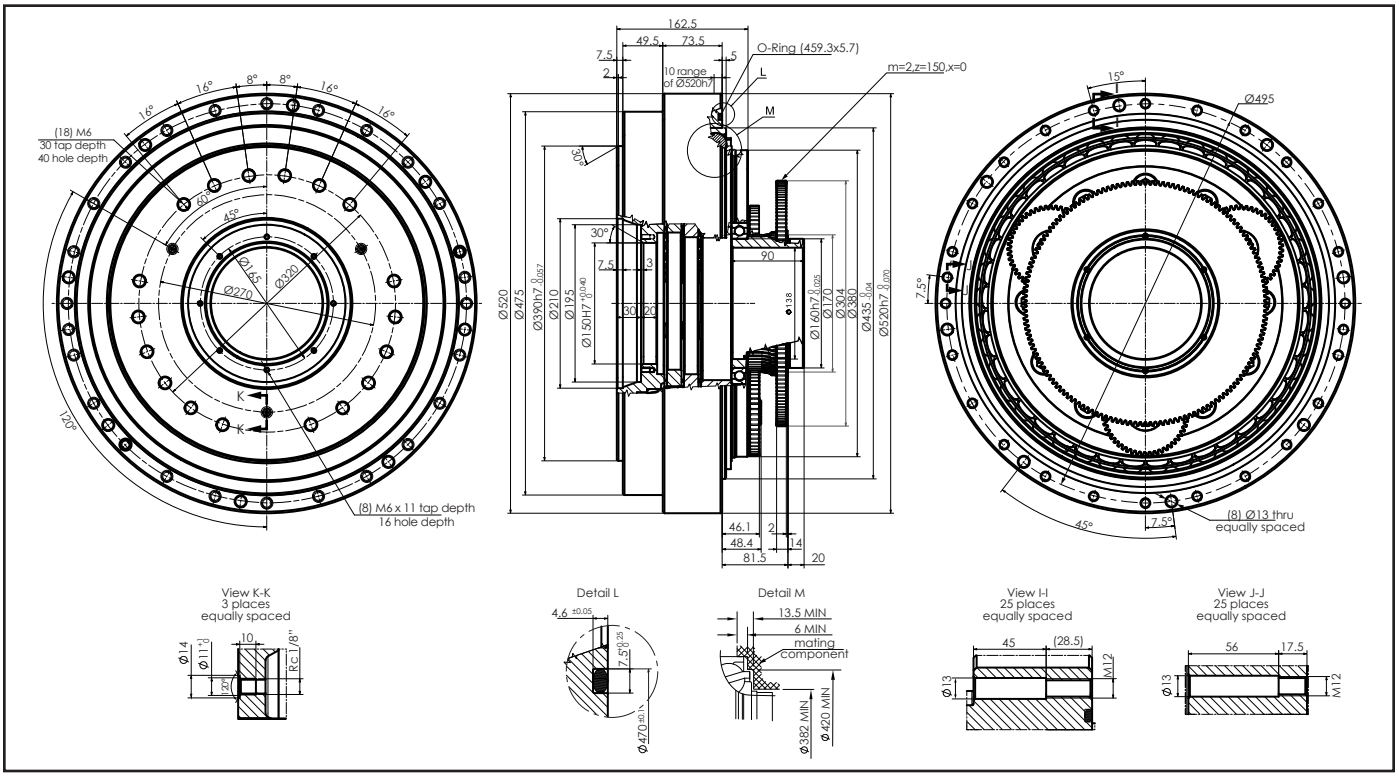


GCL-H Gearbox Dimensions

GCLC-H-400



GCLC-H-500



GCL Series Type Code & Mounting Options

TYPE CODES FOR GCL SERIES

Example: GCL - F - 080 - 121C - M0000 - H0000 - C0000

Gearbox Series
GCL = Inline with cover & integrated input (-F only)
GCLC = Inline component with loose input pinion

Gearbox Style
F = Solid Flange Output
H = Hollow Flange Output

Gearbox Size
F: 020, 040, 080, 110, 160, 320, 450
H: 050, 120, 200, 320, 400, 500

Ratio
See tables below for available ratios and associated type code values

Input Option (GCL-F Only)
C = Clamp

Motor Code
Assigned by GAM

Output Code
Assigned by GAM

Configuration Code
Assigned by GAM

GCL-F Ratios (R:1)

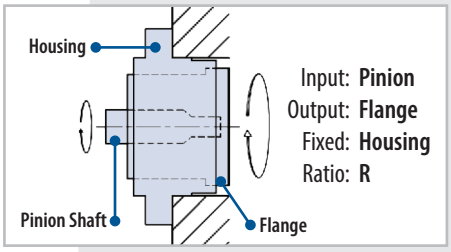
020		040		080		110		160		320		450	
Ratio	Type Code	Ratio	Type Code	Ratio	Type Code	Ratio	Type Code	Ratio	Type Code	Ratio	Type Code	Ratio	Type Code
57:1	057	57:1	057	57:1	057	81:1	081	81:1	081	81:1	081	81:1	081
81:1	081	81:1	081	81:1	081	111:1	111	101:1	101	101:1	101	101:1	101
105:1	105	105:1	105	101:1	101	161:1	161	129:1	129	118.5:1	119	129:1	129
121:1	121	121:1	121	121:1	121	175.28:1	175	145:1	145	129:1	129	153:1	153
141:1	141	153:1	153	153:1	153			171:1	171	141:1	141	171:1	171
161:1	161									153:1	153	192.4:1	192
										171:1	171	201:1	201
										185:1	185	210.23:1	210
										201:1	201	257.84:1	258

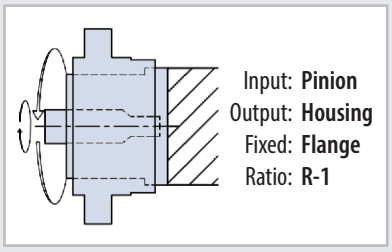
GCL-H Ratios (R:1)

050		120		200		320		320A		400		500	
Ratio	Type Code	Ratio	Type Code	Ratio	Type Code	Ratio	Type Code	Ratio	Type Code	Ratio	Type Code	Ratio	Type Code
32.54	033	36.75	037	34.86	035	35.61	036	35.61	036	35.61	036	37.34	037

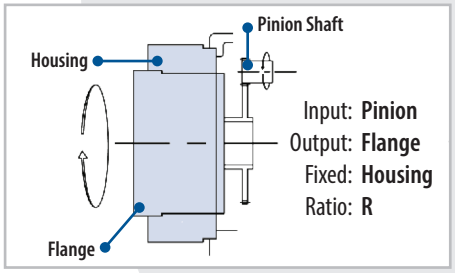
Mounting Options

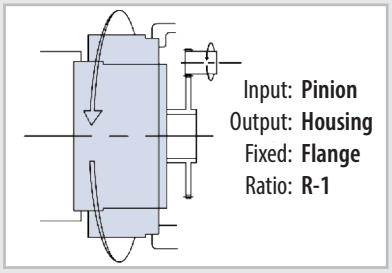
GCLC-F





GCLC-H





GCL

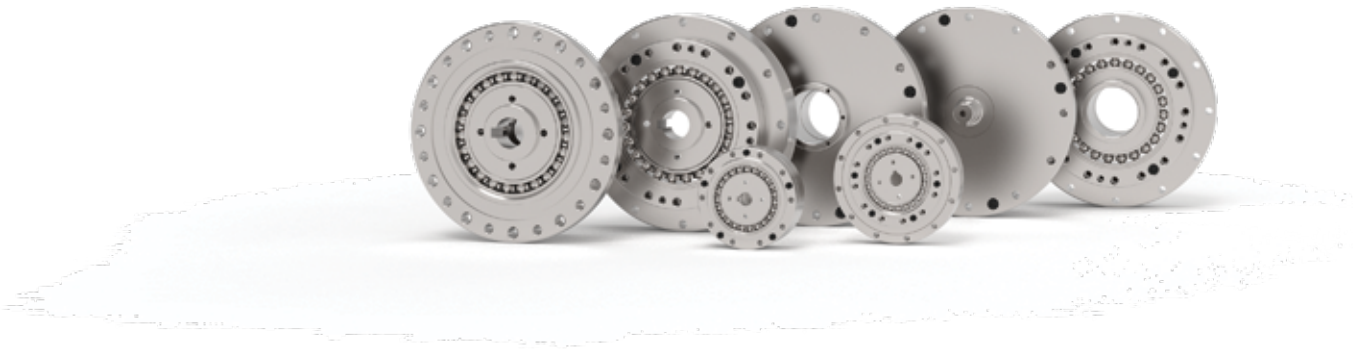
GSL Strain Wave Robotic Gearbox

Robotic Strain Wave Gearboxes

GAM's GSL Series Robotic Strain Wave Gearboxes employ harmonic gearing for zero-backlash and high torque in a small, lightweight gearbox.

With a simple design and multiple configurations, the GSL is easily integrated into precision robotic and motion control applications.

- Backlash of ≤0.5 arcmin (≤30 arcsec)
- Harmonic-type gearing
- High repeatability and positional accuracy for fine positioning
- High reduction ratios in a single stage: 50:1 to 160:1
- High torque density with low inertia
- Drops in for popular competitor gearboxes



Applications

The GSL can be used in a variety of applications with requirements such as:

- Zero-backlash and high positional accuracy
- Low profile, compact form-factor
- High torque ratio
- Full Integration into a mechanism or machine

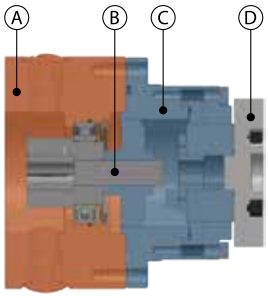
Applications include:

- Robot joints
- Antenna and solar panel positioning
- Autonomous robotic vehicle drives

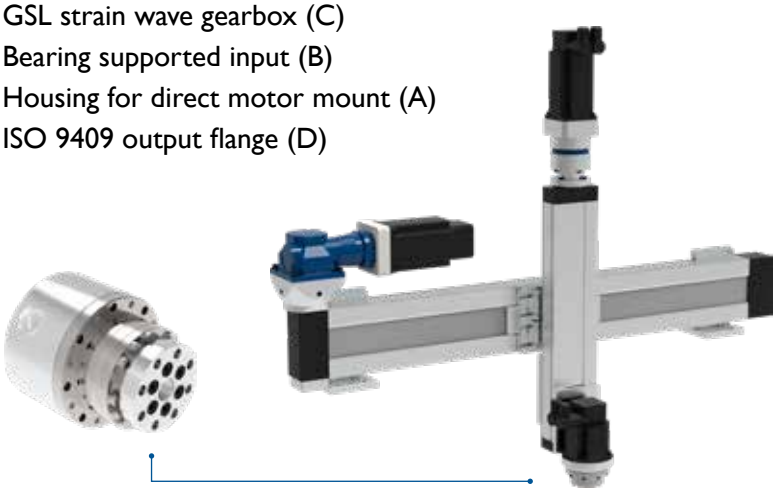
Applications

Robot Theta Axis (Wrist)

The GSL gearbox is easily integrated into a wrist application for a robot arm or cartesian system. To simplify integration,GAM can provide a sealed strain wave gearbox ready to mount into your application with:

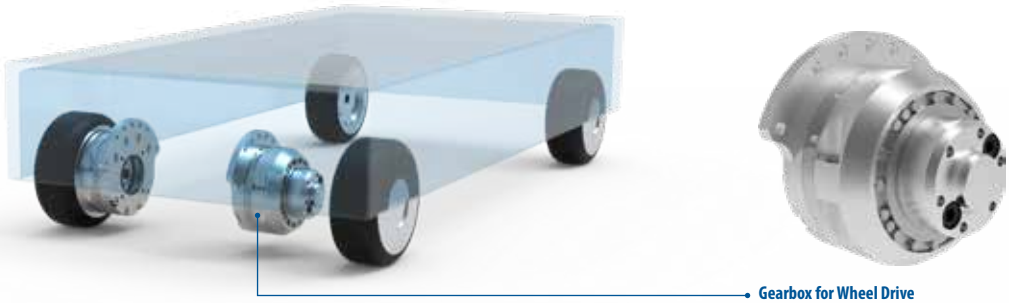


- GSL strain wave gearbox (C)
- Bearing supported input (B)
- Housing for direct motor mount (A)
- ISO 9409 output flange (D)



Automated Guided Vehicle (AGV) Wheel Drive

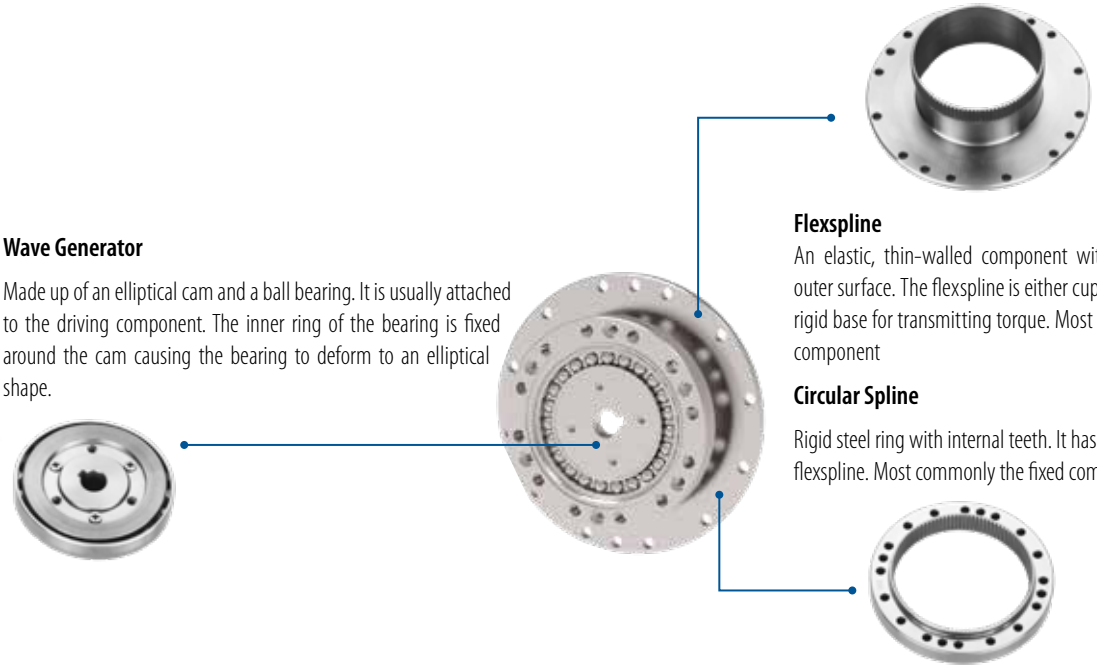
With high ratios and torque density in small size, the GSL is a ideal for the wheel drive on an AGV. And with GAM's engineering expertise, we can provide a custom housing for easy integration into the AGV.



Gearbox for Wheel Drive
GSL strain wave gearbox supplied with custom housing and output mount, manufactured to customer specifications, for easy integration

Strain Wave Operating Principle

Strain wave gear reducers have three basic components:



Wave Generator

Made up of an elliptical cam and a ball bearing. It is usually attached to the driving component. The inner ring of the bearing is fixed around the cam causing the bearing to deform to an elliptical shape.

Flexspline

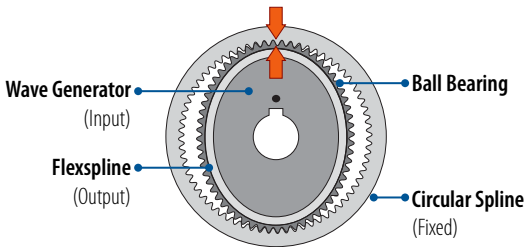
An elastic, thin-walled component with gear teeth on the outer surface. The flexspline is either cup or hat shaped, with a rigid base for transmitting torque. Most commonly the output component

Circular Spline

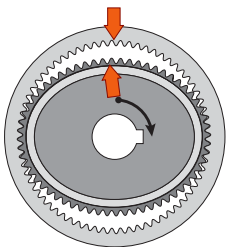
Rigid steel ring with internal teeth. It has 2 more teeth than the flexspline. Most commonly the fixed component.

Operation

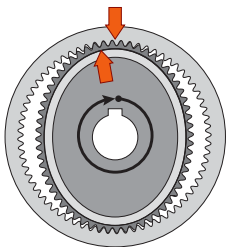
1. The Wave Generator mounts inside the Flexspline forcing the Flexspline into an elliptical shape.
2. The Flexspline teeth engage the Circular Spline teeth along the major axis of the ellipse of the Wave Generator. The Flexspline has two fewer teeth than the Circular Spline.
3. The rotation of the Wave Generator continuously deforms the Flexspline resulting in the teeth engaging and disengaging the teeth of the Circular Spline, rotating the Flexspline in the opposite direction
4. As the Wave Generator moves through 360°, since the Flexspline has two fewer teeth it "runs out" of teeth to engage with the Circular Spline before it gets to the first tooth and so moves two teeth in the opposite direction of the Wave Generator.
5. The distance (degrees) the Flexspline rotates depends on the reduction ratio: at 50:1 it moves 360/50 or 7.2°



At Input 0°:
Output at 0°



At Input 90° rotation clockwise:
Output has rotated ½ tooth counter-clockwise

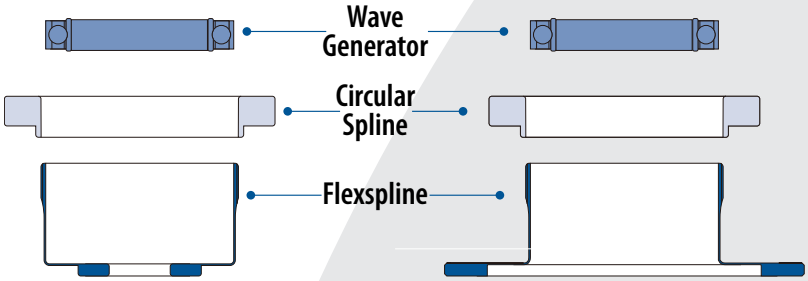


At Input 360° rotation clockwise:
Output has rotated 2 teeth counter-clockwise

GSL Operating Principle

GSL-C: Cup-Style

GSL-H: Hat-Style

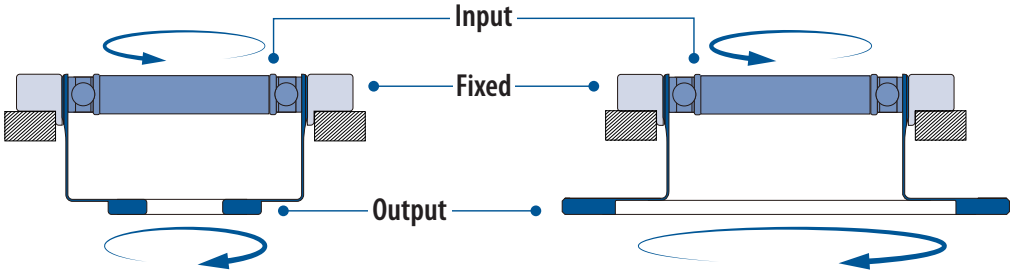


- Cup-shaped flexspline
- Smaller diameter
- Flange output eases mounting of pinions or shafts

- Hat-shaped flexspline
- Lower profile
- Rotating outer housing useful for AGV wheels or robot joints

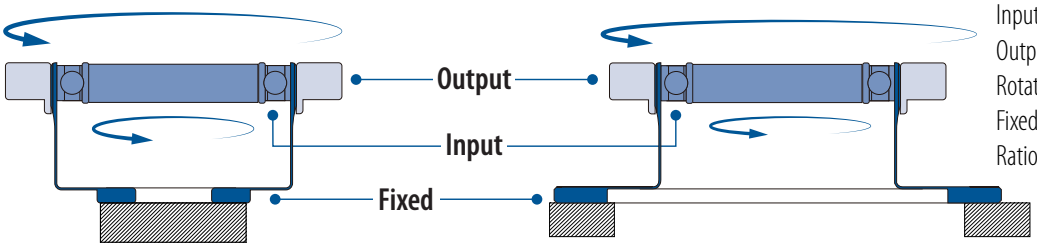
GSL Relative Rotation

Common Operation



Input	**Wave Generator**
Output	**Flexspline**
Rotation	**Opposite Direction**
Fixed	**Circular Spline**
Ratio	**Ratio, e.g. 50:1**

Alternate Operation



Input	**Wave Generator**
Output	**Circular Spline**
Rotation	**Same Direction**
Fixed	**Flexspline**
Ratio	**Ratio+1, e.g. 51:1**

GSL

GSL Gearbox Models

GSL-CS: Standard Profile (Cup)

- Cup-Style Flexspline
- Small diameter

GSL-CS-A/B

- Keyed input
- Optional Oldham coupling input (B)
- Frame sizes 014-032

Compact/Ultra-Low Profile

GSL-HT-A

- Ultra-low profile
- Keyed input
- Hat-style flexspline
- Frame sizes 014-017

GSL-CT-A

- Compact, low profile
- Keyed input
- Cup-style flexspline
- Frame sizes 014-017

GSL-CF-A

- Ultra-flat
- Flange mount
- Cup-style flexspline
- Frame sizes 011-014

GSL-HS: Standard Profile (Hat)

- Hat-Style Flexspline
- Low Profile

GSL-HS-A/B

- Keyed or set screw input
- Optional Oldham coupling input (B)
- Frame sizes 014-032

GSL-HS-C

- Hollow shaft input
- Frame sizes 014-040

GSL-HS-D

- Shaft input
- Frame sizes 014-032

GSL-HS-E

- Simplified hollow input
- Includes output bearing but no housing for more complete integration
- Frame sizes 014-032

GSLC Components

Includes wave generator, flexspline, and circular spline only for full integration into customer application

GSLC-CS

- Keyed input
- Cup-style flexspline

GSLC-HS

- Keyed input
- Hat-style flexspline

GSL Gearbox Type Codes

TYPE CODES FOR GSL-C SERIES

Example: GSL - CS - 025 - 050 - A - M0000 - H0000 - C0000

Gearbox Series GSL = With Housing
GSLC = Gearing Only

Gearbox Style C = Cup

Gearbox Profile S = Standard
T = Compact (014/017), F = Flange (011/014)

Gearbox Size 011, 014, 017, 020, 025, 032

Ratio 050, 080, 100, 120, 160 [:1]

Configuration Code (Assigned by GAM)

Output Code (Assigned by GAM)

Motor Code (Assigned by GAM)

Input Design
A = Keyed/Set Screw
B = Keyed/Set Screw with Oldham Coupling

Series	Style/ Profile	Frame Size	Ratio					Input
			50:1	80:1	100:1	120:1	160:1	
GSL, GSLC	CS	011	x	x	x			A
		014	x	x	x	x		A,B
		017	x	x	x	x		A, B
		020	x	x	x	x	x	A, B
		025	x	x	x	x		A, B
		032	x	x	x	x		A, B
GSL	CT	014	x	x	x			A
		017	x	x	x			A
GSL	CF	011	x	x	x			A
		014	x	x	x			A

TYPE CODES FOR GSL -H SERIES

Example: GSL - HS - 025 - 050 - A - M0000 - H0000 - C0000

Gearbox Series GSL = With Housing
GSLC = Gearing Only

Gearbox Style H = Hat

Gearbox Profile S = Standard
T = Compact Low Profile

Gearbox Size 014, 017, 020, 025, 032, 040

Ratio 050, 080, 100, 120, 160 [:1]

Configuration Code (Assigned by GAM)

Output Code (Assigned by GAM)

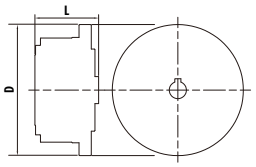
Motor Code (Assigned by GAM)

Input Design
A = Keyed/Set Screw
B = Keyed/Set Screw with Oldham Coupling
C = Hollow Shaft
D = Shaft Input
E = Basic with Hollow

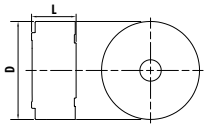
Series	Style/ Profile	Frame Size	Ratio					Input
			50:1	80:1	100:1	120:1	160:1	
GSL, GSLC	HS	014	x	x	x			A, B, C, D,E
		017	x	x	x			A, B, C, D,E
		020	x	x	x	x	x	A, B, C, D,E
		025	x	x	x	x		A, B, C, D,E
		032	x	x	x			A, B, C, D,E
		040			x			C
GSL	HT	014	x	x	x			A
		017	x					A

GSL

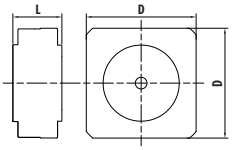
GSL-CS/CT/CF Technical Specifications



GSL-CS



GSL-CT



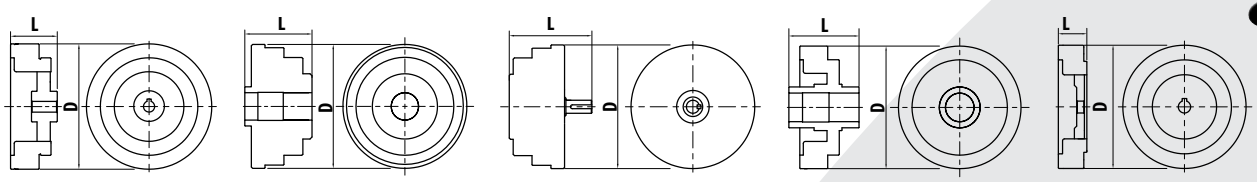
GSL-CF

Gearbox Style			GSL-CS						GSL-CT		GSL-CF	
Frame Size		Input	011*	014	017	020	025	032	014	017	011*	014
Overall Diameter (D)	mm	A-B	52	72	79	93	107	138	55	62	60 square	75 square
Overall Length (L)	mm	A-B	34	41	45	45.5	52	62	25	26.5	27	33.5
Weight	kg	A-B	0.2	0.22	0.30	0.38	0.6	1.1	0.35	0.45	0.3	0.6
Inertia	$kgcm^2$	A-B	0.015	0.033	0.079	0.193	0.413	1.69	0.021	0.054	0.015	0.040
Nominal Torque	Nm	50:1	5.5	6.9	26	34	55	108	4.8	18	-	6.9
		80:1	8.0	11	27	47	87	167	5.9	21	8	11
		100:1	8.9	11	39	49	108	216	7.7	27	8.9	11
		120:1	-	11	39	49	108	216	-	-	-	-
		160:1	-	-	-	49	-	-	-	-	-	-
Acceleration Torque	Nm	50:1	8.3	18	34	56	98	216	12	23	-	18
		80:1	9.9	23	43	74	137	304	16	30	9.9	23
		100:1	11	28	54	82	157	333	19	37	11	28
		120:1	-	28	54	87	167	353	-	-	-	-
		160:1	-	-	-	92	-	-	-	-	-	-
Emergency Stopping Torque	Nm	50:1	17	35	70	98	186	382	24	48	-	35
		80:1	22.5	47	87	127	255	568	31	58	22.5	47
		100:1	25	54	108	147	284	647	35	71	25	54
		120:1	-	54	86	147	304	686	-	-	-	-
		160:1	-	-	-	147	-	-	-	-	-	-
Rated Torque at 2000 rpm Input Speed	Nm	50:1	3.5	5.4	16	25	39	76	3.7	11	-	5.4
		80:1	4.5	7.8	22	34	63	118	4.2	14	4.5	7.8
		100:1	5.0	7.8	24	40	67	137	5.4	16	5.0	7.8
		120:1	-	7.8	24	40	67	137	-	-	-	-
		160:1	-	-	-	40	-	-	-	-	-	-
Average Allowable Input Speed		RPM	3000						3500		3500	
Maximum Input Speed		RPM	8500	7000	6500	5600	4800	4000	8500	7300	8500	8500
Bending Moment		Nm	-	20	30	42	80	220	20	30	-	-
Radial Load		N	-	180	230	270	440	900	180	230	-	-
Axial Load		N	-	180	230	270	440	900	180	230	-	-
Backlash**		arcsec	≤30						≤20		≤20	
Life		hours	15,000						10,000**		7,000	10,000

**GSL-CS and GSL-CF size 011 available with input A only. **Life for 50:1 = 9,000*

*** See page 224 for definition*

GSL-HS/HT Technical Specifications



GSL-HS-A/B GSL-HS-C GSL-HS-D GSL-HS-E GSL-HT

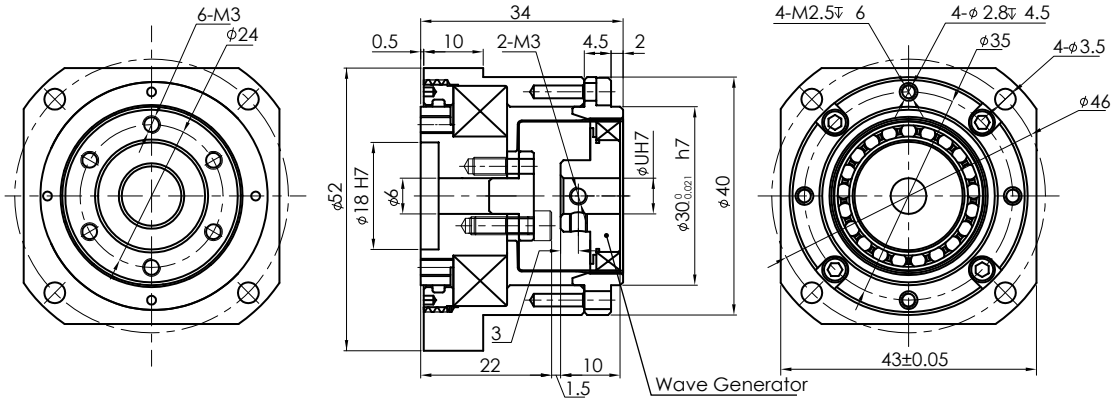
Gearbox Style			GSL-HS						GSL-HT	
Frame Size		**Input**	**014**	**017**	**020**	**025**	**032**	**040***	**014**	**017**
Overall Diameter	mm	A-B-E	70	80	90	110	142	-	70	80
		C-D	74	84	95	115	147	175	-	-
Overall Length	mm	A-B	28.5	32.5	33.5	37	37	44	17.5	18.5
		C-E	52.5	56.5	51.5	55.5	65.5	79	-	-
		D	50.5	56	63.5	72.5	84.5	-	-	-
Weight	kg	A-B	0.39	0.56	0.73	1.23	2.54	-	0.35	0.45
		C	0.71	0.98	1.34	2.04	4.2	7.2	-	-
		D	0.66	0.9	1.28	1.99	4.1	-	-	-
		E	0.55	0.7	0.98	1.5	3.15	-	-	-
Inertia	$kgcm^2$	A-B	0.015	0.033	0.079	0.193	0.413	-	0.021	0.054
		C	0.091	0.193	0.404	1.07	2.85	9.28	-	-
		D	0.025	0.059	0.137	0.32	1.2	-	-	-
		E	0.091	0.193	0.404	1.07	2.85	-	-	-
Nominal Torque	Nm	50:1	6.9	26	34	55	108	196	4.8	18
		80:1	11	27	47	87	167	284	6.2	21
		100:1	11	39	49	108	216	372	727	27
		120:1	11	39	49	108	216	451	-	-
		160:1	-	-	49	-	-	-	-	-
Acceleration Torque	Nm	50:1	18	34	56	98	216	402	12	23
		80:1	23	43	74	137	304	519	15	29
		100:1	28	54	82	157	333	568	19	37
		120:1	28	54	87	167	353	617	-	-
		160:1	-	-	92	-	-	-	-	-
Emergency Stopping Torque	Nm	50:1	35	70	98	186	382	686	23	48
		80:1	47	87	127	255	568	980	29	54
		100:1	54	110	147	284	647	1080	35	71
		120:1	54	86	147	304	686	1180	-	-
		160:1	-	-	147	-	-	-	-	-
Rated Torque at 2000 rpm Input Speed	Nm	50:1	5.4	16	25	39	76	137	3.7	11
		80:1	7.8	22	34	63	118	206	5.1	14
		100:1	7.8	24	40	67	137	265	5.4	16
		120:1	7.8	24	40	67	137	294	-	-
		160:1	-	-	40	-	-	-	-	-
Average Allowable Input Speed		RPM	3,000						3500	
Maximum Input Speed		RPM	7000	6500	5600	4800	4000	400	8500	7300
Bending Moment		Nm	41	72	140	243	460	600	41	59
Radial Load		N	270	400	650	900	1350	2000	270	330
Axial Load		N	270	400	650	900	1350	2000	270	330
Backlash ***		arcsec	≤30						≤20	
Life		hours	15,000						10,000**	

*GSL-HS size 040 available with C input only. **Life for 50:1 = 9,000 hours *** See page 224 for definitions

GSL

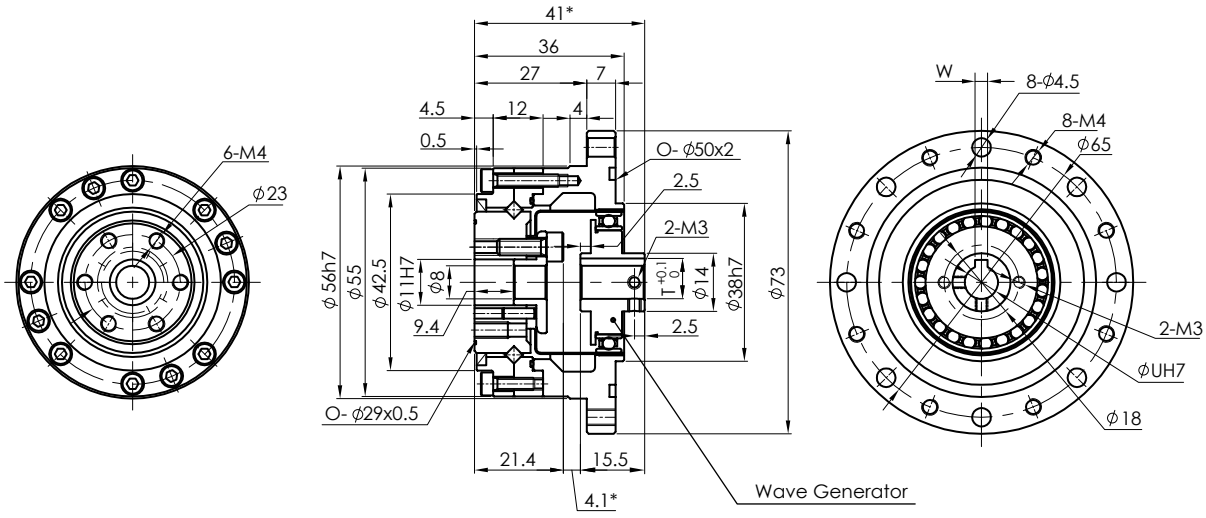
GSL-CS-A Dimensions

GSL-CS-011-A



Wave Generator Bore Dimensions (mm)	U
Standard Bores	5
	6
Available Bores	3 - 8

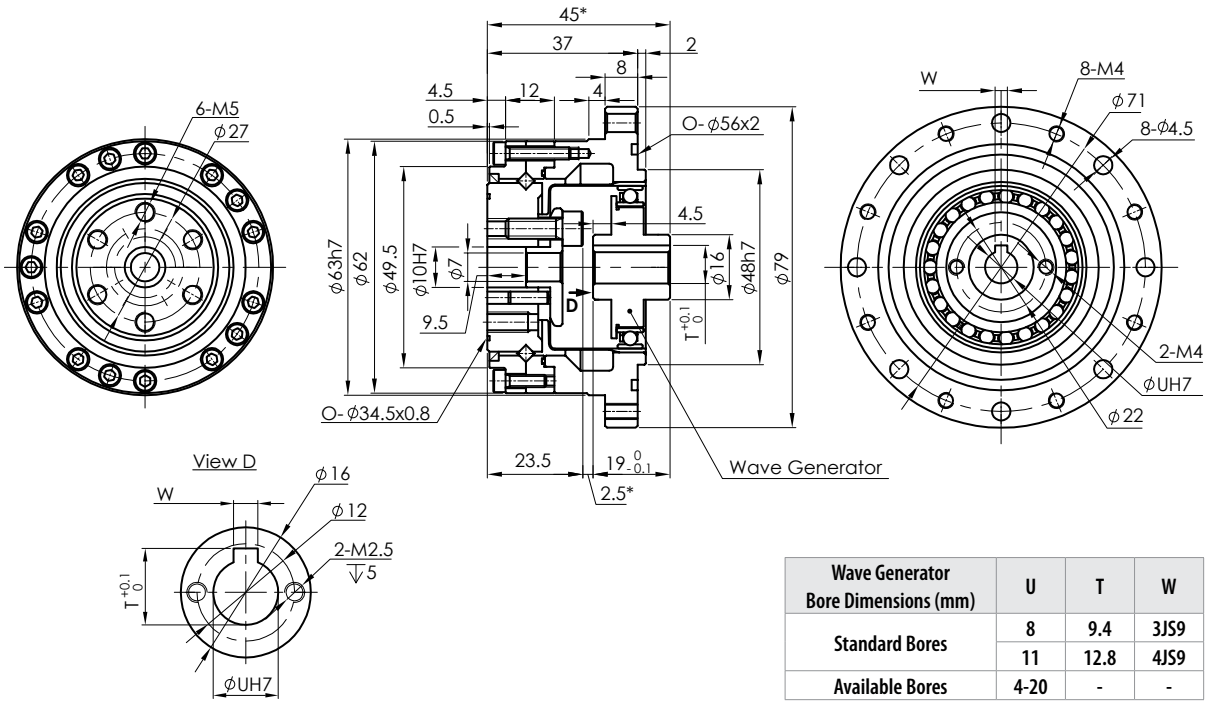
GSL-CS-014-A



Wave Generator Bore Dimensions (mm)	U	T	W
Standard Bores	6	7	2JS9
	8	9.4	3JS9
Available Bores	3 - 17	-	-

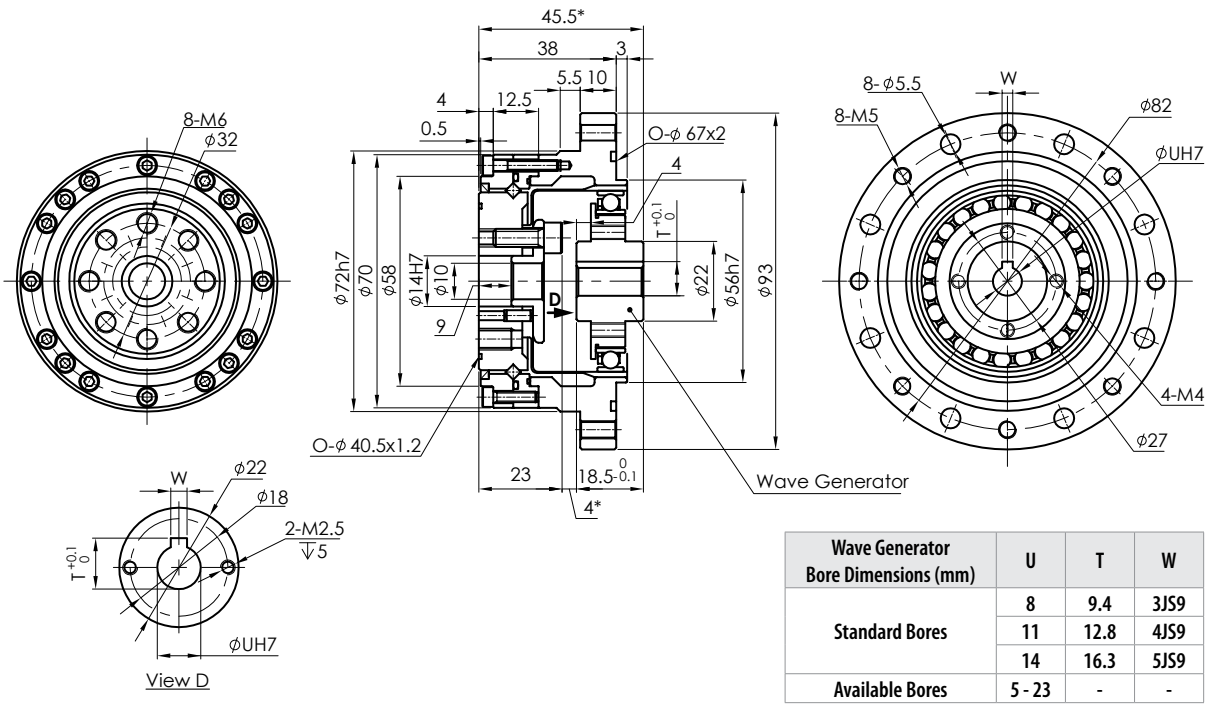
GSL-CS-A Dimensions

GSL-CS-017-A



Wave Generator Bore Dimensions (mm)	U	T	W
Standard Bores	8	9.4	3JS9
	11	12.8	4JS9
Available Bores	4-20	-	-

GSL-CS-020-A

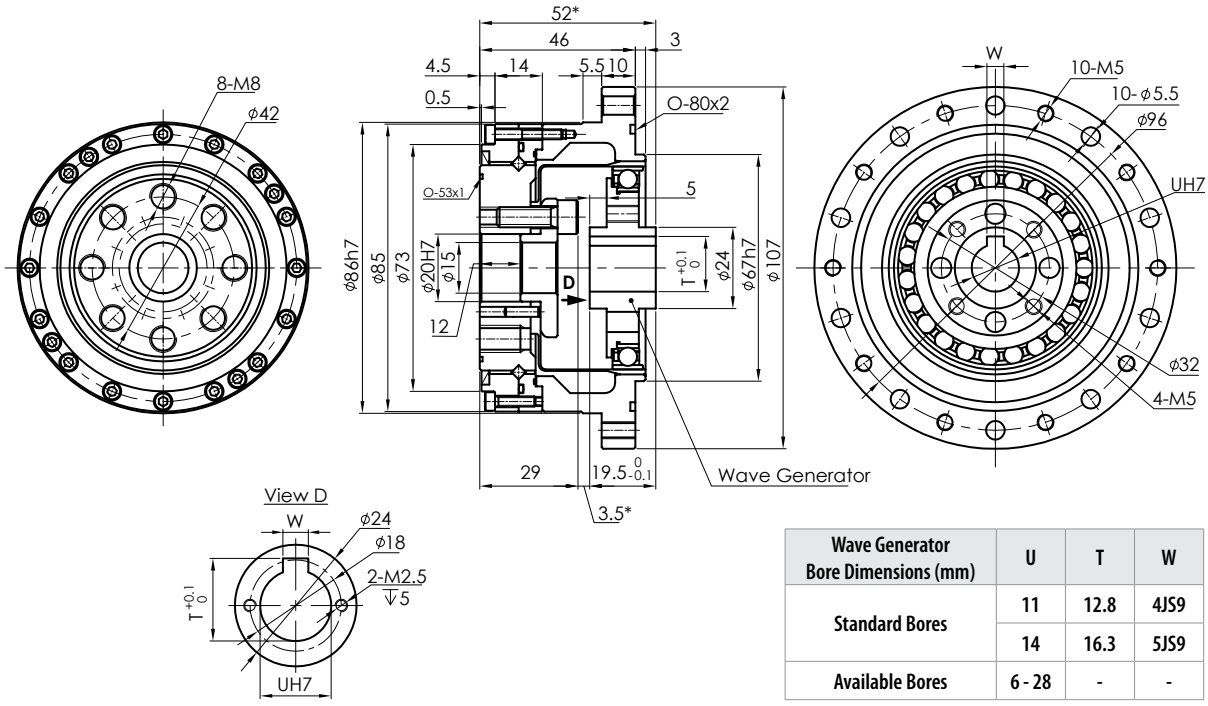


Wave Generator Bore Dimensions (mm)	U	T	W
Standard Bores	8	9.4	3JS9
	11	12.8	4JS9
	14	16.3	5JS9
Available Bores	5 - 23	-	-

GSL

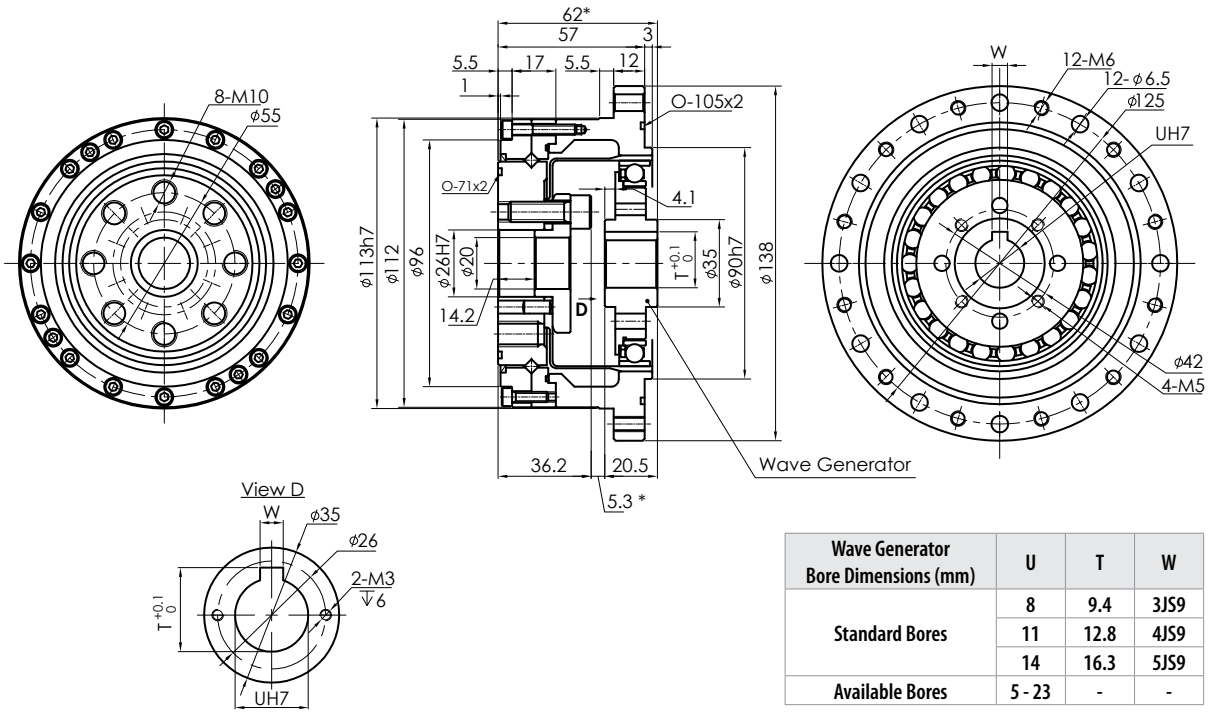
GSL-CS-A Dimensions

GSL-CS-025-A



Wave Generator Bore Dimensions (mm)	U	T	W
Standard Bores	11	12.8	4JS9
	14	16.3	5JS9
Available Bores	6 - 28	-	-

GSL-CS-032-A

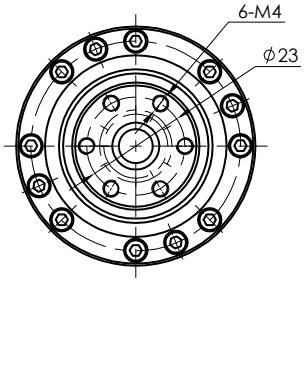


Wave Generator Bore Dimensions (mm)	U	T	W
Standard Bores	8	9.4	3JS9
	11	12.8	4JS9
	14	16.3	5JS9
Available Bores	5 - 23	-	-

GSL-CS-B Dimensions

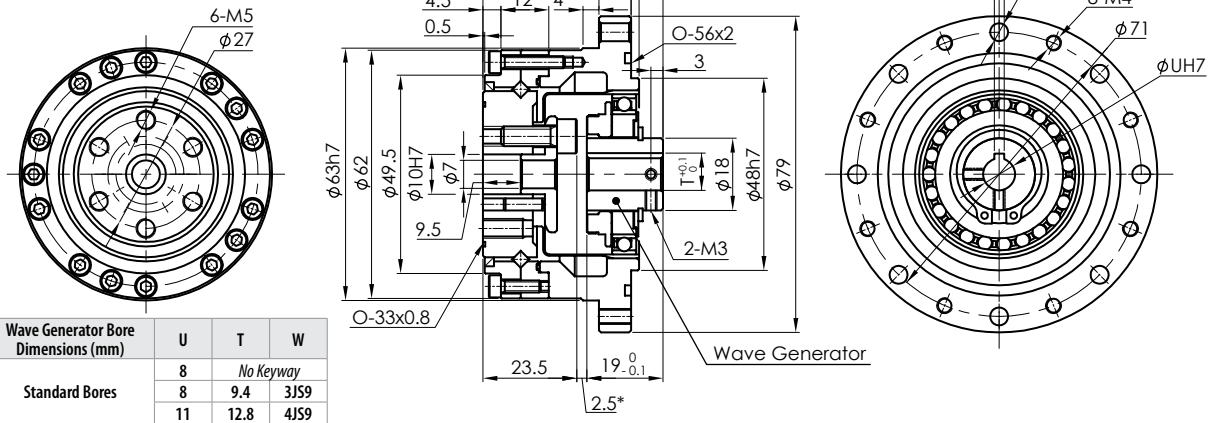
GSL-CS-014-B

Wave Generator Bore Dimension (mm)	U	T	W
Standard Bores	6	No Keyway	
	6	7	2JS9
	8	9.4	3JS9
Available Bores	3 - 17	-	-



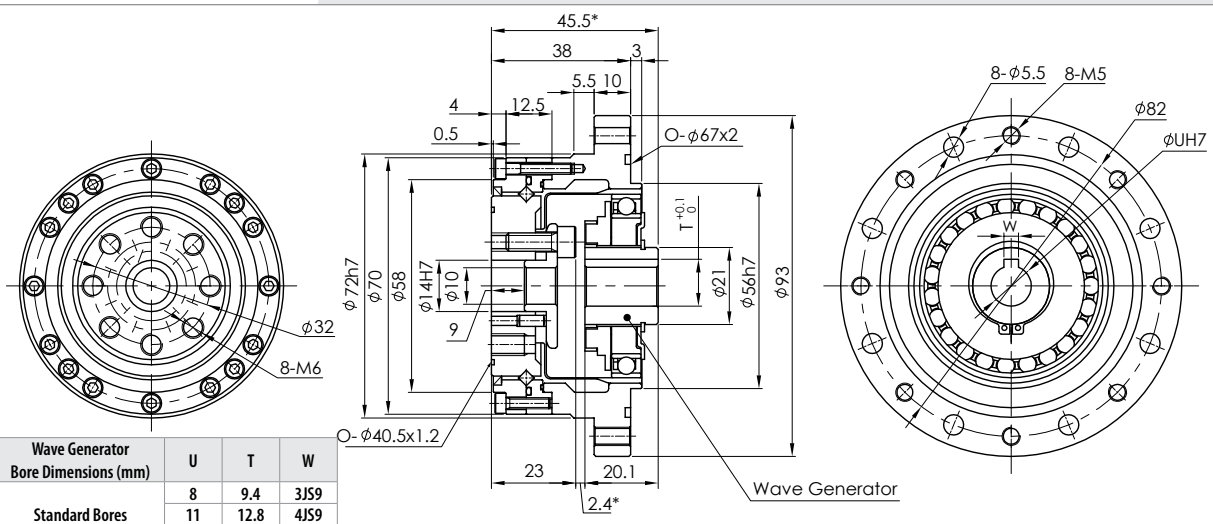
GSL-CS-017-B

Wave Generator Bore Dimensions (mm)	U	T	W
Standard Bores	8	No Keyway	
	8	9.4	3JS9
	11	12.8	4JS9
Available Bores	4 - 20	-	-



GSL-CS-020-B

Wave Generator Bore Dimensions (mm)	U	T	W
Standard Bores	8	9.4	3JS9
	11	12.8	4JS9
	12	13.8	4JS9
Available Bores	5 - 23	-	-

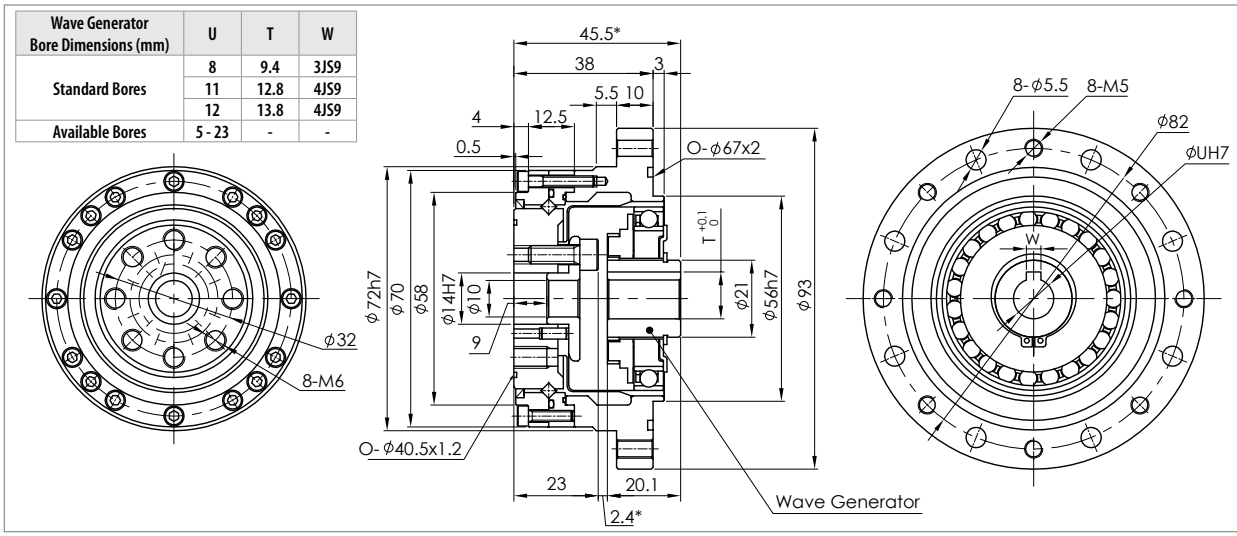


GSL

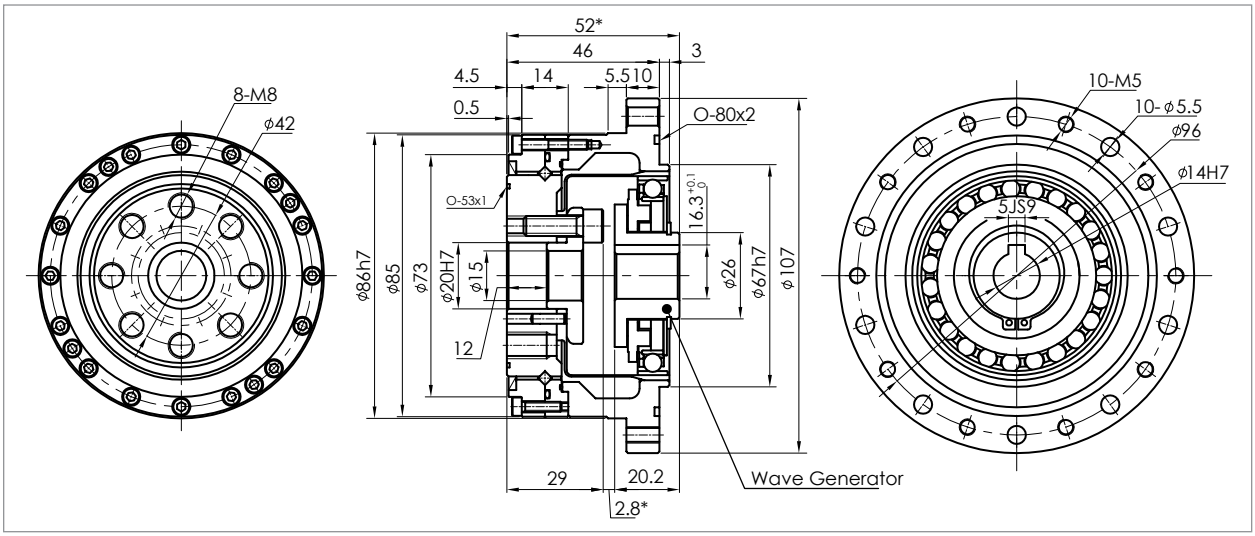
GSL-CS-B Dimensions

GSL-CS-020-B

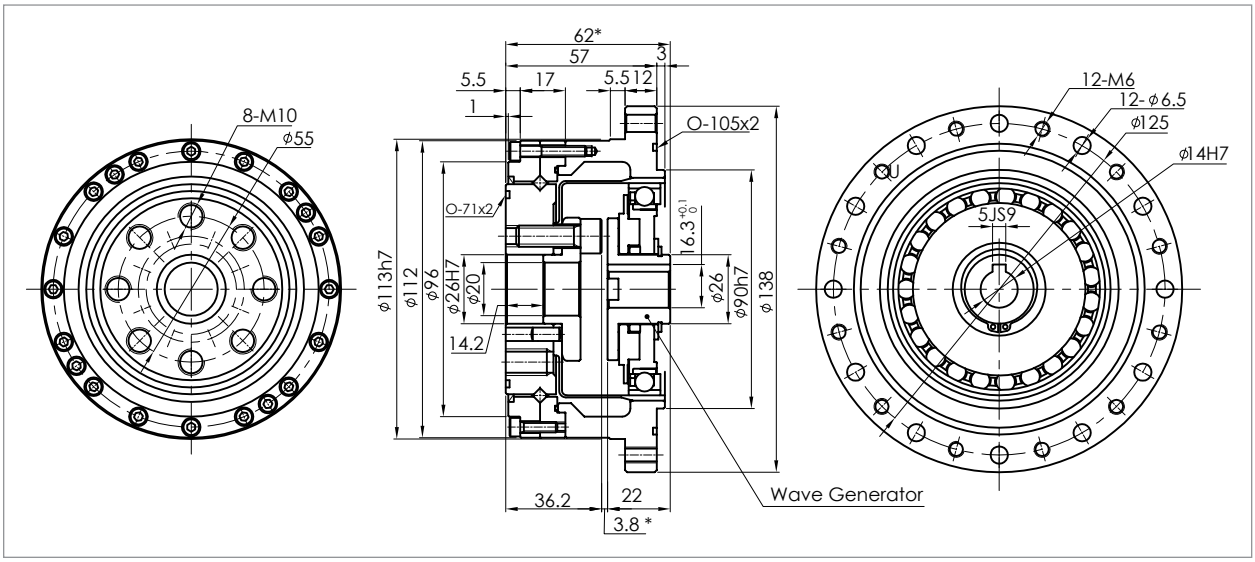
Wave Generator Bore Dimensions (mm)	U	T	W
Standard Bores	8	9.4	3JS9
	11	12.8	4JS9
	12	13.8	4JS9
Available Bores	5 - 23	-	-



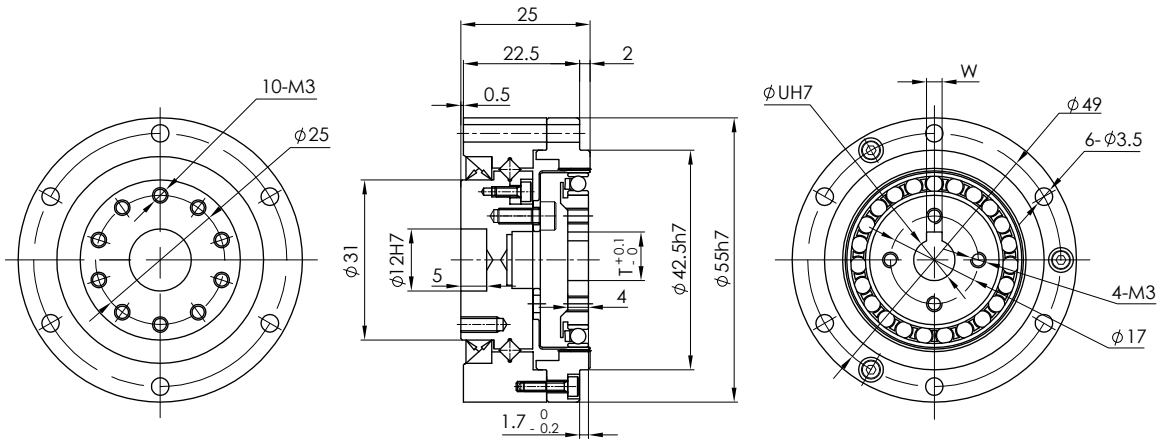
GSL-CS-025-B



GSL-CS-032-B

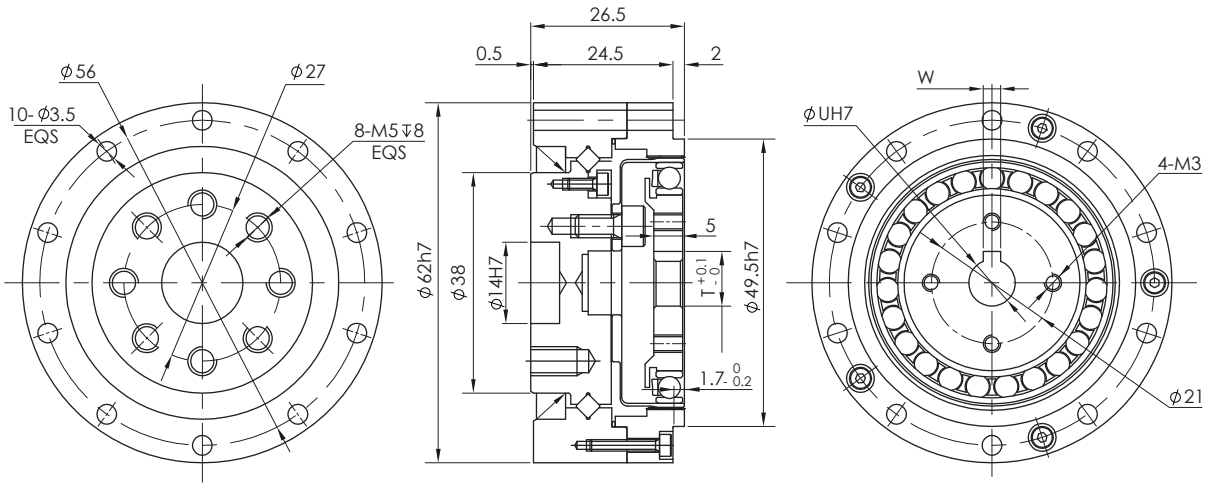


GSL-CT-014-A



Wave Generator Bore Dimensions (mm)	U	T	W
Standard Bores	6	7	2JS9
	8	9.4	3JS9
	11	No Keyway	

GSL-CT-017-A



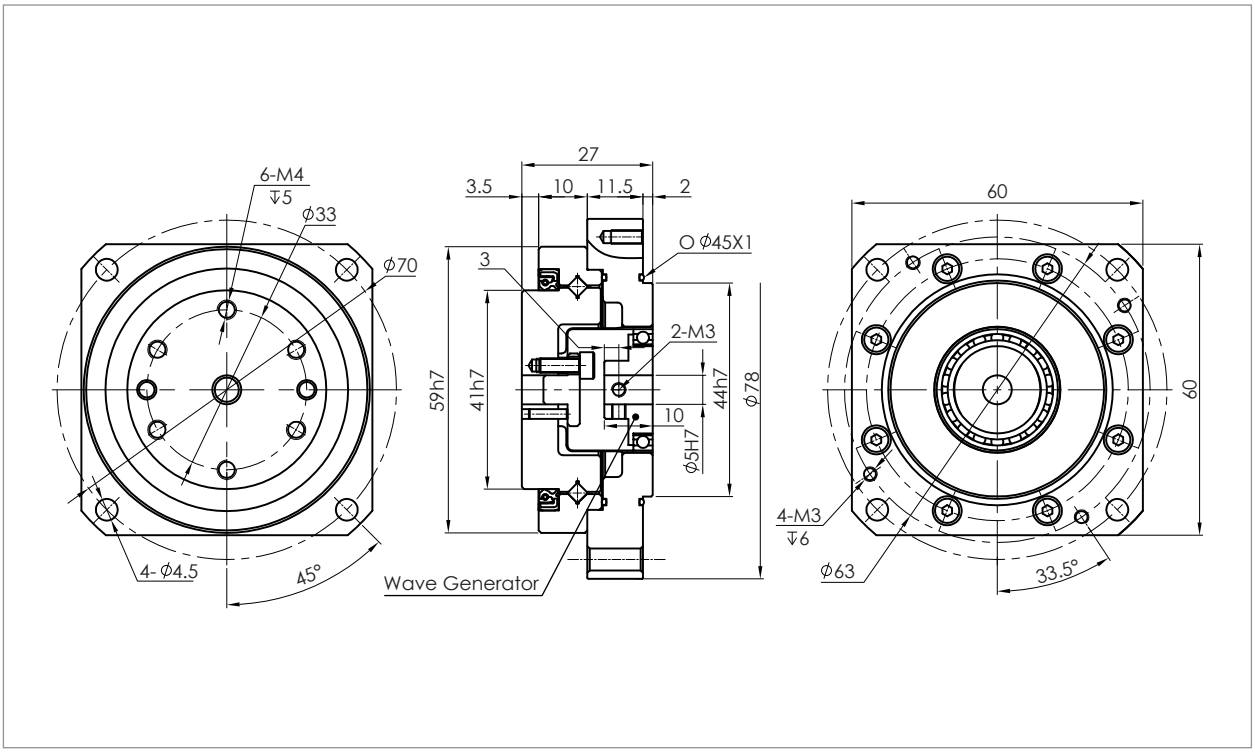
Wave Generator Bore Dimensions (mm)	U	T	W
Standard Bores	8	9.4	3JS9
	15		

GSL

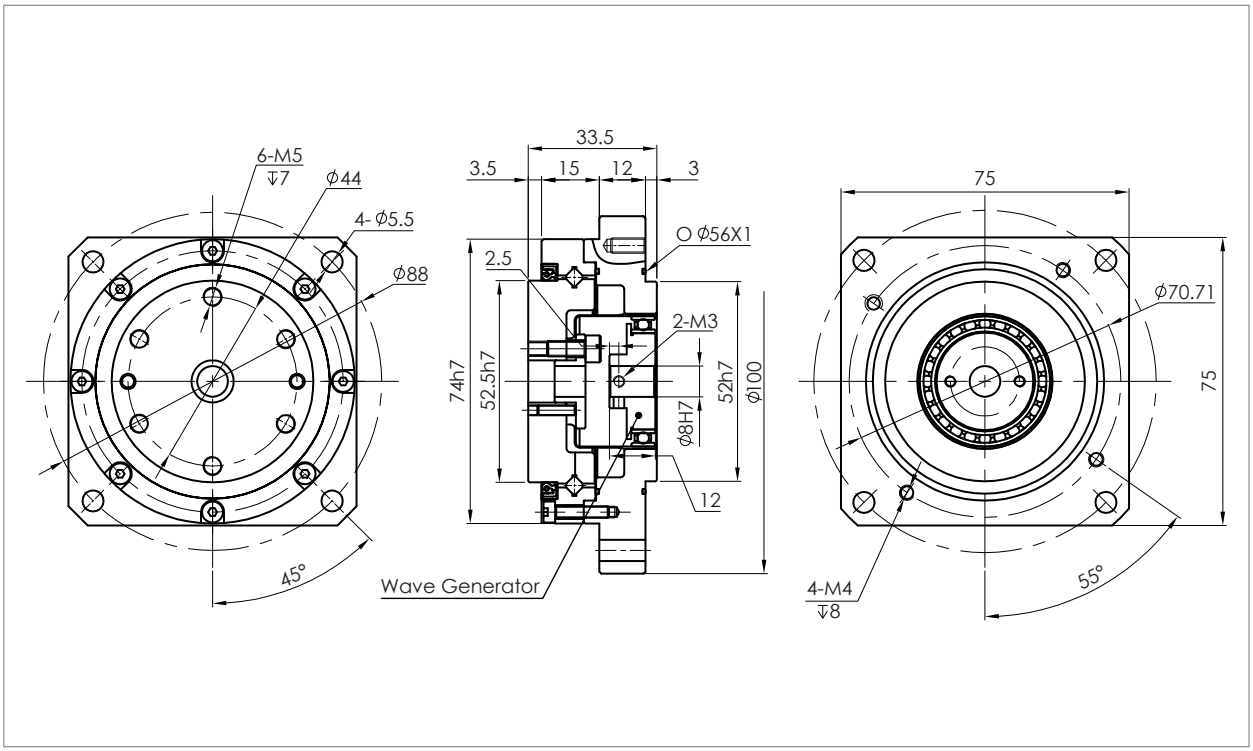
Drawings and information contained herein are for reference only. Please contact GAM for application specific drawings.

GSL-CF-A Gearbox

GSL-CF-011-A



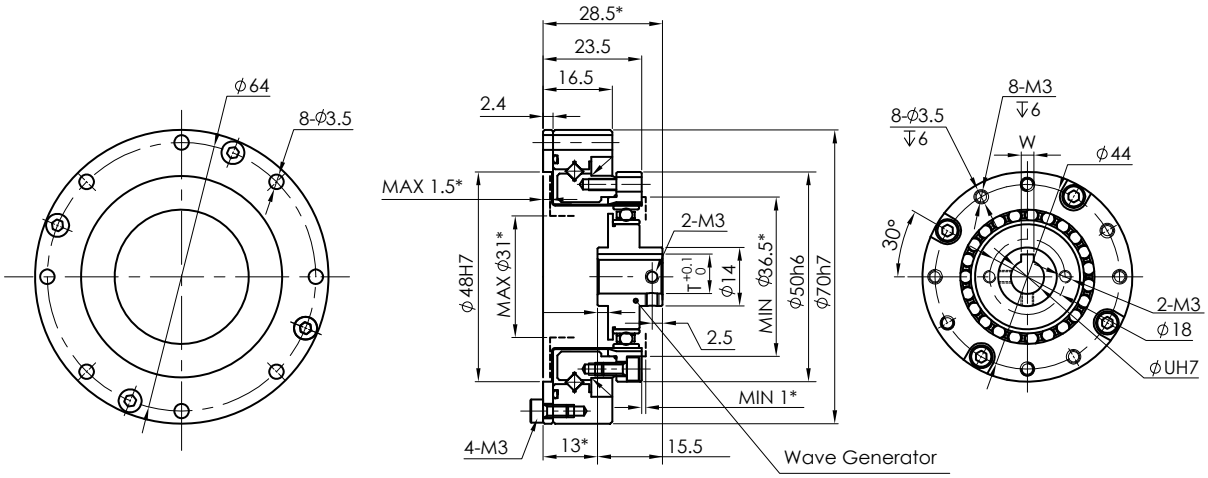
GSL-CF-014-A



Drawings and information contained herein are for reference only. Please contact GAM for application specific drawings.

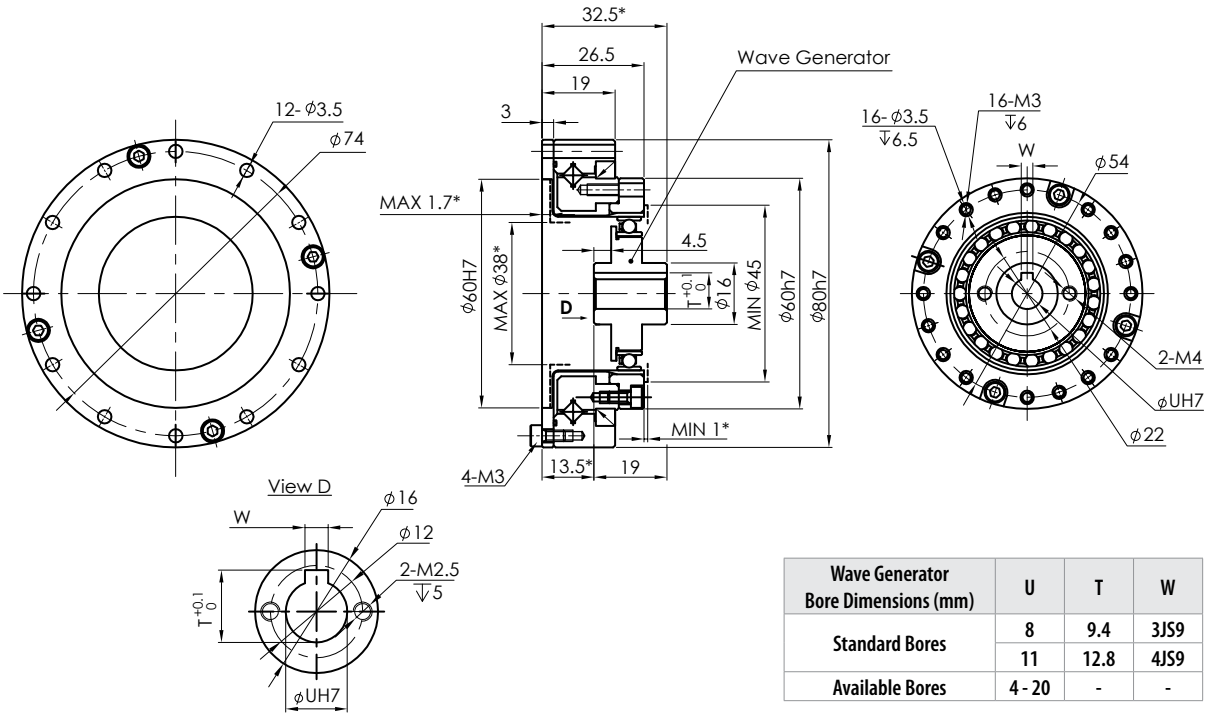
GSL-HS-A Dimensions

GSL-HS-014-A



Wave Generator Bore Dimensions (mm)	U	T	W
Standard Bores	6	7	2JS9
	8	9.4	3JS9
Available Bores	3 - 17	-	-

GSL-HS-017-A

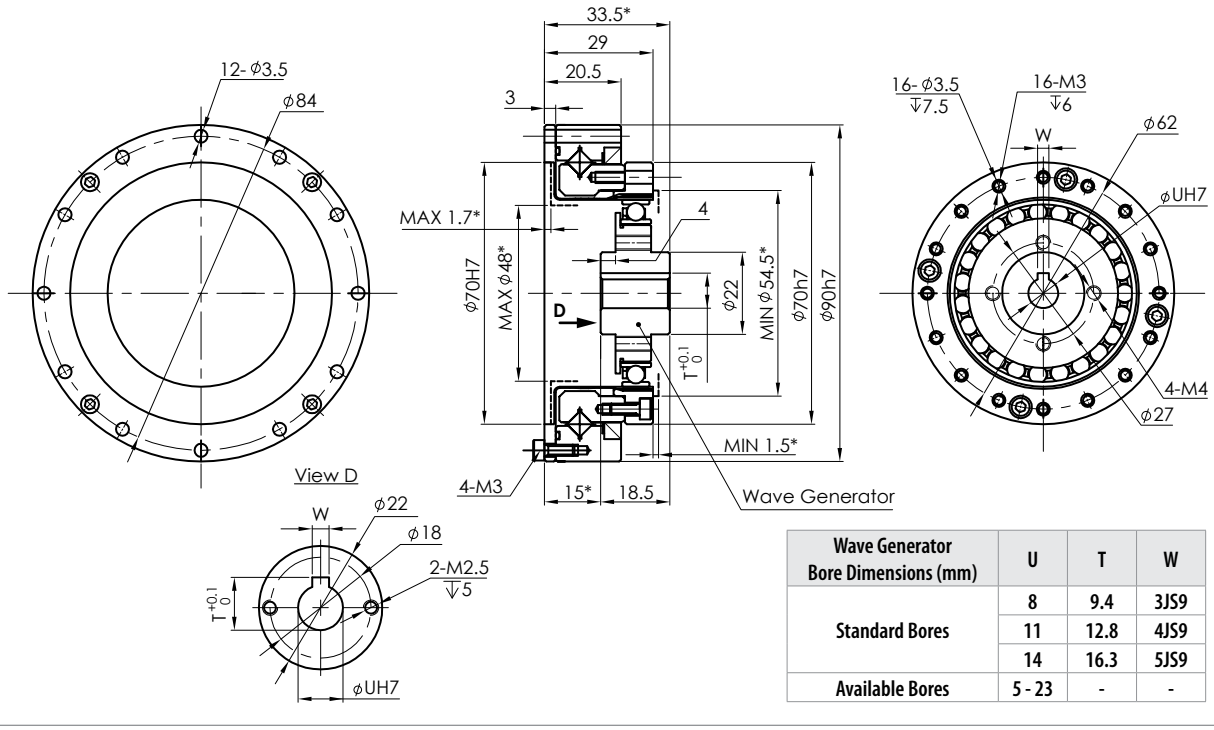


Wave Generator Bore Dimensions (mm)	U	T	W
Standard Bores	8	9.4	3JS9
	11	12.8	4JS9
Available Bores	4 - 20	-	-

GSL

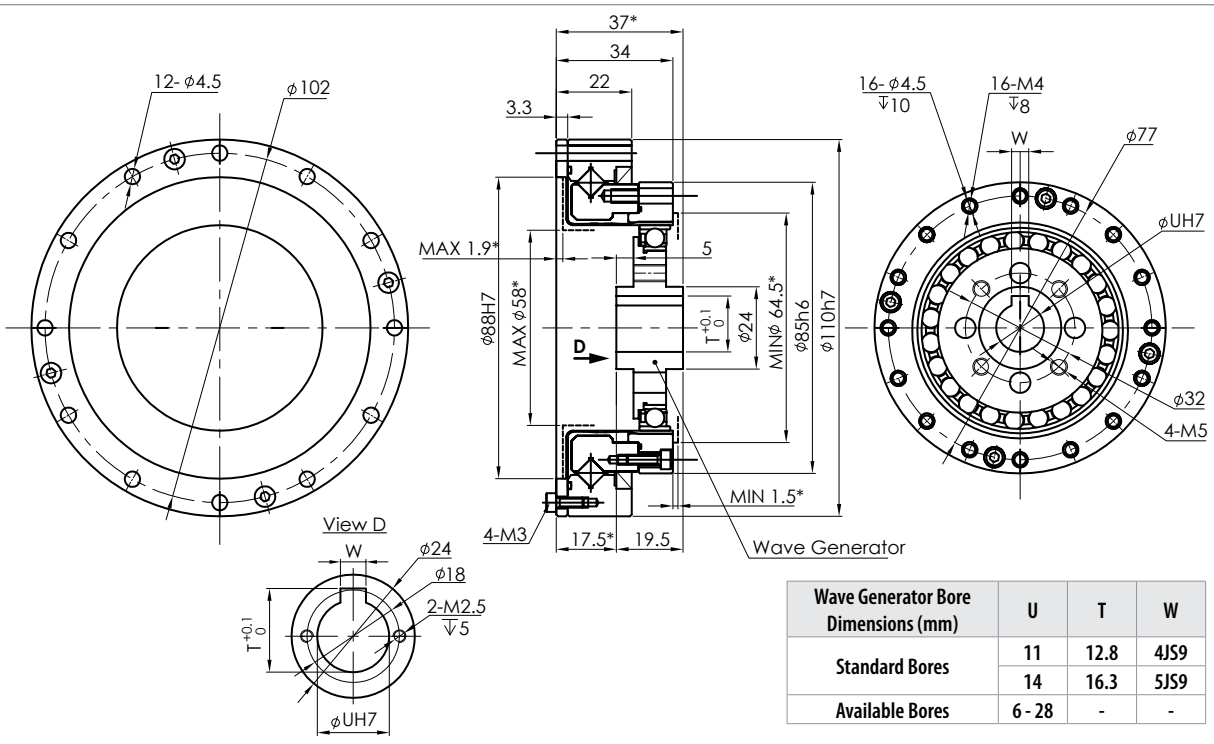
GSL-HS-A Dimensions

GSL-HS-020-A



Wave Generator Bore Dimensions (mm)	U	T	W
Standard Bores	8	9.4	3JS9
	11	12.8	4JS9
	14	16.3	5JS9
Available Bores	5 - 23	-	-

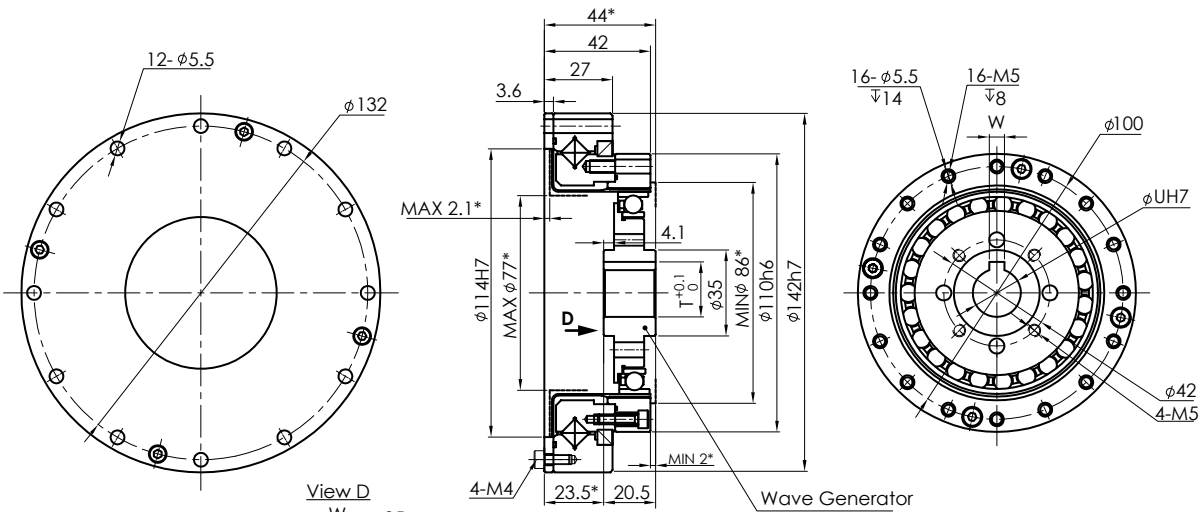
GSL-HS-025-A



Wave Generator Bore Dimensions (mm)	U	T	W
Standard Bores	11	12.8	4JS9
	14	16.3	5JS9
Available Bores	6 - 28	-	-

GSL-HS-A Dimensions

GSL-HS-032-A

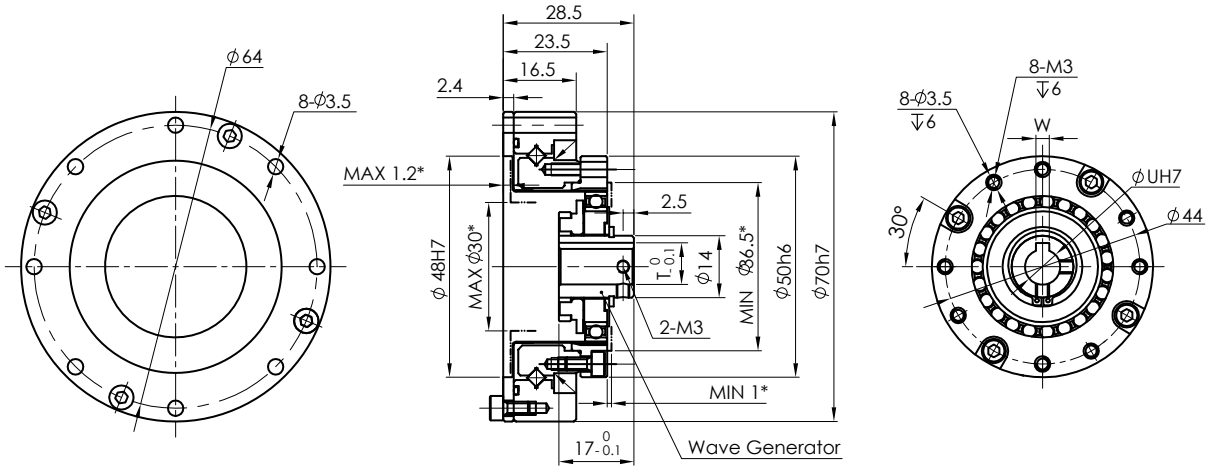


Wave Generator Bore Dimensions (mm)	U	T	W
Standard Bores	14	16.3	5JS9
	19	21.8	6JS9
	22	25.3	8JS9
Available Bores	6 - 36	-	-

GSL

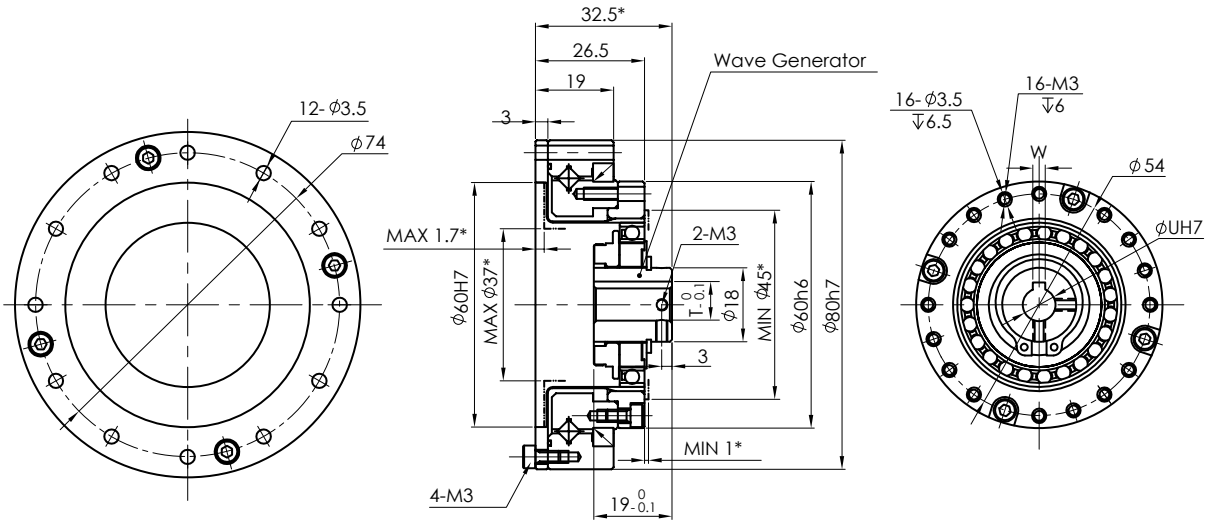
GSL-HS-B Dimensions

GSL-HS-014-B



Wave Generator Bore Dimensions (mm)	U	T	W
Standard Bores	6		
	6	7	2JS9
	8	9.4	3JS9
Available Bores	3 - 17	-	-

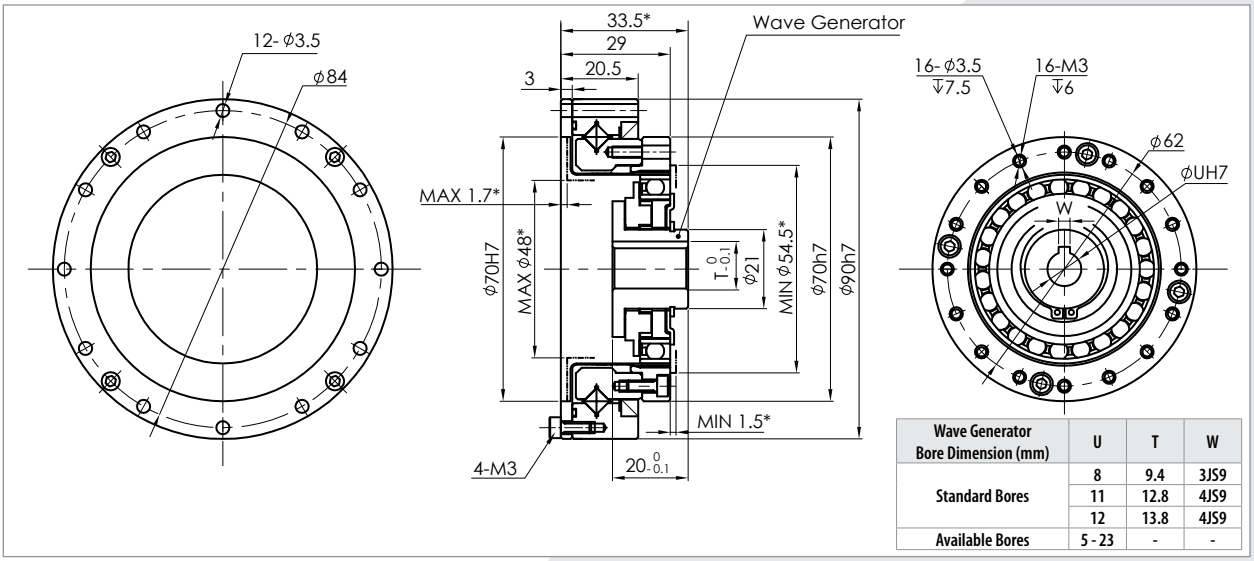
GSL-HS-017-B



Wave Generator Bore Dimensions (mm)	U	T	W
Standard Bores	8		
	8	9.4	3JS9
	11	12.8	4JS9
Available Bores	4 - 20	-	-

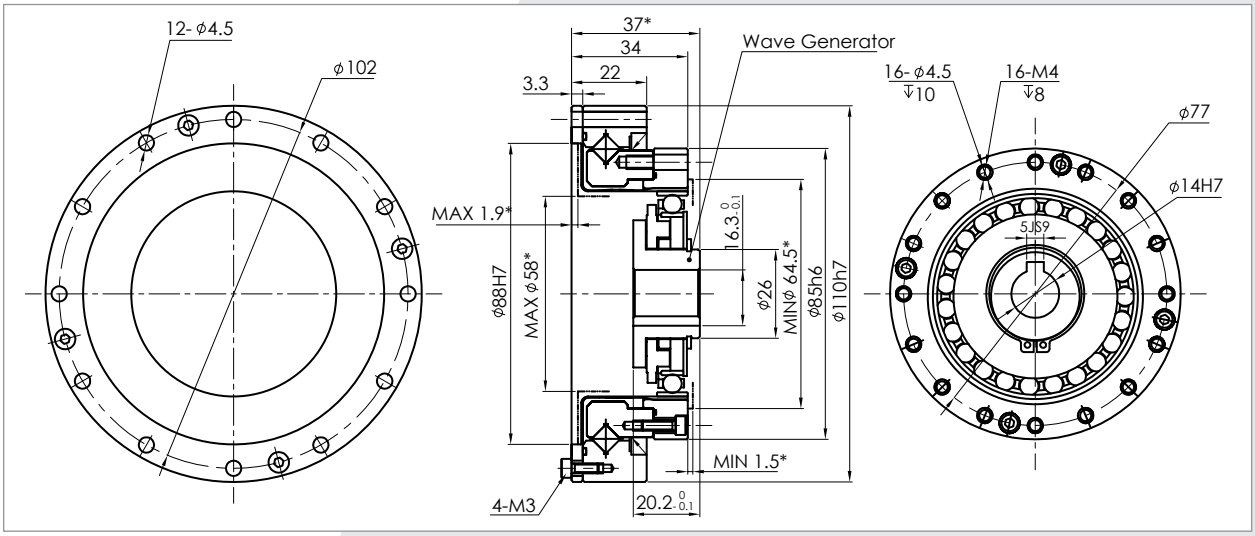
GSL-HS-B Dimensions

GSL-HS-020-B

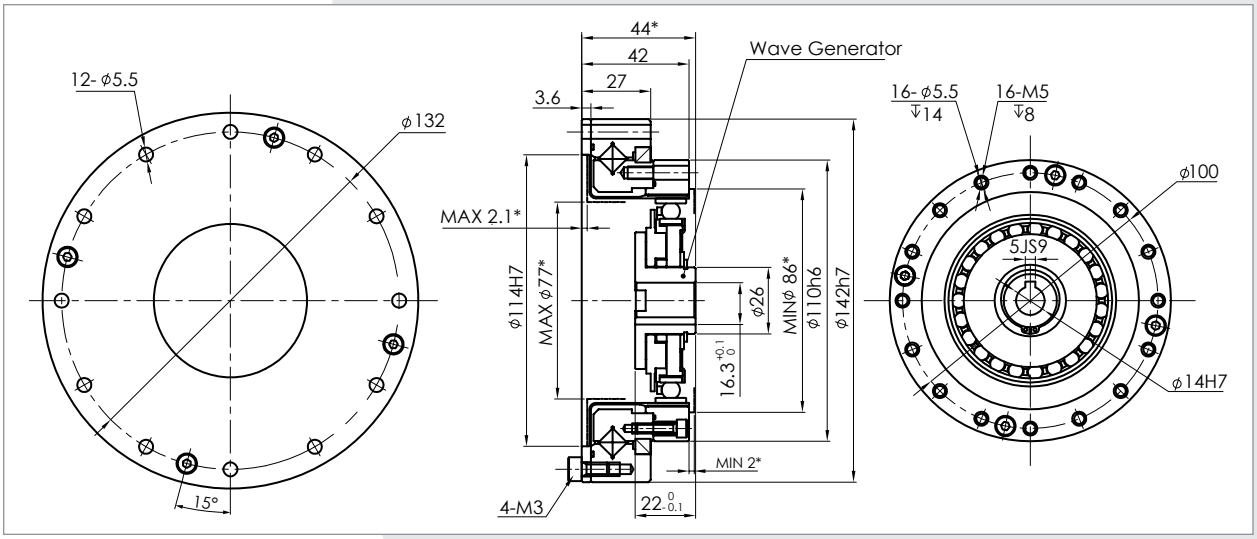


Wave Generator Bore Dimension (mm)	U	T	W
Standard Bores	8	9.4	3JS9
	11	12.8	4JS9
	12	13.8	4JS9
Available Bores	5 - 23	-	-

GSL-HS-025-B



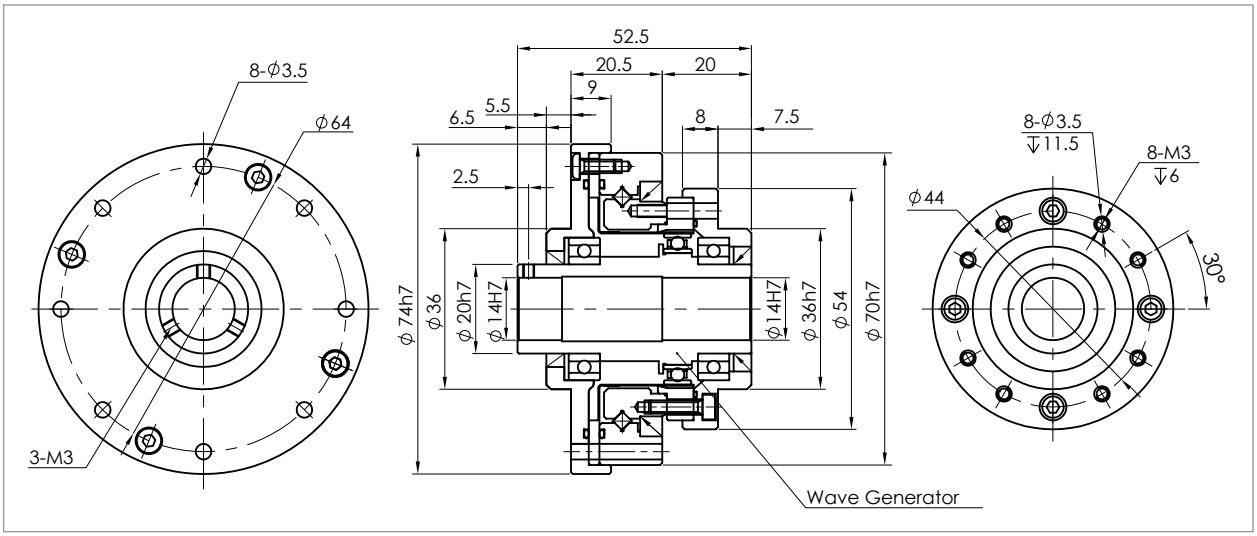
GSL-HS-032-B



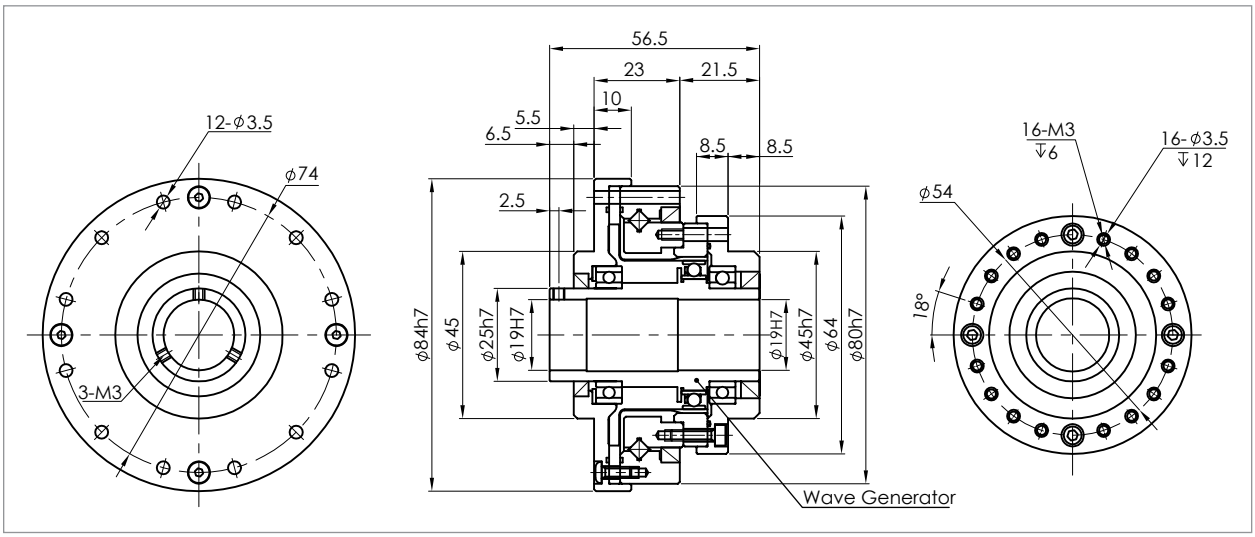
GSL

GSL-HS-C Dimensions

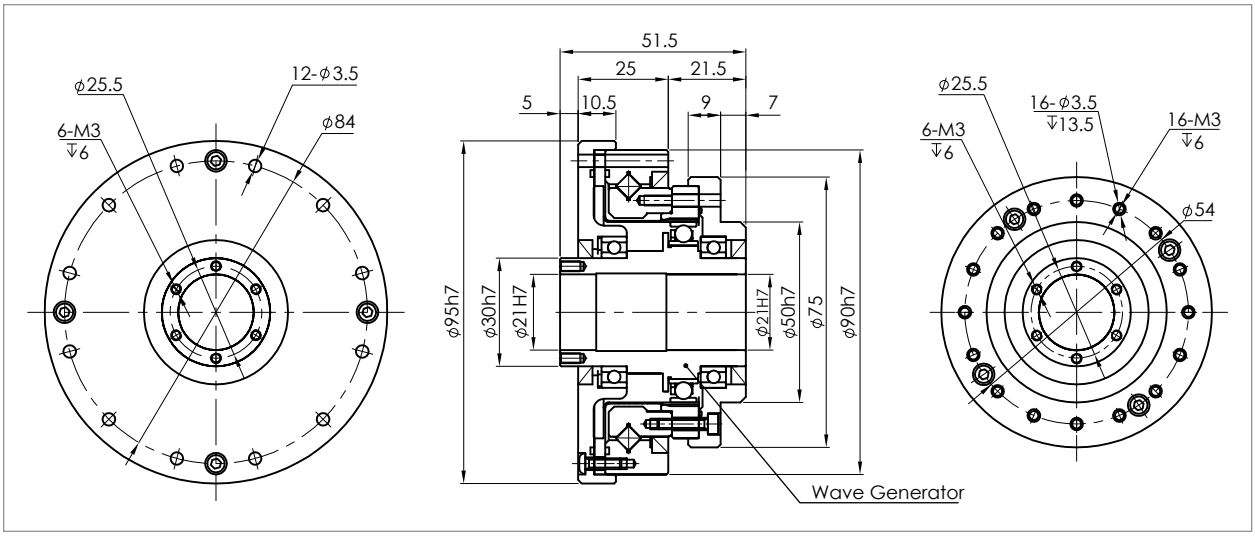
GSL-HS-014-C



GSL-HS-017-C

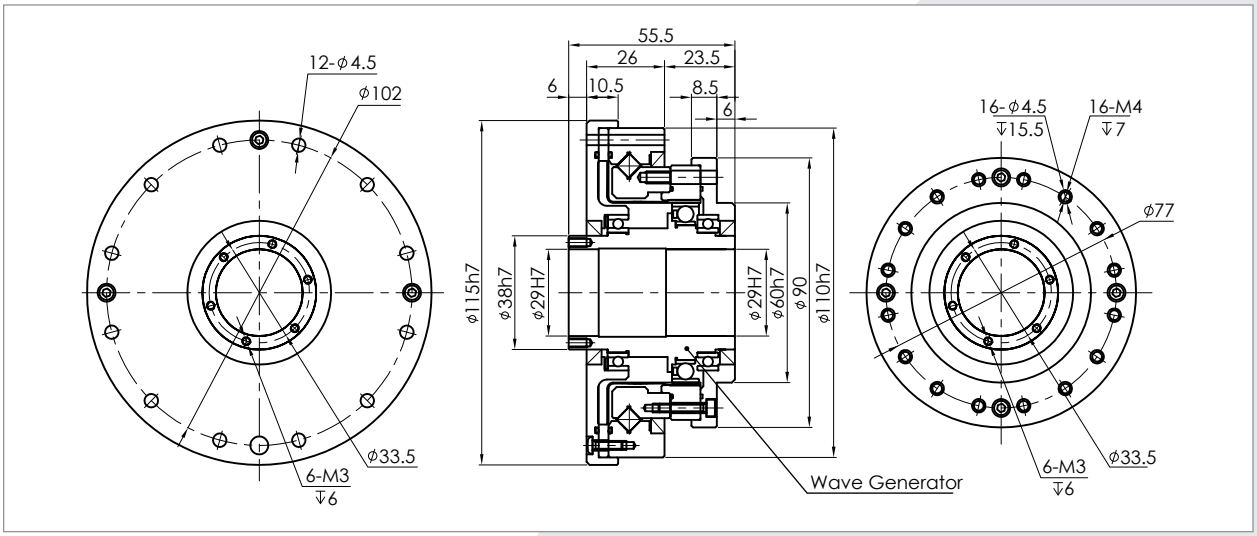


GSL-HS-020-C

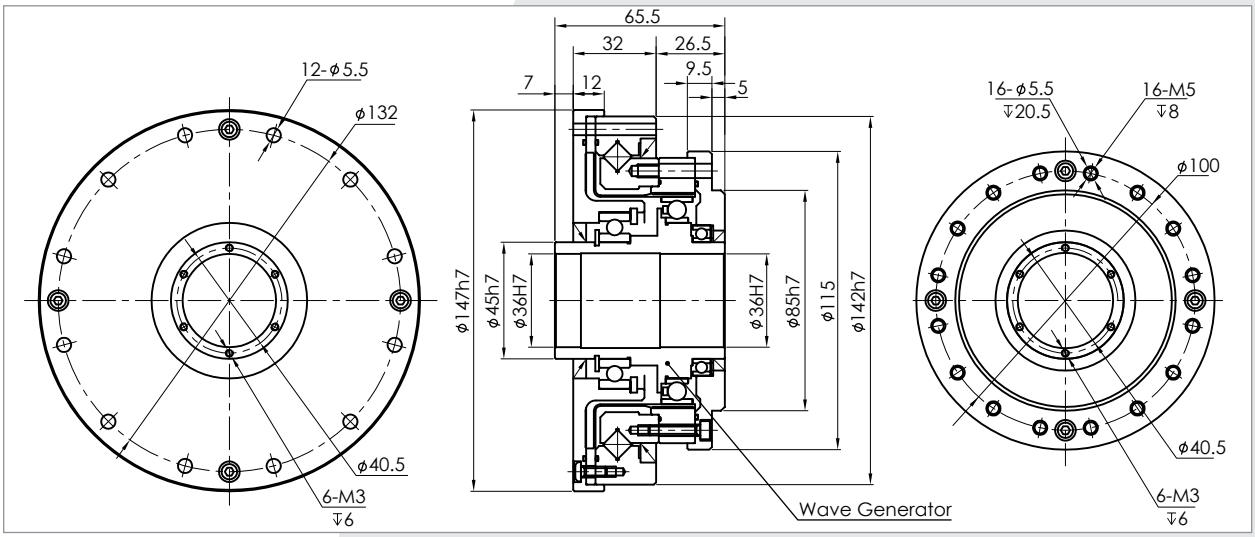


GSL-HS-C Dimensions

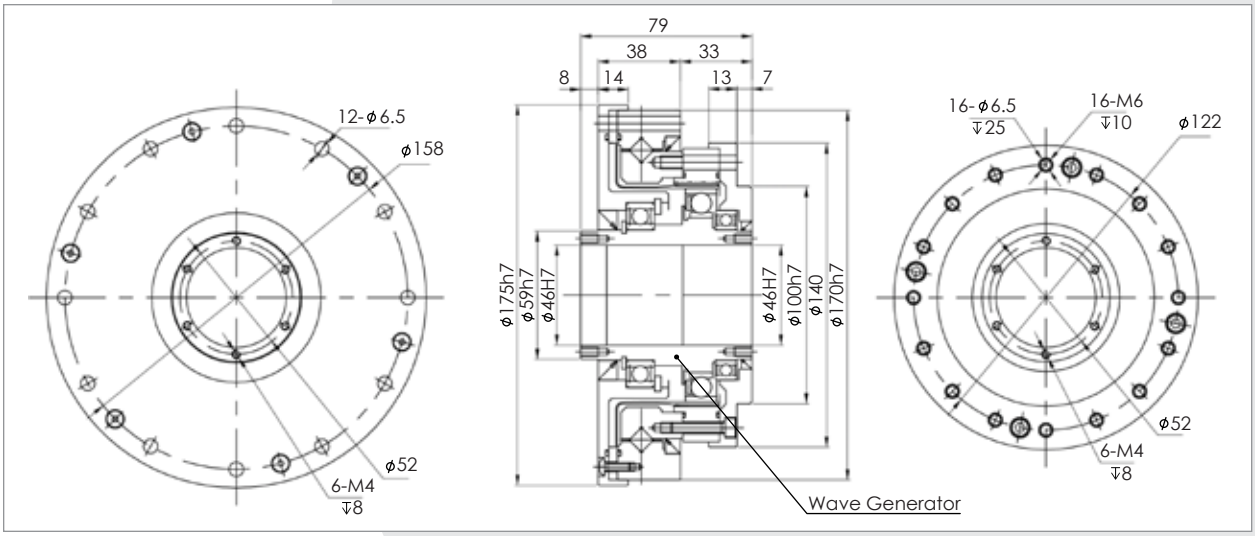
GSL-HS-025-C



GSL-HS-032-C



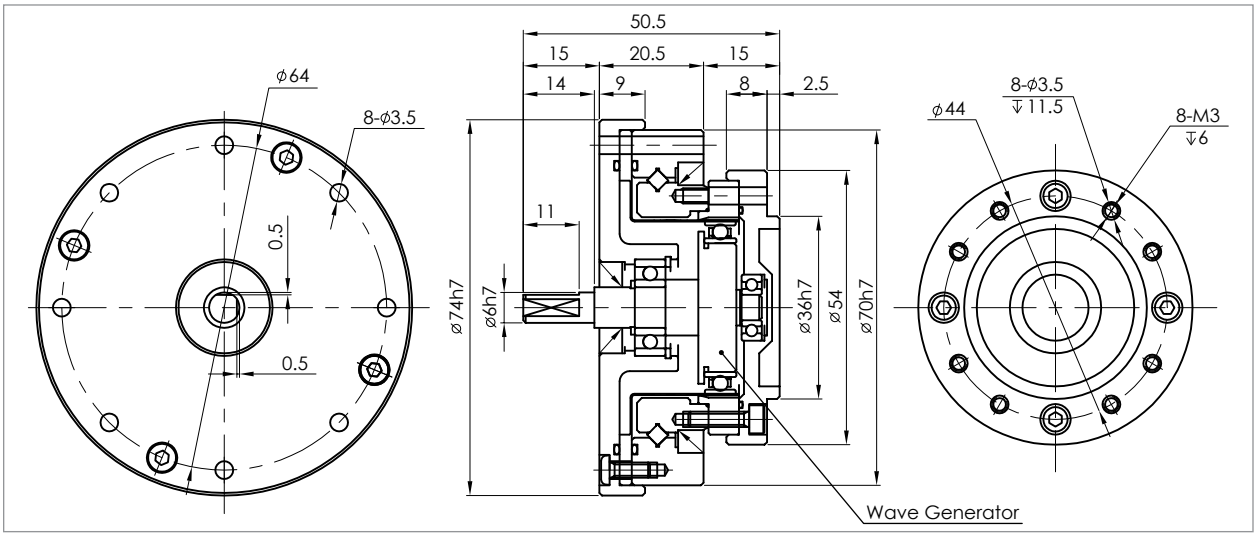
GSL-HS-040-C



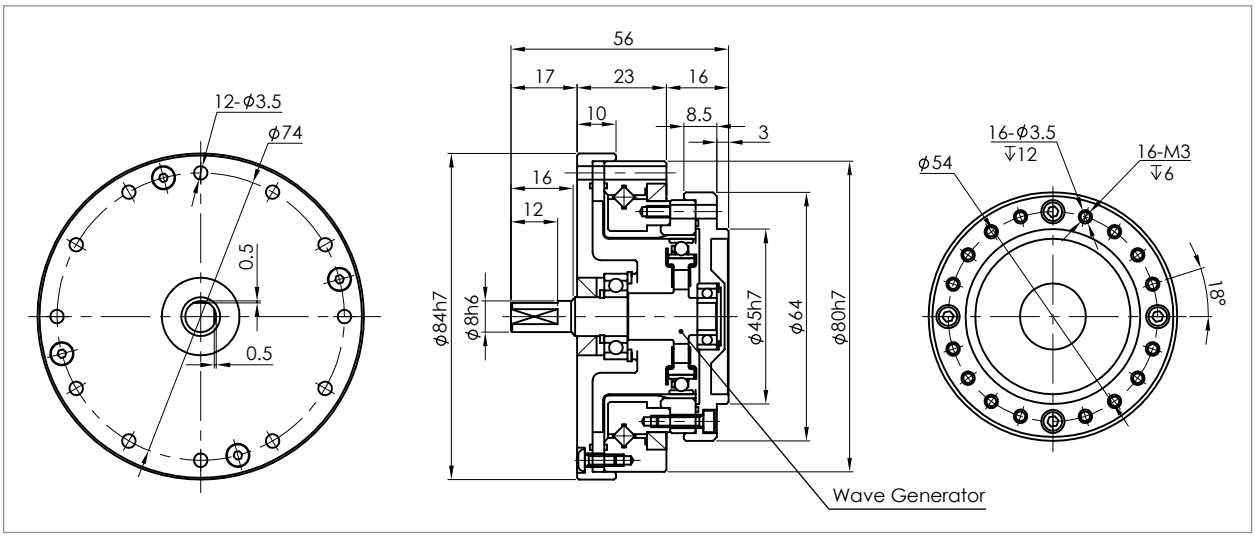
GSL

GSL-HS-D Dimensions

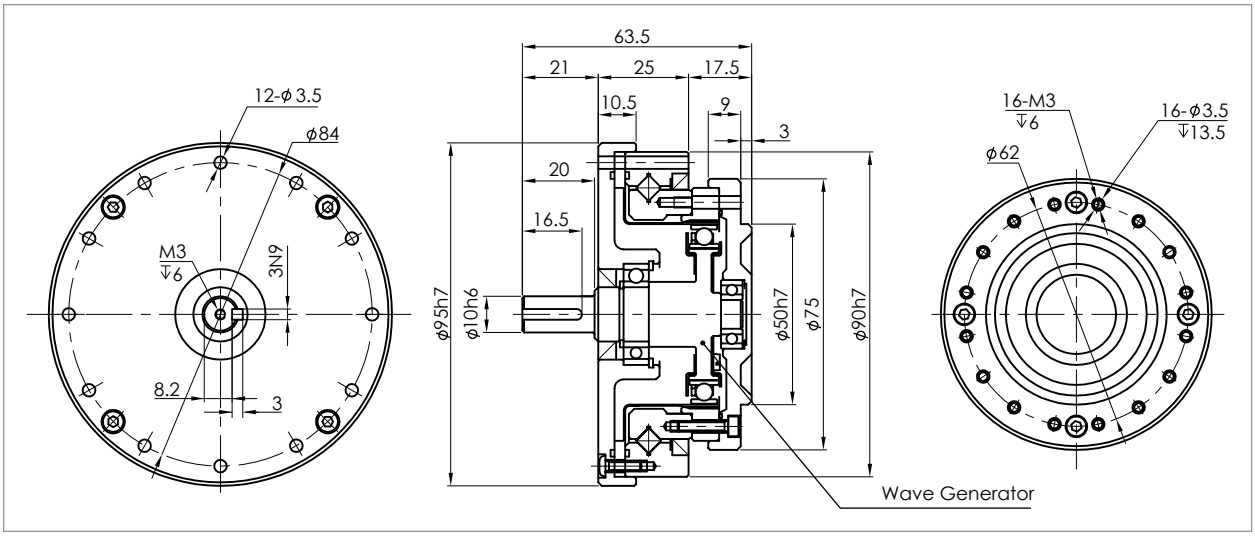
GSL-HS-014-D



GSL-HS-017-D

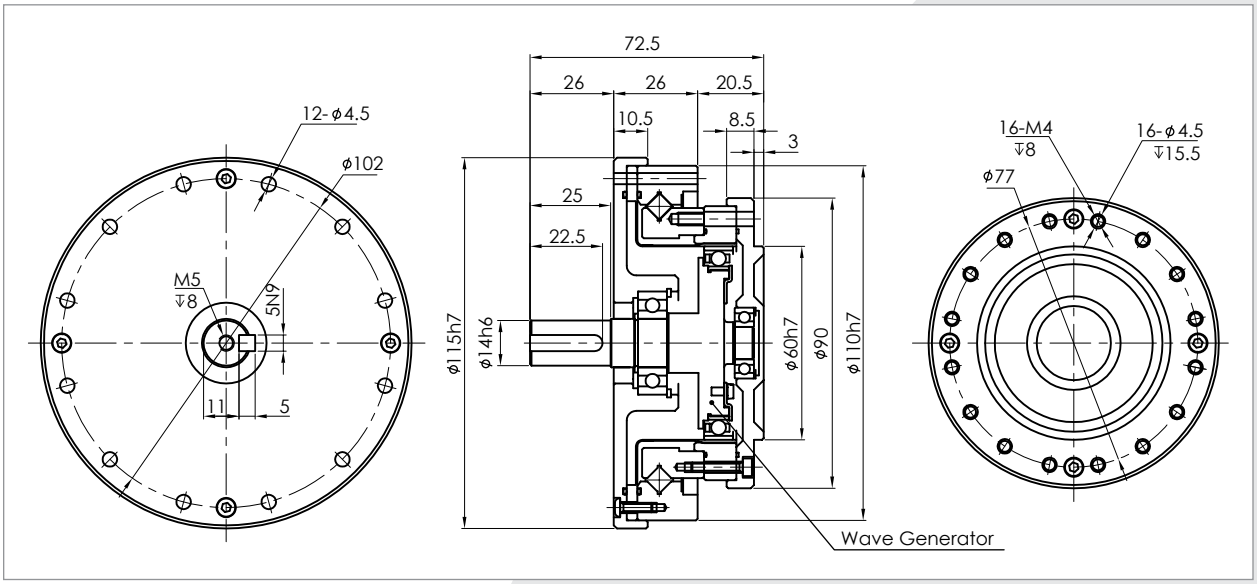


GSL-HS-020-D

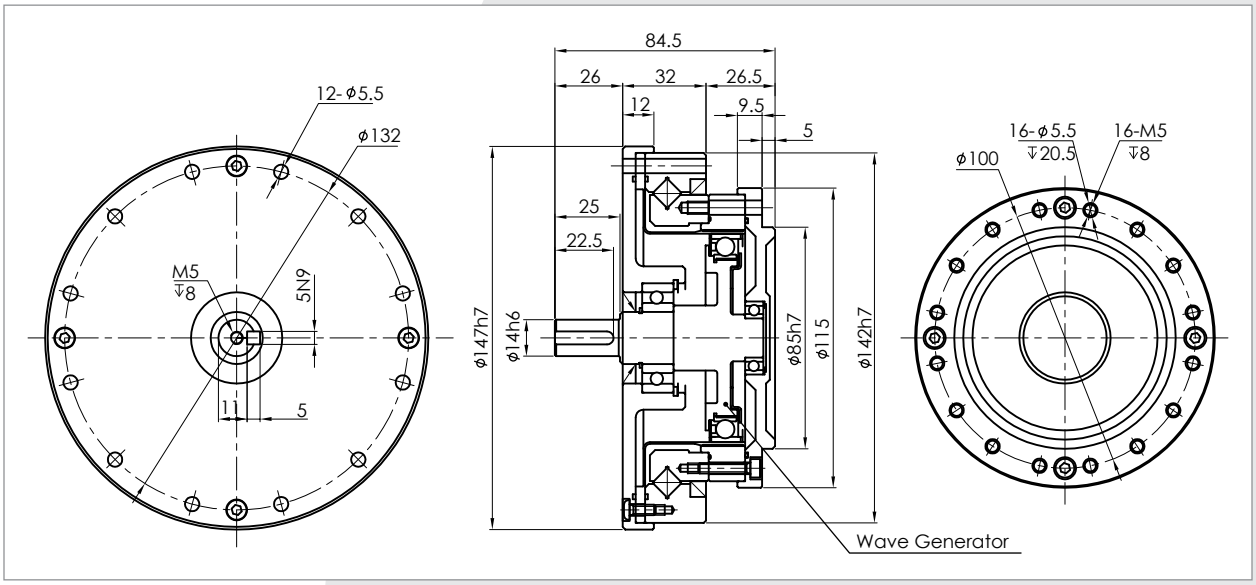


GSL-HS-D Dimensions

GSL-HS-025-D



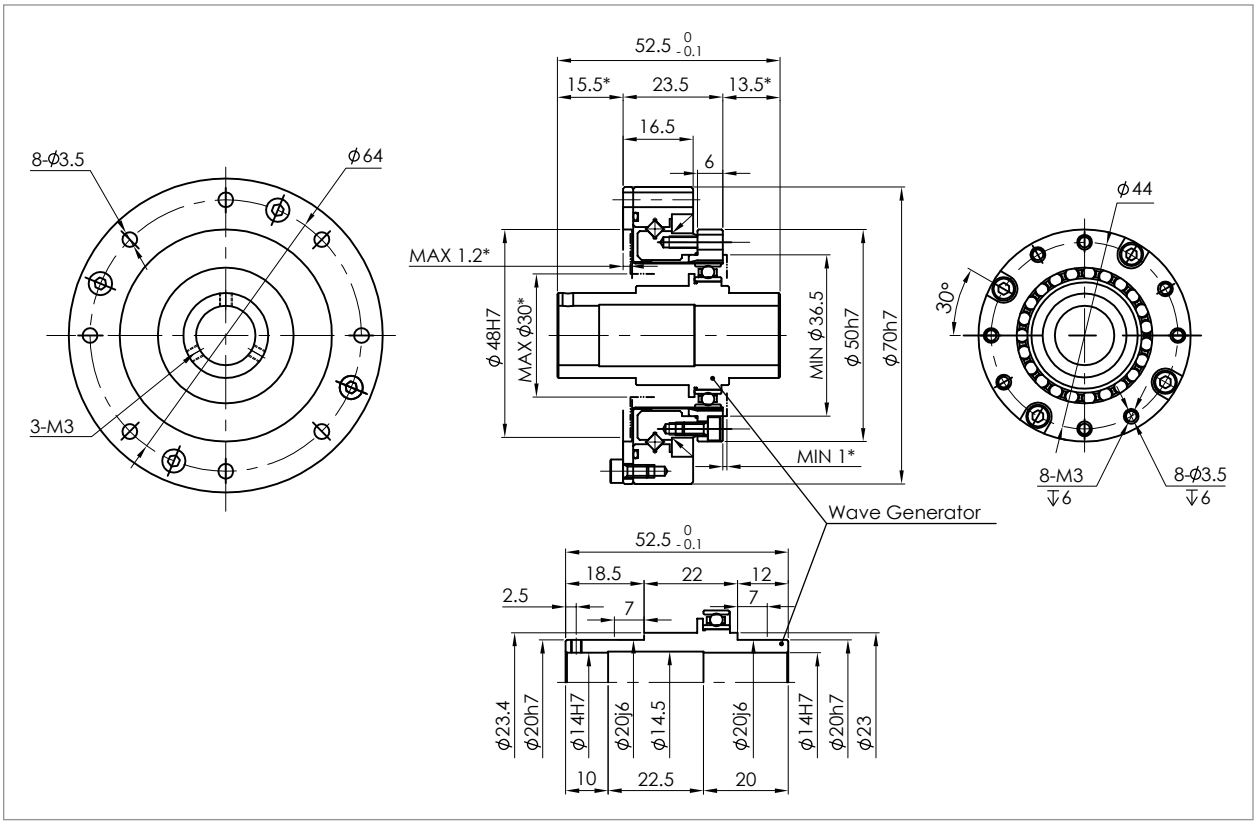
GSL-HS-032-D



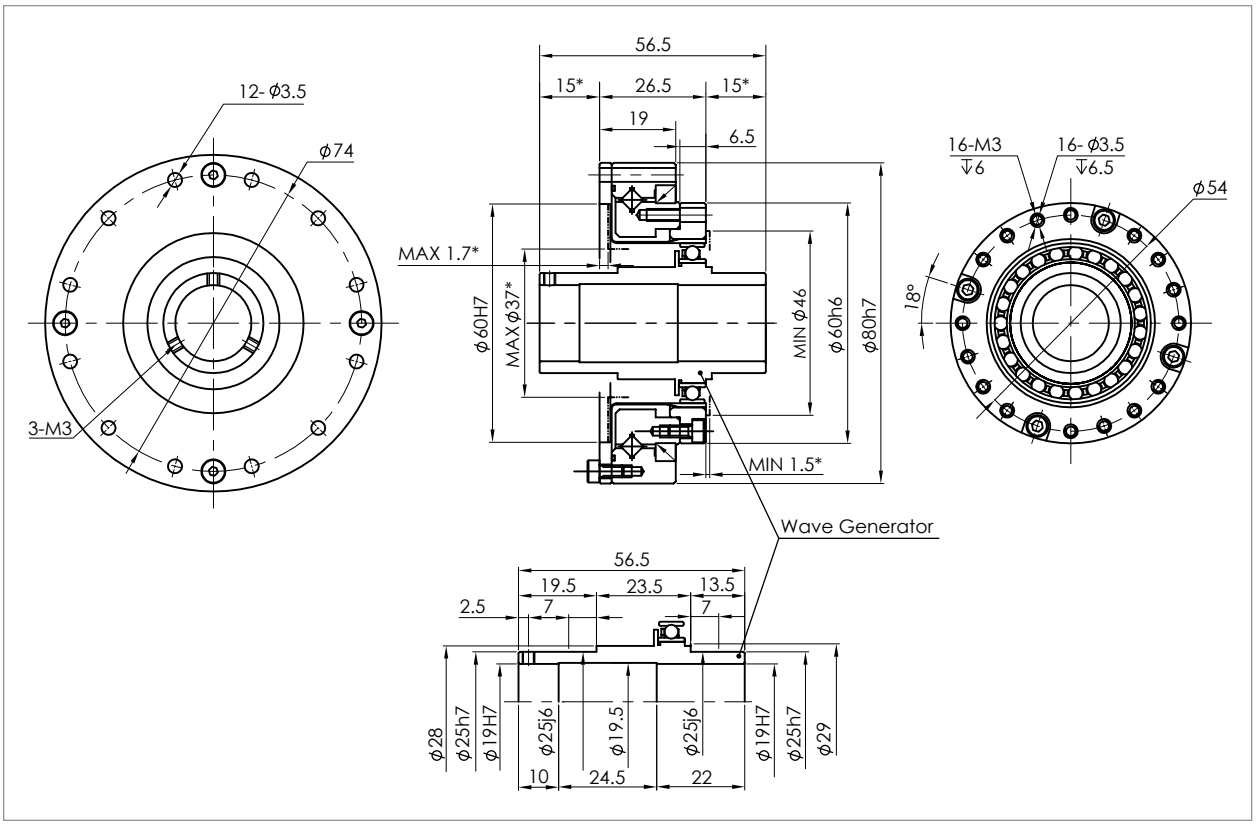
GSL

GSL-HS-E Dimensions

GSL-HS-014-E

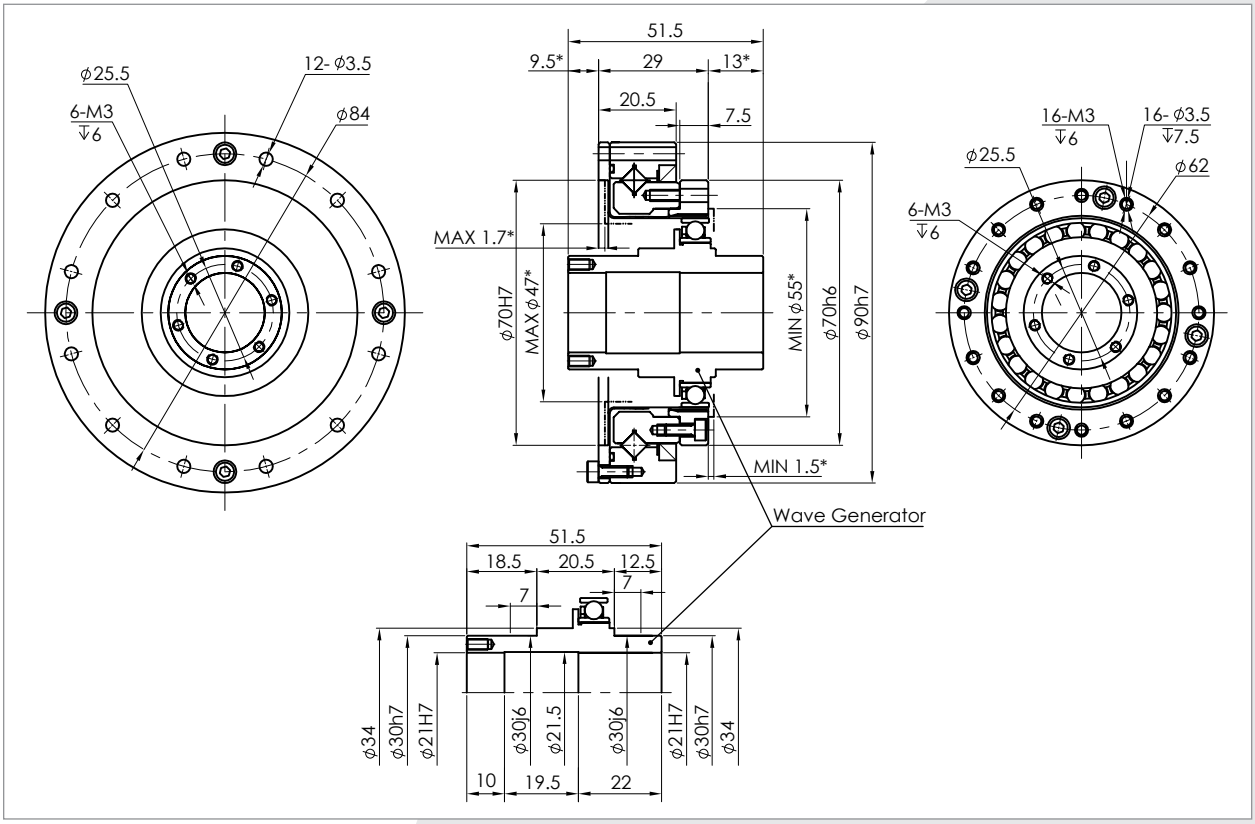


GSL-HS-017-E

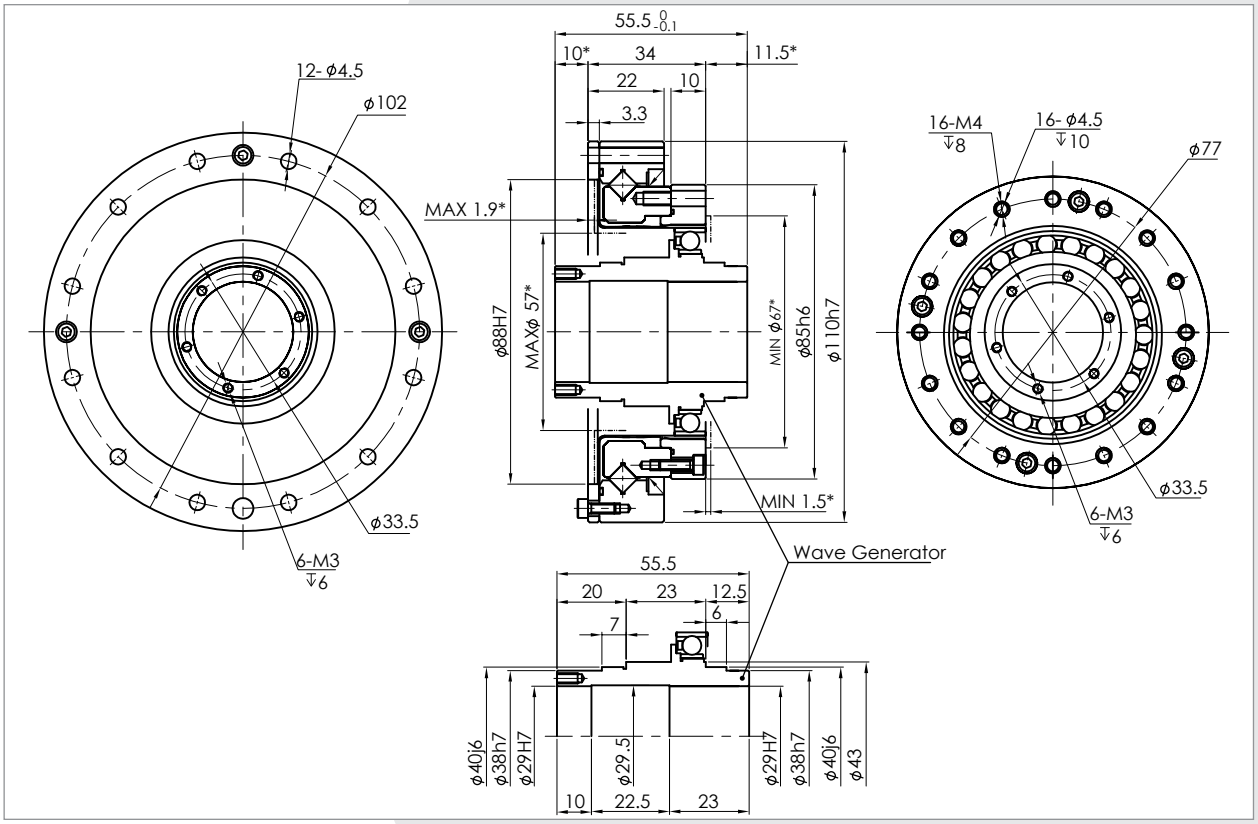


GSL-HS-E Dimensions

GSL-HS-020-E



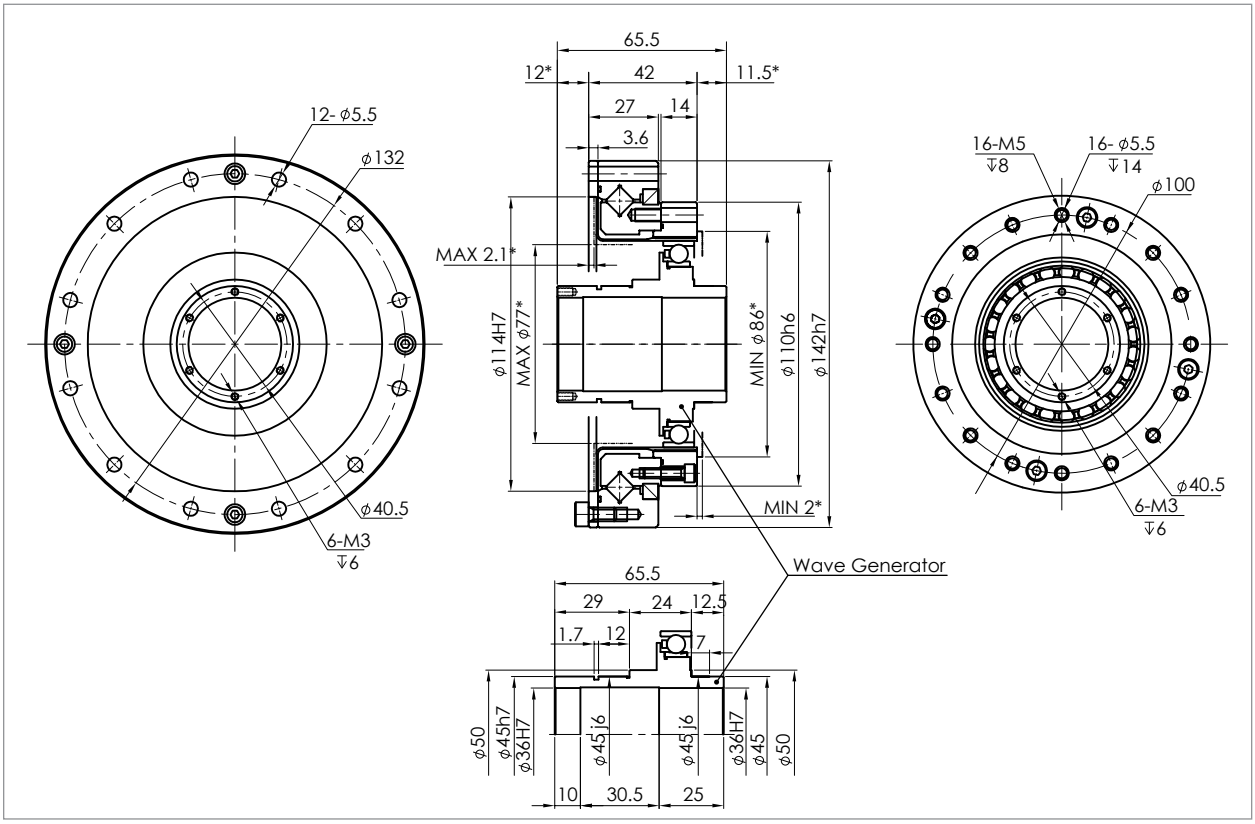
GSL-HS-025-E



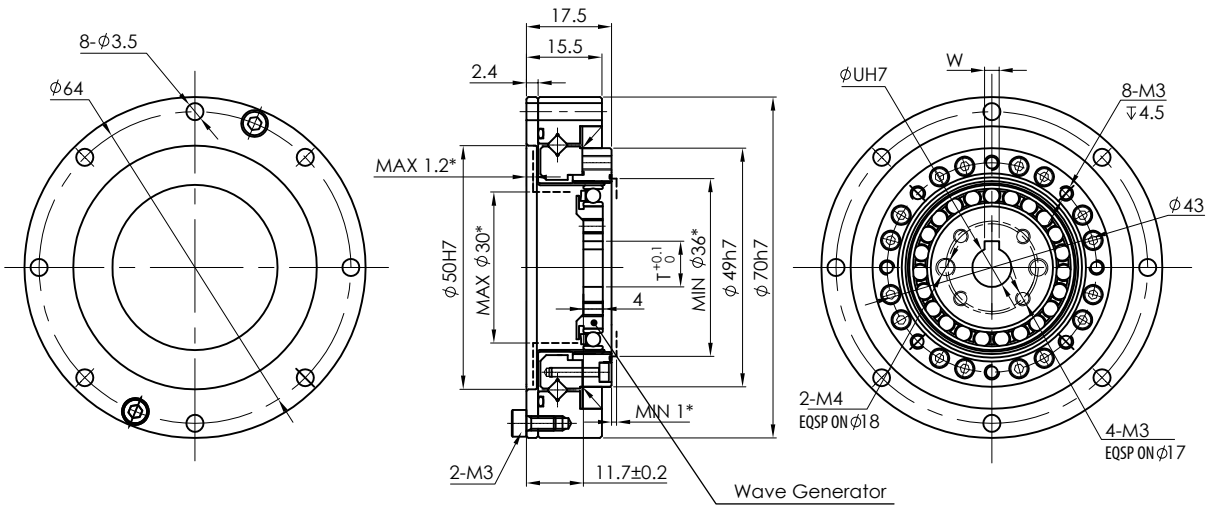
GSL

GSL-HS-E Dimensions

GSL-HS-032-E

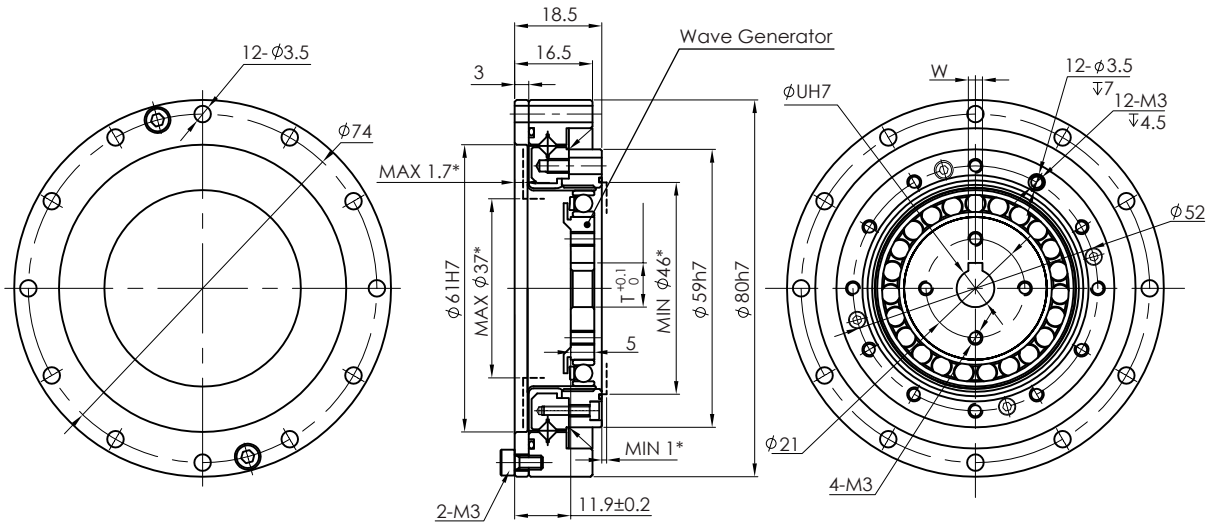


GSL-HT-014-A



Wave Generator Bore Dimensions (mm)	U	T	W
Standard Bores	6	7	2JS9
	8	9.4	3JS9
	11	No Keyway	

GSL-HT-017-A



Wave Generator Bore Dimensions (mm)	U	T	W
Standard Bores	8	9.4	3JS9
	15		

Notes

Servo Gearboxes

GAM has one of the broadest offerings of precision servo gear reducers on the market, with the engineering expertise and manufacturing flexibility to provide custom solutions, providing the best solution for your motion control applications

GAM inline and right angle gearboxes, with helical, hypoid, or planetary gearing, are available in many sizes and multiple configurations.

Servo Gearbox Features

- Inline or right angle servo gearboxes
- Output options including metric or NEMA shafts, hollow, or flange
- Frame sizes 50 to 180
- Ratios of 3:1 to 1000:1
- Motor adapter included

The GAM Advantage

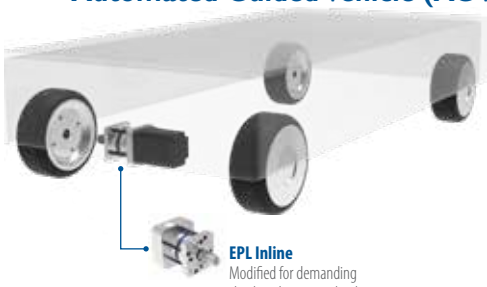
Even with such a broad range of servo gearboxes, we realize that you may not find a product that meets your exact requirements.

Our design engineers will collaborate with your design engineers for a customized, cost-effective, and high-performance solution. And, because of our flexible manufacturing, we can cost-effectively produce small batches of customized product in short lead-times.

Applications

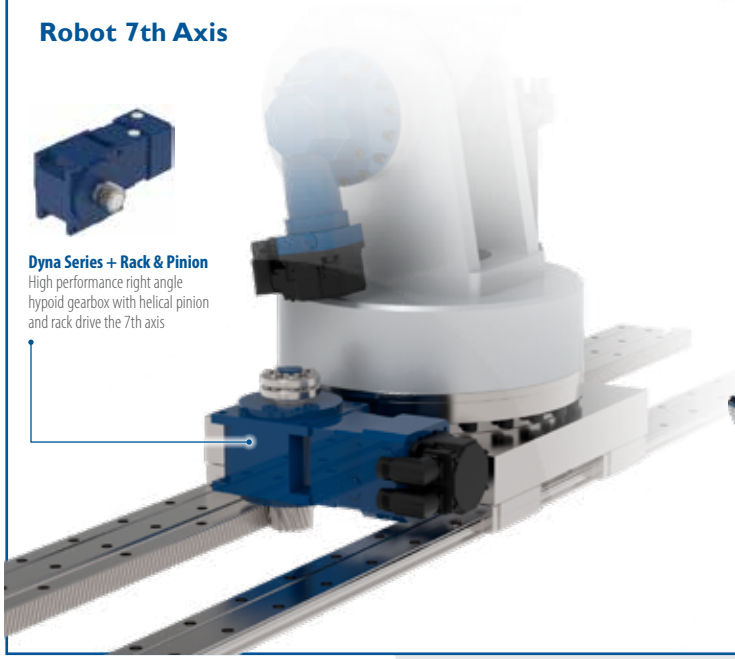
Choose from our standard products or let us customize a solution for your application. With our flexible manufacturing, we can cost-effectively produce small batches in short lead times.

Automated Guided Vehicle (AGV)



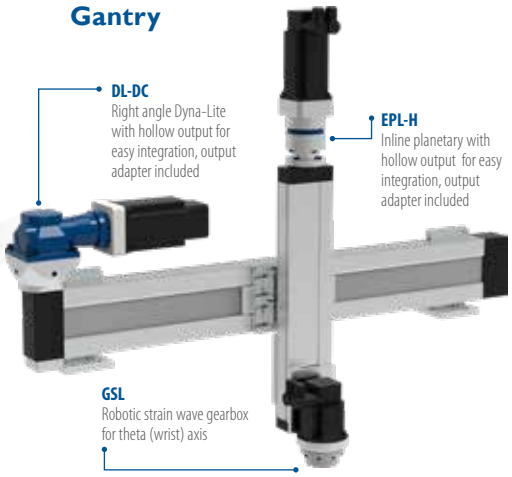
EPL Inline
Modified for demanding shock and reversing loads

Robot 7th Axis



Dyna Series + Rack & Pinion
High performance right angle hypoid gearbox with helical pinion and rack drive the 7th axis

Gantry



DL-DC
Right angle Dyna-Lite with hollow output for easy integration, output adapter included

EPL-H
Inline planetary with hollow output for easy integration, output adapter included

GSL
Robotic strain wave gearbox for theta (wrist) axis

Servo Gearboxes: Overview

Inline Servo Gearboxes

SPH Helical Inline

High performance inline planetary helical gearbox for demanding applications

- Lowest backlash <1 arcmin
- Torque capacity up to 900 Nm
- Frame sizes from 50-180 mm

EPL Inline

Performance inline planetary gearbox for general applications

- Lowest backlash <8 arcmin
- Torque capacity up to 340 Nm
- Frame sizes from 50-150 mm

PE Inline

Basic performance inline planetary gearbox for general applications

- Lowest backlash <8 arcmin
- Torque capacity up to 210 Nm
- Frame sizes from 50-118 mm

SSP Stainless Steel Inline

Performance stainless steel inline planetary gearbox

- Lowest backlash <8 arcmin
- Torque capacity up to 340 Nm
- Frame sizes from 70-120 mm

Right Angle Servo Gearboxes

Dyna Series (DS) Right Angle

High performance right angle hypoid gearbox for demanding applications

- Lowest backlash <2 arcmin
- Torque capacity up to 1400 Nm
- Frame sizes from 55-190 mm

Dyna-Lite (DL) Right Angle

Performance right angle hypoid gearbox for general applications

- Lowest backlash <6 arcmin
- Torque capacity up to 140 Nm
- Frame sizes from 55-90 mm

EPR Right Angle

Performance right angle bevel planetary gearbox for general applications

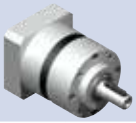
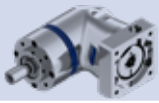
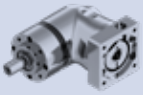
- Lowest backlash <8 arcmin
- Torque capacity up to 340 Nm
- Frame sizes from 64-118 mm

PER Right Angle

Basic performance right angle bevel planetary gearbox for general applications

- Lowest backlash <8 arcmin
- Torque capacity up to 210 Nm
- Frame sizes from 64-118 mm

Servo Gearbox Selection Guide

		Inline Planetary Gear Reducers			
		Highest Performance	High Performance	Performance	Specialty
		SPH	EPL	PE 	SSP (Stainless)
Gear Technology		Helical	Straight Tooth	Straight Tooth	Straight Tooth
Ratios	min	3	3	3	3
	max	100	1000	1000	100
Frame Sizes		5	5	4	3
Max. Nominal Torque (Nm)		900	340	210	210
Lowest Backlash (arcmin)		<1	<8	<8	<8
Max. Radial Loading (N)		20,000	7500	2500	3000
Service Life (hours)		20,000	30,000	20,000	30,000
Output Style	Shaft (Metric)				
	Shaft (NEMA)				
	Hollow				
	Flange				
		Right Angle Gear Reducers			
		Highest Performance	High Performance		
		DYNA (DS)*	DL	EPR 	PER 
Gear Technology		Hypoid	Hypoid	Right Angle Bevel Planetary	Right Angle Bevel Planetary
Ratios	min	3	5	3	3
	max	100	150	1000	1000
Frame Sizes		6	3	3	3
Max. Nominal Torque (Nm)		1400	140	149	149
Lowest Backlash (arcmin)		<2*	<6	<10	<10
Max. Radial Loading (N)		15,000	7200	5000	2500
Service Life (hours)		30,000	15,000	30,000	20,000
Output Style	Shaft (Metric)				
	Shaft (NEMA)				
	Hollow				
	Flange				

*DSX option - Ground Gears / Improved Performance / Lowest Backlash

SERVO GEARBOXES

Highest Performance: SPH Series

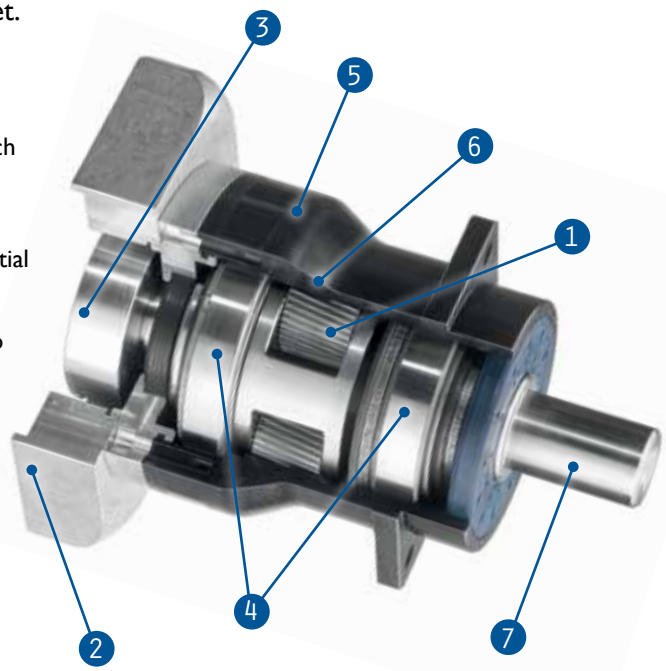
GAM can.

If you don't see exactly what you need, let us know. We can modify the SPH Series gearboxes to meet your needs. Page 5 provides examples of GAM capabilities.

The SPH series features helical gearing which brings a whole new level of power and precision to GAM's already extensive portfolio of gear reducer technology. With special attention paid to every aspect during development, the SPH gracefully combines design and engineering, to deliver our best inline planetary gear reducer yet.

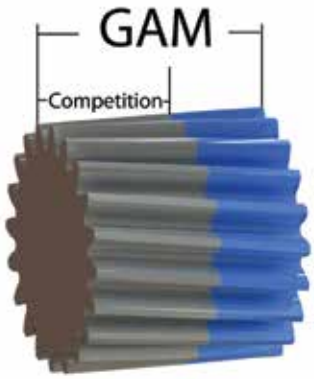
For dynamic and demanding servo applications where performance is critical, the SPH is highly powerful and efficient, yet smooth and quiet.

1. **Helical Gears** Precision cut and ground to quietly deliver higher torques and accuracies
2. **Adapter Flange** Custom machined to match any motor for easy installation
3. **Input Clamping Element** Low inertia and balanced for high speeds with a single tangential screw ensures a secure motor connection
4. **Bearings** Optimized taper roller bearings to accommodate high radial and axial loads
5. **Housing** Sleek and contoured steel housing with black oxide treatment for maximum durability
6. **Ring Gear** Machined directly into the single piece housing for maximum stiffness
7. **Output Shaft** Offered smooth or keyed and can be easily shortened if required



Helical gears make the difference

The helical gear profile is cut at an angle that allows for gradual tooth engagement allowing for smooth, accurate, and quiet transmission. GAM's SPH gears are cut at the optimal helix angle to minimize resultant axial forces and they have a larger tooth width to maximize torque carrying capacity compared to the competition.



It all starts with the gears

The SPH's helical gears are produced to an extremely high level of quality and ground for further precision. With state of the art testing and measuring instruments and qualified personnel, we assure that the SPH will meet and exceed your requirements. With the SPH, every detail counts.

The SPH is GAM's highest performing inline gear reducer

Designed for ***dynamic*** & ***cyclic*** applications

Can be optimized for ***high speed*** and ***continuous*** applications

Highest Performance: SPH Series

Available configurations for simple and compact machine integration

SPH-W
Shaft output design for mounting to pulleys and rack and pinion systems. Available with a smooth or keyed output shaft.

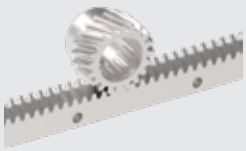
SPH-K
Features a bellows coupling on the output for maximum stiffness and the best results in highly dynamic applications. An output housing comes standard with custom housings available.

SPH-C
Same benefits as the SPH-K models without the housing on the output. Plug the gearbox directly into your machine and achieve a more compact design.

SPH-F
Flange output design for direct mounting of pinions and other machine elements.

SPH-FP version with pre-mounted GAM helical pinion pairs with helical rack for a complete system

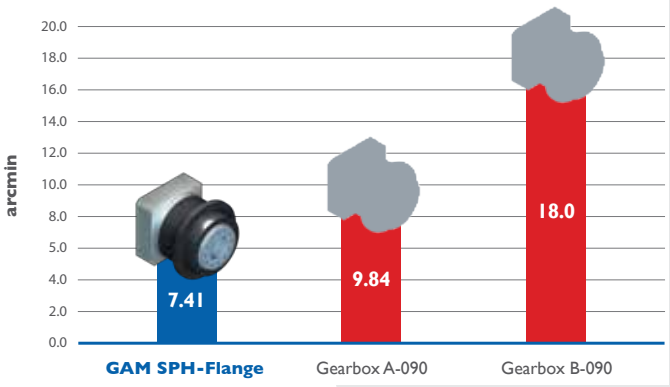
SPH-SP
Spline shaft output with GAM Helical Pinion. Use with GAM Helical Rack for a complete linear system.
See page 178



When your application is demanding...demand GAM's SPH

	LOW	HIGH	SUPERIOR	WHY GAM SPH?
Flexibility	Competition A Competition B		**SPH**	Configured to meet the application, not the other way around!
Modifications & Customizations	Competition A Competition B		**SPH**	Flexible manufacturing and experienced engineering
Performance			**SPH** Competition A Competition B	Highest quality, durability, and performance planetary gearbox
Quality			**SPH** Competition A Competition B	State of the art testing and measuring machines.

Limit Lost Motion with the SPH Flange



Lost Motion (LM) in arcmin, was calculated using the following formula: LM=(1/Ct)*Ta+j

Where: Ct= Torsional Rigidity (Nm/arcmin)
Ta= Application Torque (Nm)
j= Output Backlash - Standard (arcmin)

Backlash and Torsional Rigidity are both important values to consider when selecting a high precision gearbox as they both affect lost motion.

In this example, the SPH Flange (size 75, 5:1 ratio, standard backlash <3 arcmin, rigidity 34 Nm/arcmin) was compared to two equivalent standard backlash flange gearboxes available on the market.

Using an application torque value of 150 Nm, gearbox A-090 and gearbox B-090 exhibit 33% and 143% more lost motion respectively than the SPH Flange.

SPH-F ***Low Backlash***

<3 arcmin standard

<1 arcmin reduced

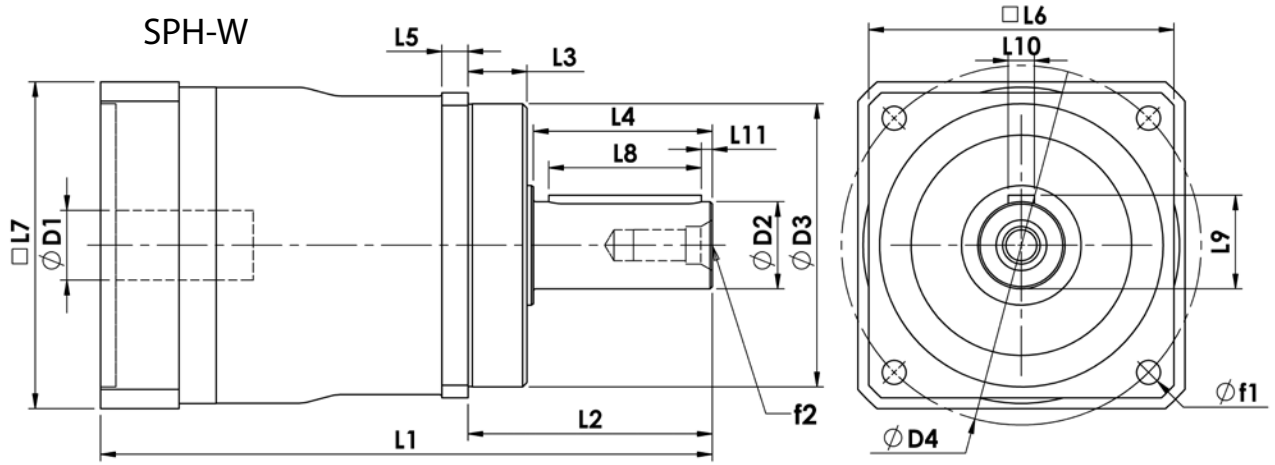
Highest Performance: SPH Series - SPH-W

SPH-W			60	75	100	140	180
All Ratios Available							
Nominal Output Torque (T_{2n})	Nm (lb-in)	3:1-5:1	60 (531)	100 (885)	250 (2213)	450 (3983)	900 (7966)
		7:1	40 (354)	80 (708)	180 (1593)	420 (3717)	800 (7081)
		10:1	30 (266)	65 (575)	110 (974)	240 (2124)	450 (3983)
		12:1-40:1	60 (531)	100 (885)	250 (2213)	450 (3983)	900 (7966)
		50:1	40 (354)	80 (708)	250 (2213)	450 (3983)	900 (7966)
		70:1	40 (354)	80 (708)	180 (1593)	420 (3717)	800 (7081)
		100:1	30 (266)	65 (575)	110 (974)	240 (2124)	450 (3983)
Max Acceleration Output Torque (T_{2B})	Nm (lb-in)		1.5 x Nominal (T2n)				
Emergency Output Torque (T_{2not})	Nm (lb-in)		3.5 x Nominal (T2n)				
Nominal Input Speed (n_{1n})	RPM	-	4500	4500	4000	3800	2000
Max Input Speed (n_{1max})		-	6000				
Standard Output Backlash* (j)	arcmin	1-stage	<4	<4	<4	<4	<4
		2-stage	<6	<6	<6	<6	<6
Reduced Output Backlash* (j)	arcmin	1-stage	<2	<2	<2	<2	-
		2-stage	<4	<4	<4	<4	-
Allowable Radial Load (F_{rad})1)	N (lbf)	-	3,500 (787)	4,500 (1012)	8,000 (1798)	12,000 (2698)	20,000 (4496)
Allowable Axial Load (F_{axial})	N (lbf)	-	1,600 (360)	2,400 (540)	2,400 (540)	6,000 (1349)	10,000 (2248)
Torsional Stiffness* (C_{t21})	Nm/arcmin (lb-in/ arcmin)	1-stage	4.0 (35)	12 (106)	32 (283)	54 (478)	168 (1487)
		2-stage	4.0 (35)	12 (106)	32 (283)	54 (478)	168 (1487)
Mass Moment of Inertia (J_1)	kg-cm^2 (lb-in^2)	3:1	0.42 (0.144)	1.26 (0.431)	4.00 (1.367)	12.90 (4.408)	62.30 (21.29)
		4:1	0.29 (0.099)	0.95 (0.325)	2.90 (0.991)	8.45 (2.888)	38.90 (13.29)
		5:1	0.22 (0.075)	0.79 (0.270)	2.20 (0.752)	6.20 (2.119)	25.90 (8.850)
		7:1	0.17 (0.058)	0.68 (0.232)	1.81 (0.619)	4.66 (1.592)	18.40 (6.288)
		10:1	0.15 (0.051)	0.62 (0.212)	1.60 (0.547)	3.86 (1.319)	13.60 (4.647)
		12-16:1	0.18 (0.062)	0.62 (0.212)	1.46 (0.499)	3.40 (1.162)	12.90 (4.408)
		20-25:1	0.14 (0.048)	0.53 (0.181)	1.20 (0.410)	2.45 (0.837)	8.69 (2.970)
		28-40:1	0.13 (0.044)	0.50 (0.171)	1.10 (0.376)	2.10 (0.718)	6.99 (2.389)
		50-100:1	0.12 (0.041)	0.46 (0.157)	0.99 (0.338)	1.73 (0.591)	5.39 (1.842)
Weight (m)	kg (lbs)	1-stage	(2.2) (4.9)	3.6 (7.9)	7.3 (16)	17.4 (38)	38 (84)
		2-stage	(2.9) (6.4)	4.9 (11)	9.1 (20)	23.3 (51)	48 (106)
Noise Level (L_{PA})	dB(A)	1-stage	<60	<63	<64	<65	<65
		2-stage	<60	<61	<62	<63	<64
Efficiency at Load			1-stage: 98% 2-stage: 96%				
Service Life			>20,000 hours				
Lubrication			Lifetime lubrication with synthetic oil				
Protection Rating			IP64 (IP65/IP66 available on request)				
Operating Temperature Range			-25°C to +80°C (short term: 100°C)				

1) Load applied at center of output shaft @ 100 RPM

* See page 224 for definitions

SPH-W



SPH-W		60		75		100		140		180	
		mm	(in)	mm	(in)	mm	(in)	mm	(in)	mm	(in)
$D1_{max}$ Standard	Motor Shaft Diameter	14	(0.551)	19	(0.748)	24	(0.945)	32	(1.260)	38	(1.496)
$D1_{max}$ Available[1]		19	(0.748)	24	(0.945)	32	(1.260)	38	(1.496)	48	(1.890)
$D1_{max}$ 2-stage		14	(0.551)	19	(0.748)	24	(0.945)	32	(1.260)	38	(1.496)
D2 k6	Output Shaft Diameter	16	(0.630)	22	(0.866)	32	(1.260)	40	(1.575)	55	(2.165)
D3 g6	Pilot Diameter	60	(2.362)	70	(2.756)	90	(3.543)	130	(5.118)	160	(6.299)
D4	Output Bolt Circle	68	(2.677)	85	(3.346)	120	(4.724)	165	(6.496)	215	(8.465)
f1	Mounting Holes	6	(0.236)	6.6	(0.260)	9	(0.354)	11	(0.433)	13	(0.512)
f2	Shaft End Thread	M5		M8		M12		M16		M20	
L1 1-stage[2]	Overall Gearbox Length	150	(5.906)	165	(6.496)	220	(8.661)	280	(11.024)	330	(12.992)
L1 2-stage[2]		190	(7.480)	210	(8.268)	270	(10.630)	345	(13.583)	420	(16.535)
L2	Shaft Length	48	(1.890)	56	(2.205)	88	(3.465)	112	(4.409)	112	(4.409)
L3	Pilot Height	18	(0.709)	18	(0.709)	28	(1.102)	27	(1.063)	27	(1.063)
L4	Usable Shaft Length	28	(1.102)	36	(1.417)	58	(2.283)	82	(3.228)	82	(3.228)
L5	Flange Thickness	6	(0.236)	7	(0.276)	10	(0.394)	12	(0.472)	18	(0.709)
L6	Output Square	61	(2.402)	75	(2.953)	100	(3.937)	140	(5.512)	180	(7.087)
L7[2]	Input Square	75	(2.953)	90	(3.543)	120	(4.724)	150	(5.906)	210	(8.268)
L8	Key Length	25	(0.984)	32	(1.260)	50	(1.969)	70	(2.756)	70	(2.756)
L9	Key Height	18	(0.709)	24.5	(0.965)	35	(1.378)	43	(1.693)	59	(2.323)
L10	Key Width	5	(0.197)	6	(0.236)	10	(0.394)	12	(0.472)	16	(0.630)
L11	Key End	1.5	(0.059)	2	(0.079)	4	(0.157)	5	(0.197)	6	(0.236)

1) For larger motor shaft diameters, please contact GAM.
2) Depending on the motor, value can vary.

TYPE CODES FOR SPH SERIES (SPH-W)

Example: SPH - W - 075 - 005G -M0000 - H0000 - C0000

Gearbox Series
SPH Series

Gearbox Style
W = Output Shaft

Gearbox Size
060, 075, 100, 140, 180

Ratio
3, 4, 5, 7, 10, 12, 15, 16, 20, 25, 28, 30, 35, 40, 50, 70, 100

Options Available for This Product
G = Key on output shaft per DIN6885
C = Reduced backlash and key on output shaft
H = Smooth output shaft
A = Reduced backlash and smooth shaft

Motor Code
Assigned by GAM

Output Code
Assigned by GAM

Configuration Code
Assigned by GAM

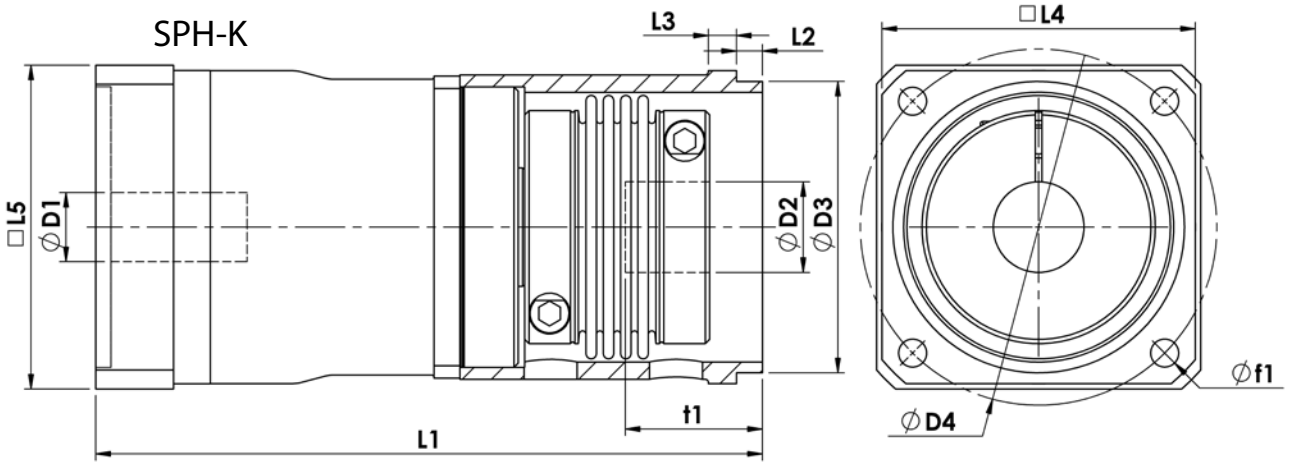
Tolerance (mm)		
Size	k6	g6
Over 6	+0.010	-0.005
Thru 10	+0.001	-0.014
Over 10	+0.012	-0.006
Thru 18	+0.001	-0.017
Over 18	+0.015	-0.007
Thru 30	+0.002	-0.020
Over 30	+0.018	-0.009
Thru 50	+0.002	-0.025
Over 50	+0.021	-0.010
Thru 80	+0.002	-0.029
Over 80	+0.025	-0.012
Thru 120	+0.003	-0.034
Over 120	+0.028	-0.014
Thru 180	+0.003	-0.037

HIGHEST PERFORMANCE: SPH SERIES - SPH-K

SPH-K			60	75	100	140	180
All Ratios Available							
Nominal Output Torque (T_{2n})	Nm (lb-in)	3:1-5:1	40 (531)	100 (885)	250 (2213)	450 (3983)	900 (7966)
		7:1	40 (354)	80 (708)	180 (1593)	420 (3717)	800 (7081)
		10:1	30 (266)	65 (575)	110 (974)	240 (2124)	450 (3983)
		12:1-40:1	40 (531)	100 (885)	250 (2213)	450 (3983)	900 (7966)
		50:1	40 (354)	80 (708)	250 (2213)	450 (3983)	900 (7966)
		70:1	40 (354)	80 (708)	180 (1593)	420 (3717)	800 (7081)
		100:1	30 (266)	65 (575)	110 (974)	240 (2124)	450 (3983)
Max Acceleration Output Torque (T_{2B})	Nm (lb-in)	1.5 x Nominal (T2n)					
Emergency Output Torque (T_{2not})	Nm (lb-in)	3.5 x Nominal (T2n)					
Nominal Input Speed (n_{1n})	RPM	-	4500	4500	4000	3800	2000
Max Input Speed (n_{1max})		-	6000				
Standard Output Backlash* (j)	arcmin	1-stage	<4	<4	<4	<4	<4
		2-stage	<6	<6	<6	<6	<6
Reduced Output Backlash* (j)	arcmin	1-stage	<2	<2	<2	<2	-
		2-stage	<4	<4	<4	<4	-
Torsional Stiffness* (C_{t21})	Nm/arcmin (lb-in/arcmin)	1-stage	2.8 (25)	7.5 (66)	20 (175)	36 (317)	96 (851)
		2-stage	2.8 (25)	7.5 (66)	20 (175)	36 (317)	96 (851)
Mass Moment of Inertia (J_1)	kg-cm^2 (lb-in^2)	3:1	0.62 (0.212)	1.65 (0.563)	6.89 (2.354)	18.90 (6.458)	89.86 (30.705)
		4:1	0.40 (0.138)	1.17 (0.399)	4.53 (1.546)	11.83 (4.041)	54.40 (18.589)
		5:1	0.29 (0.100)	0.93 (0.318)	3.24 (1.107)	8.36 (2.857)	35.82 (12.240)
		7:1	0.21 (0.071)	0.75 (0.257)	2.34 (0.800)	5.76 (1.969)	23.46 (8.017)
		10:1	0.17 (0.057)	0.66 (0.224)	1.86 (0.636)	4.40 (1.504)	16.08 (5.495)
		12-16:1	0.19 (0.064)	0.63 (0.217)	1.56 (0.534)	3.61 (1.234)	13.87 (4.739)
		20-25:1	0.14 (0.049)	0.54 (0.183)	1.24 (0.424)	2.54 (0.867)	9.09 (3.105)
		28-40:1	0.13 (0.045)	0.50 (0.172)	1.12 (0.383)	2.14 (0.733)	7.19 (2.458)
		50-100:1	0.12 (0.041)	0.46 (0.157)	0.99 (0.339)	1.74 (0.593)	5.41 (1.850)
Weight (m)	kg (lbs)	1-stage	3.0 (6.5)	4.5 (10)	11 (24)	23 (50)	52 (115)
		2-stage	3.7 (8.0)	5.8 (12.8)	13 (28)	29 (63)	62 (137)
Noise Level (L_{PA})	dB(A)	1-stage	<60	<63	<64	<65	<65
		2-stage	<60	<61	<62	<63	<64
Efficiency at Load		1-stage: 98% 2-stage: 96%					
Service Life		>20,000 hours					
Lubrication		Lifetime lubrication with synthetic oil					
Protection Rating		IP64 (IP65/IP66 available on request)					
Operating Temperature Range		-25°C to +80°C (short term: 100°C)					

* See page 224 for definitions

SPH-K



SPH-K		60		75		100		140		180	
		mm	(in)	mm	(in)	mm	(in)	mm	(in)	mm	(in)
$D1_{max}$ Standard	Motor Shaft Diameter	14	(0.551)	19	(0.748)	24	(0.945)	32	(1.260)	38	(1.496)
$D1_{max}$ Available[1]		19	(0.748)	24	(0.945)	32	(1.260)	38	(1.496)	48	(1.890)
$D1_{max}$ 2-stage		14	(0.551)	19	(0.748)	24	(0.945)	32	(1.260)	38	(1.496)
$D2_{FB\ min}$	Minimum Output Bore	12	(0.472)	22	(0.866)	22	(0.866)	42	(1.654)	50	(1.969)
$D2_{FB\ max}$	Maximum Output Bore	28	(1.102)	38	(1.496)	50	(1.969)	64	(2.520)	90	(3.543)
D3 g6	Pilot Diameter	70	(2.756)	85	(3.346)	115	(4.528)	135	(5.315)	180	(7.087)
D4	Output Bolt Circle	85	(3.346)	105	(4.134)	140	(5.512)	165	(6.496)	215	(8.465)
f1	Mounting Holes	6.6	(0.260)	9	(0.354)	11	(0.433)	13	(0.512)	17	(0.669)
L1[2]	Overall Gearbox Length	189	(7.441)	214	(8.425)	262	(10.315)	308	(12.126)	386	(15.197)
$L1_{2\text{-stage}}$[2]		229	(9.016)	259	(10.197)	312	(12.283)	373	(14.685)	476	(18.740)
L2	Pilot Height	6	(0.236)	8	(0.315)	10	(0.394)	12	(0.472)	15	(0.591)
L3	Flange Thickness	7	(0.276)	9	(0.354)	11	(0.433)	13	(0.512)	15	(0.591)
L4	Output Square	70	(2.756)	95	(3.740)	120	(4.724)	145	(5.709)	190	(7.480)
L5[2]	Input Square	75	(2.953)	90	(3.543)	120	(4.724)	150	(5.906)	210	(8.268)
$t1_{FB\ min}$	Minimum Shaft Engagement	27	(1.063)	39.5	(1.555)	44	(1.732)	49	(1.929)	65.5	(2.579)
$t1_{FB\ max}$	Maximum Shaft Engagement	51	(2.008)	62	(2.441)	74	(2.913)	86	(3.386)	105	(4.134)

1) For larger motor shaft diameters, please contact GAM.
2) Depending on the motor, value can vary.

TYPE CODES FOR SPH-K SERIES

Example: SPH - K - 060 - 005 G - M0000 - H0000 - C0000

Gearbox Series
SPH Series

Gearbox Style
K = Bellows coupling output with housing

Gearbox Size
060, 075, 100, 140, 180

Ratio
3, 4, 5, 7, 10, 12, 15, 16, 20, 25, 28, 30, 35, 40, 50, 70, 100

Options Available for This Product
G = Standard backlash and keyway in output coupling
C = Reduced backlash and keyway in output coupling
H = Standard backlash and no keyway in output coupling
A = Reduced backlash and no keyway in output coupling

Motor Code
Assigned by GAM

Output Code
Assigned by GAM

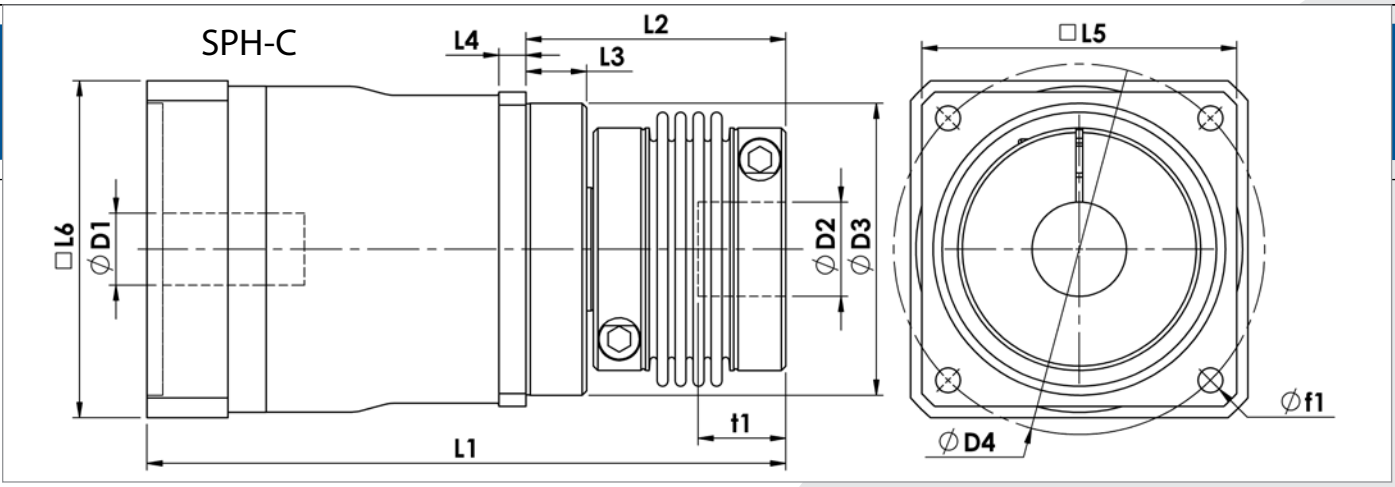
Configuration Code
Assigned by GAM

Tolerance (mm)		
Size	k6	g6
Over 6	+0.010	-0.005
Thru 10	+0.001	-0.014
Over 10	+0.012	-0.006
Thru 18	+0.001	-0.017
Over 18	+0.015	-0.007
Thru 30	+0.002	-0.020
Over 30	+0.018	-0.009
Thru 50	+0.002	-0.025
Over 50	+0.021	-0.010
Thru 80	+0.002	-0.029
Over 80	+0.025	-0.012
Thru 120	+0.003	-0.034
Over 120	+0.028	-0.014
Thru 180	+0.003	-0.037

Highest Performance: SPH Series - SPH-C

SPH-C			60	75	100	140	180
All Ratios Available							
Nominal Output Torque (T_{2n})	Nm (lb-in)	3:1-5:1	40 (531)	100 (885)	250 (2213)	450 (3983)	900 (7966)
		7:1	40 (354)	80 (708)	180 (1593)	420 (3717)	800 (7081)
		10:1	30 (266)	65 (575)	110 (974)	240 (2124)	450 (3983)
		12:1-40:1	40 (531)	100 (885)	250 (2213)	450 (3983)	900 (7966)
		50:1	40 (354)	80 (708)	250 (2213)	450 (3983)	900 (7966)
		70:1	40 (354)	80 (708)	180 (1593)	420 (3717)	800 (7081)
		100:1	30 (266)	65 (575)	110 (974)	240 (2124)	450 (3983)
Max Acceleration Output Torque (T_{2B})	Nm (lb-in)		1.5 x Nominal (T2n)				
Emergency Output Torque (T_{2not})	Nm (lb-in)		3.5 x Nominal (T2n)				
Nominal Input Speed (n1n)	RPM	-	4500	4500	4000	3800	2000
Max Input Speed (n_{1max})		-	6000				
Standard Output Backlash* (j)	arcmin	1-stage	<4	<4	<4	<4	<4
		2-stage	<6	<6	<6	<6	<6
Reduced Output Backlash* (j)	arcmin	1-stage	<2	<2	<2	<2	-
		2-stage	<4	<4	<4	<4	-
Torsional Stiffness* (C_{t21})	Nm/arcmin (lb-in/arcmin)	1-stage	2.8 (25)	7.5 (66)	20 (175)	36 (317)	96 (851)
		2-stage	2.8 (25)	7.5 (66)	20 (175)	36 (317)	96 (851)
Mass Moment of Inertia (J_1)	kg-cm^2 (lb-in^2)	3:1	0.62 (0.212)	1.65 (0.563)	6.89 (2.354)	18.90 (6.458)	89.86 (30.71)
		4:1	0.40 (0.138)	1.17 (0.399)	4.53 (1.546)	11.83 (4.041)	54.40 (18.59)
		5:1	0.29 (0.100)	0.93 (0.318)	3.24 (1.107)	8.36 (2.857)	35.82 (12.240)
		7:1	0.21 (0.071)	0.75 (0.257)	2.34 (0.800)	5.76 (1.969)	23.46 (8.017)
		10:1	0.17 (0.057)	0.66 (0.224)	1.86 (0.636)	4.40 (1.504)	16.08 (5.495)
		12-16:1	0.19 (0.064)	0.63 (0.217)	1.56 (0.534)	3.61 (1.234)	13.87 (4.739)
		20-25:1	0.14 (0.049)	0.54 (0.183)	1.24 (0.424)	2.54 (0.867)	9.09 (3.105)
		28-40:1	0.13 (0.045)	0.50 (0.172)	1.12 (0.383)	2.14 (0.733)	7.19 (2.458)
		50-100:1	0.12 (0.041)	0.46 (0.157)	0.99 (0.339)	1.74 (0.593)	5.41 (1.850)
Weight (m) With Bellows Coupling	kg (lbs)	1-stage	2.7 (6.0)	4.1 (9)	9.7 (21)	21 (46)	47 (103)
		2-stage	3.4 (7.5)	5.4 (11.9)	12 (25)	27 (59)	57 (125)
Noise Level (L_{PA})	dB(A)	1-stage	<60	<63	<64	<65	<65
		2-stage	<60	<61	<62	<63	<64
Efficiency at Load			1-stage: 98% 2-stage: 96%				
Service Life			>20,000 hours				
Lubrication			Lifetime lubrication with synthetic oil				
Protection Rating			IP64 (IP65/IP66 available on request)				
Operating Temperature Range			-25°C to +80°C (short term: 100°C)				

* See page 224 for definitions



SPH-C		60		75		100		140		180	
		mm	(in)	mm	(in)	mm	(in)	mm	(in)	mm	(in)
$D1_{max}$ Standard	Motor Shaft Diameter	14	(0.551)	19	(0.748)	24	(0.945)	32	(1.260)	38	(1.496)
$D1_{max}$ Available[1]		19	(0.748)	24	(0.945)	32	(1.260)	38	(1.496)	48	(1.890)
$D1_{max}$ 2-stage		14	(0.551)	19	(0.748)	24	(0.945)	32	(1.260)	38	(1.496)
$D2_{FB\ min}$	Minimum Output Bore	12	(0.472)	22	(0.866)	22	(0.866)	42	(1.654)	50	(1.969)
$D2_{FB\ max}$	Maximum Output Bore	28	(1.102)	38	(1.496)	50	(1.969)	64	(2.520)	90	(3.543)
D3 g6	Pilot Diameter	60	(2.362)	70	(2.756)	90	(3.543)	130	(5.118)	160	(6.299)
D4	Output Bolt Circle	68	(2.677)	85	(3.346)	120	(4.724)	165	(6.496)	215	(8.465)
f1	Mounting Holes	6	(0.236)	6.6	(0.260)	9	(0.354)	11	(0.433)	13	(0.512)
L1FB[2]	Overall Gearbox Length	177	(6.969)	197	(7.756)	244	(9.606)	283	(11.142)	356	(14.016)
L1FB 2-stage[2]		217	(8.543)	242	(9.528)	294	(11.575)	348	(13.701)	446	(17.559)
L2FB	Coupling Length	75	(2.953)	88	(3.465)	112	(4.409)	115	(4.528)	138	(5.433)
L2FE		78	(3.071)	93	(3.661)	116	(4.567)	124	(4.882)	136	(5.354)
L3	Pilot Height	18	(0.709)	18	(0.709)	28	(1.102)	27	(1.063)	27	(1.063)
L4	Flange Thickness	6	(0.236)	7	(0.276)	10	(0.394)	12	(0.472)	18	(0.709)
L5	Output Square	61	(2.402)	75	(2.953)	100	(3.937)	140	(5.512)	180	(7.087)
L6[2]	Input Square	75	(2.953)	90	(3.543)	120	(4.724)	150	(5.906)	210	(8.268)
$t1_{FB\ min}$	Minimum Shaft Engagement	16	(0.630)	22	(0.866)	26	(1.024)	24	(0.945)	35.5	(1.398)
$t1_{FB\ max}$	Maximum Shaft Engagement	39	(1.535)	45	(1.772)	56	(2.205)	61	(2.402)	75.5	(2.972)

1) For larger motor shaft diameters, please contact GAM.
2) Depending on the motor, value can vary.

TYPE CODES FOR SPH-C SERIES

Example: SPH - C - 060 - 005 G - M0000 - H0000 - C0000

Gearbox Series
SPH Series

Gearbox Style
C = Bellows coupling output

Gearbox Size
060, 075, 100, 140, 180

Ratio
3, 4, 5, 7, 10, 12, 15, 16, 20, 25, 28, 30, 35, 40, 50, 70, 100

Options Available for This Product
G = Standard backlash and keyway in output coupling
C = Reduced backlash and keyway in output coupling
H = Standard backlash and no keyway in output coupling
A = Reduced backlash and no keyway in output coupling

Motor Code
Assigned by GAM

Output Code
Assigned by GAM

Configuration Code
Assigned by GAM

Tolerance (mm)		
Size	k6	g6
Over 6	+0.010	-0.005
Thru 10	+0.001	-0.014
Over 10	+0.012	-0.006
Thru 18	+0.001	-0.017
Over 18	+0.015	-0.007
Thru 30	+0.002	-0.020
Over 30	+0.018	-0.009
Thru 50	+0.002	-0.025
Over 50	+0.021	-0.010
Thru 80	+0.002	-0.029
Over 80	+0.025	-0.012
Thru 120	+0.003	-0.034
Over 120	+0.028	-0.014
Thru 180	+0.003	-0.037

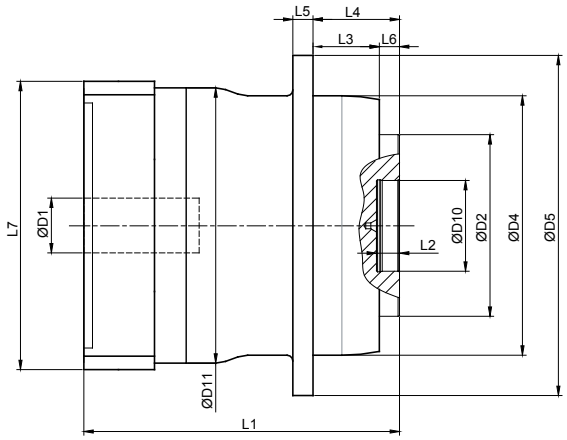
HIGHEST PERFORMANCE: SPH SERIES - SPH-F

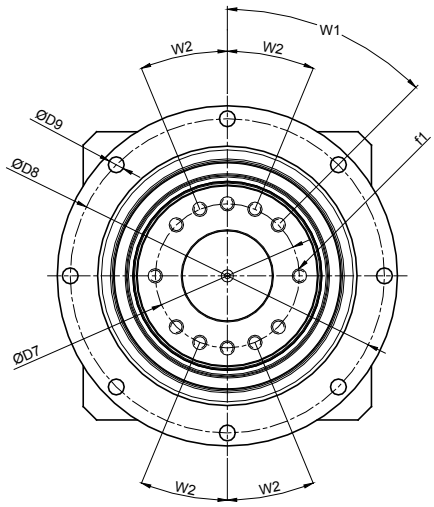
SPH-F			75	100	140
Ratios Available			1 Stage: 4, 5, 7, 10		
			2 Stage: 16, 20, 25, 28, 35, 40, 50, 70, 100		
Nominal Output Torque (T_{2n})[1]	Nm (lb-in)	4:1-5:1	100 (885)	250 (2213)	450 (3983)
		7:1	80 (708)	180 (1593)	420 (3717)
		10:1	65 (575)	110 (974)	210 (1859)
		16:1-50:1	100 (885)	250 (2213)	450 (3983)
		70:1	80 (708)	180 (1593)	420 (3717)
		100:1	65 (575)	110 (974)	210 (1859)
Max Acceleration Output Torque (T_{2B})	Nm (lb-in)		1.5 x Nominal (T_{2n})		
Emergency Output Torque (T_{2not})	Nm (lb-in)		3.5 x Nominal (T_{2n})		
Nominal Input Speed (n_{n1n})[1]	RPM	-	4500	4000	3800
Max Input Speed (n_{n1max})		-		6000	
Standard Output Backlash* (j)	arcmin	1-stage	<3	<3	<3
		2-stage	<5	<5	<5
Reduced Output Backlash*(j)	arcmin	1-stage	<1	<1	<1
		2-stage	<1	<1	<1
Allowable Radial Load (F_{radial})[2]	N (lbf)	-	3150 (708)	4000 (899)	9800 (2203)
Allowable Axial Load (F_{raxial})[3]	N (lbf)	-	5900 (1326)	6850 (1540)	6200 (1394)
Maximum Tilting Moment	Nm (lb-in)	-	290 (2567)	425 (3762)	1100 (9736)
Torsional Stiffness* (C_{t21})	Nm/arcmin (lb-in/arcmin)	1-stage	34 (301)	82 (726)	195 (1726)
		2-stage	30 (266)	74 (655)	175 (1549)
Mass Moment of Inertia (J_1)	kg-cm^2 (lb-in^2)	4:1	1.160 (0.396)	3.170 (1.083)	8.490 (2.901)
		5:1	0.942 (0.322)	2.510 (0.858)	6.210 (2.122)
		7:1	0.753 (0.257)	1.960 (0.670)	4.280 (1.463)
		10:1	0.658 (0.225)	1.680 (0.574)	3.310 (1.131)
		16:1	0.599 (0.205)	1.370 (0.468)	2.320 (0.793)
		20:1	0.563 (0.192)	1.280 (0.437)	2.010 (0.687)
		25:1	0.519 (0.177)	1.160 (0.396)	1.620 (0.554)
		28:1	0.513 (0.175)	1.140 (0.390)	1.580 (0.540)
		35:1	0.500 (0.171)	1.100 (0.376)	1.490 (0.509)
		40:1	0.490 (0.167)	1.070 (0.366)	1.430 (0.489)
		50:1	0.471 (0.161)	1.010 (0.345)	1.310 (0.448)
		70:1	0.462 (0.158)	0.981 (0.335)	1.150 (0.393)
		100:1	0.447 (0.153)	0.940 (0.321)	0.906 (0.310)
Weight (m)	kg (lbs)	1-stage	4.0 (8.8)	6.0 (13.5)	14.1 (31.1)
		2-stage	6.1 (13.5)	9.6 (22.2)	18.0 (39.7)
Noise Level (L_{PA})	dB(A)	1-stage	<59	<63	<65
		2-stage	<59	<63	<65
Efficiency at Load			>97		
Service Life			>20,000 hours		
Lubrication			Lifetime lubrication with synthetic oil		
Protection Rating			IP64 (IP65 available on request)		
Operating Temperature Range			-25°C to +80°C (short term: 100°C)		

1) For S1 continuous operation, consult with GAM. Permissible torques/speed varies with ratio.
2) Load applied to flange end @ 300 RPM
3) Load applied to flange center @ 300 RPM

* See page 224 for definitions

SPH-F





SPH-F		75		100		140	
		mm	(in)	mm	(in)	mm	(in)
$D1_{max}$ Standard	Motor Shaft Diameter	19	(0.748)	24	(0.945)	32	(1.260)
$D1_{max}$ Available[1]		24	(0.945)	32	(1.260)	38	(1.496)
$D1_{max}$ 2-stage		19	(0.748)	24	(0.945)	32	(1.260)
D2 h6	Output Flange Diameter	63	(2.480)	80	(3.150)	100	(3.937)
D4 g6	Output Pilot Diameter	90	(3.543)	110	(4.331)	140	(5.512)
D5	Output Housing Diameter	118	(4.646)	145	(5.709)	179	(7.047)
D7[3]	Output Flange Bolt Circle	50	(1.969)	63	(2.480)	80	(3.150)
D8	Output Housing Bolt Circle	109	(4.291)	135	(5.315)	168	(6.614)
D9	Output Housing Hole Diameter	(8) x 5.5		(8) x 5.5		(12) x 6.6	
D10 H7	Output Flange Pilot Diameter	31.5	(1.240)	40	(1.575)	50	(1.969)
D11	Input Housing Diameter	95.5	(3.760)	119	(4.685)	145	(5.709)
f1	Output Flange Thread Size	(8) M6 x 10		(12) M6 x 12		(12) M8 x 15	
L1 1-Stage[2]	Overall Gearbox Length	109.5	(4.311)	123.5	(4.862)	155.5	(6.122)
L1 2-Stage[2]	Overall Gearbox Length	161	(6.339)	186	(7.323)	221.5	(8.720)
L2	Output Flange Pilot Depth	8	(0.315)	8	(0.315)	15	(0.591)
L3	Output Pilot Height	23	(0.906)	23	(0.906)	30.5	(1.201)
L4	Output Length	30	(1.181)	29	(1.142)	38	(1.496)
L5	Output Housing Flange Thickness	7	(0.276)	8	(0.315)	10	(0.394)
L6	Output Flange Height	7	(0.276)	6	(0.236)	7.5	(0.295)
L7[2]	Motor Adapter Square	115	(4.528)	120	(4.724)	130	(5.118)
W1	Output Flange Thread Angle 1	8 x 45°		8 x 45°		12 x 30°	
W2	Output Flange Thread Angle 2	–		22.5°		–	

1) For larger motor shaft diameters, please contact GAM.
2) Depending on the motor, value may can vary
3) Output flange dimensions per ISO 9409

TYPE CODES FOR SPH-F SERIES

Example: SPH - F - 075 - 005 H - M0000 - H0000 - C0000

- **Gearbox Series** — SPH Series
- **Gearbox Style** — F = Flange output
- **Gearbox Size** — 075, 100, 140
- **Ratio** — 4, 5, 7, 10, 16, 20, 25, 28, 35, 40, 50, 70, 100
- **Options Available for This Product** — H = Standard backlash; A = Reduced backlash
- **Motor Code** — Assigned by GAM
- **Output Code** — Assigned by GAM
- **Configuration Code** — Assigned by GAM

Tolerance (mm)				
Size	k6	g6	h6	H7
Over 6	+0.010	-0.005	0	+0.015
Thru 10	+0.001	-0.014	-0.009	0
Over 10	+0.012	-0.006	0	+0.018
Thru 18	+0.001	-0.017	-0.011	0
Over 18	+0.015	-0.007	0	+0.021
Thru 30	+0.002	-0.020	-0.013	0
Over 30	+0.018	-0.009	0	+0.025
Thru 50	+0.002	-0.025	-0.016	0
Over 50	+0.021	-0.010	0	+0.030
Thru 80	+0.002	-0.029	-0.019	0
Over 80	+0.025	-0.012	0	+0.035
Thru 120	+0.003	-0.034	-0.022	0
Over 120	+0.028	-0.014	0	+0.040
Thru 180	+0.003	-0.037	-0.025	0

High Performance: EPL Series

GAM can.

If you don't see exactly what you need, let us know. We can modify the EPL Series gearboxes to meet your needs. Page 5 provides examples of GAM capabilities.

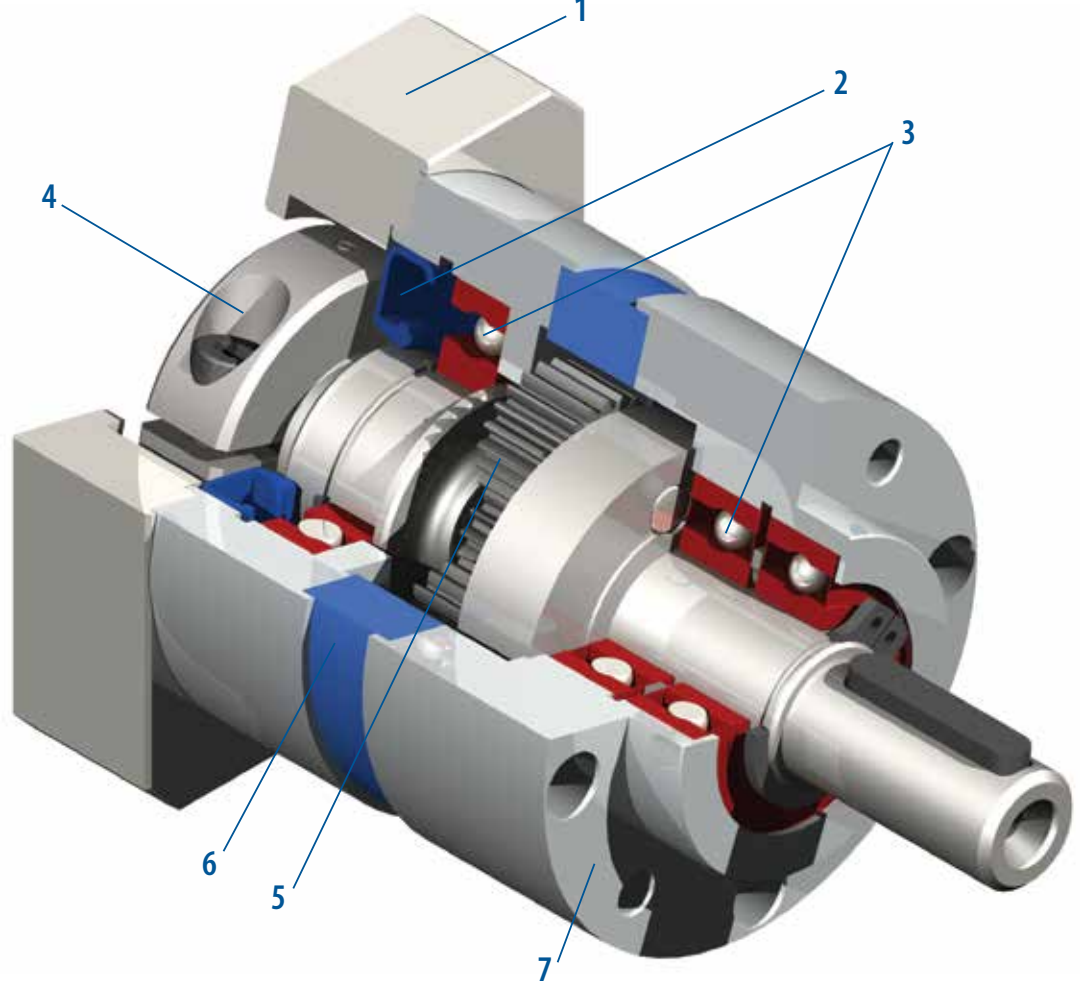
Our EPL Series is widely known as the best value on the market- tens of thousands of EPL's installed since 1998 in North America alone. That's because it offers the best quality available for the price point. We've added some features that make it unequaled in its class and ideal for most servo applications.

EPL Series enhancements include:

- A 50 mm frame size in our standard shaft version (-W) that is a drop-in for many gearboxes
- NEMA output version with oversized english shaft for improved performance
- Option for larger motor shafts

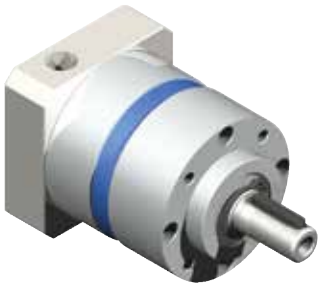
New output configurations include:

- EPL-A dimensions that drop in for popular planetary gearboxes on the market.
- EPL-F that features a flange output for a compact design and allows for easy connecting of mechanical elements such as pulleys and pinions.



1. Adapter Plate
   Customized adapter plates for quick and easy motor mounting
2. Seals
   Protective seals to isolate the gearbox
3. Angular Contact Bearings
   for high radial and axial loading
4. Input Clamping Element
5. Planet Gears
   Precision ground gears
6. Ring Gear
   Ring gear incorporated into housing
7. Output Face

High Performance: EPL Series

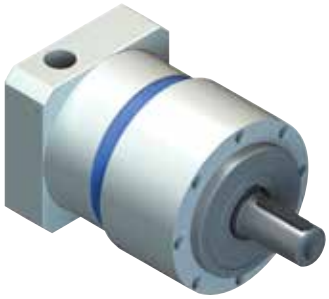


EPL-W

- GAM Metric Output Face
- Heavy Duty Output Bearings
- Ratios 3:1 to 1000:1
- Frame sizes from 50 mm to 150 mm
- Ready to mount to your motor

EPL-X (NEMA)

- NEMA output face with oversized english shaft
- Ratios 3:1 to 1000:1
- Frame sizes from NEMA 17 to 56
- Ready to mount to your motor

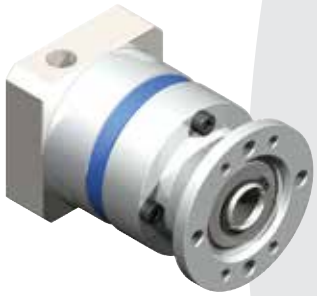


EPL-A

- Metric output dimensions match many other popular inline planetary gear reducers on the market.
- Ratios 3:1 to 1000:1
- Frame sizes from 50 mm to 155 mm
- Ready to mount to your motor
- EPL-AP available with pre-mounted GAM pinion (see page 178)

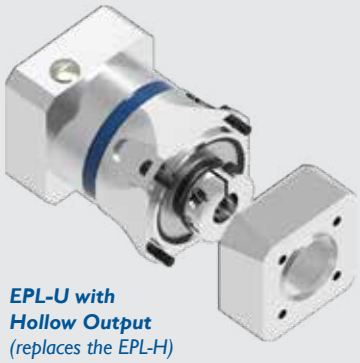
EPL-F

- Flange output
- Compact design
- Ratios 3:1 to 1000:1
- Ready to mount to your motor
- EPL-FP available with pre-mounted GAM pinion (see page 178)

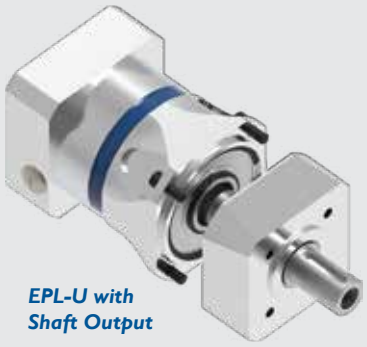


EPL-H

The EPL-H will be replaced by the EPL-U



EPL-U with Hollow Output
(replaces the EPL-H)



EPL-U with Shaft Output

EPL-U for Driving Linear Actuators

- A quick, simple, low cost solution used to mount onto any off-the-shelf linear belt or ball screw module.
- Ready to mount to your module with a customized output
  - Hollow output with zero backlash clamping ring and integral mounting plate for shaft-input actuators
  - Shaft output and integral mounting plate for hollow-input actuators
- Ready to mount to your motor on the input with included motor adapter
- For more information on Linear Mounts, refer to page 196.

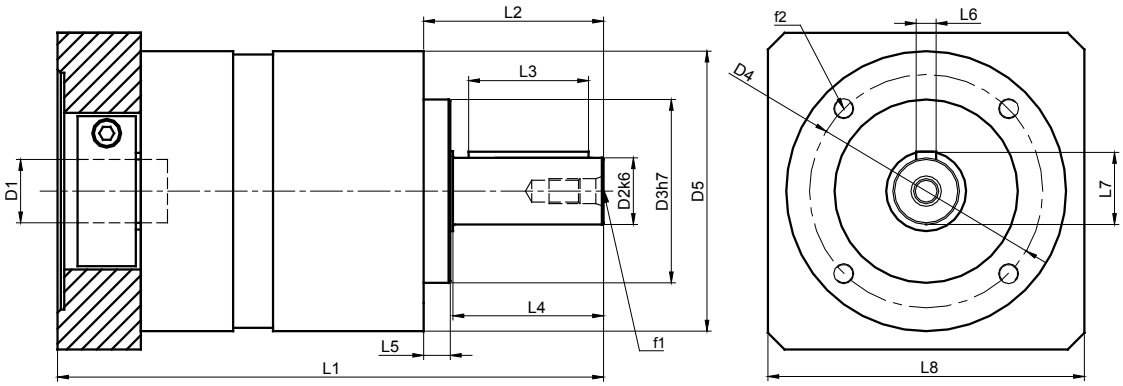
EPL Series - EPL-W

EPL-W Series			50	64	84	118	150
Stock Ratios			3, 5, 7, 10, 25, 50, 100 (Standard Input)				N/A
All Ratios Available			1-stage: 3, 4, 5, 7, 10 2-stage: 12, 16, 20, 25, 35, 40, 50, 70, 100 3-stage: 120, 160, 200, 250, 350, 490, 700, 1000 (Consult GAM for other ratios)				
Nominal Output Torque (T_{2n})	Nm (lb-in)	3:1	5 (44)	20 (177)	40 (354)	100 (885)	230 (2036)
		4, 5, 7:1	6.5 (58)	26 (230)	54 (478)	120 (1062)	310 (2744)
		10, 100, 1000:1	5 (44)	16 (142)	40 (354)	105 (929)	180 (1593)
		12:1	14 (124)	36 (319)	80 (708)	170 (1505)	272 (2407)
		all other ratios	16 (142)	42 (372)	100 (885)	210 (1859)	340 (3009)
Max Acceleration Output Torque (T_{2B})	Nm (lb-in)	3:1	10 (89)	36 (319)	70 (620)	180 (1593)	360 (3186)
		4, 5, 7:1	13 (115)	44 (389)	100 (885)	200 (1770)	460 (4071)
		10, 100, 1000:1	10 (89)	24 (212)	75 (664)	180 (1593)	340 (3009)
		12:1	17.5 (155)	45 (398)	100 (885)	215 (1903)	360 (3186)
		all other ratios	20 (177)	52 (460)	125 (1106)	255 (2257)	460 (4071)
Emergency Output Torque (T_{2not})	Nm (lb-in)	3:1	20 (177)	72 (637)	160 (1416)	200 (1770)	860 (7612)
		4, 5, 7:1	26 (230)	84 (743)	216 (1912)	480 (4248)	1000 (8851)
		10, 100, 1000:1	20 (177)	62 (549)	160 (1416)	410 (3629)	800 (7081)
		12:1	28 (248)	72 (637)	160 (1416)	400 (3540)	860 (7612)
		all other ratios	32 (283)	84 (743)	216 (1912)	480 (4248)	1000 (8851)
Nominal Speed (n1n)	RPM	-	3500	3500	3000	2500	2500
Max Speed (n_{1max})		-	6000	6000	6000	5000	4500
Standard Output Backlash* (j)	arcmin	1-stage	<16	< 10	< 10	< 8	< 8
		2-stage	<20	< 14	< 14	< 12	< 12
		3-stage	-	< 18	< 18	< 16	< 16
Allowable Radial Load (F_{rad}) 1	N (lbs)	-	650 (146)	1900 (428)	2800 (630)	5000 (1125)	7500 (1688)
Allowable Axial Load (F_{axial})	N (lbs)	-	700 (158)	1500 (338)	2500 (563)	4500 (1013)	6000 (1350)
Torsional Stiffness* (C_{t21})	Nm/arcmin (lb-in/arcmin)	10,100,1000	0.60 (5.3)	1.3 (11.5)	3.4 (30.1)	8.3 (73.5)	22 (194.7)
		7,70,700	0.78 (6.9)	1.7 (15)	4.8 (42.5)	13.6 (120.4)	27 (239)
		all other ratios	0.90 (8.0)	2.4 (21.2)	7.1 (62.8)	17.2 (152.2)	33 (292.1)
Weight (m)	kg (lbs)	1-stage	0.4 (0.9)	1.0 (2.2)	2.3 (5.1)	5.8 (12.8)	10.0 (22.1)
		2-stage	0.5 (1.1)	1.3 (2.9)	3.1 (6.8)	7.9 (17.4)	12.5 (27.6)
		3-stage	-	1.6 (3.5)	3.9 (8.6)	10.0 (22.1)	15.0 (33.1)
Noise Level (L_{PA})	dB(A)	-	< 64	< 66	< 68	< 70	< 72
Mass Moment of Inertia (J_1)	kg cm² (lb-in²)	3:1	0.06 (0.021)	0.45 (0.154)	1.37 (0.468)	6.54 (2.235)	12.23 (4.179)
		4:1, 12:1, 16:1	0.04 (0.014)	0.38 (0.130)	1.14 (0.390)	4.8 (1.640)	7.65 (2.614)
		5:1, 20:1, 25:1	0.04 (0.014)	0.36 (0.123)	1.05 (0.359)	4.05 (1.384)	6.24 (2.132)
		7:1, 35:1	0.04 (0.014)	0.35 (0.120)	0.97 (0.331)	3.4 (1.162)	4.7 (1.606)
		10:1, 40:1 - 100:1	0.04 (0.014)	0.34 (0.116)	0.93 (0.318)	3.1 (1.059)	3.8 (1.299)
		120:1 - 1000:1	(0.000)	0.34 (0.116)	0.93 (0.318)	3.12 (1.066)	3.9 (1.333)
Efficiency at Load			1-stage: 94% 2-stage: 92% 3-stage: 90%				
Service Life			> 30,000 hours				
Lubrication			Mineral Grease EP0				
Protection Rating			IP 64				
Operating Temperature Range			-20°C to 90°C				

1) Load applied at center of output shaft @100 RPM

* See page 224 for definitions

EPL-W



EPL-W Series		50		64		84		118		150	
		mm	(in)	mm	(in)	mm	(in)	mm	(in)	mm	(in)
D1 max standard*	motor shaft diameter	11	(0.433)	14	(0.551)	19	(0.748)	24	(0.945)	28	(1.102)
D1 max available*	motor shaft diameter	14	(0.551)	16	(0.63)	24	(0.945)	32	(1.26)	38	(1.496)
D2 k6	output shaft diameter	12	(0.472)	14	(0.551)	20	(0.787)	25	(0.984)	40	(1.575)
D3 h7	pilot diameter	35	(1.378)	40	(1.575)	55	(2.165)	80	(3.15)	110	(4.331)
D4	bolt circle	44	(1.732)	52	(2.047)	70	(2.756)	100	(3.937)	130	(5.118)
D5	housing diameter	50	(1.969)	64	(2.52)	84	(3.307)	118	(4.646)	150	(5.906)
f1	shaft thread	M4x8		M5x12		M6x16		M10x22		M10x30	
f2	mounting holes	M4x6		M5x12		M6x14		M8x18		M10x20	
L1 1-stage**	gearbox total length	93	(3.661)	117	(4.606)	162	(6.378)	199	(7.835)	265	(10.433)
L1 2-stage**		109	(4.291)	139	(5.472)	195	(7.677)	239	(9.409)	305	(12.008)
L1 3-stage**		-		161	(6.339)	228	(8.976)	280	(11.024)	346	(13.622)
L2	shaft length	24.5	(0.965)	39	(1.535)	54	(2.126)	61	(2.402)	81	(3.189)
L3	key length	16	(0.63)	25	(0.984)	36	(1.417)	45	(1.772)	60	(2.362)
L4	usable shaft length	18	(0.709)	30	(1.181)	45	(1.772)	50	(1.969)	70	(2.756)
L5	pilot height	4	(0.157)	8	(0.315)	8	(0.315)	10	(0.394)	10	(0.394)
L6	key width	4	(0.157)	5	(0.197)	6	(0.236)	8	(0.315)	12	(0.472)
L7	key height	13.5	(0.531)	16	(0.63)	22.5	(0.886)	28	(1.102)	43	(1.693)
L8**	adapter size	50	(1.969)	70	(2.756)	90	(3.543)	120	(4.724)	150	(5.906)

* for larger motor shaft diameters, please contact GAM ** depending on the motor, value can vary

Recommended Output Coupling (if necessary)						
metal bellows	KLC-25	KLC-50	KLC-125	KM-270	KM-400
elastomer	EKM-45	EKM-60	EKM-150	EKM-300	EKM-400

TYPE CODES FOR EPL SERIES (EPL-W)

Example: EPL - W - 084 - 005 G - M0000 - H0000 - C0000

Gearbox Series
EPL w/ Metric Output

Gearbox Style
W = Output Shaft

Gearbox Size
050, 064, 084, 118, 150

Ratio
3, 4, 5, 7, 10, 12, 16, 20, 25, 35, 40, 50, 70, 100, 120, 160, 200, 250, 350, 490, 700, 000=1000

Options Available for This Product
G = Key on output shaft per DIN6885

Motor Code
Assigned by GAM

Output Code
Assigned by GAM

Configuration Code
Assigned by GAM

Tolerances (mm)		
Size	k6	h7
Over 10	+0.012	0
Thru 18	+0.001	-0.018
Over 18	+0.015	0
Thru 30	+0.002	-0.021
Over 30	+0.018	0
Thru 50	+0.002	-0.025
Over 50	+0.021	0
Thru 80	+0.002	-0.030
Over 80	+0.025	0
Thru 120	+0.003	-0.035

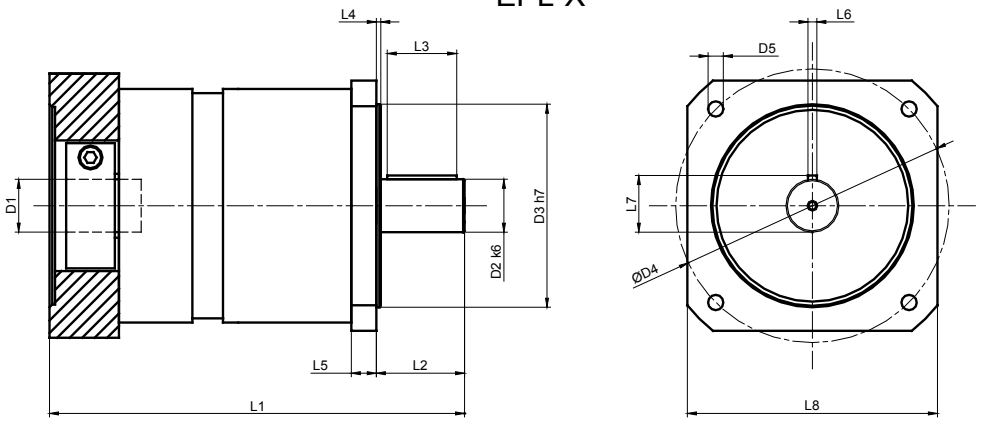
EPL Series - EPL-X (NEMA)

EPL-X (NEMA) Series			17	23	34	42	56
Stock Ratios			N/A	3, 5, 7, 10, 25, 50, 100		N/A	N/A
All Ratios Available			1-stage: 3, 4, 5, 7, 10 2-stage: 12, 16, 20, 25, 35, 40, 50, 70, 100 3-stage: 120, 160, 200, 250, 350, 490, 700, 1000				
Nominal Output Torque (T_{2n})	Nm (lb-in)	3:1	5 (44)	20 (177)	40 (354)	100 (885)	100 (885)
		4, 5, 7:1	6.5 (58)	26 (230)	54 (478)	120 (1062)	120 (1062)
		10, 100, 1000:1	5 (44)	16 (142)	40 (354)	105 (929)	105 (929)
		12:1	14 (124)	36 (319)	80 (708)	170 (1505)	170 (1505)
		all other ratios	16 (142)	42 (372)	100 (885)	210 (1859)	210 (1859)
Max Accel. Torque (T_{2B})	Nm (lb-in)	3:1	10 (89)	36 (319)	70 (620)	180 (1593)	180 (1593)
		4, 5, 7:1	13 (115)	44 (389)	100 (885)	200 (1770)	200 (1770)
		10, 100, 1000:1	10 (89)	24 (212)	75 (664)	180 (1593)	180 (1593)
		12:1	17.5 (155)	45 (398)	100 (885)	215 (1903)	215 (1903)
		all other ratios	20 (177)	52 (460)	125 (1106)	255 (2257)	255 (2257)
Emergency Output Torque (T_{2not})	Nm (lb-in)	3:1	20 (177)	72 (637)	160 (1416)	200 (1770)	200 (1770)
		4, 5, 7:1	26 (230)	84 (743)	216 (1912)	480 (4248)	480 (4248)
		10, 100, 1000:1	20 (177)	62 (549)	160 (1416)	410 (3629)	410 (3629)
		12:1	28 (248)	72 (637)	160 (1416)	400 (3540)	400 (3540)
		all other ratios	32 (283)	84 (743)	216 (1912)	480 (4248)	480 (4248)
Nominal Speed (n_{1n})	RPM	-	3500	3500	3000	2500	2500
Max Input Speed (n_{1max})			6000	6000	6000	5000	5000
Standard Output Backlash* (j)	arcmin	1-stage	< 20	< 10	< 10	< 8	< 8
		2-stage	< 24	< 14	< 14	< 12	< 12
		3-stage	< 30	< 18	< 18	< 16	< 16
Allowable Radial Load (F_{rad}) 1)	N (lbs)	-	375 (84)	450 (101)	900 (203)	2175 (489)	2175 (489)
Allowable Axial Load (F_{axial})	N (lbs)	-	300 (68)	420 (95)	650 (146)	1375 (309)	1375 (309)
Torsional Stiffness* (C_{t21})	Nm/arcmin (lb-in/arcmin)	10,100,1000	Contact GAM	1.3 (11.5)	3.4 (30.1)	8.3 (73.5)	8.3 (73.5)
		7,70,700	Contact GAM	1.7 (15)	4.8 (42.5)	13.6 (120.4)	13.6 (120.4)
		all other ratios	Contact GAM	2.4 (21.2)	7.1 (62.8)	17.2 (152.2)	17.2 (152.2)
Weight (m)	kg (lbs)	1-stage	0.4 (0.88)	1.0 (2.2)	2.3 (5.1)	5.8 (12.8)	5.8 (12.8)
		2-stage	0.5 (1.1)	1.3 (2.9)	3.1 (6.8)	7.9 (17.4)	7.9 (17.4)
		3-stage	0.6 (1.32)	1.6 (3.5)	3.9 (8.6)	10.0 (22.1)	10.0 (22.1)
Noise Level (L_{PA})	dB(A)	-	< 60	< 66	< 68	< 70	< 70
Mass Moment of Inertia (J_1)	kg cm² (lb-in²)	3:1	0.0144 (0.005)	0.45 (0.154)	1.37 (0.468)	6.54 (2.235)	6.54 (2.235)
		4:1, 12:1, 16:1	0.0096 (0.003)	0.38 (0.130)	1.14 (0.390)	4.8 (1.640)	4.8 (1.640)
		5:1, 20:1, 25:1	0.0096 (0.003)	0.36 (0.123)	1.05 (0.359)	4.05 (1.384)	4.05 (1.384)
		7:1, 35:1	0.0152 (0.005)	0.35 (0.120)	0.97 (0.331)	3.4 (1.162)	3.4 (1.162)
		10:1, 40:1 - 100:1	0.0078 (0.003)	0.34 (0.116)	0.93 (0.318)	3.1 (1.059)	3.1 (1.059)
		120:1 - 1000:1	0.0078 (0.003)	0.34 (0.116)	0.93 (0.318)	3.12 (1.066)	3.12 (1.066)
Efficiency at Load			1-stage: 94% 2-stage: 92% 3-stage: 90%				
Service Life			> 30,000 hours				
Lubrication			Mineral Grease EP0				
Protection Rating			IP 64				
Operating Temperature Range			-20°C to 90°C				

1) Load applied at center of output shaft @100 RPM

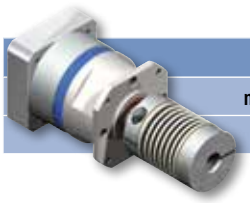
* See page 224 for definitions

EPL-X



EPL-X (NEMA) Series		17		23		34		42		56	
		mm	(in)	mm	(in)	mm	(in)	mm	(in)	mm	(in)
D1 max standard*	motor shaft diameter	11	(0.433)	14	(0.551)	19	(0.748)	24	(0.945)	24	(0.945)
D1 max available*	motor shaft diameter	-	(-)	16	(0.63)	24	(0.945)	32	(1.26)	32	(1.26)
D2 k6	output shaft diameter	9.525	(0.375)	12.7	(0.5)	19.050	(0.75)	25	(0.984)	25	(0.984)
D3 h7	pilot diameter	21.97	(0.865)	38.1	(1.5)	73	(2.874)	55.55	(2.187)	114.300	(4.50)
D4	bolt circle	43.8	(1.724)	66.7	(2.626)	98.400	(3.874)	125.7	(4.949)	177.800	(7.000)
D5	mounting holes	3.25	(0.128)	5	(0.197)	5.5	(0.217)	7.1	(0.28)	10.200	(0.402)
L1 1-stage**	gearbox total length	108	(4.252)	111	(4.37)	147	(5.787)	199	(7.835)	199	(7.835)
L1 2-stage**		124	(4.882)	133	(5.236)	180	(7.087)	239	(9.409)	239	(9.409)
L1 3-stage**		139.5	(5.492)	155	(6.102)	213	(8.386)	280	(11.024)	280	(11.024)
L2	shaft length	25.4	(1.000)	25.4	(1.000)	31.8	(1.252)	42	(1.654)	41	(1.614)
L3	key length	-	(-)	19.05	(0.75)	25.4	(1)	38	(1.496)	32	(1.26)
L4	pilot height	1.6	(0.063)	1.6	(0.063)	1.7	(0.067)	2.4	(0.094)	4	(0.157)
L5	flange thickness	4.9	(0.193)	5	(0.197)	10	(0.394)	19	(0.748)	20	(0.7874)
L6	key width	-	(-)	3.175	(0.125)	4.78	(0.188)	8	(0.315)	8	(0.315)
L7	key height / flat height	9.14	(0.36)	14.22	(0.56)	21.290	(0.838)	28	(1.102)	28	(1.102)
L8	flange size	40	(1.575)	65	(2.559)	90	(3.543)	120	(4.724)	145	(5.709)

* for larger motor shaft diameters, please contact GAM **depending on the motor, value can vary *** long motor shafts can be accommodated, but overall gearbox length will grow



Recommended Output Coupling (if necessary)						
	metal bellows	KLC-25	KLC-50	KLC-125	KM-270	KM-400
	elastomer	EKM-20	EKM-60	EKM-150	EKM-300	EKM-400

TYPE CODES FOR EPL SERIES (EPL-X (NEMA))

Example: EPL - X - 023 - 005 G - M0000 - H0000 - C0000

- **Gearbox Series** — EPL w/ NEMA output
- **Gearbox Style** — X = NEMA output
- **Gearbox Size** — 017, 023, 034, 042, 056
- **Ratio** — 3, 4, 5, 7, 10, 12, 16, 20, 25, 35, 40, 50, 70, 100, 120, 160, 200, 250, 350, 490, 700, 000=1000
- **Options Available for This Product** — G = Key on output shaft per DIN6885
- **Motor Code** — Assigned by GAM
- **Output Code** — Assigned by GAM
- **Configuration Code** — Assigned by GAM

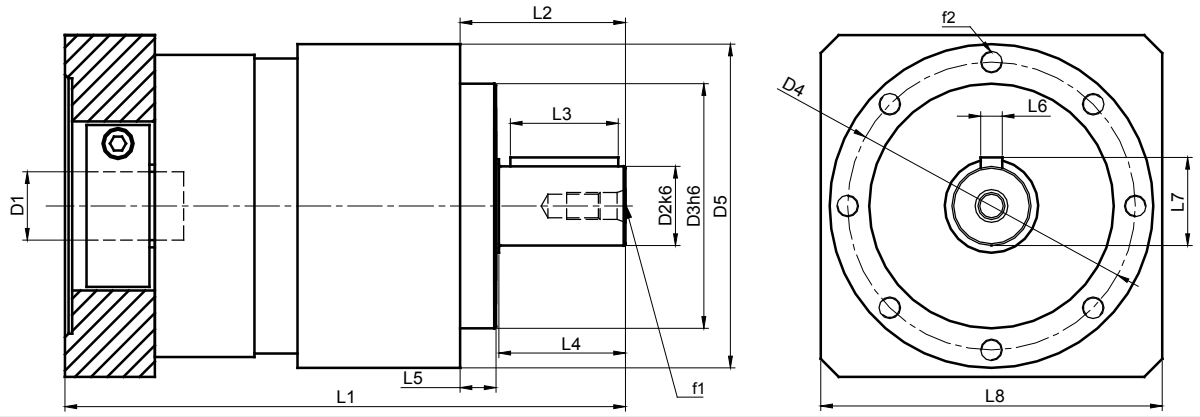
Tolerances (mm)		
Size	k6	h7
Over 10	+0.012	0
Thru 18	+0.001	-0.018
Over 18	+0.015	0
Thru 30	+0.002	-0.021
Over 30	+0.018	0
Thru 50	+0.002	-0.025
Over 50	+0.021	0
Thru 80	+0.002	-0.030
Over 80	+0.025	0
Thru 120	+0.003	-0.035

EPL Series - EPL-A

EPL-A Series			50		70		90		120		155	
All Ratios Available			1-stage: 3, 4, 5, 7, 10 2-stage: 12,16, 20, 25, 35, 40, 50, 70, 100 3-stage: 120, 160, 200, 250, 350, 490, 700, 1000 (Consult GAM for other ratios)									
Nominal Output Torque (T_{2n})	Nm (lb-in)	3:1	5	(44)	20	(177)	40	(354)	100	(885)	230	(2036)
		4, 5, 7:1	6.5	(58)	26	(230)	54	(478)	120	(1062)	310	(2744)
		10, 100, 1000:1	5	(44)	16	(142)	40	(354)	105	(929)	180	(1593)
		12:1	14	(124)	36	(319)	80	(708)	170	(1505)	272	(2407)
		all other ratios	16	(142)	42	(372)	100	(885)	210	(1859)	340	(3009)
Max Acceleration Output Torque (T_{2B})	Nm (lb-in)	3:1	10	(89)	36	(319)	70	(620)	180	(1593)	360	(3186)
		4, 5, 7:1	13	(115)	44	(389)	100	(885)	200	(1770)	460	(4071)
		10, 100, 1000:1	10	(89)	24	(212)	75	(664)	180	(1593)	340	(3009)
		12:1	17.5	(155)	45	(398)	100	(885)	215	(1903)	360	(3186)
		all other ratios	20	(177	52	(460)	125	(1106)	255	(2257)	460	(4071)
Emergency Output Torque (T_{2not})	Nm (lb-in)	3:1	20	(177)	72	(637)	160	(1416)	200	(1770)	860	(7612)
		4, 5, 7:1	26	(230	84	(743)	216	(1912)	480	(4248)	1000	(8851)
		10, 100, 1000:1	20	(177)	62	(549)	160	(1416)	410	(3629)	800	(7081)
		12:1	28	(248)	72	(637)	160	(1416)	400	(3540)	860	(7612)
		all other ratios	32	(283)	84	(743)	216	(1912)	480	(4248)	1000	(8851)
Nominal Speed (n1n)	RPM	-	3500		3500		3000		2500		2500	
Max Speed (n_{1max})	RPM	-	6000		6000		6000		5000		4500	
Standard Output Backlash* (j)	arcmin	1-stage	<16		< 10		< 10		< 8		< 8	
		2-stage	<20		< 14		< 14		< 12		< 12	
		3-stage	-		< 18		< 18		< 16		< 16	
Allowable Radial Load (F_{rad}) 1	N (lbs)	-	650	(146)	1550	(348)	2400	(540)	4600	(1034)	7500	(1686)
Allowable Axial Load (F_{axial})	N (lbs)	-	700	(158)	1450	(326)	1900	(427)	4000	(899)	6000	(1349)
Torsional Stiffness* (C_{t21})	Nm/arcmin (lb-in/arcmin)	10,100,1000	0.60	(5.3)	1.3	(11.5)	3.4	(30.1)	8.3	(73.5)	22	(194.7)
		7,70,700	0.78	(6.9)	1.7	(15)	4.8	(42.5)	13.6	(120.4)	27	(239)
		all other ratios	0.90	(8.0)	2.4	(21.2)	7.1	(62.8)	17.2	(152.2)	33	(292.1)
Weight (m)	kg (lbs)	1-stage	0.4	(0.9)	1	(2.2)	2.3	(5.1)	5.8	(12.8)	10	(22.1)
		2-stage	0.5	(1.1)	1.3	(2.9)	3.1	(6.8)	7.9	(17.4)	12.5	(27.6)
		3-stage	-		1.6	(3.5)	3.9	(8.6)	10.0	(22.1)	15	(33.1)
Noise Level (L_{PA})	dB(A)	-	< 64		<66		<68		<70		<72	
Mass Moment of Inertia (J_1)	kg cm^2 (lb-in^2)	3:1	0.06	(0.021)	0.45	(0.154)	1.37	(0.468)	6.54	(2.235)	12.23	(4.179)
		4:1, 12:1, 16:1	0.04	(0.014)	0.38	(0.13)	1.14	(0.390)	4.8	(1.640)	7.65	(2.614)
		5:1, 20:1, 25:1	0.04	(0.014)	0.36	(0.123)	1.05	(0.359)	4.05	(1.384)	6.24	(2.132)
		7:1, 35:1	0.04	(0.014)	0.35	(0.12)	0.97	(0.331)	3.4	(1.162)	4.7	(1.606)
		10:1, 40:1 - 100:1	0.04	(0.014)	0.34	(0.116)	0.93	(0.318)	3.1	(1.059)	3.8	(1.299)
		120:1 - 1000:1	0	0	0.34	(0.116)	0.93	(0.318)	3.12	(1.066)	3.9	(1.333)
Efficiency at Load		1-stage: 94% 2-stage: 92% 3-stage: 90%										
Service Life		> 30,000 hours										
Lubrication		Mineral Grease EP0										
Protection Rating		IP 64										
Operating Temperature Range		-20°C to 90°C										

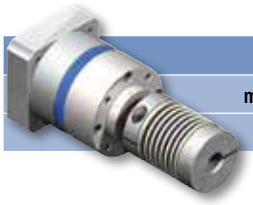
* See page 224 for definitions

EPL-A



EPL-A Series		50		70		90		120		155	
		mm	(in)	mm	(in)	mm	(in)	mm	(in)	mm	(in)
D1 max standard*	motor shaft diameter	11	(0.433)	14	(0.551)	19	(0.748)	24	(0.945)	28	(1.102)
D1 max available*	motor shaft diameter	14	(0.551)	16	(0.630)	24	(0.945)	32	(1.260)	38	(1.496)
D2 k6	output shaft diameter	12	(0.472)	16	(0.630)	22	(0.866)	32	(1.260)	40	(1.575)
D3h7	pilot diameter	35	(1.378)	52	(2.047)	68	(2.677)	90	(3.543)	120	(4.724)
D4	Bolt Circle	44	(1.732)	62	(2.441)	80	(3.150)	108	(4.252)	140	(5.512)
D5	Housing Diameter	50	(1.968)	70	(2.756)	90	(3.543)	118	(4.646)	155	(6.102)
f1	Shaft Thread	M4x8		M5x17		M8x25		M12x37		M16x26	
f2	Mounting Holes	(8x) M4x8		(8x) M5x12		(8x) M6x14		(8x) M8x18		(8x) M10x24	
L1 1-stage**	gearbox total length	93	(3.661)	130	(5.118)	164	(6.457)	222	(8.740)	300	(11.811)
L1 2-stage**		109	(4.291)	152	(5.984)	196	(7.717)	263	(10.354)	341	(13.425)
L1 3-stage**		-	-	174	(6.850)	229	(9.016)	304	(11.968)	382	(15.039)
L2	Shaft length	24.5	(0.965)	36	(1.417)	46	(1.811)	70	(2.756)	94	(3.701)
L3	Key Length	16	(0.630)	25	(0.984)	30	(1.181)	50	(1.968)	70	(2.756)
L4	Usable Shaft Length	18	(0.709)	28	(1.102)	35	(1.378)	58	(2.283)	82	(3.228)
L5	Pilot Height	4	(0.157)	5.5	(0.217)	9	(0.354)	7	(0.276)	5.5	(0.217)
L6	Key Width	4	(0.157)	5	(0.197)	6	(0.236)	10	(0.394)	12	(0.472)
L7	Key Height	13.5	(0.531)	18	(0.709)	24.5	(0.965)	35	(1.378)	43	(1.693)
L8**	Adapter Size	50	(1.968)	70	(2.756)	90	(3.543)	120	(4.724)	150	(5.905)

* for larger motor shaft diameters, please contact GAM **depending on the motor, value can vary *** longer motor shafts can be accommodated, but overall gearbox length will grow



Recommended Output Coupling (if necessary)						
metal bellows	KLC-25	KLC-50	KLC-125	KM-270	KM-400
elastomer	EKM-20	EKM-60	EKM-150	EKM-300	EKM-400

TYPE CODES FOR EPL SERIES (EPL-A)

Example: EPL - A - 090 - 005 G - M0000 - H0000 - C0000

Gearbox Series
EPL w/ Popular Metric Output Dimensions

Gearbox Style
A= Output Shaft

Gearbox Size
050, 070, 090, 120, 155

Ratio
3, 4, 5, 7, 10, 12, 16, 20, 25, 35, 40, 50, 70, 100, 120, 160, 200, 250, 350, 490, 700, 000=1000

Options Available for This Product
G = Key on output shaft per DIN6885

Motor Code
Assigned by GAM

Output Code
Assigned by GAM

Configuration Code
Assigned by GAM

Tolerances (mm)		
Size	k6	h6
Over 10	+0.012	0
Thru 18	+0.001	-0.011
Over 18	+0.015	0
Thru 30	+0.002	-0.013
Over 30	+0.018	0
Thru 50	+0.002	-0.016
Over 50	+0.021	0
Thru 80	+0.002	-0.019
Over 80	+0.025	0
Thru 120	+0.003	-0.022

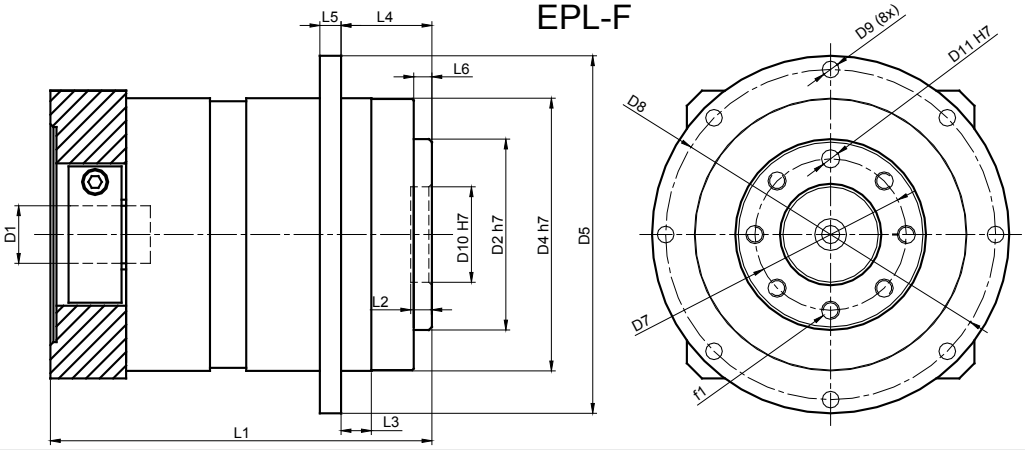
EPL Series - EPL-F

EPL-F Series			47	64	90	110	140
All Ratios Available			1-Stage: 3, 4, 5, 7, 10 2-Stage: 12, 16, 20, 25, 35, 40, 50, 70, 100 3-Stage: 120, 160, 200, 250, 350, 490, 700, 1000				
Nominal Output Torque (T_{2n})	Nm (lb-in)	3:1	5 (44)	20 (177)	40 (354)	100 (885)	230 (2036)
		4, 5, 7:1	6.5 (58)	26 (230)	54 (478)	120 (1062)	310 (2744)
		10, 100, 1000:1	5 (44)	16 (142)	40 (354)	105 (929)	180 (1593)
		12:1	14 (124)	36 (319)	80 (708)	170 (1505)	272 (2407)
		all other ratios	16 (142)	42 (372)	100 (885)	210 (1859)	340 (3009)
Max Acceleration Output Torque (T_{2B})	Nm (lb-in)	3:1	10 (89)	36 (319)	70 (620)	180 (1593)	360 (3186)
		4, 5, 7:1	13 (115)	44 (389)	100 (885)	200 (1770)	460 (4071)
		10, 100, 1000:1	10 (89)	24 (212)	75 (664)	180 (1593)	340 (3009)
		12:1	17.5 (155)	45 (398)	100 (885)	215 (1903)	360 (3186)
		all other ratios	20 (177)	52 (460)	125 (1106)	255 (2257)	460 (4071)
Emergency Output Torque (T_{2not})	Nm (lb-in)	3:1	20 (177)	72 (637)	160 (1416)	200 (1770)	860 (7612)
		4, 5, 7:1	26 (230)	84 (743)	216 (1912)	480 (4248)	1000 (8851)
		10, 100, 1000:1	20 (177)	62 (549)	160 (1416)	410 (3629)	800 (7081)
		12:1	28 (248)	72 (637)	160 (1416)	400 (3540)	860 (7612)
		all other ratios	32 (283)	84 (743)	216 (1912)	480 (4248)	1000 (8851)
Nominal Speed (n1n)	RPM	-	3500	3500	3000	2500	2500
Max Speed (n_{1max})	RPM	-	6000	6000	6000	5000	4500
Standard Output Backlash* (j)	arcmin	1-stage	< 16	< 10	< 10	< 8	< 8
		2-stage	< 20	< 14	< 14	< 12	< 12
		3-stage	-	< 18	< 18	< 16	< 16
Allowable Radial Load (F_{rad}) 1	N (lbs)	-	750 (169)	1200 (270)	2000 (450)	3100 (697)	8500 (1911)
Allowable Axial Load (F_{axial})	N (lbs)	-	1000 (225)	1100 (247)	2500 (562)	3900 (877)	11200 (2518)
Torsional Stiffness* (C_{t21})	Nm/arcmin (lb-in/arcmin)	10,100,1000	0.60 (5.3)	1.3 (11.5)	3.4 (30.1)	8.3 (73.5)	22 (194.7)
		7,70,700	0.78 (6.9)	1.7 (15)	4.8 (42.5)	13.6 (120.4)	27 (194.7)
		all other ratios	0.90 (8.0)	2.4 (21.2)	7.1 (62.8)	17.2 (152.2)	33 (292.1)
Weight (m)	kg (lbs)	1-stage	0.4 (0.9)	1 (2.2)	2.3 (5.1)	5.8 (12.8)	10.0 (22.1)
		2-stage	0.5 (1.1)	1.3 (2.9)	3.1 (6.8)	7.9 (17.4)	12.5 (27.6)
		3-stage	- -	1.96 (3.5)	3.9 (8.6)	10.0 (22.1)	15.0 (33.1)
Noise Level (L_{PA})	dB(A)	-	< 64	< 66	< 68	< 70	< 72
Mass Moment of Inertia (J_1)	kg cm² (lb-in²)	3:1	0.06 (0.021)	0.61 (0.208)	1.79 (0.612)	8.53 (2.915)	12.23 (4.179)
		4:1, 12:1, 16:1	0.04 (0.014)	0.5 (0.171)	1.47 (0.502)	6.11 (2.088)	7.65 (2.614)
		5:1, 20:1, 25:1	0.04 (0.014)	0.48 (0.164)	1.23 (0.420)	4.87 (1.664)	6.24 (2.132)
		7:1, 35:1	0.04 (0.014)	0.39 (0.133)	1.14 (0.390)	3.71 (1.268)	4.7 (1.606)
		10:1, 40:1 - 100:1	0.04 (0.014)	0.38 (0.130)	1.1 (0.376)	3.38 (1.155)	3.8 (1.299)
		120:1 - 1000:1	- -	0.38 (0.130)	1.1 (0.376)	3.39 (1.158)	3.9 (1.333)
Efficiency at Load			1-stage: 94% 2-stage: 92% 3-stage: 90%				
Service Life			> 30,000 hours				
Lubrication			Mineral Grease EP0				
Protection Rating			IP 64				
Operating Temperature Range			-20°C to 90°C				

1) Load applied at center of output shaft @100 RPM

*See page 224 for definitions

EPL-F



EPL-F Series		47		64		90		110		140	
		mm	(in)	mm	(in)	mm	(in)	mm	(in)	mm	(in)
D1 max standard*	motor shaft diameter	11	(0.433)	14	(0.551)	19	(0.748)	24	(0.945)	32	(1.260)
D1 max available*	motor shaft diameter	14	(0.551)	16	(0.630)	24	(0.945)	32	(1.260)	38	(1.496)
D2 h7	output flange diameter	28	(1.102)	40	(1.575)	63	(2.480)	80	(3.150)	100	(3.937)
D4 h7	pilot diameter	47	(1.850)	64	(2.520)	90	(3.543)	110	(4.331)	140	(5.512)
D5	flange diameter	72	(2.835)	86	(3.386)	118	(4.646)	145	(5.709)	179	(7.047)
D7	inner bolt circle	20	(0.787)	31.5	(1.240)	50	(1.968)	63	(2.480)	80	(3.150)
D8	outer bolt circle	67	(2.638)	79	(3.110)	109	(4.291)	135	(5.315)	168	(6.614)
D9	mounting hole diameter (8x)	(8) 3.5	(0.138)	(8) 4.5	(0.177)	(8) 5.5	(0.217)	(8) 5.5	(0.217)	(12) 7.3	(0.287)
D10 H7	flange pilot	12	(0.472)	20	(0.787)	31.5	(1.240)	40	(1.575)	50	(1.968)
D11 H7	dowel diameter	3	(0.118)	5	(0.197)	6	(0.236)	6	(0.236)	8	(0.315)
f1	flange tap	(7) M4x8		(7) M5x7		(7) M6x10		(15) M6x12		(11) M8x16	
L1 1-stage**	gearbox total length	84	(3.307)	93	(3.661)	126	(4.961)	150	(5.905)	189	(7.441)
L1 2-stage**		102	(4.106)	113	(4.490)	158	(6.220)	190	(7.480)	230	(9.055)
L1 3-stage**		120	(4.724)	129	(5.08)	191	(7.520)	231	(9.094)	270	(10.63)
L2	flange pilot depth	4	(0.157)	4	(0.157)	6	(0.236)	6	(0.236)	6	(0.236)
L3	pilot height	-	-	7	(0.276)	10	(0.394)	10	(0.394)	12	(0.472)
L4	output length	19.5	(0.768)	19.5	(0.768)	30	(1.181)	29	(1.142)	38	(1.496)
L5	flange thickness	4	(0.157)	4	(0.157)	7	(0.276)	8	(0.315)	10	(0.394)
L6	output flange length	3	(0.118)	3	(0.118)	6	(0.236)	6	(0.236)	6	(0.236)

* for larger motor shaft diameters, please contact GAM ** depending on the motor, value can vary

TYPE CODES FOR EPL SERIES (EPL-F)

Example: EPL - F - 090 - 005 H - M0000 - H0000 - C0000

Gearbox Series
EPL w/ Flange Output

Gearbox Style
F = Flange Output Shaft

Gearbox Size
047, 064, 090, 110, 140

Ratio
3, 4, 5, 7, 10, 12, 16, 20, 25, 35, 40, 50, 70, 100, 120, 160, 200, 250, 350, 490, 700, 000=1000

Options Available for This Product
H= No Keyways

Motor Code
Assigned by GAM

Output Code
Assigned by GAM

Configuration Code
Assigned by GAM

Tolerances (mm)		
Size	h7	H7
Over 10	0	0.018
Thru 18	-0.018	0
Over 18	0	0.021
Thru 30	-0.021	0
Over 30	0	+0.025
Thru 50	-0.025	0
Over 50	0	+0.030
Thru 80	-0.030	0
Over 80	0	+0.035
Thru 120	-0.035	0

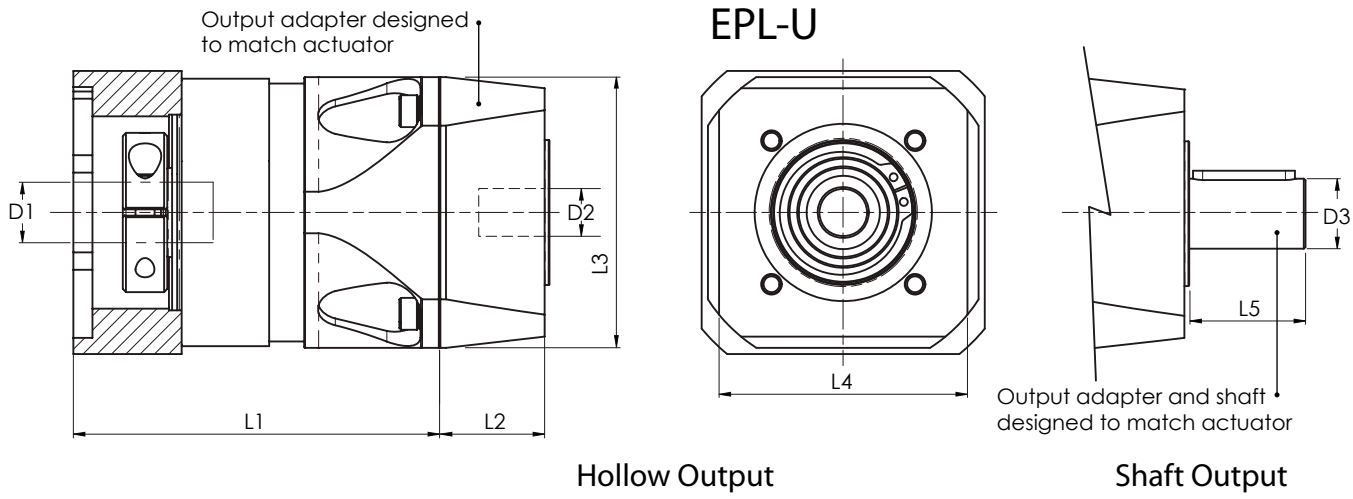
EPL Series: EPL-U

The EPL-U is designed to drive linear actuators with an integral mounting plate and hollow or shaft output

- Hollow output to mount to shaft-input actuators (*replaces the* ***EPL-H***)
- Shaft output to mount to hollow-input actuators

EPL-U Series			50	64	84	118
Stock Ratios			3, 5, 7, 10, 25, 50, 100 (Standard Input)			
All Ratios Available			1-stage: 3, 4, 5, 7, 10 2-stage: 12, 16, 20, 25, 35, 40, 50, 70, 100 3-stage: 120, 160, 200, 250, 350, 490, 700, 1000 (Consult GAM for other ratios)			
Nominal Output Torque (T_{2n})	Nm (lb-in)	3:1	5 (44)	20 (177)	40 (354)	100 (885)
		4, 5, 7:1	6.5 (58)	26 (230)	54 (478)	120 (1062)
		10, 100, 1000:1	5 (44)	16 (142)	40 (354)	105 (929)
		12:1	14 (124)	36 (319)	80 (708)	170 (1505)
		all other ratios	16 (142)	42 (372)	100 (885)	210 (1859)
Max Acceleration Output Torque (T_{2B})	Nm (lb-in)	3:1	10 (89)	36 (319)	70 (620)	180 (1593)
		4, 5, 7:1	13 (115)	44 (389)	100 (885)	200 (1770)
		10, 100, 1000:1	10 (89)	24 (212)	75 (664)	180 (1593)
		12:1	17.5 (155)	45 (398)	100 (885)	215 (1903)
		all other ratios	20 (177)	52 (460)	125 (1106)	255 (2257)
Nominal Input Speed (n_1)	RPM	-	3500	3500	3000	2500
Max Input Speed (n_{1max})		-	6000	6000	6000	5000
Standard Output Backlash* (j)	arcmin	1-stage	<16	< 10	< 10	< 8
		2-stage	<20	< 14	< 14	< 12
		3-stage	-	< 18	< 18	< 16
Weight (m)	kg (lbs)	1-stage	0.4 (0.9)	1.0 (2.2)	2.3 (5.1)	5.8 (12.8)
		2-stage	0.5 (1.1)	1.3 (2.9)	3.1 (6.8)	7.9 (17.4)
		3-stage	-	1.6 (3.5)	3.9 (8.6)	10.0 (22.1)
Noise Level (L_{PA})	dB(A)	-	< 64	< 66	< 68	< 70
Mass Moment of Inertia (J_1)	kg cm^2 (lb-in^2)	3:1	0.06 (0.021)	0.45 (0.154)	1.37 (0.468)	6.54 (2.235)
		4:1, 12:1, 16:1	0.04 (0.014)	0.38 (0.130)	1.14 (0.390)	4.8 (1.640)
		5:1, 20:1, 25:1	0.04 (0.014)	0.36 (0.123)	1.05 (0.359)	4.05 (1.384)
		7:1, 35:1	0.04 (0.014)	0.35 (0.120)	0.97 (0.331)	3.4 (1.162)
		10:1, 40:1 - 100:1	0.04 (0.014)	0.34 (0.116)	0.93 (0.318)	3.1 (1.059)
		120:1 - 1000:1	(0.000)	0.34 (0.116)	0.93 (0.318)	3.12 (1.066)
Efficiency at Load			1-stage: 94% 2-stage: 92% 3-stage: 90%			
Service Life			> 30,000 hours			
Lubrication			Mineral Grease EP0			
Protection Rating			IP 64			
Operating Temperature Range			-20°C to 90°C			

*See page 224 for definition



EPL-U Series		50		64		84		118	
		mm	(in)	mm	(in)	mm	(in)	mm	(in)
D1 max standard*	motor shaft diameter	11	(0.433)	14	(0.551)	19	(0.748)	24	(0.945)
D1 max available*		14	(0.551)	16	(0.63)	24	(0.945)	32	(1.26)
D2 min	output hollow shaft diameter	6	(0.236)	8	(0.315)	10	(0.394)	12	(0.472)
D2 max		25	(0.984)	35	(1.378)	50	(1.969)	80	(3.150)
D3 min	output shaft diameter	12	(0.472)	14	(0.551)	20	(0.787)	25	(0.984)
D3 max		25	(0.984)	35	(1.378)	55	(2.165)	70	(2.756)
L1 1-stage**	overall gearbox length	74.5	(2.933)	90.5	(3.563)	115	(4.528)	137.5	(5.413)
L1 2-stage**		90.5	(3.563)	112.5	(4.429)	148	(5.827)	178	(7.008)
L1 3-stage**		106.5	(4.193)	134.5	(5.295)	181	(7.126)	218.5	(8.602)
L2	output adapter length	dimensions determined by actuator used in application							
L3	housing size (square)	50	(1.969)	64	(2.52)	85	(3.346)	118	(4.646)
L4	output mounting face	dimensions determined by actuator used in application							
L5	output shaft length	dimensions determined by actuator used in application							

*** for larger motor shaft diameters, please contact GAM ** dimension varies depending on motor**

TYPE CODES FOR EPL SERIES (EPL-U)

Example: EPL - U - 084 - 005 H - M0000 - H0000 - C0000

Gearbox Series
EPL

Gearbox Style
U = Universal

Gearbox Size
050, 064, 084, 118

Ratio
3, 4, 5, 7, 10, 12, 16, 20, 25, 35, 40, 50, 70, 100, 120, 160, 200, 250, 350, 490, 700, 000 = 1000

Options Available for This Product
G = Keyway on output per DIN6885
H = No Keyway

Motor Code
Assigned by GAM

Output Code
Assigned by GAM

Configuration Code
Assigned by GAM

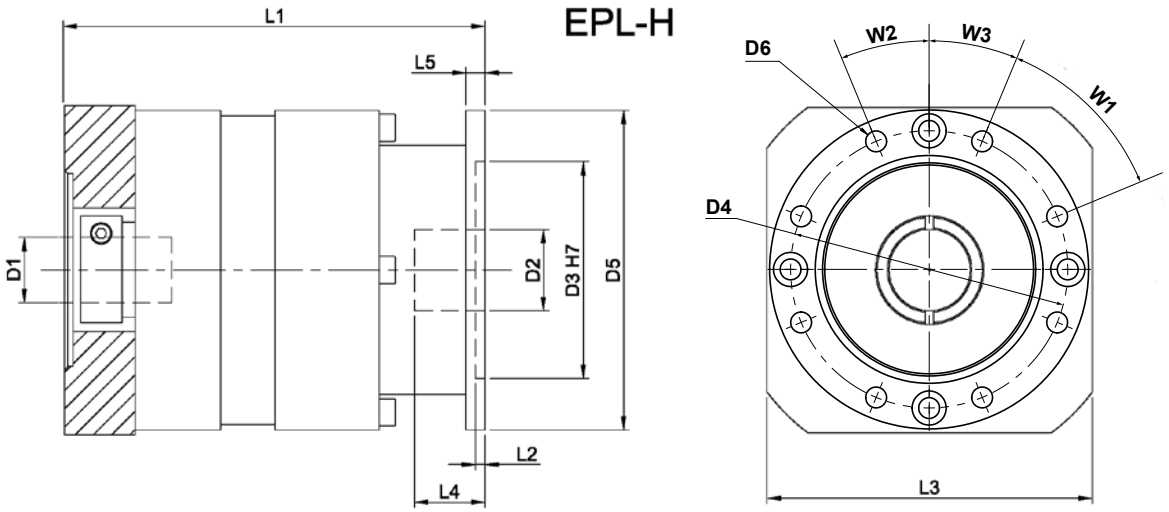
EPL Series: EPL-H

NOTE: The EPL-H will be replaced by the EPL-MH

EPL-H Series			64	84	118
Stock Ratios		3, 5, 7, 10, 25, 50, 100 (Standard Input)			
All Ratios Available		1-stage: 3, 4, 5, 7, 10			
		2-stage: 12, 16, 20, 25, 35, 40, 50, 70, 100			
		3-stage: 120, 160, 200, 250, 350, 490, 700, 1000			
Nominal Output Torque (T_{2n})	Nm (lb-in)	3:1, 10:1, 100:1, 1000:1	14 (124)	40 (354)	100 (885)
		4:1, 5:1, 7:1	26 (230)	50 (443)	120 (1062)
		all other ratios	36 (319)	64 (566)	165 (1460)
Max Accel Output Torque (T_{2B})	Nm (lb-in)	3:1, 10:1, 100:1, 1000:1	25 (221)	60 (531)	150 (1328)
		4:1, 5:1, 7:1	40 (354)	75 (664)	180 (1593)
		all other ratios	44 (389)	75 (664)	180 (1593)
Nominal Input Speed (n_{1n})	RPM	-	3500	3000	2500
Max Input Speed (n_{1max})	RPM	-	6000	6000	5000
Standard Output Backlash* (j)	arcmin	3:1 - 10:1	< 10	< 10	< 8
		12:1 - 100:1	< 14	< 14	< 12
		120:1 - 1000:1	< 18	< 18	< 16
Weight (m)	kg (lb)	1-stage	1.0 (2.2)	2.3 (5.1)	5.8 (12.8)
		2-stage	1.3 (2.9)	3.1 (6.8)	7.9 (17.4)
		3-stage	1.6 (3.5)	3.9 (8.6)	10.0 (22.1)
Noise Level (L_{PA})	dB (A)	-	< 66	< 68	< 70
Mass Moment of Inertia (J_1)	kg cm^2 (lb-in^2)	3:1	0.45 (0.154)	1.37 (0.468)	6.54 (2.235)
		4:1, 12:1, 16:1	0.38 (0.130)	1.14 (0.390)	4.8 (1.640)
		5:1, 20:1, 25:1	0.36 (0.123)	1.05 (0.359)	4.05 (1.384)
		7:1, 35:1	0.35 (0.120)	0.97 (0.331)	3.4 (1.162)
		10:1, 40:1 - 100:1	0.34 (0.116)	0.93 (0.318)	3.1 (1.059)
		120:1 - 1000:1	0.34 (0.116)	0.93 (0.318)	3.12 (1.066)
Efficiency at Load		1-stage: 92% 2-stage: 90% 3-stage: 88%			
Service Life		> 20,000 hours			
Lubrication		Mineral Grease EP0			
Protection Rating		IP 64			
Operating Temperature Range		-20°C to 90°C			

*See page 224 for definitions

EPL-H



EPL Series		64		84		118	
		mm	(in)	mm	(in)	mm	(in)
D1 max standard*	motor shaft diameter	14	(0.551)	19	(0.748)	24	(0.945)
D1 max available*	motor shaft diameter	16	(0.63)	24	(0.945)	32	(1.26)
D2 max	output shaft diameter	16	(0.63)	20	(0.787)	30	(1.181)
D3 H7	pilot diameter	44	(1.732)	60	(2.362)	80	(3.15)
D4	bolt circle	55.5	(2.185)	73	(2.874)	105	(4.134)
D5	flange diameter	70	(2.756)	84	(3.307)	118	(4.646)
D6	mounting holes	8 x 5.5	(0.217)	8 x 5.5	(0.217)	8 x 6.8	(0.267)
L1 1-stage**	gearbox total length	98.5	(3.878)	122	(4.803)	155.5	(6.122)
L1 2-stage**		120.5	(4.744)	155	(6.102)	196	(7.717)
L1 3-stage**		142.5	(5.61)	188	(7.402)	236.5	(9.311)
L2	pilot depth	3.5	(0.138)	3.5	(0.138)	3.5	(0.138)
L3	flange size	70	(2.756)	90	(3.543)	120	(4.724)
L4	allowable shaft depth	28	(1.102)	30	(1.181)	27	(1.063)
L5	flange thickness	6	(0.236)	6	(0.236)	10	(0.394)
W1	hole spacing	35°		45°		45°	
W2	hole angle 1	27.5°		22.5°		22.5°	
W3	hole angle 2	27.5°		22.5°		22.5°	

* for larger motor shaft diameters, please contact GAM ** depending on the motor, value can vary

TYPE CODES FOR EPL SERIES (EPL-H)

Example: EPL - H - 084 - 005 H - M0000 - H0000 - C0000

Gearbox Series
EPL w/ Linear Mount Output

Gearbox Style
H = Hollow Output Shaft

Gearbox Size
064, 084, 118

Ratio
3, 4, 5, 7, 10, 12, 16, 20, 25, 35, 40, 50, 70, 100, 120, 160, 200, 250, 350, 490, 700, 000 = 1000

Options Available for This Product
H = No Keyways

Motor Code
Assigned by GAM

Output Code
Assigned by GAM

Configuration Code
Assigned by GAM

Tolerances (mm)	
Size	H7
Over 6	+0.015
Thru 10	0
Over 10	+0.018
Thru 18	0
Over 18	+0.021
Thru 30	0
Over 30	+0.025
Thru 50	0
Over 50	+0.030
Thru 80	0

High Performance: SSP Series

GAM can.

If you don't see exactly what you need, let us know. We can modify the SSP Series gearboxes to meet your needs. Page 5 provides examples of GAM capabilities.

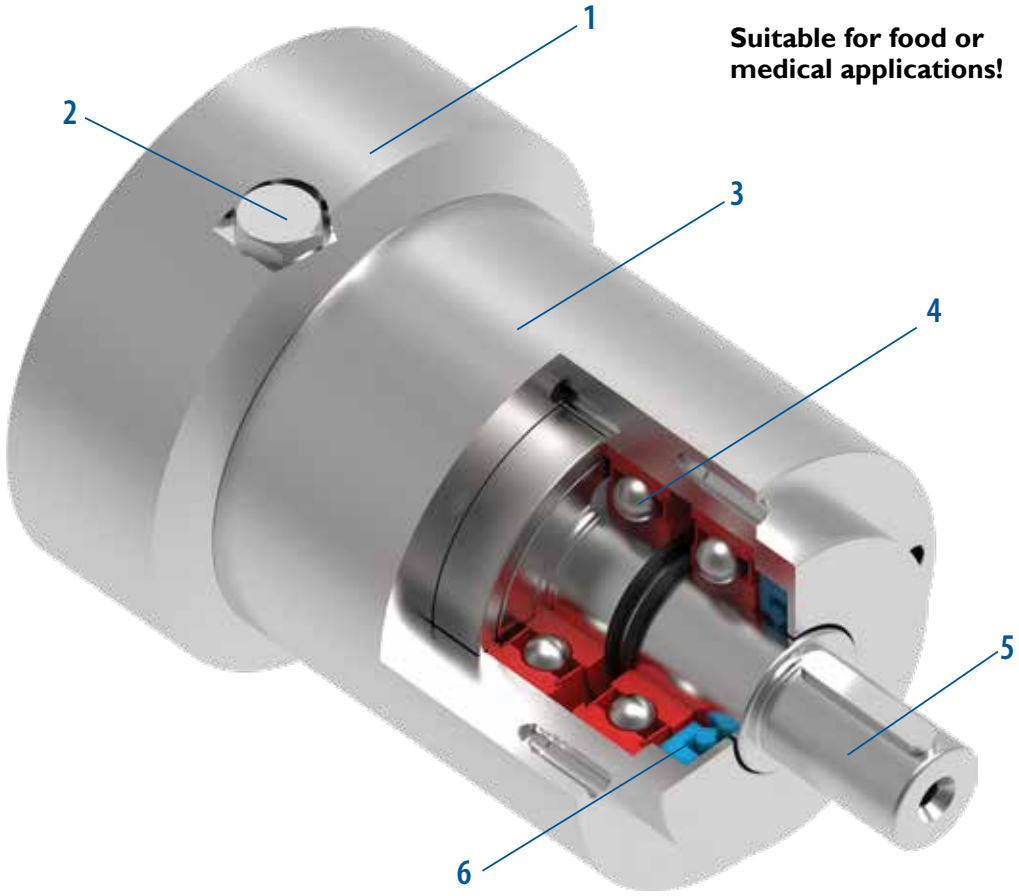
Our Stainless Steel Planetary (SSP) Series is an innovative washdown servo gearbox solution designed for food, medical or sanitary applications. It is a precision planetary gearbox outwardly constructed of 300-series stainless steel. The motor adapter plate, housing and shaft are all stainless steel. Viton® seals, stainless steel hardware and sealed interfaces provide outstanding corrosion resistance in all types of wet and caustic washdown environments.

Ideal for any light or demanding servo application where corrosion resistance is a requirement, the SSP Series offers economy, high precision, and long lasting performance.

SSP Series Benefits:

- All exposed surfaces stainless steel
- Frame sizes from 70 to 120 mm
- Ratios from 3:1 to 100:1

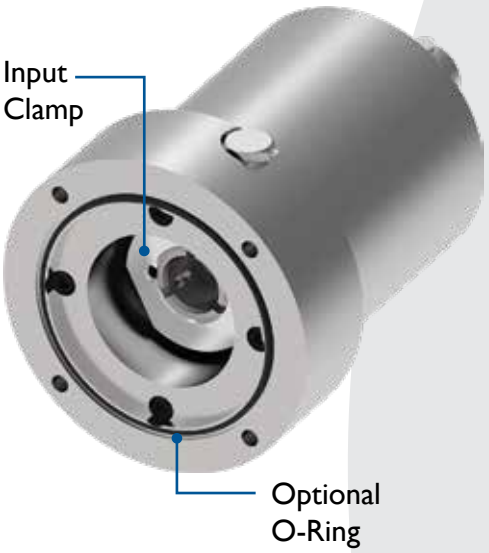
Suitable for food or medical applications!



1. Adapter Flange
   Stainless steel adapter for quick and easy motor mounting
2. Hole Plug
   Threaded stainless steel plug
3. Lubrication (internal)
   Standard with food grade grease
4. Bearings (internal)
   Dual output bearings for high radial and axial loading
5. Shaft
   Stainless steel keyed output shaft
6. Seals (internal)
   Viton® seals keep contaminants out and lubricant in and achieves an IP66 rating

SSP-W

- Frame sizes from 70 mm to 120 mm
- Ratios from 3:1 to 100:1



SSP-W Input

- Input clamping element for fast and easy mounting
- Optional input O-ring to keep contaminants out custom designed for your motor. (Special request at time of order)

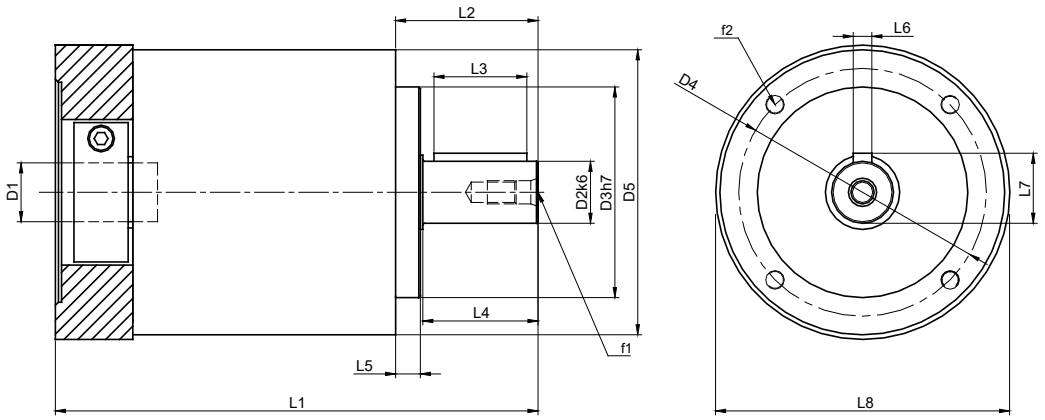
SSP-Series - SSP

SSP Series			70	90	120
Stock Ratios			5,10		
All Ratios Available			1-stage: 3, 4, 5, 7, 10 2-stage: 12, 16, 20, 25, 35, 40, 50, 70, 100 For other ratios, consult GAM		
Nominal Output Torque (T_{2n})	Nm (lb-in)	3:1	20 (177)	40 (354)	100 (885)
		4, 5, 7:1	26 (230)	54 (478)	120 (1062)
		10, 100, 1000:1	16 (142)	40 (354)	105 (929)
		12:1	36 (319)	80 (708)	170 (1505)
		all other ratios	42 (372)	100 (885)	210 (1859)
Max Acceleration Output Torque (T_{2B})	Nm (lb-in)	3:1	36 (319)	70 (620)	180 (1593)
		4, 5, 7:1	44 (389)	100 (885)	200 (1770)
		10, 100, 1000:1	24 (212)	75 (664)	180 (1593)
		12:1	45 (398)	100 (885)	215 (1903)
		all other ratios	52 (460)	125 (1106)	255 (2257)
Emergency Output Torque (T_{2not})	Nm (lb-in)	3:1	72 (637)	160 (1416)	200 (1770)
		4, 5, 7:1	84 (743)	216 (1912)	480 (4248)
		10, 100, 1000:1	62 (549)	160 (1416)	410 (3629)
		12:1	72 (637)	160 (1416)	400 (3540)
		all other ratios	84 (743)	216 (1912)	480 (4248)
Nominal Input Speed (n_{1n})	RPM	-	3500	3000	2500
Max Speed (n_{1max})		-	6000	6000	5000
Standard Output Backlash* (j)	arcmin	3:1 - 10:1	< 10	< 10	< 8
		12:1 - 100:1	< 14	< 14	< 12
Allowable Radial Load (F_{rad}) 1)	N (lbs)	-	910 (205)	1500 (338)	3000 (675)
Allowable Axial Load (F_{axial})	N (lbs)	-	500 (113)	1000 (225)	1500 (338)
Torsional Stiffness* (C_{t21})	Nm/ arcmin (lb-in/arcmin)	10:1, 100:1	1.3 (11.5)	3.4 (30.1)	8.3 (73.5)
		7:1, 70:1	1.7 (15)	4.8 (42.5)	13.6 (120.4)
		all other ratios	2.4 (21.2)	7.1 (62.8)	17.2 (152.2)
Weight (m)	kg (lbs)	1-stage	2 (4.4)	3.9 (8.6)	8.8 (19.4)
		2-stage	2.3 (5.1)	4.7 (10.4)	10.9 (24)
Noise Level (L_{PA})	dB(A)	-	< 64	< 66	< 68
Mass Moment of Inertia (J_1)	kg cm² (lb-in²)	3:1	0.45 (0.154)	1.37 (0.468)	6.54 (2.235)
		4:1, 12:1, 16:1	0.38 (0.130)	1.14 (0.390)	4.8 (1.640)
		5:1, 20:1, 25:1	0.36 (0.123)	1.05 (0.359)	4.05 (1.384)
		7:1, 35:1	0.35 (0.120)	0.97 (0.331)	3.4 (1.162)
		10:1, 40:1 - 100:1	0.34 (0.116)	0.93 (0.318)	3.1 (1.059)
Efficiency at Load			1-stage: 94% 2-stage: 92%		
Service Life			> 30,000 hours		
Lubrication			Food Grade Grease: Note 1. Meets FDA 21 CFR 178.3570 requirements Note 2. USDA H1 authorized (authorized for use in federally inspected meat and poultry plants)		
Protection Rating			IP 66		
Operating Temperature Range			-20°C to 90°C		

1) Load applied at center of output shaft @100 RPM

*See page 224 for definitions

SSP-W



SSP Series		70		90		120	
		mm	(in)	mm	(in)	mm	(in)
D1 max standard	motor shaft diameter	14	(0.551)	19	(0.748)	24	(0.945)
D1 max available*	motor shaft diameter	16	(0.630)	24	(0.945)	32	(1.260)
D2 k6	output shaft diameter	16	(0.630)	22	(0.866)	32	(1.260)
D3 h7	pilot diameter	52	(2.047)	68	(2.677)	90	(3.543)
D4	bolt circle	62	(2.441)	80	(3.150)	108	(4.252)
D5	housing diameter	70	(2.756)	92	(3.622)	125	(4.921)
f1	shaft thread	M5x14		M6x17		M12x33.5	
f2	mounting holes	(4) M6x12		(4) M6x14		(8) M8x18	
L1 1-stage**	gearbox total length	131	(5.157)	174	(6.85)	232	(9.134)
L1 2-stage**		153	(6.024)	207	(8.15)	271	(10.669)
L2	shaft length	36	(1.417)	46.2	(1.819)	70	(2.756)
L3	key length	25	(0.984)	30	(1.181)	50	(1.969)
L4	usable shaft length	28	(1.102)	36	(1.417)	58	(2.283)
L5	pilot height	7.6	(0.299)	10	(0.394)	11	(0.433)
L6	key width	5	(0.197)	6	(0.236)	10	(0.394)
L7	key height	18	(0.709)	24.6	(0.969)	35	(1.378)
L8**	adapter size	70	(2.756)	90	(3.543)	120	(4.724)

* for larger motor shaft diameters, please contact GAM
** depending on the motor, value can vary

Recommended Output Coupling (if necessary)			
all stainless bellows	KG-VA-80	KG-VA-220	KG-VA-350

TYPE CODES FOR SSP SERIES (SSP-W)

Example: SSP - W - 090 - 005 G - M0000 - H0000 - C0000

Gearbox Series
Stainless Steel Planetary Series

Gearbox Style
W = Output Shaft

Gearbox Size
070, 090, 120

Ratio
3, 4, 5, 7, 10, 12, 16, 20, 25, 35, 40, 50, 70, 100

Options Available for This Product
G = Key on output DIN688

Motor Code
Assigned by GAM

Output Code
Assigned by GAM

Configuration Code
Assigned by GAM

Tolerances (mm)		
Size	k6	h7
Over 10	+0.012	0
Thru 18	+0.001	-0.018
Over 18	+0.015	0
Thru 30	+0.002	-0.021
Over 30	+0.018	0
Thru 50	+0.002	-0.025
Over 50	+0.021	0
Thru 80	+0.002	-0.030
Over 80	+0.025	0
Thru 120	+0.003	-0.035

Performance: PE Series

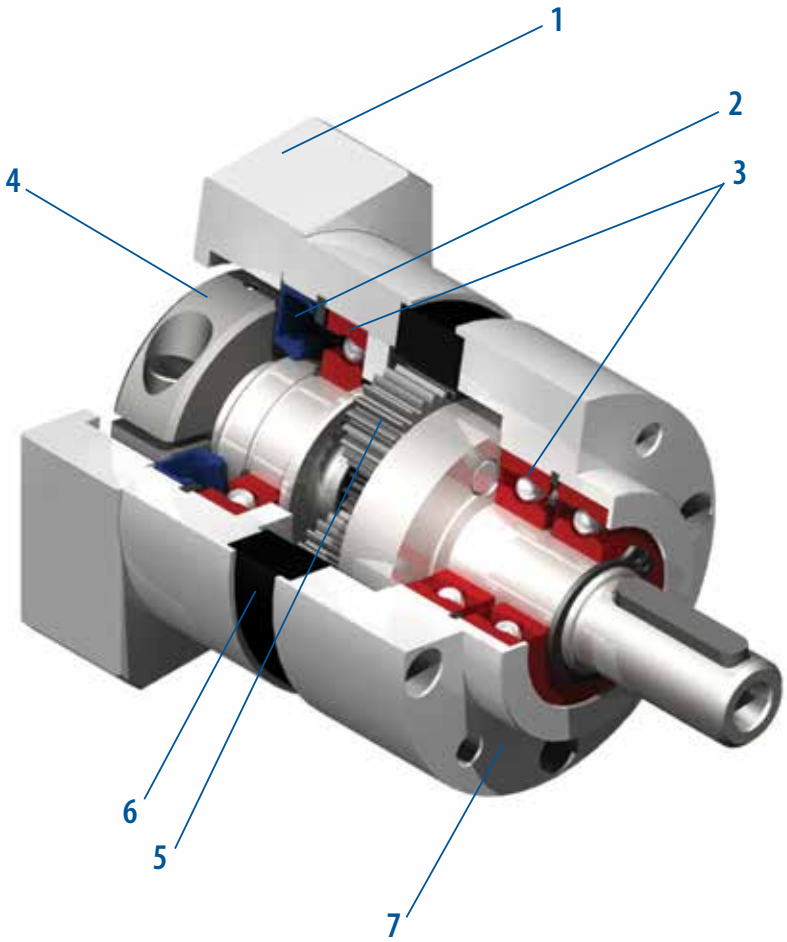
GAM can.

If you don't see exactly what you need, let us know. We can modify the PE Series gearboxes to meet your needs. Page 5 provides examples of GAM capabilities.

The GAM PE series is a great gearbox value for servo, stepper, and other motion control applications. It offers the best quality available for the price point. Based on the design of the popular EPL series, the PE series is a reliable alternative when radial or axial loadings are minimized.

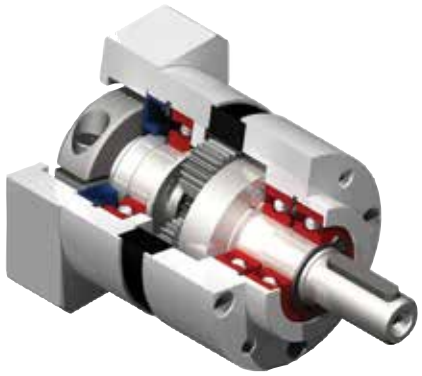
PE Series offers:

- Metric output (4 sizes)
- NEMA output (4 sizes)
- Wide range of ratios (3:1 to 1000:1)



1. Adapter Plate
   Customized adapter plates for quick and easy motor mounting
2. Seals
   Protective seals to isolate the gearbox
3. Ball Bearings
   dual ball bearings
4. Input Clamping Element
5. Planet Gears
   Precision ground gears
6. Ring Gear
   Ring gear incorporated into housing
7. Output Face

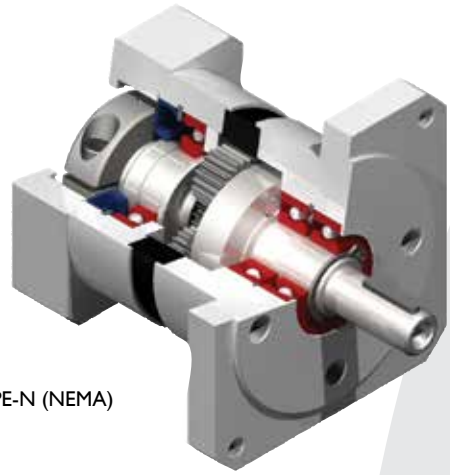
Performance: PE Series



PE-W

PE-W

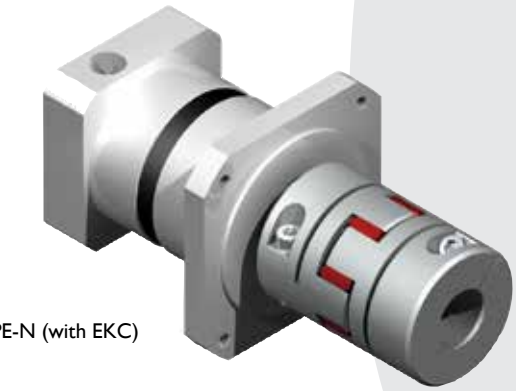
- Metric output face
- Ratios 3:1 to 1000:1
- Frame sizes from 50 mm to 118 mm
- Ready to mount to your motor



PE-N (NEMA)

PE-N (NEMA)

- NEMA output face
- Ratios 3:1 to 1000:1
- Frame sizes from NEMA 17 to 42
- Ready to mount to your motor

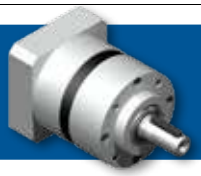


PE-N (with EKC)

PE-N (shown with GAM's EKC elastomer coupling)

- Use the PE Series gearbox with the EKC coupling for the most cost-effective solution!

PE-W Series - (Metric)

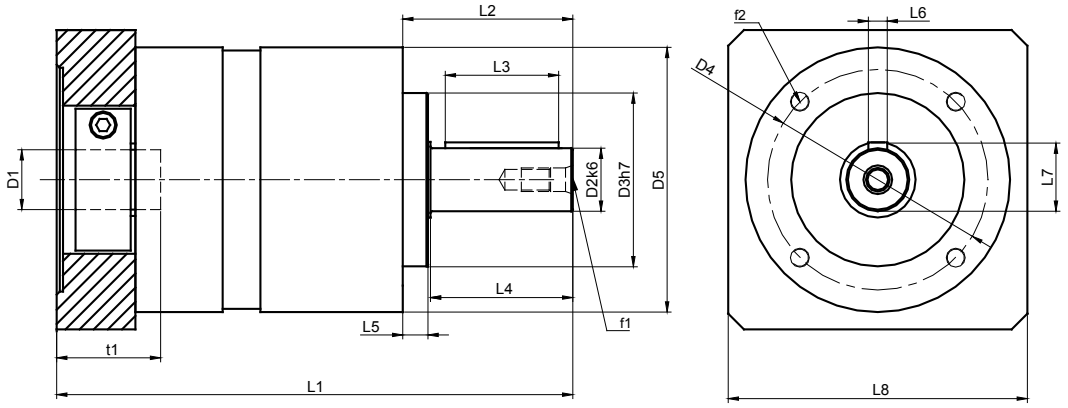


PE-W Series			50	64	84	118
Stock Ratios			5, 10, 50			
All Ratios Available			1-stage: 3, 4, 5, 7, 10 2-stage: 12, 16, 20, 25, 35, 40, 50, 70, 100 3-stage: 120, 160, 200, 250, 350, 490, 700, 1000			
Nominal Output Torque (T_{2n})	Nm (lb-in)	3:1	5 (44)	20 (177)	40 (354)	100 (885)
		4, 5, 7:1	6.5 (58)	26 (230)	54 (478)	120 (1062)
		10, 100, 1000:1	5 (44)	16 (142)	40 (354)	105 (929)
		12:1	14 (124)	36 (319)	80 (708)	170 (1505)
		all other ratios	16 (142)	42 (372)	100 (885)	210 (1859)
Max Acceleration Output Torque (T_{2B})	Nm (lb-in)	3:1	10 (89)	36 (319)	70 (620)	180 (1593)
		4, 5, 7:1	13 (115)	44 (389)	100 (885)	200 (1770)
		10, 100, 1000:1	10 (89)	24 (212)	75 (664)	180 (1593)
		12:1	17.5 (155)	45 (398)	100 (885)	215 (1903)
		all other ratios	20 (177)	52 (460)	125 (1106)	255 (2257)
Emergency Output Torque (T_{2not})	Nm (lb-in)	3:1	20 (177)	72 (637)	160 (1416)	200 (1770)
		4, 5, 7:1	26 (230)	84 (743)	216 (1912)	480 (4248)
		10, 100, 1000:1	20 (177)	62 (549)	160 (1416)	410 (3629)
		12:1	28 (248)	72 (637)	160 (1416)	400 (3540)
		all other ratios	32 (283)	84 (743)	216 (1912)	480 (4248)
Nominal Speed (n_{1n})	RPM	-	3500	3500	3000	2500
Max Speed (n_{1max})		-	6000	6000	6000	5000
Standard Output Backlash* (j)	arcmin	3:1 - 10:1	<16	<10	<10	<8
		12:1 - 100:1	<20	<14	<14	<12
		120:1 - 1000:1	-	<18	<18	<16
Allowable Radial Load (F_{rad}) 1)	N (lbs)	-	425 (96)	560 (126)	1300 (293)	2500 (563)
Allowable Axial Load (F_{axial})	N (lbs)	-	350 (79)	500 (113)	1000 (225)	1500 (338)
Torsional Stiffness* (C_{t21})	Nm/arcmin (lb-in/arcmin)	10, 100, 1000	0.60 (5.3)	1.3 (11.5)	3.4 (30.1)	8.3 (73.5)
		7, 70, 700	0 .78 (6.9)	1.7 (15)	4.8 (42.5)	13.6 (120.4)
		all other ratios	0.9 (8.0)	2.4 (21.2)	7.1 (62.8)	17.2 (152.2)
Weight (m)	kg (lbs)	1-stage	0.4 (0.9)	1.0 (2.2)	2.3 (5.1)	5.8 (12.8)
		2-stage	0.5 (1.1)	1.3 (2.9)	3.1 (6.8)	7.9 (17.4)
		3-stage	- (-)	1.6 (3.5)	3.9 (8.6)	10.0 (22.1)
Noise Level (L_{PA})	dB(A)	-	< 64	< 66	< 68	< 70
Mass Moment of Inertia (J_1)	kg cm^2 (lb-in^2)	3:1	0.06 (0.021)	0.45 (0.154)	1.37 (0.468)	6.54 (2.235)
		4:1, 12:1, 16:1	0.04 (0.014)	0.38 (0.130)	1.14 (0.390)	4.8 (1.640)
		5:1, 20:1, 25:1	0.04 (0.014)	0.36 (0.123)	1.05 (0.359)	4.05 (1.384)
		7:1, 35:1	0.04 (0.014)	0.35 (0.120)	0.97 (0.331)	3.4 (1.162)
		10:1, 40:1 - 100:1	0.04 (0.014)	0.34 (0.116)	0.93 (0.318)	3.1 (1.059)
		120:1 - 1000:1	(0.000)	0.34 (0.116)	0.93 (0.318)	3.12 (1.066)
Efficiency at Load			1-stage: 94% 2-stage: 92% 3-stage: 90%			
Service Life			>20,000			
Lubrication			Mineral Grease EP0			
Protection Rating			IP 64			
Operating Temperature Range			-20°C to 90°C			

1) Load applied at center of output shaft @100 RPM

*See page 224 for definitions

PE-W



PE-W Series		50		64		84		118	
		mm	(in)	mm	(in)	mm	(in)	mm	(in)
D1 max standard*	motor shaft diameter	11	(0.433)	14	(0.551)	19	(0.748)	24	(0.945)
D1 max available*	motor shaft diameter	14	(0.551)	16	(0.630)	24	(0.945)	32	(1.260)
D2 k6	output shaft diameter	12	(0.472)	14	(0.551)	20	(0.787)	25	(0.984)
D3 h7	pilot diameter	35	(1.378)	40	(1.575)	55	(2.165)	80	(3.15)
D4	bolt circle	44	(1.732)	52	(2.047)	70	(2.756)	100	(3.937)
D5	housing diameter	50	(1.969)	64	(2.52)	84	(3.307)	118	(4.646)
f1	shaft thread	M4x8		M5x12		M6x16		M10x22	
f2	mounting holes	M4x6		M5x12		M6x14		M8x18	
L1 1-stage**	gearbox total length	93	(3.661)	117	(4.606)	162	(6.378)	199	(7.835)
L1 2-stage**		108	(4.252)	139	(5.472)	195	(7.677)	239	(9.409)
L1 3-stage**		-	(-)	161	(6.339)	228	(8.976)	280	(11.024)
L2	shaft length	24.5	(0.965)	39	(1.535)	54	(2.126)	61	(2.402)
L3	key length	16	(0.63)	25	(0.984)	36	(1.417)	45	(1.772)
L4	usable shaft length	18	(0.709)	30	(1.181)	45	(1.772)	50	(1.969)
L5	pilot height	4	(0.157)	8	(0.315)	8	(0.315)	10	(0.394)
L6	key width	4	(0.157)	5	(0.197)	6	(0.236)	8	(0.315)
L7	key height	13.5	(0.531)	16	(0.63)	22.5	(0.886)	28	(1.102)
L8**	adapter size	50	(1.969)	70	(2.756)	90	(3.543)	120	(4.724)
t1***	allowable shaft length	23	(0.87)	23	(0.906)	30	(1.181)	40	(1.575)

* for larger motor shaft diameters, please contact GAM ** depending on the motor, value can vary *** long motor shafts can be accommodated, but overall gearbox length will grow
****The PE-W-050 may have a blue ring gear

Recommended Output Coupling (if necessary)				
metal bellows	KLC-25	KLC-50	KLC-125	KM-270
elastomer	EKC-25	EKC-35	EKC-80 or 110	EKM-300

TYPE CODES FOR PE-W SERIES (METRIC)

Example: PE - W - 084 - 005 G - M0000 - H0000 - C0000

- **Gearbox Series** — PE w/ Metric Output
- **Gearbox Style** — W = Output Shaft
- **Gearbox Size** — 050, 064, 084, 118
- **Ratio** — 3, 4, 5, 7, 10, 12, 16, 20, 25, 35, 40, 50, 70, 100, 120, 160, 200, 250, 350, 490, 700, 000=1000
- **Options Available for This Product** — G = Key on output shaft per DIN6885
- **Motor Code** — Assigned by GAM
- **Output Code** — Assigned by GAM
- **Configuration Code** — Assigned by GAM

Tolerances (mm)		
Size	k6	h7
Over 6	+0.010	0
Thru 10	+0.001	-0.015
Over 10	+0.012	0
Thru 18	+0.001	-0.018
Over 18	+0.015	0
Thru 30	+0.002	-0.021
Over 30	+0.018	0
Thru 50	+0.002	-0.025
Over 50	+0.021	0
Thru 80	+0.002	-0.030

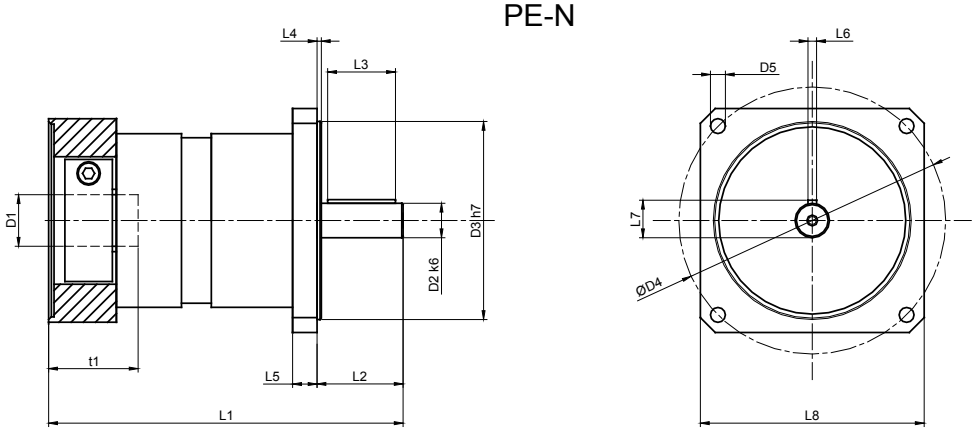
PE-N Series - (NEMA)

PE-N Series			17		23		34		42	
Stock Ratios			5, 10, 50							
All Ratios Available			1-stage: 3, 4, 5, 7, 10 2-stage: 12, 16, 20, 25, 35, 40, 50, 70, 100 3-stage: 120, 160, 200, 250, 350, 490, 700, 1000							
Nominal Output Torque (T_{2n})	Nm (lb-in)	3:1	5	(44)	5	(44)	20	(177)	40	(354)
		4, 5, 7:1	6.5	(58)	6.5	(58)	26	(230)	54	(478)
		10, 100, 1000:1	5	(44)	5	(44)	16	(142)	40	(354)
		12:1	14	(124)	14	(124)	36	(319)	80	(708)
		all other ratios	16	(142)	16	(142)	42	(372)	100	(885)
Max Accel. Torque (T_{2B})	Nm (lb-in)	3:1	10	(89)	10	(89)	36	(319)	70	(620)
		4, 5, 7:1	13	(115)	13	(115)	44	(389)	100	(885)
		10, 100, 1000:1	10	(89)	10	(89)	24	(212)	75	(664)
		12:1	17.5	(155)	17.5	(155)	45	(398)	100	(885)
		all other ratios	20	(177)	20	(177)	52	(460)	125	(1106)
Emergency Output Torque (T_{2not})	Nm (lb-in)	3:1	20	(177)	20	(177)	72	(637)	160	(1416)
		4, 5, 7:1	26	(230)	26	(230)	84	(743)	216	(1912)
		10, 100, 1000:1	20	(177)	20	(177)	62	(549)	160	(1416)
		12:1	28	(248)	28	(248)	72	(637)	160	(1416)
		all other ratios	32	(283)	32	(283)	84	(743)	216	(1912)
Nominal Speed (n_{1n})	RPM	-	3500		3500		3500		3000	
Max Input Speed (n_{1max})		-	6000		6000		6000		6000	
Standard Output Backlash* (j)	arcmin	3:1 - 10:1	<20		<16		< 10		< 10	
		12:1 - 100:1	<24		<20		< 14		< 14	
		120:1 - 1000:1	-		-		< 18		< 18	
Allowable Radial Load (F_{rad}) 1)	N (lbs)	-	361	(81)	361	(81)	476	(107)	1105	(249)
Allowable Axial Load (F_{axial})	N (lbs)	-	298	(67)	298	(67)	425	(96)	850	(191)
Torsional Stiffness* (C_{t21})	Nm/arcmin (lb-in/arcmin)	10, 100, 1000	0.50	(4.4)	0.60	(5.3)	1.3	(11.5)	3.4	(30.1)
		7, 70, 700	0.65	(5.8)	0 .78	(6.9)	1.7	(15)	4.8	(42.5)
		all other ratios	0.8	(7.5)	0.9	(8.0)	2.4	(21.2)	7.1	(62.8)
Weight (m)	kg (lbs)	1-stage	0.45	(1.0)	0.45	(1.0)	1.1	(2.4)	2.4	(5.3)
		2-stage	0.55	(1.2)	0.55	(1.2)	1.4	(3.1)	3.2	(7.1)
		3-stage	-	(-)	-	(-)	1.7	(3.7)	4.0	(8.8)
Noise Level (L_{PA})	dB(A)	-	<60		<64		< 66		< 68	
Mass Moment of Inertia (J_1)	kg cm^2 (lb-in^2)	3:1	0.0144	(0.005)	0.06	(0.021)	0.45	(0.154)	1.37	(0.468)
		4:1, 12:1, 16:1	0.0096	(0.003)	0.04	(0.014)	0.38	(0.130)	1.14	(0.390)
		5:1, 20:1, 25:1	0.0096	(0.003)	0.04	(0.014)	0.36	(0.123)	1.05	(0.359)
		7:1, 35:1	0.0152	(0.005)	0.04	(0.014)	0.35	(0.120)	0.97	(0.331)
		10:1, 40:1 - 100:1	0.0078	(0.003)	0.04	(0.014)	0.34	(0.116)	0.93	(0.318)
		120:1 - 1000:1	-	(-)	-	(-)	0.34	(0.116)	0.93	(0.318)
Efficiency at Load		1-stage: 94% 2-stage: 92% 3-stage: 90%								
Service Life		>20,000								
Lubrication		Mineral Grease EP0								
Protection Rating		IP 64								
Operating Temperature Range		-20°C to 90°C								

1) Load applied at center of output shaft @100 RPM

*See page 224 for definitions

PE-N



PE-N Series		17		23		34		42	
		mm	(in)	mm	(in)	mm	(in)	mm	(in)
D1 max standard*	motor shaft diameter	11	(0.433)	11	(0.433)	14	(0.551)	19	(0.748)
D1 max available*	motor shaft diameter	11	(0.433)	14	(0.551)	16	(0.630)	24	(0.945)
D2 k6	output shaft diameter	9.525	(0.375)	9.525	(0.375)	12.70	(0.500)	19.05	(0.750)
D3 h7	pilot diameter	21.97	(0.865)	38.10	(1.500)	73.025	(2.875)	55.55	(2.187)
D4	bolt circle	43.8	(1.725)	66.7	(2.625)	98.4	(3.875)	125.7	(4.95)
D5	mounting holes	3.25	(0.128)	5	(0.2)	5.5	(0.22)	7.1	(0.28)
L1 1-stage**	gearbox total length	108	(4.252)	102	(4.016)	125	(4.921)	162	(6.378)
L1 2-stage**		124	(4.882)	122.5	(4.823)	147	(5.787)	194.5	(7.657)
L1 3-stage**		-	(-)	-	(-)	169	(6.654)	227	(8.937)
L2	shaft length	25.4	(1.00)	25.4	(1.00)	31.8	(1.25)	31.8	(1.25)
L3	key length	-	(-)	-	(-)	27	(1.06)	29	(1.14)
L4	pilot height	1.6	(0.063)	1.6	(0.06)	1.7	(0.07)	2.4	(0.09)
L5	flange thickness	4.9	(0.193)	5	(0.2)	10	(0.39)	13	(0.51)
L6	key width	-	(-)	-	(-)	3.2	(0.13)	4.8	(0.19)
L7	flat height	9.14	(0.36)	9.14	(0.36)	-	-	-	-
	key height	-	-	-	-	14.3	(0.56)	18.260	(0.72)
L8	output flange size	40	(1.575)	57.14	(2.25)	82.55	(3.25)	106.68	(4.20)
t1***	allowable motor shaft	25	(0.984)	23	(0.87)	32	(1.26)	40	(1.575)

* for larger motor shaft diameters, please contact GAM **depending on the motor, value can vary *** longer motor shafts can be accommodated, but overall gearbox length will grow

Recommended Output Coupling (if necessary)				
metal bellows	KLC-25	KLC-25	KLC-50	KLC-125
elastomer	EKC-25	EKC-25	EKC-35	EKC-110

TYPE CODES FOR PE-N SERIES (NEMA)

Example: PE - N - 023 - 005 G - M0000 - H0000 - C0000

- **Gearbox Series** — PE w/ NEMA output
- **Gearbox Style** — N = NEMA shaft output
- **Gearbox Size** — 017, 023, 034, 042
- **Ratio** — 3, 4, 5, 7, 10, 12, 16, 20, 25, 35, 40, 50, 70, 100, 120, 160, 200, 250, 350, 490, 700, 000=1000
- **Options Available for This Product** — G = Key on output shaft per DIN6885 flat on NEMA 17 and NEMA 23
- **Motor Code** — Assigned by GAM
- **Output Code** — Assigned by GAM
- **Configuration Code** — Assigned by GAM

Tolerances (mm)		
Size	k6	h7
Over 6	+0.010	0
Thru 10	+0.001	-0.015
Over 10	+0.012	0
Thru 18	+0.001	-0.018
Over 18	+0.015	0
Thru 30	+0.002	-0.021
Over 30	+0.018	0
Thru 50	+0.002	-0.025
Over 50	+0.021	0
Thru 80	+0.002	-0.030

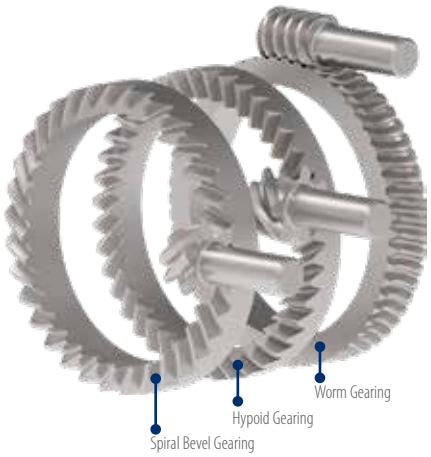
Right Angle Gearing: Types & Advantages

Right Angle Gearing

A right angle gearbox has an input and output perpendicular to each other. The design of different types of conventional right-angle gearing each have their advantages but come down to a trade-off between the ratio density or torque capacity and the mechanical efficiency.

We will consider the three most common types of right angle gearing: Spiral Bevel, Worm, and Hypoid gearing.

The primary difference between these three types of gearing is the position of the input (drive) pinion along the arc of the output (driven) gear. This has a significant impact on available ratios, load-carrying capabilities and mechanical efficiency.



Gearing Terms

Meshing Action

Mechanism for how the teeth of the pinion come into contact and drive the gear. Meshing can be sliding, rolling, or a combination.

Meshing of paired gears with intersecting axes, such as spiral bevel, will have a simple rolling motion with minimal slippage for high efficiency.

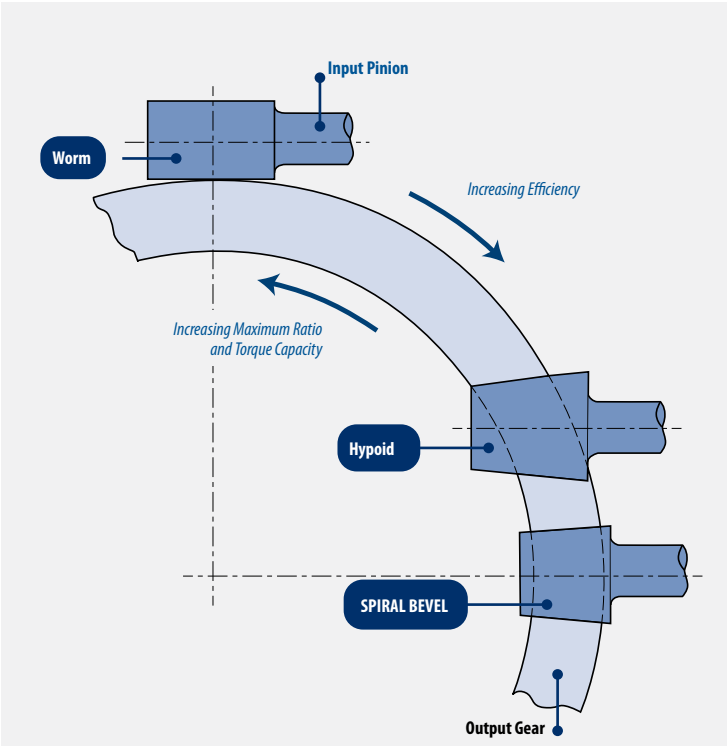
Non-intersecting gears, such as worm gears, rotate with high slippage, producing friction and decreasing efficiency.

Tooth Contact Area

Amount of load sharing among teeth. Higher tooth contact area results in higher torque capacity

Backlash

Amount that the space between teeth on one gear exceeds the thickness of the engaging tooth on the other gear. In a gearbox, this will result in motion at the output when the input is held stationary.



Input pinion position relative to output gear for different types of right angle gearing

Backlash, Wear, and Sliding Action

None of these three types of gears have inherently less backlash.

- Less sliding action means less wear resulting in the backlash increasing less over time.
- For similar precision level, less backlash means more heat which decreases efficiency. For spiral bevel gearing, which already has high efficiency, this is less of an issue. For inefficient worm gearing, this is more of an issue.

Types of Right Angle Gearing

SPIRAL BEVEL GEARING

Conventional spiral bevel gearing uses helical teeth. The angled teeth produce a purely rolling meshing action resulting in very high efficiency. However, it also has a small total tooth contact area, so its torque capacity is lower compared to other types of right angle gearing.

Single-stage spiral bevel gearing is typically available with 1:1 to 6:1 reduction ratios. Higher ratios can be easily achieved with multiple-stage configurations, but the additional gear stage lowers mechanical efficiency, increases backlash, consumes space and weight, and reduces reliability.

The gear set geometry, along with the low ratios, allow for many output configurations.

Advantage: High efficiency, low ratios, and high configurability for design flexibility

WORM GEARING

Conventional worm gearing uses a straight tooth gear with a spiral tooth pinion. The meshing action of this design has a high component of sliding action, generating friction, and resulting in the lowest mechanical efficiency.

This design has very high total tooth contact area providing high torque capacity and high speed reduction, typically 5:1 to 60:1. Worm gearing is also subject to wear that requires adjustment to maintain accuracy.

Advantage: High reduction ratio, high torque throughput

HYPOID GEARING

Hypoid gearing is a type of spiral gearing with axes offset from each other, neither inline as with bevel gearing or perpendicular like worm gearing. This design results in a meshing action that is mostly rolling with a small component of sliding.

The tooth contact area is greater than bevel gearing, so its load-carrying capability is greater. Hypoid gearing offers further advantages with typical ratios up to 10:1 (15:1 with GAM Dyna or Dyna-Lite series) in a single stage and low backlash.

Advantage: Combines the space and configuration advantages of worm gearing with the high efficiency of bevel gearing.

Summary

Feature	Spiral Bevel	Hypoid	Worm
Meshing Action	Rolling	Rolling with some sliding	Sliding
Pinion position	Inline	Offset inline	Perpendicular
Maximum Ratio (single stage)	1:1 to 6:1	3:1 to 10:1 (15:1 with GAM)	5:1 to 60:1
Relative Torque Capacity	Lowest	High	Highest
Efficiency	Highest	High	Lowest

Highest Performance: Dyna Series

GAM can.

If you don't see exactly what you need, let us know. We can modify the Dyna Series gearboxes to meet your needs. Page 5 provides examples of GAM capabilities.

The Dyna Series is our highest performance right-angle gear reducer utilizing sophisticated hypoid gearing. The benefit of hypoid gearing is that it combines the space and configuration advantages of worm gearing with the high efficiencies of bevel gearing. The result is that the Dyna Series is able to achieve ratios up to 15:1 in a single stage and ratios up to 100:1 in 2 stages.

DSX version for the highest performance available!

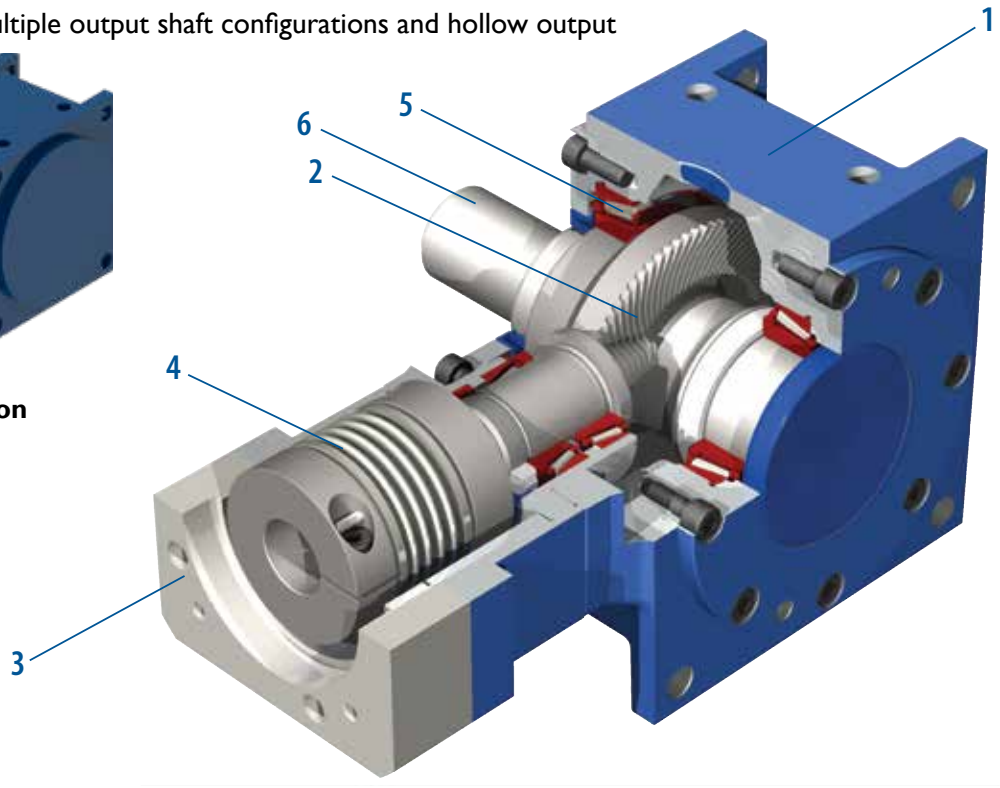
The DSX is our flagship right angle hypoid gearbox that has been optimized for the most demanding motion control applications that require high angular accuracy. Featuring hypoid gears that have been ground, the DSX has the smoothest torque transmission and extremely low backlash and noise levels.

Contact GAM for further information on the DSX.

Dyna Series benefits include:

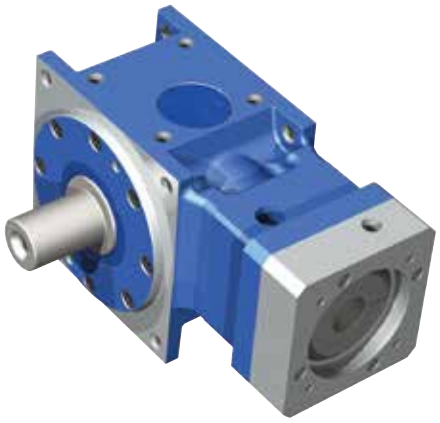
- Ratios up to 15:1 in a single stage, the highest in the market, and 100:1 in just two gear stages
- High efficiencies
- High allowable axial and radial loading
- Ultra low backlash
- Back drivable
- Multiple output shaft configurations and hollow output

High ratio version



1. Aluminum Housing
   Aluminum housing significantly reduces the weight of the gearbox
2. Hypoid Gearing
   Optimized gearing allows ratios up to 15:1 in a single stage; 100:1 in two stages. DSX gears are ground for improved performance.
3. Adapter Flange
   Customized adapter flanges for quick and easy mounting to any motor
4. Coupling
   Gearbox can be supplied with either a bellows or elastomer coupling on the input
5. Tapered Roller Bearings
   Roller bearings for high radial and axial loading
6. Output Shaft
   Gearbox can be supplied with one or two solid shafts or hollow shafts

Highest Performance: Dyna Series

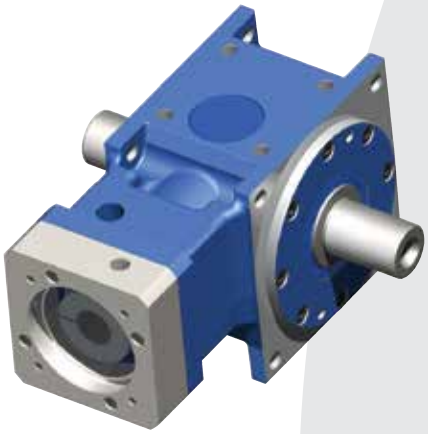


DS-W

- Single output shaft configuration with our high performance bellow coupling input and machined motor flange to mount to any servo motor
- Frame sizes from 55 mm to 190 mm
- DSX option available

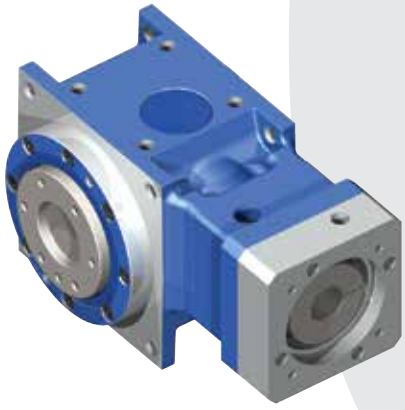
DS-H

- Hollow bore output configuration with our high performance bellow coupling input and machined motor flange to mount to any servo motor
- Zero-backlash shrink disk coupling on the output included with the gearbox
- DS-HP version with pre-mounted GAM helical pinion for use with helical rack for a complete system
- Frame sizes from 55 mm to 190 mm
- DSX option available
- DS-HP available with pre-mounted GAM pinion (see page 178)



DS-T

- Dual output shaft configuration with our high performance bellow coupling input and machined motor flange to mount to any servo motor
- Frame sizes from 55 mm to 190 mm
- DSX option available

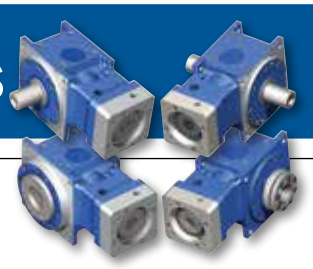


DS-F

- Flange output allows connection of pinion gears, pulleys, rotary index tables, and transmission shafting directly to the output for a more compact and stiffer solution
- Frame sizes from 55 mm to 190 mm
- DSX option available
- DS-FP available with pre-mounted GAM pinion (see page 178)

DS

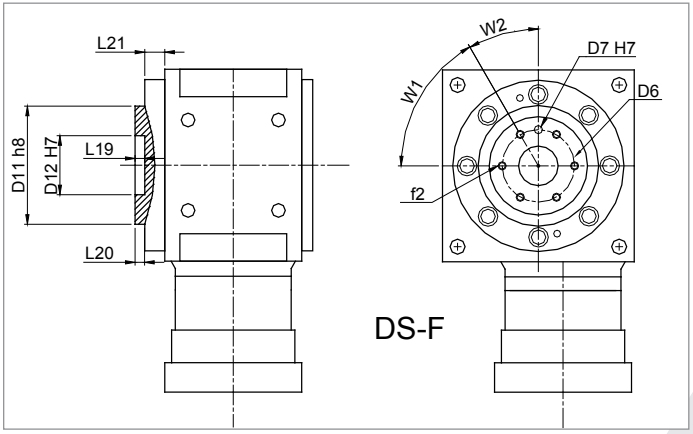
Highest Performance: Dyna Series

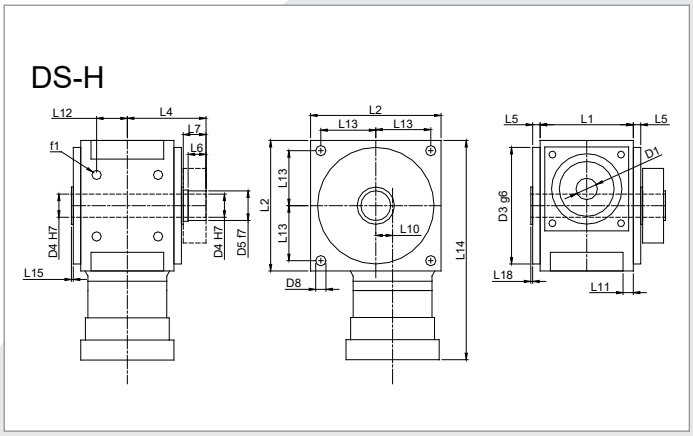


Dyna Series			55	75	90	115	140	190
Stock Ratios [1]			3, 5, 10, 15, 30, 50, 100		3, 5, 10, 15			N/A
All Ratios Available			1-stage: 3, 4, 5, 6, 8, 10, 12, 15 2-stage: 25, 30, 40, 50, 70 ,100 3-stage: consult GAM					
Nominal Output Torque (T_{2n})	Nm (lb-in)	3:1-10:1	35 (310)	70 (620)	140 (1239)	260 (2301)	720 (6372)	1440 (12744)
		12:1-15:1	25 (221)	50 (443)	95 (841)	180 (1593)	510 (4514)	1020 (9027)
		All 2-Stage Ratios	35 (310)	70 (620)	140 (1239)	260 (2301)	720 (6372)	1440 (12744)
Max Acceleration Output Torque (T_{2B})	Nm (lb-in)	-	1.5 x Nominal	1.5 x Nominal	1.5 x Nominal	1.5 x Nominal	1.5 x Nominal	1.5 x Nominal
Emergency Output Torque (T_{2not})	Nm (lb-in)	3:1-10:1	70 (620)	140 (1239)	280 (2478)	520 (4602)	1440 (12744)	2880 (25488)
		12:1-15:1	50 (443)	100 (885)	190 (1682)	360 (3186)	1020 (9027)	2040 (18054)
		All 2-Stage Ratios	70 (620)	140 (1239)	280 (2478)	520 (4602)	1440 (12744)	2880 (25488)
Nominal Input Speed[6] (n_{1n})	RPM	3:1-5:1	2100	1800	1500	1150	700	550
		6:1-10:1	3200	2700	2200	1800	1200	1000
		12:1-15:1	3900	3300	2800	2300	1600	1300
		2 Stage	3500	3000	3000	2500	2500	2500
Max Input Speed[6] (n_{1max})	RPM	1 stage	8000	8000	7000	6000	5000	4500
		2 Stage	6000	6000	6000	6000	6000	4500
Standard Output Backlash* (j)	arcmin	1 Stage	<5	<5	<4	<4	<4	<4
		2 Stage	<7	<7	<6	<6	<6	<6
Reduced Output Backlash* (j)	arcmin	1 Stage	<3 [1]	<3	<2	<2	<2	<2
		2 Stage	<5	<5	<3	<3	<3	<3
Noise Level (L_{PA})	dB	-	<66	<66	<68	<68	<70	<72
Allowable Radial Load [4] (F_{rad})	N (lbs)	-	3300 (742)	4900 (1102)	7200 (1619)	10000 (2248)	15000 (3372)	22500 (5058)
Allowable Axial Load (F_{axial})	N (lbs)	-	1650 (371)	2450 (551)	3600 (809)	5000 (1124)	7500 (1686)	11250 (2529)
Torsional Stiffness (C_{t21})[5]*	Nm/arcmin (lb-in/arcmin)	1 Stage	2.1 (18.6)	4.2 (37.2)	10.5 (92.9)	23.4 (207.1)	61.8 (547.0)	126 (1115.2)
		2 Stage	2.1 (18.6)	4.2 (37.2)	10.2 (90.3)	22.8 (201.8)	60.1 (531.9)	119.2 (1055.0)
Weight (m)	kg (lbs)	1 Stage	3.5 (7.7)	5.5 (12.1)	9.5 (20.9)	15.5 (34.2)	32.5 (71.6)	60 (132.3)
		2 Stage	4 (8.8)	6.5 (14.3)	12.5 (27.6)	19.5 (43)	36 (79.4)	61.5 (135.6)
Mass Moment of Inertia	kg cm² (lb-in²)	3:1	0.584 (0.200)	1.32 (0.451)	3.41 (1.165)	8.49 (2.901)	29.7 (10.149)	91.3 (31.199)
		4:1	0.439 (0.150)	0.993 (0.339)	2.46 (0.841)	6.03 (2.061)	20 (6.834)	61.2 (20.913)
		5:1	0.357 (0.122)	0.834 (0.285)	1.98 (0.677)	4.79 (1.637)	14.7 (5.023)	45.1 (15.412)
		6:1	0.258 (0.088)	0.747 (0.255)	1.24 (0.424)	4.04 (1.381)	11.7 (3.998)	34.9 (11.926)
		8:1	0.214 (0.073)	0.654 (0.223)	0.958 (0.327)	3.36 (1.148)	9.08 (3.103)	25.8 (8.816)
		10:1	0.192 (0.066)	0.612 (0.209)	0.842 (0.288)	3.04 (1.039)	7.85 (2.683)	21.8 (7.449)
		12:1	0.181 (0.062)	0.592 (0.202)	0.78 (0.267)	2.87 (0.981)	7.14 (2.440)	19.6 (6.698)
		15:1	0.17 (0.058)	0.568 (0.194)	0.715 (0.244)	2.72 (0.929)	6.55 (2.238)	19.5 (6.664)
		30:1	0.405 (0.138)	0.487 (0.166)	1.309 (0.447)	4.043 (1.382)	7.100 (2.426)	13.944 (4.765)
		40:1	0.367 (0.126)	0.402 (0.137)	1.084 (0.370)	3.477 (1.188)	5.050 (1.726)	7.625 (2.606)
		50:1	0.354 (0.121)	0.373 (0.128)	1.009 (0.345)	3.292 (1.125)	4.388 (1.499)	5.604 (1.915)
		70:1	0.352 (0.120)	0.356 (0.122)	0.978 (0.334)	3.430 (1.172)	4.779 (1.633)	4.918 (1.681)
		100:1	0.342 (0.117)	0.346 (0.118)	0.938 (0.321)	3.130 (1.070)	3.879 (1.325)	4.018 (1.373)
Efficiency at Load			3:1 - 8:1 > 96% 10:1 - 15:1 > 93% 30:1 - 100:1 > 92%					
Service Life			>30,000 hours					
Lubrication			Synthetic Oil: ISO VG 100					
Protection Rating			IP 64					
Operating Temperature Range			-10°C to 90°C					

1) Stock ratios listed are available in Standard and Reduced Backlash (DS 055 15:1 Standard Backlash only).
2) Nominal torque and speed values listed are for gear tooth ratings. Use thermal limit for continuous operation.
3) DSX Precision ground gearing for quieter and smoother operation, improved accuracy, and repeatability.
4) Load applied at center of output shaft @400 RPM.
5) Stiffness values relate to DS-W version only. Stiffness for DS-H,F may vary slightly- contact GAM for values.
6) Higher input speeds may be possible – consult GAM.
*See page 224 for definitions

Dyna Series Dimensions: DS-F, DS-H



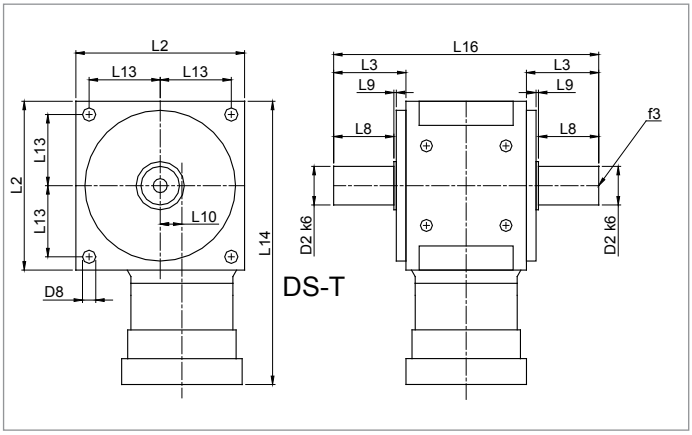


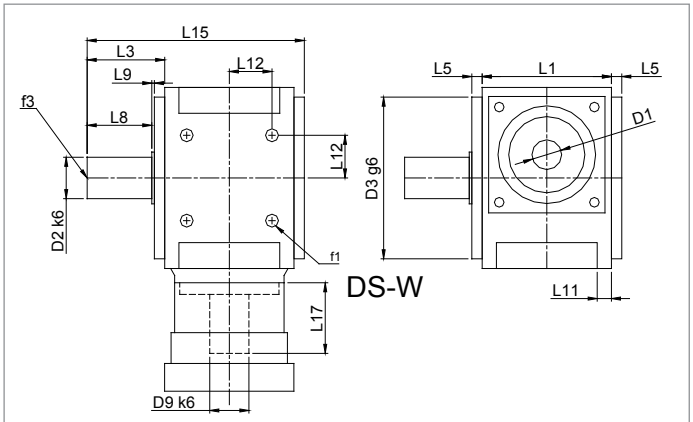
DS-F / DS-H		55		75		90		115		140		190	
		mm	(in)	mm	(in)	mm	(in)	mm	(in)	mm	(in)	mm	(in)
$D1_{max\ 1\text{-}stage}$*	input shaft diameter	21	(0.827)	28	(1.102)	35	(1.378)	43	(1.693)	55	(2.165)	55	(2.165)
$D1_{max\ std\ 2\text{-}stage}$		14	(0.551)	14	(0.551)	19	(0.748)	24	(0.945)	28	(1.102)	28	(1.102)
$D1_{max\ avail\ 2\text{-}stage}$		16	(0.630)	16	(0.630)	24	(0.945)	32	(1.26)	38	(1.496)	38	(1.496)
D3 g6	pilot diameter	89	(3.504)	105	(4.134)	125	(4.921)	150	(5.906)	195	(7.677)	245	(9.646)
D4 H7 **	hollow bore	20	(0.787)	25	(0.984)	30	(1.181)	40	(1.575)	55	(2.165)	70	(2.756)
D5 f7	hollow outer diameter	24	(0.945)	30	(1.181)	36	(1.417)	50	(1.969)	68	(2.677)	80	(3.15)
D6	flange bolt circle	40	(1.575)	50	(1.969)	63	(2.48)	80	(3.15)	100	(3.937)	125	(4.921)
D7 H7	locating hole diameter	6	(0.236)	6	(0.236)	6	(0.236)	8	(0.315)	8	(0.315)	10	(0.394)
D8	mounting hole diameter	6.6	(0.26)	9	(0.354)	11	(0.433)	14	(0.551)	17.5	(0.689)	17.5	(0.689)
D9 k6	gearbox input shaft dia	14	(0.551)	18	(0.709)	22	(0.866)	28	(1.102)	32	(1.26)	40	(1.575)
D11 h8	flange pilot (OD)	50	(1.969)	63	(2.48)	80	(3.15)	100	(3.937)	125	(4.921)	160	(6.299)
D12 H7	flange pilot (ID)	25	(0.984)	31.5	(1.24)	40	(1.575)	50	(1.969)	63	(2.48)	80	(3.15)
f1	mounting hole thread	M6		M8		M10		M12		M16		M16	
f2	flange tapped holes	7 x M6x9		7 x M6x9		7 x M6x9		11 x M8x12		11 x M8x12		11 x M10x15	
L1	housing width	60	(2.362)	80	(3.15)	100	(3.937)	120	(4.724)	146	(5.748)	196	(7.717)
L2	housing size	90	(3.543)	115	(4.528)	140	(5.512)	170	(6.693)	215	(8.465)	260	(10.236)
L4	hollow hub length	73	(2.874)	81	(3.189)	95	(3.74)	109	(4.291)	129	(5.079)	161	(6.339)
L5	pilot height	13.5	(0.531)	8.5	(0.335)	8	(0.315)	8	(0.315)	10	(0.394)	10	(0.394)
L6	hub length	20	(0.787)	22	(0.866)	26	(1.024)	29	(1.142)	32	(1.26)	34	(1.339)
L7	shoulder + hub length	23	(0.906)	25	(0.984)	29	(1.142)	33	(1.299)	37	(1.457)	40	(1.575)
L10	hypoid offset	9	(0.354)	14	(0.551)	18	(0.709)	23	(0.906)	32	(1.26)	42	(1.654)
L11	flange thickness	8	(0.315)	10	(0.394)	11	(0.433)	13	(0.512)	15	(0.591)	17	(0.669)
L12	hole location	22	(0.866)	27	(1.063)	33	(1.299)	40	(1.575)	52	(2.047)	70	(2.756)
L13	hole location	39	(1.535)	49	(1.929)	59	(2.323)	72	(2.835)	91	(3.583)	112	(4.409)
L14	input length 1-stage***	181	(7.126)	219	(8.622)	250.5	(9.862)	286.5	(11.28)	363.5	(14.311)	439	(17.283)
L14	input length 2-stage***	229.5	(9.035)	262	(10.315)	247.5	(9.744)	280	(11.024)	372	(14.646)	591	(23.268)
L17	input shaft length	20	(0.787)	26	(1.024)	43	(1.693)	48	(1.89)	55	(2.165)	62	(2.441)
L18	shoulder height	1.5	(0.059)	1.5	(0.059)	2	(0.079)	2	(0.079)	2	(0.079)	2	(0.079)
L19	inner flange pilot depth	6.5	(0.256)	6.5	(0.256)	6.5	(0.256)	8.5	(0.335)	8.5	(0.335)	10.5	(0.413)
L20	outer flange pilot height	7	(0.276)	7	(0.276)	7	(0.276)	10	(0.394)	10	(0.394)	12	(0.472)
L21	pilot height	20	(0.787)	15.5	(0.61)	16	(0.630)	17	(0.669)	17.5	(0.689)	22.5	(0.886)
W1	hole angle 1	45°		45°		45°		30°		30°		30°	
W2	hole angle 2	45°		45°		45°		30°		30°		30°	

* for larger shaft diameters consult GAM **mating shaft should have h6 tolerance *** depending on motor, length may vary

DS

Dyna Series Dimensions: DS-W, DS-T

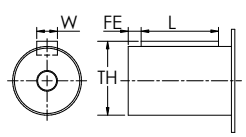




DS-W / DS-T		55		75		90		115		140		190	
		mm	(in)	mm	(in)	mm	(in)	mm	(in)	mm	(in)	mm	(in)
$D1_{max\ 1\text{-}stage*}$	input shaft diameter	21	(0.827)	28	(1.102)	35	(1.378)	43	(1.693)	55	(2.165)	55	(2.165)
$D1_{max\ std\ 2\text{-}stage}$		14	(0.551)	14	(0.551)	19	(0.748)	24	(0.945)	28	(1.102)	28	(1.102)
$D1_{max\ avail\ 2\text{-}stage}$		16	(0.630)	16	(0.630)	24	(0.945)	32	(1.26)	38	(1.496)	38	(1.496)
D2 k6	output shaft diameter	20	(0.787)	24	(0.945)	32	(1.26)	40	(1.575)	55	(2.165)	70	(2.756)
D3 g6	pilot diameter	89	(3.504)	105	(4.134)	125	(4.921)	150	(5.906)	195	(7.677)	245	(9.646)
D8	mounting hole diameter	6.6	(0.26)	9	(0.354)	11	(0.433)	14	(0.551)	17.5	(0.689)	17.5	(0.689)
D9 k6	gearbox input shaft dia	14	(0.551)	18	(0.709)	22	(0.866)	28	(1.102)	32	(1.26)	40	(1.575)
f1	mounting hole thread	M6		M8		M10		M12		M16		M16	
f3	shaft thread per DIN332/1	M6x16		M8x19		M12x28		M16x36		M20x42		M20x42	
L1	housing width	60	(2.362)	80	(3.15)	100	(3.937)	120	(4.724)	146	(5.748)	196	(7.717)
L2	housing size	90	(3.543)	115	(4.528)	140	(5.512)	170	(6.693)	215	(8.465)	260	(10.236)
L3	output shaft length	50	(1.969)	50	(1.969)	60	(2.362)	70	(2.756)	102	(4.016)	122	(4.803)
L5	pilot height	13.5	(0.531)	8.5	(0.335)	8	(0.315)	8	(0.315)	10	(0.394)	10	(0.394)
L8	usable shaft length	35	(1.378)	40	(1.575)	50	(1.969)	60	(2.362)	90	(3.543)	110	(4.331)
L9	shoulder height	1.5	(0.059)	1.5	(0.059)	2	(0.079)	2	(0.079)	2	(0.079)	2	(0.079)
L10	hypoid offset	9	(0.354)	14	(0.551)	18	(0.709)	23	(0.906)	32	(1.26)	42	(1.654)
L11	flange thickness	8	(0.315)	10	(0.394)	11	(0.433)	13	(0.512)	15	(0.591)	17	(0.669)
L12	hole location	22	(0.866)	27	(1.063)	33	(1.299)	40	(1.575)	52	(2.047)	70	(2.756)
L13	hole location	39	(1.535)	49	(1.929)	59	(2.323)	72	(2.835)	91	(3.583)	112	(4.409)
L14	input length 1-stage**	181	(7.126)	219	(8.622)	250.5	(9.862)	286.5	(11.28)	363.5	(14.311)	439	(17.283)
	input length 2-stage**	229.5	(9.035)	262	(10.315)	247.5	(9.744)	280	(11.024)	372	(14.646)	591	(23.268)
L17	input shaft length	20	(0.787)	26	(1.024)	43	(1.693)	48	(1.89)	55	(2.165)	62	(2.441)
L15	gearbox width	123.5	(4.862)	138.5	(5.453)	168	(6.614)	198	(7.795)	258	(10.157)	328	(12.913)
L16	gearbox width	160	(6.299)	180	(7.087)	220	(8.661)	260	(10.236)	350	(13.78)	440	(17.323)

* for larger shaft diameters consult GAM ** depending on motor, length may vary

Optional Output Keyway Dimensions



DS Size	W	L	TH	FE
055	6	32	22.5	1.5
075	8	36	27	2
090	10	40	35	5
115	10	50	35	5
130	14	63	51.5	5
140	16	70	59	5
160	18	90	67	5
190	20	90	74.5	5

Recommended Output Coupling (if necessary)						
metal bellows	KM-60	KM-170	KM-270	KM-400	KM-1300	KSD-2500
elastomer	EKM-60	EKM-150	EKM-300	EKM-500	EKM-1000	-

Dyna Series Type Code

TYPE CODES FOR DYNA SERIES

Example: DS - W B - 090 - 005 G - M0000 - H0000 - C0000

Gearbox Series
DS = Dyna Series
DSX = Dyna Series Extreme

Gearbox Style
W = Single output shaft
T = Dual output shaft
H = Hollow output shaft (HP with pinion)
F = Flange output (FP with pinion)

Input Type
B = Bellows coupling input
E = Elastomer coupling input
L = Shaft input

Gearbox Size
055, 075, 090, 115, 130, 140, 160, 190

Ratio
003, 004, 005, 006, 008, 010, 012, 015, 030, 040, 050, 070, 100

Contact GAM for DSX Drawings

Configuration Code
Assigned by GAM

Output Code
Assigned by GAM

Motor Code
Assigned by GAM

Options Available for This Product

	LOW	OUTPUT
OPTION	BACKLASH	KEYWAY
A=	Y	N
C=	Y	Y
G=	N	Y
H=	N	N

Options C and G N/A for DS-F/H models.

Tolerances (mm)							
Over	To (incl.)	f7	g6	h6	h8	k6	H7
6	10	-0.013 -0.028	-0.005 -0.014	0 -0.009	0 -0.018	+0.010 +0.001	+0.015 0
10	18	-0.016 -0.034	-0.006 -0.017	0 -0.011	0 -0.027	+0.012 +0.001	+0.018 0
18	30	-0.02 -0.041	-0.007 -0.020	0 -0.013	0 -0.033	+0.015 +0.002	+0.021 0
30	50	-0.025 -0.05	-0.009 -0.025	0 -0.016	0 -0.039	+0.018 +0.002	+0.025 0
50	80	-0.03 -0.06	-0.010 -0.029	0 -0.019	0 -0.046	+0.021 +0.002	+0.030 0
80	120	-0.036 -0.021	-0.012 -0.034	0 -0.022	0 -0.054	+0.025 +0.003	+0.035 0
120	180	-0.043 -0.083	-0.014 -0.039	0 -0.025	0 -0.063	+0.028 +0.003	+0.040 0

High Performance: Dyna-Lite Series

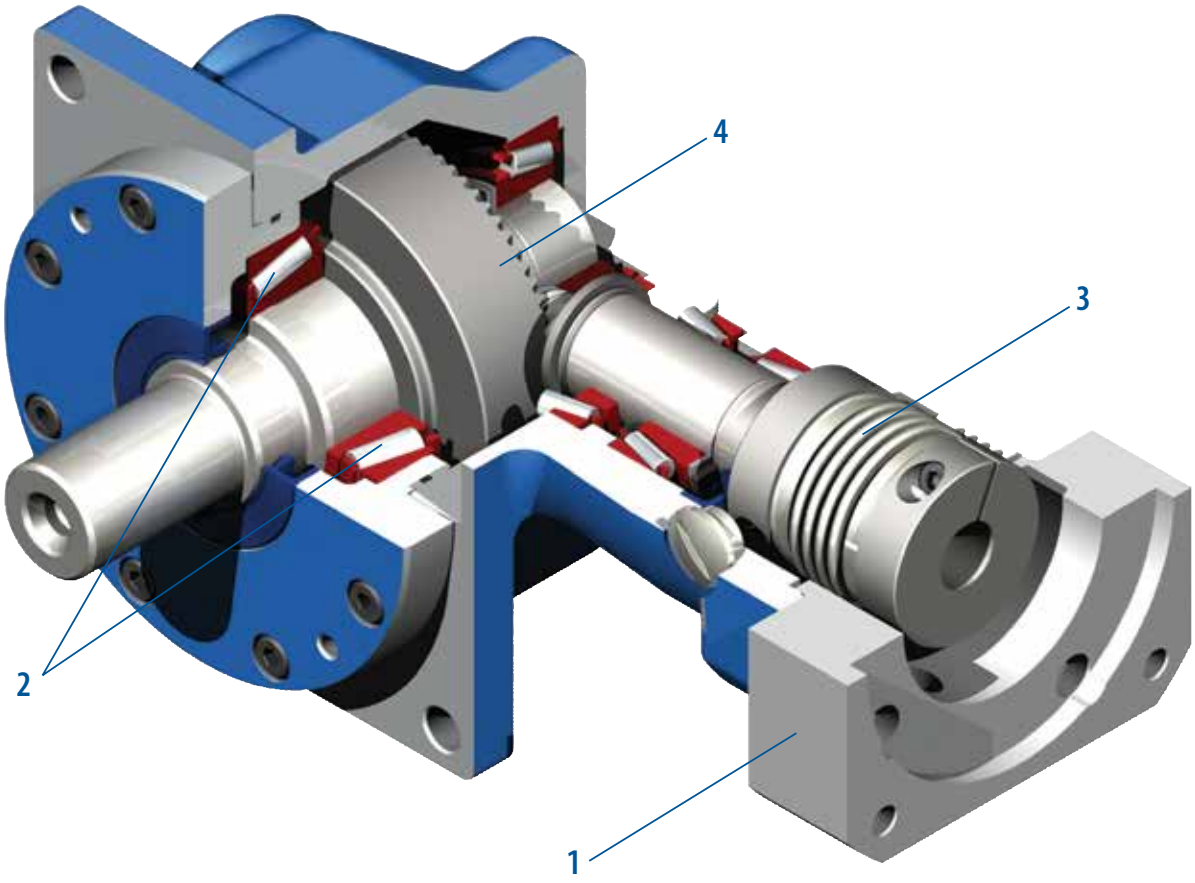
GAM can.

If you don't see exactly what you need, let us know. We can modify the Dyna-Lite Series gearboxes to meet your needs. Page 5 provides examples of GAM capabilities.

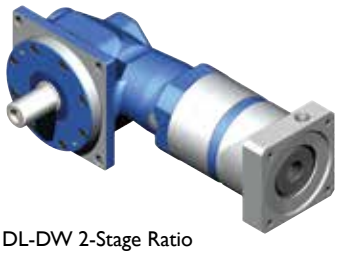
Now there's a right-angle gearbox that has the performance and price point of a precision in-line gearbox. Our redesigned Dyna-Lite Series use hypoid gearing that combines the space and configuration advantages of worm gearing with the high efficiency of bevel gearing. It is drop-in replacement for many right-angle and in-line planetary gear reducers.

Dyna-Lite Series benefits include:

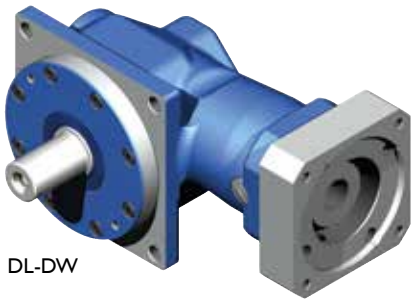
- High efficiency – 96%
- Standard backlash < 6 arcmin
- Back drivable
- High radial loading
- Available in shaft output and hollow output



1. Adapter Plate
   Allows for quick and easy motor mounting
2. Bearings
   Taper roller bearings allows high radial loading of output shaft
3. Bellows Coupling
   Bellows coupling for quick motor mounting
4. Hypoid Gearing
   Optimized gearing allows ratios up to 15:1 in a single stage; 150:1 in two stages



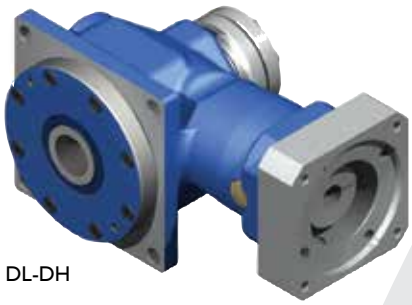
DL-DW 2-Stage Ratio
(2-Stage Ratio available on all versions)



DL-DW

DL-DW

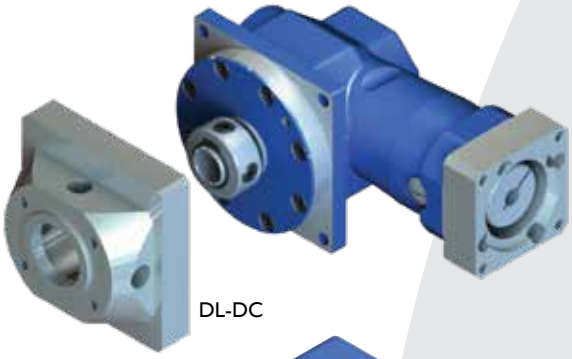
- Single output shaft configuration with our high performance bellow coupling
- Input and housing to mount to any servo motor
- Ratios up to 15:1 in a single stage and 150:1 in two stages
- Frame sizes: 55, 75 and 90 mm
- Drop-in for our highest precision Dyna Series



DL-DH

DL-DH

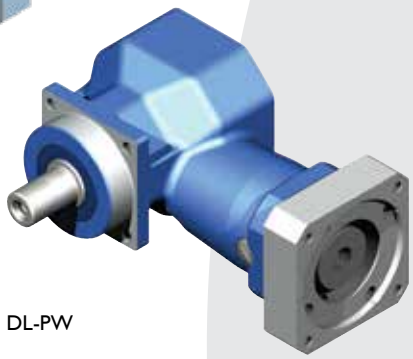
- Smooth hollow output shaft configuration (includes shrink disc)
- Input and housing to mount to any servo motor
- Ratios up to 15:1 in a single stage and 150:1 in two stages
- Frame sizes: 55, 75 and 90 mm
- Drop-in for our highest precision Dyna Series



DL-DC

DL-DC

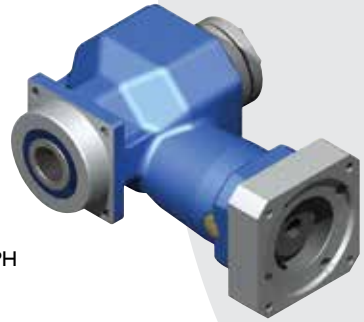
- Right angle hypoid gearbox with unique hollow output and zero-backlash clamping ring
- Mount directly to any linear belt or ball screw module for a compact design
- Ratios from 3:1 up to 150:1
- Frame sizes from 55, 75 and 90 mm



DL-PW

DL-PW

- Single output shaft configuration with our high performance bellow coupling
- Input and housing to mount to any servo motor
- Ratios up to 15:1 in a single stage and 150:1 in two stages
- Frame sizes: 55, 75 and 90 mm
- Drop-in for many right-angle and in-line planetary gear reducers
- Rotation direction is opposite for DW and PW models.



DL-PH

DL-PH

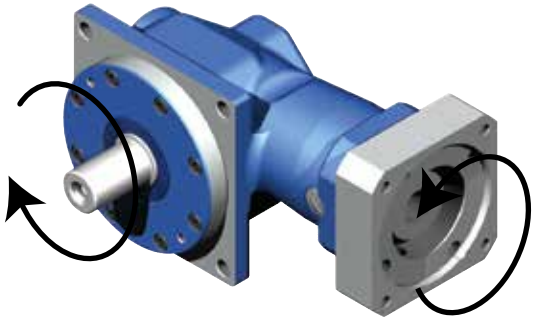
- Smooth hollow output shaft configuration (includes shrink disc)

Dyna-Lite Series - DL-DW & DL-DH

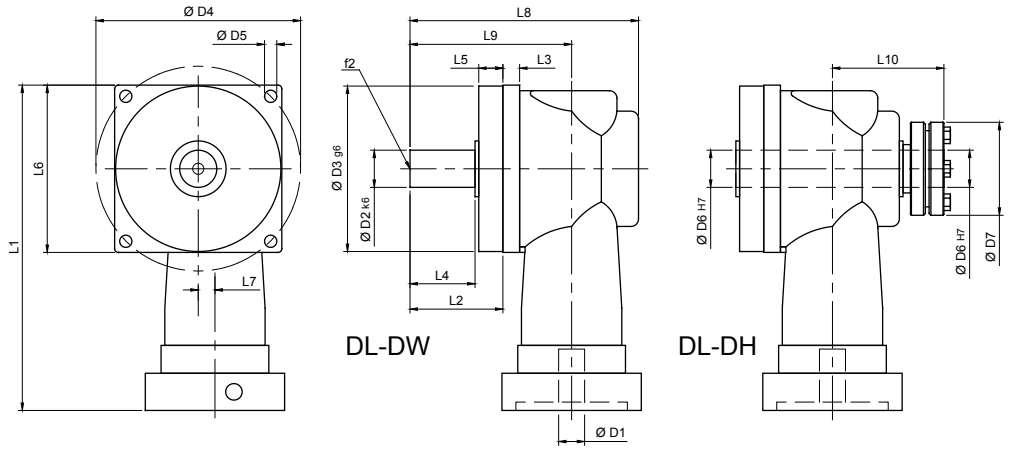
Dyna-Lite Series			55	75	90
Stock Ratios			5, 10, 25, 50, 100		
All Ratios Available*			1-stage: 5, 10, 15** 2-stage: 15**, 25, 50, 100, 150* For other ratios, consult GAM.		
Nominal Output Torque (T_{2n})	Nm (lb-in)	5:1, 10:1, 15:1$_{(2)}$, 25:1, 50:1, 100:1	35 (310)	70 (620)	140 (1239)
		15:1$_{(1)}$, 150:1	25 (221)	50 (443)	90 (797)
Max Acceleration Output Torque (T_{2B})	Nm (lb-in)	5:1, 10:1, 15:1$_{(2)}$, 25:1, 50:1, 100:1	53 (469)	105 (929)	210 (1859)
		15:1$_{(1)}$, 150:1	38 (336)	75 (664)	143 (1266)
Emergency Output Torque (T_{2not})	Nm (lb-in)	5:1, 10:1, 15:1$_{(2)}$, 25:1, 50:1, 100:1	70 (620)	140 (1239)	280 (2478)
		15:1$_{(1)}$, 150:1	50 (443)	100 (885)	190 (1682)
Nominal Input Speed (n_{1n})	RPM	5:1	3700	3100	2700
		10:1, 15:1$_{(1)}$	4200	3500	3000
		2-stage	3500	3000	3000
Max Input Speed (n_{1max})	RPM		6000	6000	5000
Standard Output Backlash*** (j)	arcmin	1-stage	< 7	< 7	< 6
		2-stage	< 9	< 9	< 8
Allowable Radial Load (F_{rad})[1]	N (lbs)		3300 (743)	4900 (1103)	7200 (1620)
Allowable Axial Load (F_{axial})	N (lbs)		1650 (371)	2450 (551)	3600 (810)
Torsional Stiffness*** (C_{t21})	Nm/arcmin		1.5	4.0	10.0
	(lb-in/arcmin)		(13.28)	(35.40)	(88.51)
Weight (m)	kg (lbs)	1-stage	2.6 (5.7)	4.5 (9.9)	9 (19.8)
		2-stage	3.6 (7.9)	6.8 (15)	14.8 (32.6)
Noise Level (L_{PA})	dB(A)	1-stage	< 66	< 66	< 68
		2-stage	< 69	< 70	< 72
Mass Moment of Inertia (J_1)	kg cm^2 (lb-in^2)	5:1	0.44 (0.15)	1.06 (0.36)	3.6 (1.224)
		10:1, 15:1$_{(1)}$	0.35 (0.119)	0.84 (0.286)	2.9 (0.986)
		15:1$_{(2)}$, 25:1	0.17 (0.058)	0.45 (0.153)	1.65 (0.561)
		50:1, 100:1	0.14 (0.048)	0.34 (0.116)	1.1 (0.374)
Efficiency at Load		5,10: 96%	15:1$_{(1)}$ 93%	15$_{(2)}$, 25, 50, 100, 150 87%	
Service Life		>15000 hours			
Lubrication		Life Time Lubrication			
Protection Rating		IP 64			
Operating Temperature Range		-10°C to 100°C (14°F to 212°F)			

1) Load applied at center of output shaft @100 RPM

* other ratios available ** 15:1 ratio available in 1-stage and 2-stage variations *** See page 224 for definitions



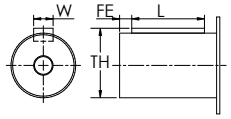
Recommended Output Coupling (if necessary)			
Frame Size	55	75	90
metal bellows	KLC-50	KLC-125	KM-270
elastomer	EKC-80	EKC-110	EKM-300



DL - DW and DL - DH		55		75		90	
		mm	(in)	mm	(in)	mm	(in)
D1 max (1 stage)*	motor shaft diameter	16	(0.63)	20	(0.787)	35	(1.378)
D1 max (2 stage standard)*	motor shaft diameter	14	(0.551)	19	(0.748)	19	(0.748)
D1 max (2 stage available)*	motor shaft diameter	16	(0.63)	24	(0.945)	24	(0.945)
D2 k6	output shaft diameter	20	(0.787)	24	(0.945)	32	(1.26)
D3 g6	pilot diameter	89	(3.504)	105	(4.134)	125	(4.921)
D4	bolt circle	110.3	(4.343)	138.6	(5.457)	166.8	(6.567)
D5	mounting holes	6.6	(0.26)	9	(0.354)	11	(0.433)
D6 H7**	hollow bore diameter	20	(0.787)	25	(0.984)	30	(1.181)
D7	shrink disc OD (included)	50	(1.97)	60	(2.36)	72	(2.83)
L1 1-stage***	gearbox length	175	(6.89)	213.5	(8.406)	257	(10.118)
L1 2-stage***		236	(9.291)	304.5	(11.99)	336	(13.23)
L2	shaft length	50.0	(1.969)	55	(2.165)	68	(2.677)
L3	flange thickness	9	(0.354)	11	(0.433)	14	(0.551)
L4	usable shaft length	35	(1.378)	40	(1.575)	50	(1.969)
L5	pilot height	13	(0.512)	13	(0.512)	16	(0.63)
L6	flange size	90	(3.543)	115	(4.528)	140	(5.512)
L7	gear offset	9	(0.354)	14	(0.551)	18	(0.709)
L8	gearbox width	123	(4.843)	142	(5.591)	175	(6.89)
L9	shaft to centerline	87	(3.425)	100	(3.937)	126	(4.961)
L10	shrink disc to centerline	64.5	(2.539)	73.5	(2.894)	87	(3.425)
f2	shaft thread per DIN332/1	M6 x 16		M8 x 19		M12 x 28	

* for larger motor shaft diameters, please contact GAM **mating shaft should have h6 tolerance ***depending on motor, length may vary

Optional Output Keyway Dimensions (DL-DW)



DL-DW	W	L	TH	FE
055	6	32	22.5	1.5
075	8	36	27	2
090	10	40	35	4

TYPE CODES FOR DYNA-LITE SERIES (DL-DW & DL-DH)

Example: DL - DW - 075 - 005 H - M0000 - H0000 - C0000

Gearbox Series
DL = Dyna-Lite

Gearbox Style
DW = shaft output
DH = hollow output

Gearbox Size
055, 075, 090

Ratio
5, 10, 15, 25, 50, 100, 150

Options Available for This Product
G = Keyed output shaft
H = Smooth output shaft

Motor Code
Assigned by GAM

Output Code
Assigned by GAM

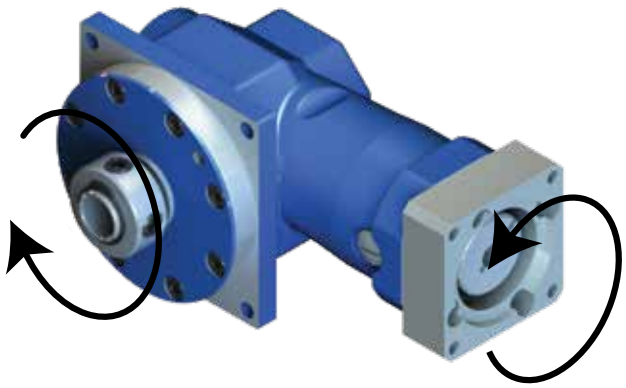
Configuration Code
Assigned by GAM

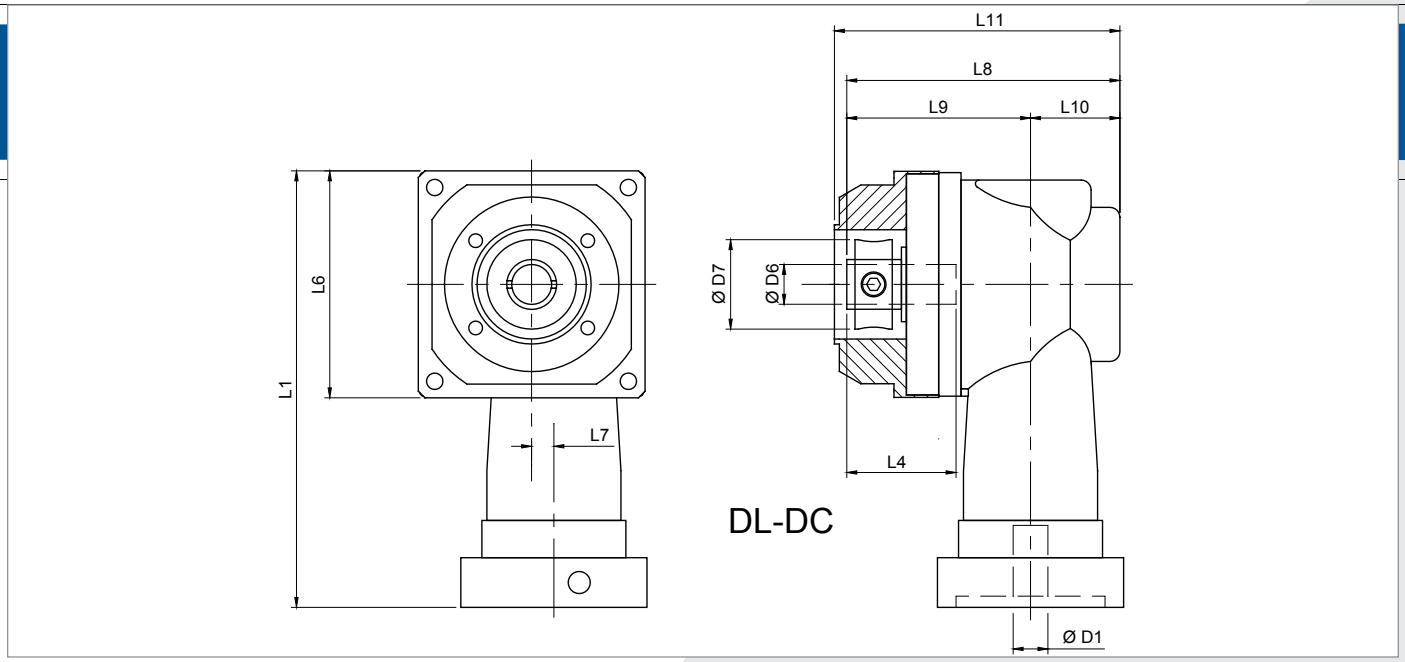
Tolerances (mm)				
Over	To (incl.)	g6	k6	H7
6	10	-0.005 -0.014	+0.010 +0.001	+0.015 0
10	18	-0.006 -0.017	+0.012 +0.001	+0.018 0
18	30	-0.007 -0.020	+0.015 +0.002	+0.021 0
30	50	-0.009 -0.025	+0.018 +0.002	+0.025 0
50	80	-0.010 -0.029	+0.021 +0.002	+0.030 0
80	120	-0.012 -0.034	+0.025 +0.003	+0.035 0
120	180	-0.014 -0.039	+0.028 +0.003	+0.040 0

Dyna-Lite Series - DL-DC

Dyna-Lite Series			55	75	90
Stock Ratios			5, 10, 25, 50, 100		
All Ratios Available*			1-stage: 5, 10, 15** 2-stage: 15**, 25, 50, 100, 150* For other ratios, consult GAM.		
Nominal Output Torque (T_{2n})	Nm (lb-in)	5:1, 10:1, 15:1$_{(2)}$, 25:1, 50:1, 100:1	35 (310)	70 (620)	140 (1239)
		15:1$_{(1)}$, 150:1	25 (221)	50 (443)	90 (797)
Max Acceleration Output Torque (T_{2B})	Nm (lb-in)	5:1, 10:1, 15:1$_{(2)}$, 25:1, 50:1, 100:1	53 (469)	105 (929)	210 (1859)
		15:1$_{(1)}$, 150:1	38 (336)	75 (664)	143 (1266)
Nominal Input Speed (n_{1n})	RPM	5:1	3700	3100	2700
		10:1, 15:1$_{(1)}$	4200	3500	3000
		2-stage	3500	3000	3000
Max Input Speed (n_{1max})	RPM		6000	6000	5000
Standard Output Backlash*** (j)	arcmin	1-stage	< 7	< 7	< 6
		2-stage	< 9	< 9	< 8
Torsional Stiffness*** (C_{t21})	Nm/arcmin		1.5	4.0	10.0
	(lb-in/arcmin)		(13.28)	(35.40)	(88.51)
Weight (m)	kg (lbs)	1-stage	2.6 (5.7)	4.5 (9.9)	9 (19.8)
		2-stage	3.6 (7.9)	6.8 (15)	14.8 (32.6)
Noise Level (L_{PA})	dB(A)	1-stage	< 66	< 66	< 68
		2-stage	< 69	< 70	< 72
Mass Moment of Inertia (J_1)	kg cm^2 (lb-in^2)	5:1	0.44 (0.15)	1.06 (0.36)	3.6 (1.224)
		10:1, 15:1$_{(1)}$	0.35 (0.119)	0.84 (0.286)	2.9 (0.986)
		15:1$_{(2)}$, 25:1	0.17 (0.058)	0.45 (0.153)	1.65 (0.561)
		50:1, 100:1	0.14 (0.048)	0.34 (0.116)	1.1 (0.374)
Efficiency at Load			5,10: 96% 15:1$_{(1)}$ 93% 15$_{(2)}$, 25, 50, 100, 150 87%		
Service Life			>15000 hours		
Lubrication			Life Time Lubrication		
Protection Rating			IP 64		
Operating Temperature Range			-10°C to 100°C (14°F to 212°F)		

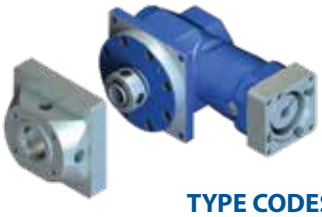
* other ratios available
** 15:1 ratio available in 1-stage and 2-stage variations
*** See page 224 for definitions





DL-DC		55		75		90	
		mm	(in)	mm	(in)	mm	(in)
D1 max (1 stage)*	motor shaft diameter	16	(0.63)	20	(0.787)	35	(1.378)
D1 max (2 stage standard)*	motor shaft diameter	14	(0.551)	19	(0.748)	19	(0.748)
D1 max (2 stage available)*	motor shaft diameter	16	(0.63)	24	(0.945)	24	(0.945)
D6 max	hollow bore diameter	16	(0.63)	20	(0.787)	30	(1.181)
D7	clamping ring diameter	36	(1.417)	46	(1.811	56	(2.205)
L1 1-stage***	gearbox length	175	(6.89)	213.5	(8.406)	257	(10.118)
L1 2-stage***		236	(9.291)	304.5	(11.99)	336	(13.23)
L4	allowable shaft length	44	(1.732)	50	(1.968)	50	(1.968)
L6	flange size	90	(3.543)	115	(4.528)	140	(5.512)
L7	gear offset	9	(0.354)	14	(0.551)	18	(0.709)
L8	gearbox width	109.5	(4.311)	126.2	(4.968)	152	(5.984)
L9	hollow shaft to centerline	73.5	(2.894)	84	(3.307)	100	(3.937)
L10	housing to centerline	36	(1.417)	42.2	(1.661)	52	(2.047)
L11**	overall width w/ adapter	115	(4.528)	131	(5.157)	154	(6.063)

*** for larger motor shaft diameters, please contact GAM **depending on actuator, width may vary ***depending on motor, length may vary**



TYPE CODES FOR DYNA-LITE SERIES (DL-DC)

Example: DL - DC - 075 - 005 H - M0000 - H0000 - C0000

Gearbox Series
DL = Dyna-Lite

Gearbox Style
DC = hollow clamp output (Dyna Series Style Output)

Gearbox Size
055, 075, 090

Ratio
5, 10, 15, 25, 50, 100, 150

Options Available for This Product
H = Smooth output shaft

Motor Code
Assigned by GAM

Output Code
Assigned by GAM

Configuration Code
Assigned by GAM

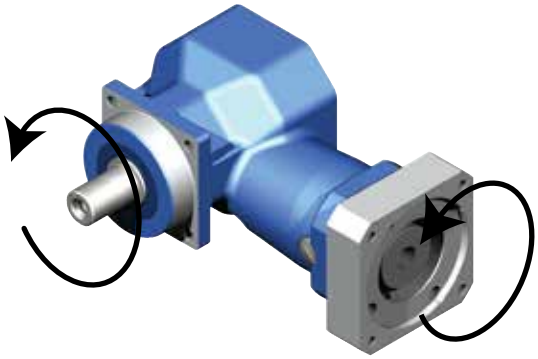
Tolerances (mm)				
Over	To (incl.)	g6	k6	H7
6	10	-0.005 -0.014	+0.010 +0.001	+0.015 0
10	18	-0.006 -0.017	+0.012 +0.001	+0.018 0
18	30	-0.007 -0.020	+0.015 +0.002	+0.021 0
30	50	-0.009 -0.025	+0.018 +0.002	+0.025 0
50	80	-0.010 -0.029	+0.021 +0.002	+0.030 0
80	120	-0.012 -0.034	+0.025 +0.003	+0.035 0
120	180	-0.014 -0.039	+0.028 +0.003	+0.040 0

Dyna-Lite Series - DL-P

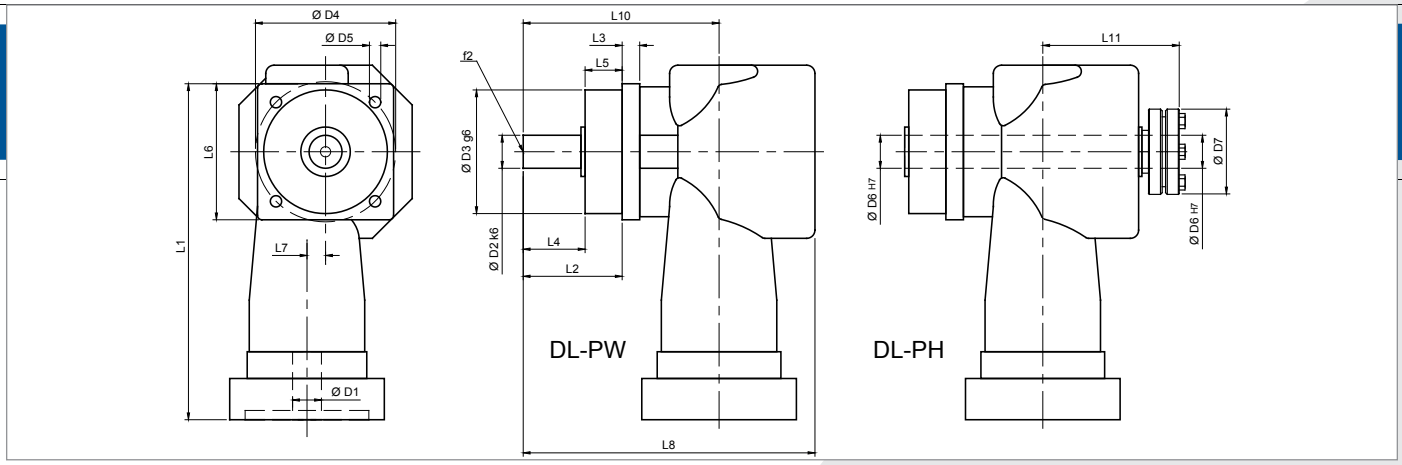
Dyna-Lite Series			55	75	90
Stock Ratios			5, 10, 25, 50, 100		
All Ratios Available*			1-stage: 5, 10, 15** 2-stage: 15**, 25, 50, 100, 150* For other ratios, consult GAM.		
Nominal Output Torque (T_{2n})	Nm (lb-in)	5:1, 10:1, 15:1$_{(2)}$, 25:1, 50:1, 100:1	35 (310)	70 (620)	140 (1239)
		15:1$_{(1)}$, 150:1	25 (221)	50 (443)	90 (797)
Max Acceleration Output Torque (T_{2B})	Nm (lb-in)	5:1, 10:1, 15:1$_{(2)}$, 25:1, 50:1, 100:1	53 (469)	105 (929)	210 (1859)
		15:1$_{(1)}$, 150:1	38 (336)	75 (664)	143 (1266)
Emergency Output Torque (T_{2not})	Nm (lb-in)	5:1, 10:1, 15:1$_{(2)}$, 25:1, 50:1, 100:1	70 (620)	140 (1239)	280 (2478)
		15:1$_{(1)}$, 150:1	50 (443)	100 (885)	190 (1682)
Nominal Input Speed (n_{1n})	RPM	5:1	3700	3100	2700
		10:1, 15:1$_{(1)}$	4200	3500	3000
		2-stage	3500	3000	3000
Max Input Speed (n_{1max})	RPM		6000	6000	5000
Standard Output Backlash (j)	arcmin	1-stage	< 7	< 7	< 6
		2-stage	< 9	< 9	< 8
Allowable Radial Load (F_{rad})[1)]	N (lbs)		2200 (495)	4050 (911)	6200 (1395)
Allowable Axial Load (F_{axial})	N (lbs)		1100 (248)	2025 (456)	3100 (698)
Torsional Stiffness (C_{t21})	Nm/arcmin		1.5	4.0	10.0
	(lb-in/arcmin)		(13.28)	(35.40)	(88.51)
Weight (m)	kg (lbs)	1-stage	2.6 (5.7)	4.5 (9.9)	9 (19.8)
		2-stage	3.6 (7.9)	6.8 (15)	14.8 (32.6)
Noise Level (L_{PA})	dB(A)	1-stage	< 66	< 66	< 68
		2-stage	< 69	< 70	< 72
Mass Moment of Inertia (J_1)	kg cm^2 (lb-in^2)	5:1	0.44 (0.15)	1.08 (0.37)	3.7 (1.258)
		10:1, 15:1$_{(1)}$	0.35 (0.119)	0.84 (0.286)	2.9 (0.986)
		15:1$_{(2)}$, 25:1	0.17 (0.058)	0.45 (0.153)	1.65 (0.561)
		50:1, 100:1	0.14 (0.048)	0.34 (0.116)	1.1 (0.374)
Efficiency at Load			5,10: 96% 15:1$_{(1)}$ 93% 15$_{(2)}$, 25, 50, 100, 150 87%		
Service Life			>15000 hours		
Lubrication			Life Time Lubrication		
Protection Rating			IP 64		
Operating Temperature Range			-10°C to 100°C (14°F to 212°F)		

1) Load applied at center of output shaft @100 RPM

* other ratios available ** 15:1 ratio available in 1-stage and 2-stage variations *** See page 224 for definitions



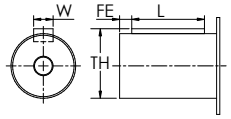
Recommended Output Coupling (if necessary)			
Frame Size	55	75	50
metal bellows	KLC-50	KLC-125	KM-270
elastomer	EKC-80	EKC-110	EKM-300



DL - PW and DL - PH		55		75		90	
		mm	(in)	mm	(in)	mm	(in)
D1 max (1 stage)*	motor shaft diameter	16	(0.63)	20	(0.787)	35	(1.378)
D1 max (2 stage standard)*	motor shaft diameter	14	(0.551)	19	(0.748)	19	(0.748)
D1 max (2 stage available)*	motor shaft diameter	16	(0.63)	24	(0.945)	24	(0.945)
D2 k6	output shaft diameter	16	(0.63)	22	(0.866)	32	(1.26)
D3 g6	pilot diameter	60	(2.362)	70	(2.756)	90	(3.543)
D4	bolt circle	68	(2.677)	85	(3.346)	120	(4.724)
D5	mounting holes	5.5	(0.217)	6.6	(0.26)	9	(0.354)
D6 H7**	hollow bore diameter	15	(0.591)	20	(0.787)	30	(1.181)
D7	shrink disc OD (included)	44	(1.732)	50	(1.969)	72	(2.835)
L1 1-stage***	gearbox length	172	(6.772)	206	(8.11)	249.5	(9.823)
L1 2-stage***		236	(9.291)	304.5	(11.99)	336	(13.23)
L2	shaft length	48.0	(1.89)	56	(2.205)	80	(3.15)
L3	flange thickness	8.5	(0.335)	10	(0.394)	13	(0.512)
L4	usable shaft length	28	(1.102)	36	(1.417)	58	(2.283)
L5	pilot height	18	(0.709)	18	(0.709)	20	(0.787)
L6	flange size	66	(2.598)	76	(2.992)	101	(3.976)
L7	gear offset	9	(0.354)	14	(0.551)	18	(0.709)
L8	gearbox width	141.5	(5.571)	166	(6.535)	216	(8.504)
L10	shaft to centerline	95	(3.740)	110	(4.331)	148	(5.827)
L11	shrink disc to centerline	estimated 70	(2.756)	estimated 86	(3.386)	estimated 108	(4.252)
F2	shaft thread per DIN332/1	M6 x 16		M8 x 19		M12x28	

* for larger motor shaft diameters, please contact GAM **mating shaft should have h6 tolerance ***depending on motor, length may vary

Optional Output Keyway Dimensions (DL-PW)



DL-PW	W	L	TH	FE
055	5	25	18	1.5
075	6	32	24.5	2
090	10	50	35	4

TYPE CODES FOR DYNA-LITE SERIES (DL-P)

Example: DL - PW - 075 - 005 H - M0000 - H0000 - C0000

Gearbox Series
DL = Dyna-Lite

Gearbox Style
PW = shaft output
PH = hollow output

Gearbox Size
055, 075, 090

Ratio
5, 10, 15, 25, 50, 100, 150

Options Available for This Product
G = Keyed output shaft
H = Smooth output shaft

Motor Code
Assigned by GAM

Output Code
Assigned by GAM

Configuration Code
Assigned by GAM

Tolerances (mm)				
Over	To (incl.)	g6	k6	H7
6	10	-0.005 -0.014	+0.010 +0.001	+0.015 0
10	18	-0.006 -0.017	+0.012 +0.001	+0.018 0
18	30	-0.007 -0.020	+0.015 +0.002	+0.021 0
30	50	-0.009 -0.025	+0.018 +0.002	+0.025 0
50	80	-0.010 -0.029	+0.021 +0.002	+0.030 0
80	120	-0.012 -0.034	+0.025 +0.003	+0.035 0
120	180	-0.014 -0.039	+0.028 +0.003	+0.040 0

High Performance: EPR Series

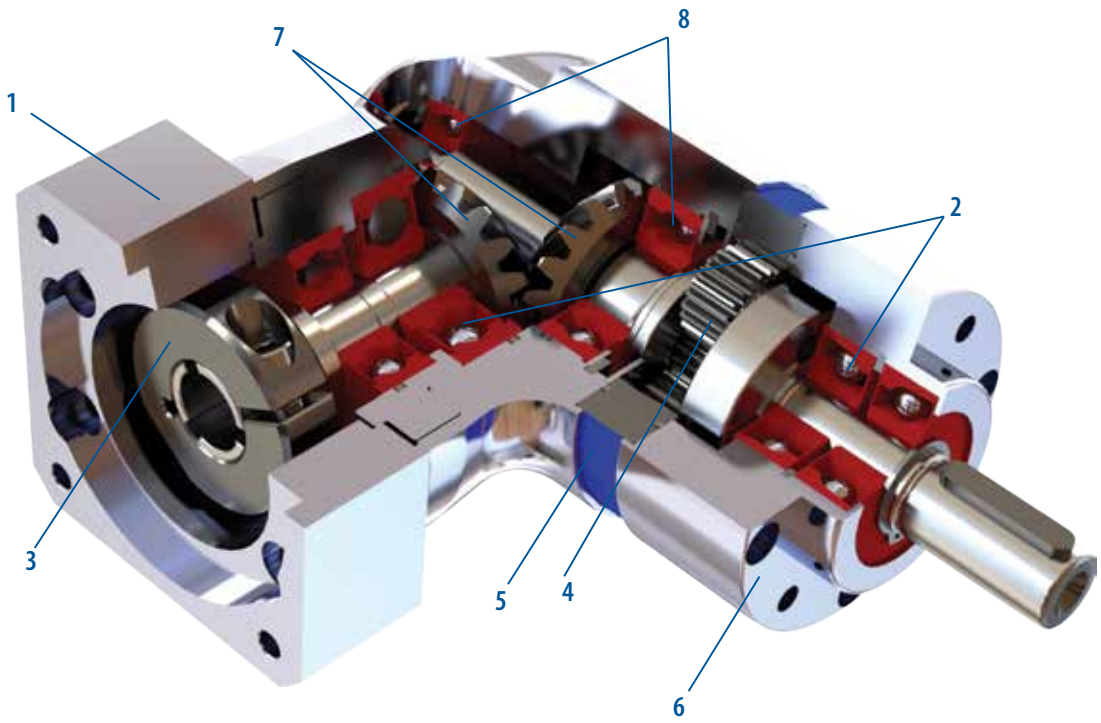
GAM can.

If you don't see exactly what you need, let us know. We can modify the EPR Series gearboxes to meet your needs. Page 5 provides examples of GAM capabilities.

The EPR Series Right Angle Bevel Planetary Gearboxes provide all the advantages of our popular EPL inline gearboxes in a right angle configuration. Offering the best quality available for the price point, the EPR is ideal for most servo, stepper and other motion control applications. With the same selection of outputs as the EPL, there is an EPR to fit your application.

EPR Features

- Easy to configure with 5 outputs matching the EPL
- 30,000 hours of service life for most models
- Ratios from 3:1 to 1000:1
- Ready to mount to your motor



1. Adapter Plate
   Customized adapter plates for quick and easy motor mounting
2. Angular Contact Bearings
   For high radial and axial loading
3. Input Clamping Element
4. Planet Gears
   Precision ground gears
5. Ring Gear
   Ring gear incorporated into housing
6. Output face
7. Precision ground spiral bevel gears
8. Bevel gear supported at both ends
   Input to planetary

EPR-W

- GAM metric output face with heavy-duty output bearings
- Frame sizes from 50 mm to 150 mm

EPR-X

- NEMA output face with oversized English shaft
- Frame sizes from NEMA 17 to 56

EPR-A

- Metric output dimensions match popular gearboxes
- Frame sizes from 50 mm to 155 mm
- EPR-AP available with pre-mounted GAM pinion (see page 178)

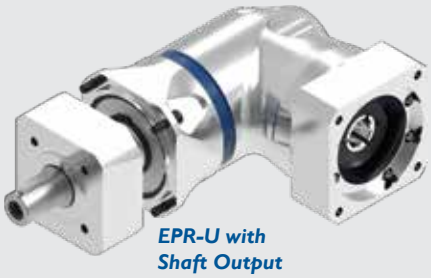
EPR-F

- Flange output
- Sizes from 110 mm to 140 mm
- EPR-FP available with pre-mounted GAM pinion (see page 178)

EPR-H

The EPR-H will be replaced by the EPR-U

EPR-U with Hollow Output
(replaces the EPR-H)



EPR-U with Shaft Output

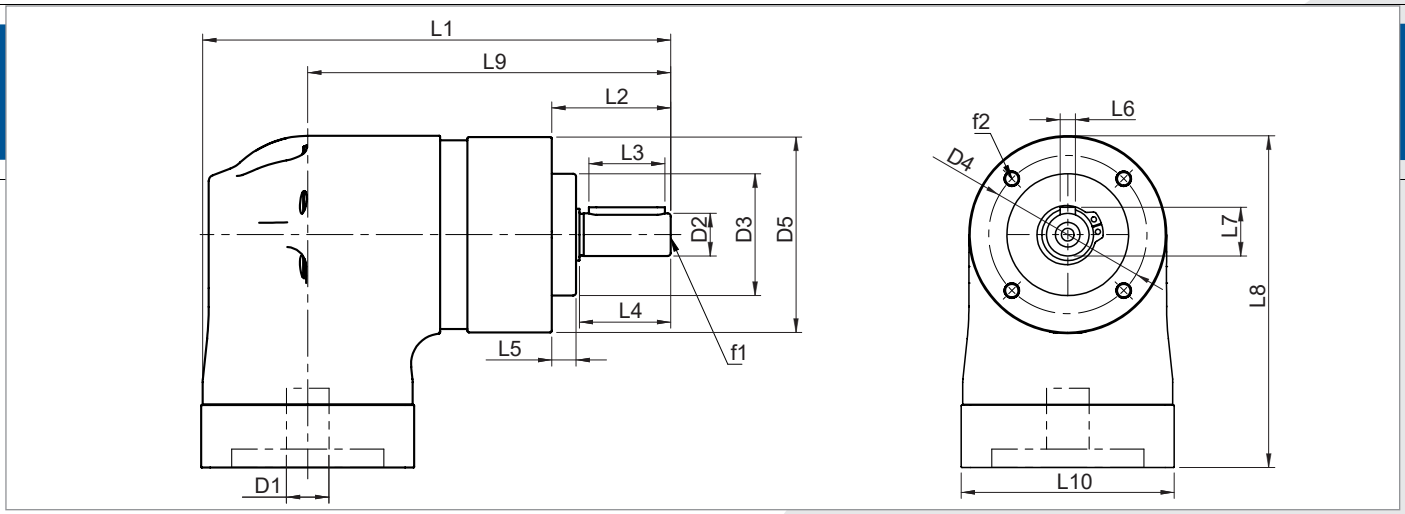
EPR-U Modular for Driving Linear Actuators

- A quick, simple solution used to mount onto any off-the-shelf linear belt or ball screw module
- Ready to mount to your module with a customized output
- Hollow output with zero backlash clamping ring and integral mounting plate for shaft input actuators
- Shaft output and integral mounting plate for hollow input actuators
- Ready to mount to your motor on the input with included motor adapter
- For more information on Linear Mounts, refer to page 196.

EPR-W Series			64	84	118
Stock Ratios			3, 5, 7, 10, 25, 50, 100 (Standard Input)		
All Ratios Available			1-Stage Planetary: 3, 4, 5, 7, 10 2-Stage Planetary: 12, 16, 20, 25, 35, 40, 50, 70, 100 3-Stage Planetary: 120, 160, 200, 250, 350, 490, 700, 1000 (Consult GAM for other ratios)		
Nominal Output Torque (T_{2n})	Nm (lb-in)	3:1	16 (142)	33 (292)	82 (726)
		4, 5, 7:1	22 (195)	45 (398)	101 (894)
		10, 100, 1000:1	14 (124)	34 (301)	90 (797)
		all other ratios	30 (266)	71 (628)	149 (1319)
Max Acceleration Output Torque (T_{2B})	Nm (lb-in)	3:1	30 (266)	57 (504)	148 (1310)
		4, 5, 7:1	37 (327)	84 (743)	168 (1487)
		10, 100, 1000:1	21 (186)	65 (575)	155 (1372)
		all other ratios	37 (327)	89 (788)	181 (1602)
Emergency Output Torque (T_{2not})	Nm (lb-in)	3:1	72 (637)	160 (1416)	200 (1770)
		4, 5, 7:1	84 (743)	216 (1912)	480 (4248)
		10, 100, 1000:1	62 (549)	160 (1416)	410 (3629)
		all other ratios	84 (743)	216 (1912)	480 (4248)
Nominal Speed (n1n)	RPM	-	3500	3000	2500
Max Speed (n_{1max})		-	6000	6000	5000
Standard Output Backlash* (j)	arcmin	1-stage	≤12	≤12	≤10
		2-stage	≤14	≤14	≤12
		3-stage	≤15	≤15	≤12
Allowable Radial Load (F_{rad}) 1)	N (lbs)	-	1900 (427)	2800 (629)	5000 (1124)
Allowable Axial Load (F_{axial})	N (lbs)	-	1500 (337)	2500 (562)	4500 (1012)
Torsional Stiffness* (C_{t21})	Nm/arcmin (lb-in/arcmin)	10,100,1000	2.8 (25)	5.4 (48)	10 (89)
		7,70,700	3.2 (28)	6.8 (60)	16 (142)
		all other ratios	3.9 (35)	9.1 (81)	19 (168)
Weight (m)	kg (lbs)	1-stage	3.0 (6.6)	5.6 (12)	15 (33)
		2-stage	3.3 (7.3)	6.4 (14)	17 (37)
		3-stage	3.6 (7.9)	7.2 (16)	19 (42)
Noise Level (L_{PA})	dB(A)	-	≤75	≤78	≤78
Mass Moment of Inertia (J_1)	kg cm² (lb-in²)	3:1	0.95 (0.32)	5.4 (1.8)	22 (7.5)
		4:1, 12:1, 16:1	0.88 (0.30)	5.1 (1.7)	20 (6.8)
		5:1, 20:1, 25:1	0.86 (0.29)	5.1 (1.7)	20 (6.8)
		7:1, 35:1	0.85 (0.29)	5.0 (1.7)	19 (6.5)
		10:1, 40:1 - 100:1	0.84 (0.29)	4.9 (1.7)	19 (6.5)
		120:1 - 1000:1	0.84 (0.29)	4.9 (1.7)	19 (6.5)
Efficiency at Load			1-stage: 92% 2-stage: 90% 3-stage: 88%		
Service Life			> 30,000 hours		
Lubrication			Mineral Grease EP0		
Protection Rating			IP 64		
Operating Temperature Range			-20°C to 90°C		

1) Load applied at center of output shaft @100 RPM

* See page 224 for definitions



EPR-W Series		64		84		118	
		mm	(in)	mm	(in)	mm	(in)
D1 max standard	motor shaft diameter	14	(0.551)	19	(0.748)	24	(0.945)
D2 k6	output shaft diameter	14	(0.551)	20	(0.787)	25	(0.984)
D3 h7	pilot diameter	40	(1.575)	55	(2.165)	80	(3.15)
D4	bolt circle	52	(2.047)	70	(2.756)	100	(3.937)
D5	housing diameter	64	(2.52)	84	(3.307)	118	(4.646)
f1	shaft thread	M5x12		M6x16		M10x22	
f2	mounting holes	M5x12		M6x14		M8x18	
L1 (1-stage)*	gearbox length	154	(6.063)	217.5	(8.563)	276.5	(10.886)
L1 (2-stage)*		176	(6.929)	250.5	(9.862)	316.5	(12.461)
L1 (3-stage)*		198	(7.795)	283.5	(11.161)	357.5	(14.075)
L2	shaft length	39	(1.535)	54	(2.126)	61	(2.402)
L3	key length	25	(0.984)	36	(1.417)	45	(1.772)
L4	usable shaft length	30	(1.181)	45	(1.772)	50	(1.969)
L5	pilot height	8	(0.315)	8	(0.315)	10	(0.394)
L6	key width	5	(0.197)	6	(0.236)	8	(0.315)
L7	key height	16	(0.63)	22.5	(0.886)	28	(1.102)
L8**	gearbox height	108.6	(4.276)	153	(6.024)	183.5	(7.224)
L9 (1-stage)	length to input centerline	119.3	(4.697)	171	(6.732)	216.5	(8.524)
L9 (2-stage)		141.3	(5.563)	204	(8.031)	256.5	(10.098)
L9 (3-stage)		163.3	(6.429)	237	(9.331)	297.5	(11.713)
L10**	adapter size	70	(2.756)	90	(3.543)	120	(4.724)

* depending on the motor, value can vary

TYPE CODES FOR EPR SERIES (EPR-W)

Example: EPR - W - 084 - 005 G - M0000 - H0000 - C0000

Gearbox Series
EPR

Gearbox Style
W = Metric output shaft

Gearbox Size
064, 084, 118

Ratio
3, 4, 5, 7, 10, 12, 16, 20, 25, 35, 40, 50, 70, 100, 120, 160, 200, 250, 350, 490, 700, 000=1000

Options Available for This Product
G = Key on output shaft per DIN6885

Motor Code
Assigned by GAM

Output Code
Assigned by GAM

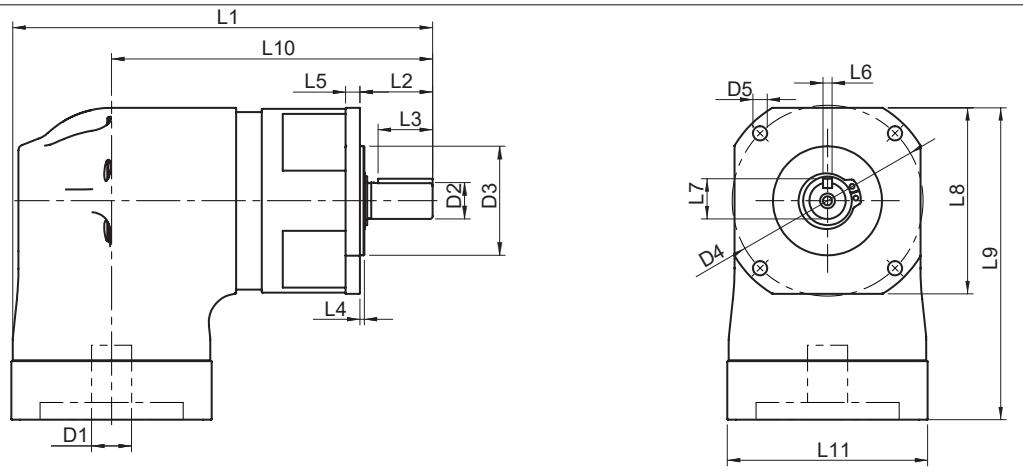
Configuration Code
Assigned by GAM

Shaft (Outer Diameter) Tolerances (mm)			
Over	To (incl.)	h7	k6
6	10	0 -0.015	+0.010 +0.001
10	18	0 -0.018	+0.012 +0.001
18	30	0 -0.021	+0.015 +0.002
30	50	0 -0.025	+0.018 +0.002
50	80	0 -0.030	+0.021 +0.002
80	120	0 -0.035	+0.025 +0.003
120	180	0 -0.040	+0.028 +0.003

EPR-X (NEMA) Series			23	34	42	56
Stock Ratios			3, 5, 7, 10, 25, 50, 100		N/A	N/A
All Ratios Available			1-Stage Planetary: 3, 4, 5, 7, 10 2-Stage Planetary: 12, 16, 20, 25, 35, 40, 50, 70, 100 3-Stage Planetary: 120, 160, 200, 250, 350, 490, 700, 1000			
Nominal Output Torque (T_{2n})	Nm (lb-in)	3:1	16 (142)	33 (292)	82 (726)	82 (726)
		4, 5, 7:1	22 (195)	45 (398)	101 (894)	101 (894)
		10, 100, 1000:1	14 (124)	34 (301)	90 (797)	90 (797)
		all other ratios	30 (266)	71 (628)	149 (1319)	149 (1319)
Max Accel. Torque (T_{2B})	Nm (lb-in)	3:1	30 (266)	57 (504)	148 (1310)	148 (1310)
		4, 5, 7:1	37 (327)	84 (743)	168 (1487)	168 (1487)
		10, 100, 1000:1	21 (186)	65 (575)	155 (1372)	155 (1372)
		all other ratios	37 (327)	89 (788)	181 (1602)	181 (1602)
Emergency Output Torque (T_{2not})	Nm (lb-in)	3:1	72 (637)	160 (1416)	200 (1770)	200 (1770)
		4, 5, 7:1	84 (743)	216 (1912)	480 (4248)	480 (4248)
		10, 100, 1000:1	62 (549)	160 (1416)	410 (3629)	410 (3629)
		all other ratios	84 (743)	216 (1912)	480 (4248)	480 (4248)
Nominal Speed (n_{1n})	RPM	-	3300	2900	2400	2400
Max Input Speed (n_{1max})			6000	6000	5000	5000
Standard Output Backlash* (j)	arcmin	1-stage	< 12	< 12	< 10	< 10
		2-stage	< 14	< 14	< 12	< 12
		3-stage	< 15	< 15	< 12	< 12
Allowable Radial Load (F_{rad}) [1]	N (lbs)	-	450 (101)	900 (203)	2175 (489)	2175 (489)
Allowable Axial Load (F_{axial})	N (lbs)	-	420 (95)	650 (146)	1375 (309)	1375 (309)
Torsional Stiffness* (C_{t21})	Nm/arcmin (lb-in/arcmin)	10,100,1000	2.8 (25)	5.4 (48)	10 (89)	10 (89)
		7,70,700	3.2 (28)	6.8 (60)	16 (142)	16 (142)
		all other ratios	3.9 (35)	9.1 (81)	19 (168)	19 (168)
Weight (m)	kg (lbs)	1-stage	3.0 (6.6)	5.6 (12)	15 (33)	15 (33)
		2-stage	3.3 (7.3)	6.4 (14)	17 (37)	17 (37)
		3-stage	3.6 (7.9)	7.2 (16)	19 (42)	19 (42)
Noise Level (L_{PA})	dB(A)	-	< 75	< 78	< 78	< 78
Mass Moment of Inertia (J_1)	kg cm² (lb-in²)	3:1	0.95 (0.32)	5.4 (1.8)	22 (7.5)	22 (7.5)
		4:1, 12:1, 16:1	0.88 (0.30)	5.1 (1.7)	20 (6.8)	20 (6.8)
		5:1, 20:1, 25:1	0.86 (0.29)	5.1 (1.7)	20 (6.8)	20 (6.8)
		7:1, 35:1	0.85 (0.29)	5.0 (1.7)	19 (6.5)	19 (6.5)
		10:1, 40:1 - 100:1	0.84 (0.29)	4.9 (1.7)	19 (6.5)	19 (6.5)
		120:1 - 1000:1	0.84 (0.29)	4.9 (1.7)	19 (6.5)	19 (6.5)
Efficiency at Load			1-stage: 92% 2-stage: 90% 3-stage: 88%			
Service Life			> 30,000 hours			
Lubrication			Mineral Grease EP0			
Protection Rating			IP 64			
Operating Temperature Range			-20°C to 90°C			

1) Load applied at center of output shaft @100 RPM

* See page 224 for definitions



EPR-X Series		23		34		42		56	
		mm	(in)	mm	(in)	mm	(in)	mm	(in)
D1 max standard	motor shaft diameter	14	(0.55)	19	(0.748)	24	(0.945)	24	(0.945)
D2 k6	output shaft diameter	12.7	(0.50)	19.1	(0.75)	25	(0.984)	25	(0.984)
D3 h7	pilot diameter	38.1	(1.50)	73.0	(2.875)	55.55	(2.187)	114.30	(4.50)
D4	bolt circle	66.7	(2.625)	98.4	(3.875)	125.7	(4.95)	177.8	(7.000)
D5	mounting holes	5	(0.197)	5.5	(0.217)	7.1	(0.28)	10.2	(0.402)
L1 (1-stage)*	gearbox length	147.2	(5.795)	203	(7.992)	276.5	(10.886)	275.5	(10.846)
L1 (2-stage)*		169.2	(6.661)	236	(9.291)	316.5	(12.461)	316.0	(12.440)
L1 (3-stage)*		191.2	(7.528)	269	(10.591)	357.5	(14.075)	356.5	(14.035)
L2	shaft length	25.4	(1.000)	31.8	(1.25)	42	(1.654)	41	(1.614)
L3	key length	19.1	(0.75)	25.4	(1.00)	38	(1.496)	32	(1.26)
L4	pilot height	1.6	(0.063)	1.7	(0.067)	2.4	(0.094)	4	(0.157)
L5	flange thickness	5	(0.197)	10	(0.394)	19	(0.748)	20	(0.7874)
L6	key width	3.18	(0.125)	4.78	(0.188)	8	(0.315)	8	(0.315)
L7	key height / flat height	14.22	(0.56)	21.29	(0.838)	28	(1.102)	28	(1.102)
L8	flange size	65	(2.559)	90	(3.543)	120	(4.724)	145	(5.709)
L9**	gearbox height	109	(4.291)	154.7	(6.091)	184.5	(7.264)	184.5	(7.264)
L10 (1-stage)	length to input centerline	112.2	(4.417)	156	(6.142)	216.5	(8.524)	216.5	(8.524)
L10 (2-stage)		134.2	(5.283)	189	(7.441)	256.5	(10.098)	256.5	(10.098)
L10 (3-stage)		156.2	(6.150)	222	(8.740)	297.5	(11.713)	297.5	(11.713)
L11*	adapter size	70	(2.756)	90	(3.543)	120	(4.724)	120	(4.724)

*depending on the motor, value can vary

TYPE CODES FOR EPR SERIES (EPR-X (NEMA))

Example: EPR - X - 023 - 005 G - M0000 - H0000 - C0000

Gearbox Series
EPR

Gearbox Style
X = NEMA output

Gearbox Size
023, 034, 042, 056

Ratio
3, 4, 5, 7, 10, 12, 16, 20, 25, 35, 40, 50, 70, 100, 120, 160, 200, 250, 350, 490, 700, 000=1000

Options Available for This Product
G = Key on output shaft per DIN6885

Motor Code
Assigned by GAM

Output Code
Assigned by GAM

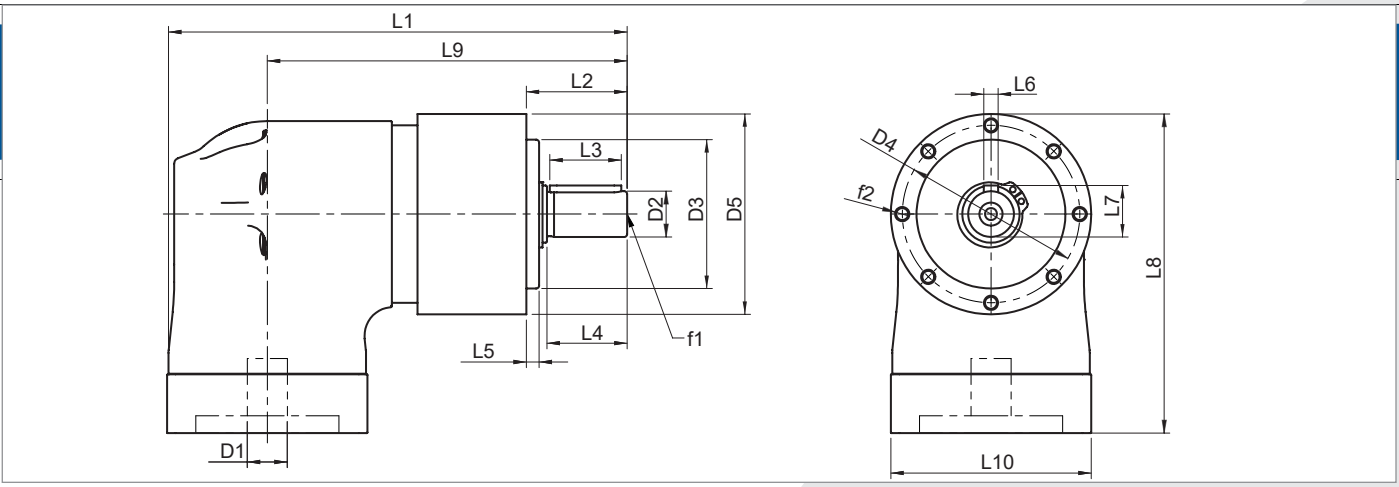
Configuration Code
Assigned by GAM

Shaft (Outer Diameter) Tolerances (mm)			
Over	To (incl.)	h7	k6
6	10	0 -0.015	+0.010 +0.001
10	18	0 -0.018	+0.012 +0.001
18	30	0 -0.021	+0.015 +0.002
30	50	0 -0.025	+0.018 +0.002
50	80	0 -0.030	+0.021 +0.002
80	120	0 -0.035	+0.025 +0.003
120	180	0 -0.040	+0.028 +0.003

EPR-A Series			70	90	120
All Ratios Available			1-Stage Planetary: 3, 4, 5, 7, 10 2-Stage Planetary: 12,16, 20, 25, 35, 40, 50, 70, 100 3-Stage Planetary: 120, 160, 200, 250, 350, 490, 700, 1000 (Consult GAM for other ratios)		
Nominal Output Torque (T_{2n})	Nm (lb-in)	3:1	16 (142)	33 (292)	82 (726)
		4, 5, 7:1	22 (195)	45 (398)	101 (894)
		10, 100, 1000:1	14 (124)	34 (301)	90 (797)
		all other ratios	30 (266)	71 (628)	149 (1319)
Max Acceleration Output Torque (T_{2B})	Nm (lb-in)	3:1	30 (266)	57 (504)	148 (1310)
		4, 5, 7:1	37 (327)	84 (743)	168 (1487)
		10, 100, 1000:1	21 (186)	65 (575)	155 (1372)
		all other ratios	37 (327)	89 (788)	181 (1602)
Emergency Output Torque (T_{2not})	Nm (lb-in)	3:1	72 (637)	160 (1416)	200 (1770)
		4, 5, 7:1	84 (743)	216 (1912)	480 (4248)
		10, 100, 1000:1	62 (549)	160 (1416)	410 (3629)
		all other ratios	84 (743)	216 (1912)	480 (4248)
Nominal Speed (n1n)	RPM	-	3300	2900	2400
Max Speed (n_{1max})	RPM	-	6000	6000	5000
Standard Output Backlash* (j)	arcmin	1-stage	< 12	< 12	< 10
		2-stage	< 14	< 14	< 12
		3-stage	< 15	< 15	< 12
Allowable Radial Load (F_{rad}) 1)	N (lbs)	-	1550 (348)	2400 (540)	4600 (1034)
Allowable Axial Load (F_{axial})	N (lbs)	-	1450 (326)	1900 (427)	4000 (899)
Torsional Stiffness* (C_{t21})	Nm/arcmin (lb-in/arcmin)	10,100,1000	2.8 (25)	5.4 (48)	10 (89)
		7,70,700	3.2 (28)	6.8 (60)	16 (142)
		all other ratios	3.9 (35)	9.1 (81)	19 (168)
Weight (m)	kg (lbs)	1-stage	3.0 (6.6)	5.6 (12)	15 (33)
		2-stage	3.3 (7.3)	6.4 (14)	17 (37)
		3-stage	3.6 (7.9)	7.2 (16)	19 (42)
Noise Level (L_{PA})	dB(A)	-	< 75	< 78	< 78
Mass Moment of Inertia (J_1)	kg cm² (lb-in²)	3:1	0.95 (0.32)	5.4 (1.8)	22 (7.5)
		4:1, 12:1, 16:1	0.88 (0.30)	5.1 (1.7)	20 (6.8)
		5:1, 20:1, 25:1	0.86 (0.29)	5.1 (1.7)	20 (6.8)
		7:1, 35:1	0.85 (0.29)	5.0 (1.7)	19 (6.5)
		10:1, 40:1 - 100:1	0.84 (0.29)	4.9 (1.7)	19 (6.5)
		120:1 - 1000:1	0.84 (0.29)	4.9 (1.7)	19 (6.5)
Efficiency at Load			1-stage: 92% 2-stage: 90% 3-stage: 88%		
Service Life			> 30,000 hours		
Lubrication			Mineral Grease EP0		
Protection Rating			IP 64		
Operating Temperature Range			-20°C to 90°C		

1) Load applied at center of output shaft @100 RPM

* See page 224 for definitions



EPR-A Series		70		90		120	
		mm	(in)	mm	(in)	mm	(in)
D1 max standard	motor shaft diameter	14	(0.551)	19	(0.748)	24	(0.945)
D2 k6	output shaft diameter	16	(0.630)	22	(0.866)	32	(1.260)
D3 h7	pilot diameter	52	(2.047)	68	(2.677)	90	(3.543)
D4	bolt circle	62	(2.441)	80	(3.150)	108	(4.252)
D5	housing diameter	70	(2.756)	90	(3.543)	118	(4.646)
f1	shaft thread	M5x17		M8x25		M12x37	
f2	mounting holes	(8x) M5x12		(8x) M6x14		(8x) M8x18	
L1 (1-stage)*	gearbox total length	161	(6.339)	212	(8.346)	300.5	(11.831)
L1 (2-stage)*		183	(7.205)	244	(9.606)	341.5	(13.445)
L1 (3-stage)*		205	(8.071)	277	(10.906)	382.5	(15.059)
L2	shaft length	36	(1.417)	46	(1.811)	70	(2.756)
L3	key length	25	(0.984)	30	(1.181)	50	(1.968)
L4	usable shaft length	28	(1.102)	35	(1.378)	58	(2.283)
L5	pilot height	5.5	(0.217)	9	(0.354)	7	(0.276)
L6	key width	5	(0.197)	6	(0.236)	10	(0.394)
L7	key height	18	(0.709)	24.5	(0.965)	35	(1.378)
L8**	gearbox height	111.5	(4.390)	156	(6.142)	184.5	(7.264)
L9 (1-stage)	length to input centerline	126	(4.961)	166	(6.535)	240.5	(9.469)
L9 (2-stage)		148	(5.827)	198	(7.795)	281.5	(11.083)
L9 (3-stage)		170	(6.693)	231	(9.094)	322.5	(12.697)
L10**	adapter size	70	(2.756)	90	(3.543)	120	(4.724)

*depending on the motor, value can vary

TYPE CODES FOR EPR SERIES (EPR-A)

Example: EPR - A - 090 - 005 G - M0000 - H0000 - C0000

Gearbox Series
EPR

Gearbox Style
A = Output Shaft with popular metric output dimensions

Gearbox Size
070, 090, 120

Ratio
3, 4, 5, 7, 10, 12, 16, 20, 25, 35, 40, 50, 70, 100, 120, 160, 200, 250, 350, 490, 700, 000=1000

Options Available for This Product
G = Key on output shaft per DIN6885

Motor Code
Assigned by GAM

Output Code
Assigned by GAM

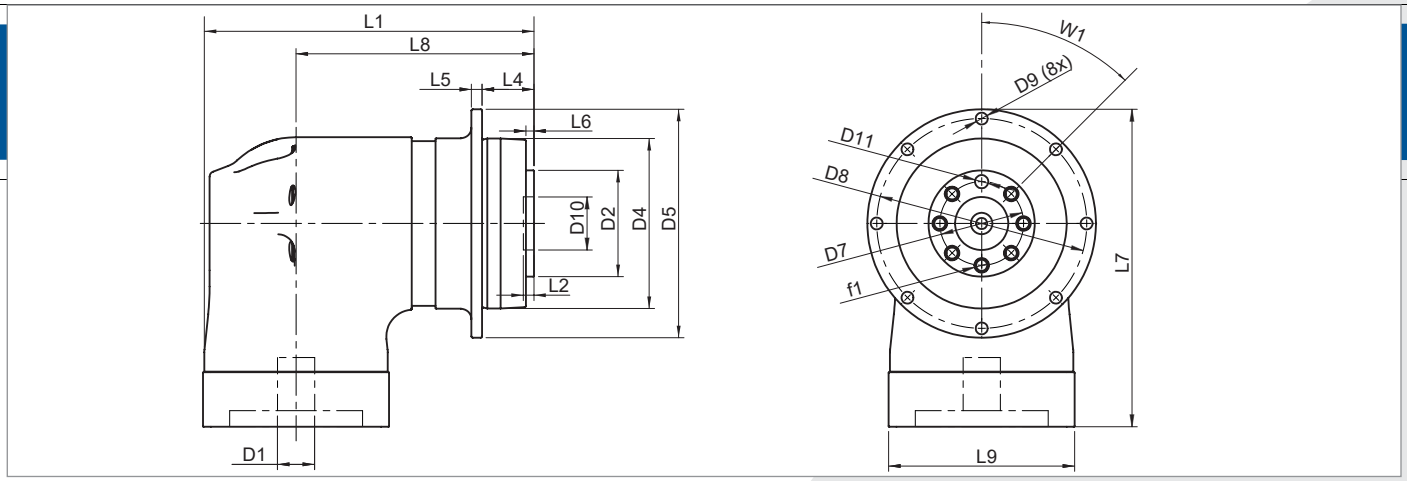
Configuration Code
Assigned by GAM

Shaft (Outer Diameter) Tolerances (mm)			
Over	To (incl.)	h6	k6
6	10	0 -0.009	+0.010 +0.001
10	18	0 -0.011	+0.012 +0.001
18	30	0 -0.013	+0.015 +0.002
30	50	0 -0.016	+0.018 +0.002
50	80	0 -0.019	+0.021 +0.002
80	120	0 -0.022	+0.025 +0.003
120	180	0 -0.025	+0.028 +0.003

EPR-F Series			64	90	110
All Ratios Available			1-Stage Planetary: 3, 4, 5, 7, 10 2-Stage Planetary: 12, 16, 20, 25, 35, 40, 50, 70, 100 3-Stage Planetary: 120, 160, 200, 250, 350, 490, 700, 1000		
Nominal Output Torque (T_{2n})	Nm (lb-in)	3:1	16 (142)	33 (292)	82 (726)
		4, 5, 7:1	22 (195)	45 (398)	101 (894)
		10, 100, 1000:1	14 (124)	34 (301)	90 (797)
		all other ratios	30 (266)	71 (628)	149 (1319)
Max Acceleration Output Torque (T_{2B})	Nm (lb-in)	3:1	30 (266)	57 (504)	148 (1310)
		4, 5, 7:1	37 (327)	84 (743)	168 (1487)
		10, 100, 1000:1	21 (186)	65 (575)	155 (1372)
		all other ratios	37 (327)	89 (788)	181 (1602)
Emergency Output Torque (T_{2not})	Nm (lb-in)	3:1	72 (637)	160 (1416)	200 (1770)
		4, 5, 7:1	84 (743)	216 (1912)	480 (4248)
		10, 100, 1000:1	62 (549)	160 (1416)	410 (3629)
		all other ratios	84 (743)	216 (1912)	480 (4248)
Nominal Speed (n1n)	RPM	-	3300	2900	2400
Max Speed (n_{1max})	RPM	-	6000	6000	5000
Standard Output Backlash* (j)	arcmin	1-stage	≤12	≤12	≤10
		2-stage	≤14	≤14	≤12
		3-stage	≤15	≤15	≤12
Allowable Radial Load (F_{rad}) [1]	N (lbs)	-	1200 (270)	2000 (450)	3100 (697)
Allowable Axial Load (F_{axial})	N (lbs)	-	1100 (247)	2500 (562)	3900 (877)
Torsional Stiffness* (C_{t21})	Nm/arcmin (lb-in/arcmin)	10,100,1000	2.8 (25)	5.4 (48)	10 (89)
		7,70,700	3.2 (28)	6.8 (60)	16 (142)
		all other ratios	3.9 (35)	9.1 (81)	19 (168)
Weight (m)	kg (lbs)	1-stage	3.0 (6.6)	5.6 (12)	15 (33)
		2-stage	3.3 (7.3)	6.4 (14)	17 (37)
		3-stage	3.6 (7.9)	7.2 (16)	19 (42)
Noise Level (L_{PA})	dB(A)	-	< 75	< 78	< 78
Mass Moment of Inertia (J_1)	kg cm² (lb-in²)	3:1	1.11 (0.38)	5.8 (2.0)	24 (8.2)
		4:1, 12:1, 16:1	1.00 (0.34)	5.5 (1.9)	22 (7.5)
		5:1, 20:1, 25:1	0.98 (0.33)	5.2 (1.8)	20 (6.8)
		7:1, 35:1	0.89 (0.30)	5.1 (1.7)	19 (6.5)
		10:1, 40:1 - 100:1	0.88 (0.30)	5.1 (1.7)	19 (6.5)
		120:1 - 1000:1	0.88 (0.30)	5.1 (1.7)	19 (6.5)
Efficiency at Load			1-stage: 92% 2-stage: 90% 3-stage: 88%		
Service Life			> 30,000 hours		
Lubrication			Mineral Grease EP0		
Protection Rating			IP 64		
Operating Temperature Range			-20°C to 90°C		

1) Load applied at center of output shaft @100 RPM

* See page 224 for definitions



EPR-F Series		64		90		110	
		mm	(in)	mm	(in)	mm	(in)
D1 max standard	motor shaft diameter	14	(0.551)	19	(0.748)	24	(0.945)
D2 h7	output flange diameter	40	(1.575)	63	(2.480)	80	(3.150)
D4 h7	pilot diameter	64	(2.520)	90	(3.543)	110	(4.331)
D5	flange diameter	86	(3.386)	118	(4.646)	145	(5.709)
D7	inner bolt circle	31.5	(1.240)	50	(1.968)	63	(2.480)
D8	outer bolt circle	79	(3.110)	109	(4.291)	135	(5.315)
D9	mounting hole diameter (8x)	4.5	(0.177)	5.5	(0.217)	5.5	(0.217)
D10 H7	flange pilot	20	(0.787)	31.5	(1.240)	40	(1.575)
D11 H7	dowel diameter	5	(0.197)	6	(0.236)	6	(0.236)
f1	flange tap	(7) M5x10		(7) M6x12		(15) M6x12	
L1 (1-stage)*	gearbox Length	124.5	(4.902)	169	(6.654)	238.5	(9.390)
L1 (2-stage)*		146.5	(5.768)	202	(7.953)	279.5	(11.004)
L1 (3-stage)*		168.5	(6.634)	235	(9.252)	320.5	(12.618)
L2	flange pilot depth	4	(0.157)	6	(0.236)	6	(0.236)
L4	output length	19.5	(0.768)	30	(1.181)	29	(1.142)
L5	flange thickness	4	(0.157)	7	(0.276)	8	(0.315)
L6	output flange length	3	(0.118)	6	(0.236)	6	(0.236)
W1	output flange thread angle	45°		45°		22.5°	
L7**	gearbox height	119.5	(4.705)	170	(6.693)	197	(7.756)
L8 (1-stage)	length to input centerline	89.5	(3.524)	122	(4.803)	178.5	(7.028)
L8 (2-stage)		111.5	(4.390)	155	(6.102)	219.5	(8.642)
L8 (3-stage)		133.5	(5.256)	188	(7.402)	260.5	(10.256)
L9**	adapter size	70	(2.756)	90	(3.543)	120	(4.724)

* depending on the motor, value can vary

TYPE CODES FOR EPR SERIES (EPR-F)

Example: EPR - F - 090 - 005 H - M0000 - H0000 - C0000

Gearbox Series
EPR

Gearbox Style
F = Flange output

Gearbox Size
064, 090, 110

Ratio
3, 4, 5, 7, 10, 12, 16, 20, 25, 35, 40, 50, 70, 100, 120, 160, 200, 250, 350, 490, 700, 000=1000

Options Available for This Product
H = No Keyways

Motor Code
Assigned by GAM

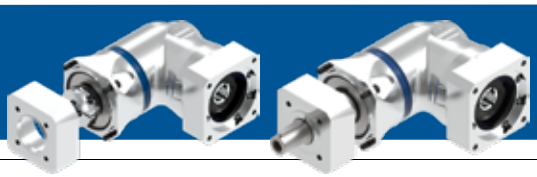
Output Code
Assigned by GAM

Configuration Code
Assigned by GAM

Tolerances (mm)			
Over	To (incl.)	h7	H7
6	10	0 -0.015	+0.015 0
10	18	0 -0.018	+0.018 0
18	30	0 -0.021	+0.021 0
30	50	0 -0.025	+0.025 0
50	80	0 -0.030	+0.030 0
80	120	0 -0.035	+0.035 0
120	180	0 -0.040	+0.040 0

EPR

EPR Series: EPR-U

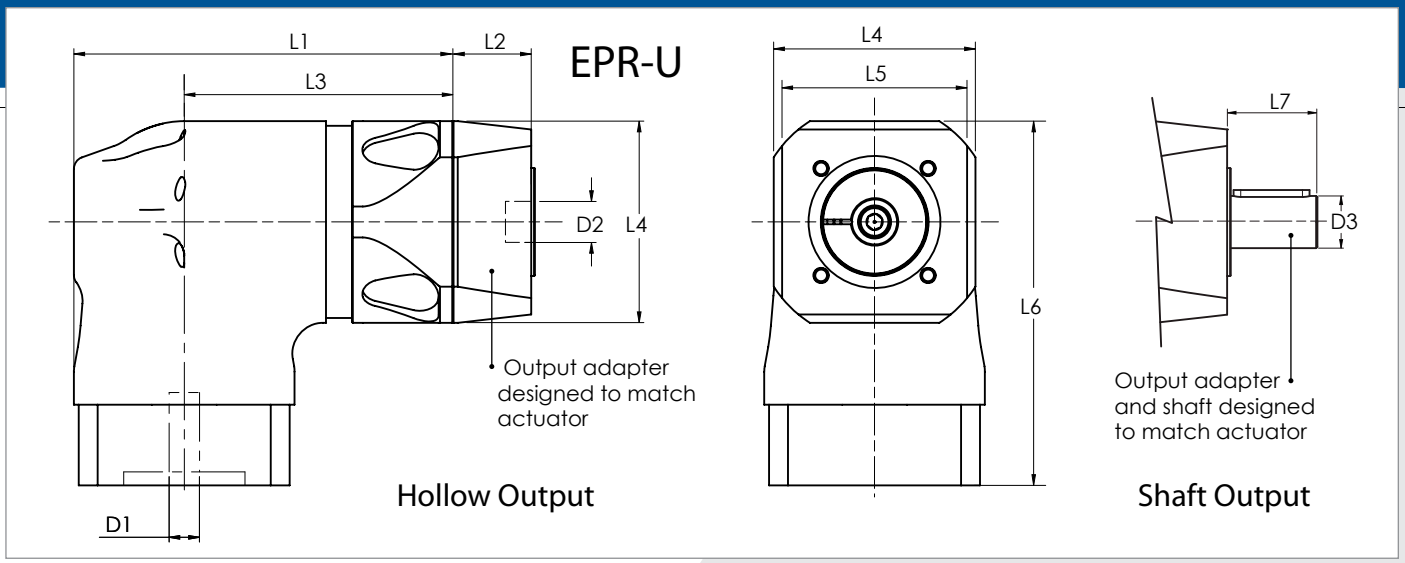


The EPR-U is designed to drive linear actuators with an integral mounting plate and hollow or shaft output

- Hollow output to mount to shaft input actuators (*replaces the* ***EPR-H***)
- Shaft output to mount to hollow input actuators

EPR-U Series			64	84	118
Stock Ratios			3, 5, 7, 10, 25, 50, 100 (Standard Input)		
All Ratios Available			1-Stage Planetary: 3, 4, 5, 7, 10 2-Stage Planetary: 12, 16, 20, 25, 35, 40, 50, 70, 100 3-Stage Planetary: 120, 160, 200, 250, 350, 490, 700, 1000 (Consult GAM for other ratios)		
Nominal Output Torque (T_{2n})	Nm (lb-in)	3:1	16 (142)	33 (292)	82 (726)
		4, 5, 7:1	22 (195)	45 (398)	101 (894)
		10, 100, 1000:1	14 (124)	34 (301)	90 (797)
		all other ratios	30 (266)	71 (628)	149 (1319)
Max Acceleration Output Torque (T_{2B})	Nm (lb-in)	3:1	30 (266)	57 (504)	148 (1310)
		4, 5, 7:1	37 (327)	84 (743)	168 (1487)
		10, 100, 1000:1	21 (186)	65 (575)	155 (1372)
		all other ratios	37 (327)	89 (788)	181 (1602)
Emergency Output Torque (T_{2not})	Nm (lb-in)	3:1	72 (637)	160 (1416)	200 (1770)
		4, 5, 7:1	84 (743)	216 (1912)	480 (4248)
		10, 100, 1000:1	62 (549)	160 (1416)	410 (3629)
		all other ratios	84 (743)	216 (1912)	480 (4248)
Nominal Speed (n1n)	RPM	-	3500	3000	2500
Max Speed (n_{1max})		-	6000	6000	5000
Standard Output Backlash* (j)	arcmin	1-stage	≤12	≤12	≤10
		2-stage	≤14	≤14	≤12
		3-stage	≤15	≤15	≤12
Weight (m)	kg (lbs)	1-stage	3.0 (6.6)	5.6 (12)	15 (33)
		2-stage	3.3 (7.3)	6.4 (14)	17 (37)
		3-stage	3.6 (7.9)	7.2 (16)	19 (42)
Noise Level (L_{PA})	dB(A)	-	≤75	≤78	≤78
Mass Moment of Inertia (J_1)	kg cm^2 (lb-in^2)	3:1	0.95 (0.32)	5.4 (1.8)	22 (7.5)
		4:1, 12:1, 16:1	0.88 (0.30)	5.1 (1.7)	20 (6.8)
		5:1, 20:1, 25:1	0.86 (0.29)	5.1 (1.7)	20 (6.8)
		7:1, 35:1	0.85 (0.29)	5.0 (1.7)	19 (6.5)
		10:1, 40:1 - 100:1	0.84 (0.29)	4.9 (1.7)	19 (6.5)
		120:1 - 1000:1	0.84 (0.29)	4.9 (1.7)	19 (6.5)
Efficiency at Load			1-stage: 92% 2-stage: 90% 3-stage: 88%		
Service Life			> 30,000 hours		
Lubrication			Mineral Grease EP0		
Protection Rating			IP 64		
Operating Temperature Range			-20°C to 90°C		

* See page 224 for definitions



EPR-U Series		64		84		118	
		mm	(in)	mm	(in)	mm	(in)
D1 max standard*	motor shaft diameter	14	(0.551)	19	(0.748)	24	(0.945)
D1 max available*		16	(0.630)	24	(0.945)	32	(1.260)
D2 min	output hollow shaft diameter	8	(0.315)	10	(0.394)	12	(0.472)
D2 max		35	(1.378)	50	(1.969)	80	(3.150)
D3 min	output shaft diameter	14	(0.551)	20	(0.787)	25	(0.984)
D3 max		35	(1.378)	55	(2.165)	70	(2.756)
L1 1-stage**	gearbox length	118	(4.646)	160	(6.299)	205	(8.071)
L1 2-stage**		140	(5.512)	193	(7.598)	245.5	(9.665)
L1 3-stage**		162	(6.378)	226	(8.898)	286	(11.260)
L2	output adapter length	dimensions determined by actuator used in application					
L3 1-stage**	gearbox length to input center line	85.5	(3.366)	113	(4.449)	146	(5.748)
L3 2-stage**		107.5	(4.232)	146	(5.748)	186.5	(7.343)
L3 3-stage**		129.5	(5.098)	179	(7.047)	227	(8.937)
L4	housing size (square)	64	(2.520)	85	(3.346)	118	(4.646)
L5	output mounting face	dimensions determined by actuator used in application					
L6	gearbox height	105	(4.134)	153.5	(6.043)	188.5	(7.421)
L7	output shaft length	dimensions determined by actuator used in application					

*for larger motor shaft diameters, please contact GAM ** depending on the motor, value can vary

TYPE CODES FOR EPR SERIES (EPR-U)

Example: EPR - U - 084 - 005 H - M0000 - H0000 - C0000

- **Gearbox Series** — EPR
- **Gearbox Style** — U = Universal
- **Gearbox Size** — 064, 084, 118
- **Ratio** — 3, 4, 5, 7, 10, 12, 16, 20, 25, 35, 40, 50, 70, 100, 120, 160, 200, 250, 350, 490, 700, 000 = 1000
- **Options Available for This Product** — G = Keyway on output per DIN6885; H = No Keyway
- **Motor Code** — Assigned by GAM
- **Output Code** — Assigned by GAM
- **Configuration Code** — Assigned by GAM

Tolerances (mm)		
Over	To (incl.)	H7
6	10	+0.015 0
10	18	+0.018 0
18	30	+0.021 0
30	50	+0.025 0
50	80	+0.030 0
80	120	+0.035 0
120	180	+0.040 0

EPR

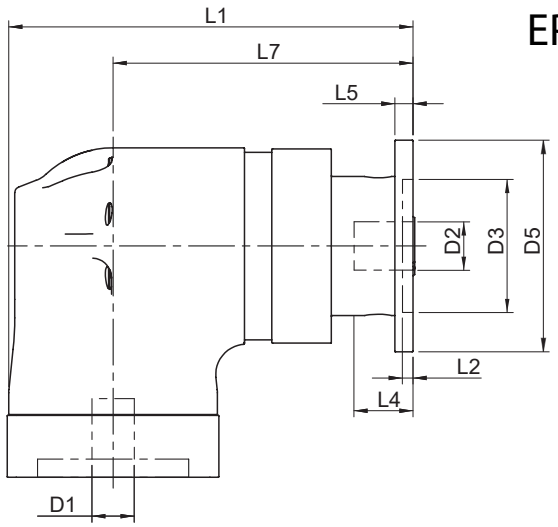
EPR Series: EPR-H

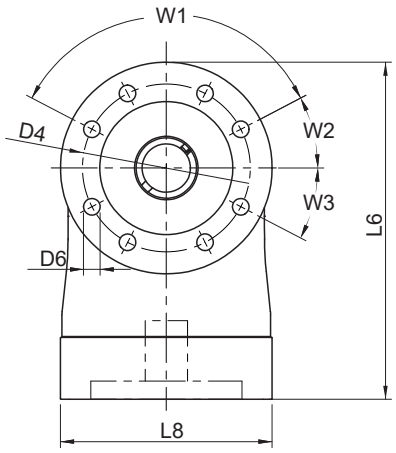
NOTE: The EPR-H will be replaced by the EPR-MH

EPR-H Series			64	84	118
Stock Ratios			3, 5, 7, 10, 25, 50, 100 (Standard Input)		
All Ratios Available			1-Stage Planetary: 3, 4, 5, 7, 10 2-Stage Planetary: 12, 16, 20, 25, 35, 40, 50, 70, 100 3-Stage Planetary: 120, 160, 200, 250, 350, 490, 700, 1000		
Nominal Output Torque (T_{2n})	Nm (lb-in)	3:1	14 (124)	33 (292)	82 (726)
		4:1, 5:1, 7:1	22 (195)	45 (398)	101 (894)
		10:1, 100:1, 1000:1	14 (124)	34 (301)	90 (797)
		all other ratios	30 (266)	64 (566)	149 (1319)
Max Accel Output Torque (T_{2B})	Nm (lb-in)	3:1	25 (221)	57 (504)	148 (1310)
		4:1, 5:1, 7:1	37 (327)	75 (664)	168 (1487)
		10:1, 100:1, 1000:1	21 (186)	65 (575)	155 (1372)
		all other ratios	37 (327)	75 (664)	180 (1593)
Nominal Input Speed (n_{1n})	RPM	-	3300	2900	2400
Max Input Speed (n_{1max})	RPM	-	6000	6000	5000
Standard Output Backlash (j)	arcmin	1-stage	≤12	≤12	≤10
		2-stage	≤14	≤14	≤12
		3-stage	≤15	≤15	≤12
Weight (m)	kg (lb)	1-stage	3.0 (6.6)	5.6 (12)	15 (33)
		2-stage	3.3 (7.3)	6.4 (14)	17 (37)
		3-stage	3.6 (7.9)	7.2 (16)	19 (42)
Noise Level (L_{PA})	dB (A)	-	< 75	< 78	< 78
Mass Moment of Inertia (J_1)	kg cm^2 (lb-in^2)	3:1	0.95 (0.32)	5.4 (1.8)	22 (7.5)
		4:1, 12:1, 16:1	0.88 (0.30)	5.1 (1.7)	20 (6.8)
		5:1, 20:1, 25:1	0.86 (0.29)	5.1 (1.7)	20 (6.8)
		7:1, 35:1	0.85 (0.29)	5.0 (1.7)	19 (6.5)
		10:1, 40:1 - 100:1	0.84 (0.29)	4.9 (1.7)	19 (6.5)
		120:1 - 1000:1	0.84 (0.29)	4.9 (1.7)	19 (6.5)
Efficiency at Load			1-stage: 92% 2-stage: 90% 3-stage: 88%		
Service Life			> 20,000 hours		
Lubrication			Mineral Grease EP0		
Protection Rating			IP 64		
Operating Temperature Range			-20°C to 90°C		

* See page 224 for definitions

EPR-H





EPR-H Series		64		84		118	
		mm	(in)	mm	(in)	mm	(in)
D1 max standard	motor shaft diameter	14	(0.551)	19	(0.748)	24	(0.945)
D2 max	output shaft diameter	16	(0.630)	20	(0.787)	30	(1.181)
D3 H7	pilot diameter	44	(1.732)	60	(2.362)	80	(3.150)
D4	bolt circle	55.5	(2.185)	73	(2.874)	105	(4.134)
D5	flange diameter	70	(2.756)	84	(3.307)	118	(4.646)
D6	mounting holes	8 x 5.5	(0.217)	8 x 5.5	(0.217)	8 x 6.8	(0.267)
L1 (1-stage)*	gearbox length	134.2	(5.283)	177	(6.969)	234	(9.213)
L1 (2-stage)*		156.2	(6.150)	210	(8.268)	275	(10.827)
L1 (3-stage)*		178.2	(7.016)	243	(9.567)	316	(12.441)
L2	pilot depth	3.5	(0.138)	3.5	(0.138)	3.5	(0.138)
L4	allowable shaft depth	28	(1.102)	30	(1.181)	27	(1.063)
L5	flange thickness	6	(0.236)	6	(0.236)	10	(0.394)
W1	bolt hole spacing	125°		135°		135°	
W2	hole angle 1	27.5°		22.5°		22.5°	
W3	hole angle 2	27.5°		22.5°		22.5°	
L6**	gearbox height	111.5	(4.390)	153	(6.024)	183.5	(7.224)
L7 (1-stage)	length to input centerline	99.2	(3.906)	130.5	(5.138)	173.7	(6.839)
L7 (2-stage)		121.2	(4.772)	163.5	(6.437)	214.7	(8.453)
L7 (3-stage)		143.2	(5.638)	196.5	(7.736)	255.7	(10.067)
L8**	adapter size	50	(1.969)	70	(2.756)	90	(3.543)

* depending on the motor, value can vary

TYPE CODES FOR EPR SERIES (EPR-H)

Example: EPR - H - 084 - 005 H - M0000 - H0000 - C0000

Gearbox Series
EPR

Gearbox Style
H = Hollow Output Shaft

Gearbox Size
064, 084, 118

Ratio
3, 4, 5, 7, 10, 12, 16, 20, 25, 35, 40, 50, 70, 100, 120, 160, 200, 250, 350, 490, 700, 000 = 1000

Options Available for This Product
H = No Keyways

Motor Code
Assigned by GAM

Output Code
Assigned by GAM

Configuration Code
Assigned by GAM

Tolerances (mm)		
Over	To (incl.)	H7
6	10	+0.015 0
10	18	+0.018 0
18	30	+0.021 0
30	50	+0.025 0
50	80	+0.030 0
80	120	+0.035 0
120	180	+0.040 0

Performance: PER Series

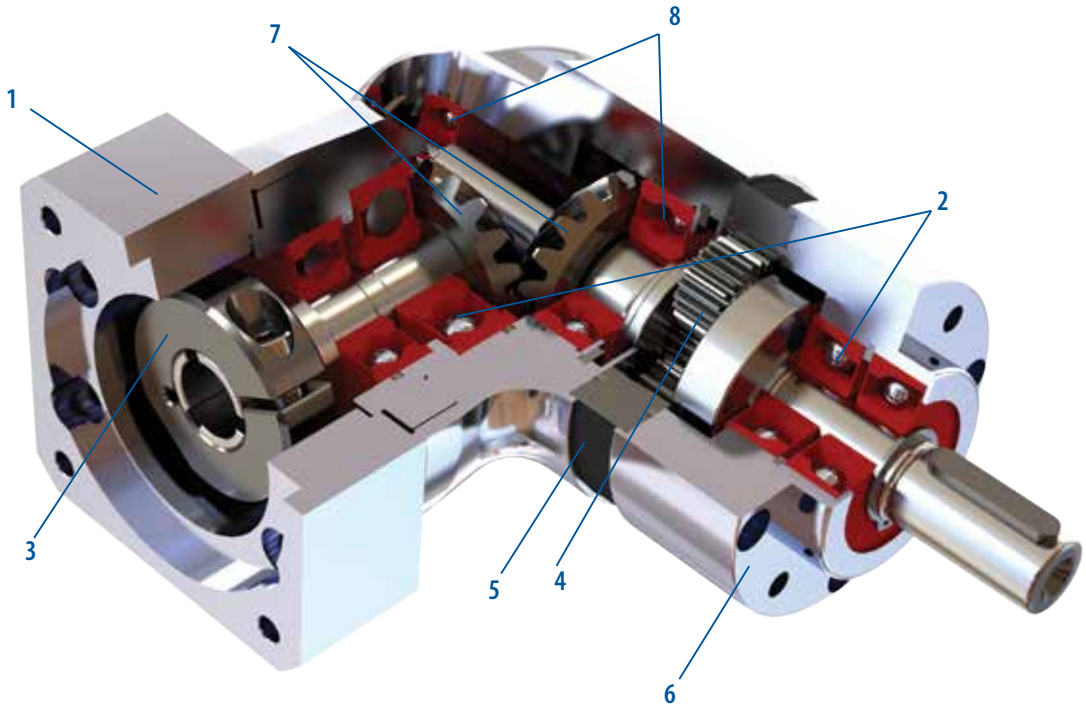
GAM can.

If you don't see exactly what you need, let us know. We can modify the PE Series gearboxes to meet your needs. Page 5 provides examples of GAM capabilities.

The GAM PER series is a great gearbox value for servo, stepper, and other motion control applications. It offers the best quality available for the price point. Offering the advantages of the popular EPL in a right angle configuration, the PER series is a reliable alternative when radial or axial loadings are minimized.

PER Series offers:

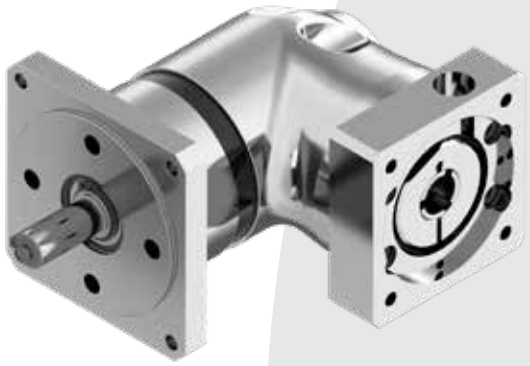
- PER-W with a metric output
- PER-N with a NEMA output
- Ratios from 3:1 to 1000:1
- Ready to mount to your motor



1. Adapter Plate
   Customized adapter plates for quick and easy motor mounting
2. Deep Groove Ball Bearings
   Dual ball bearings
3. Input Clamping Element
4. Planet Gears
   Precision ground gears
5. Ring Gear
   Ring gear incorporated into housing
6. Output face
7. Precision ground spiral bevel gears
8. Bevel gear supported at both ends
   Input to planetary

PER-W

- GAM Metric output face
- Frame sizes from 50 mm to 118 mm



PER-N

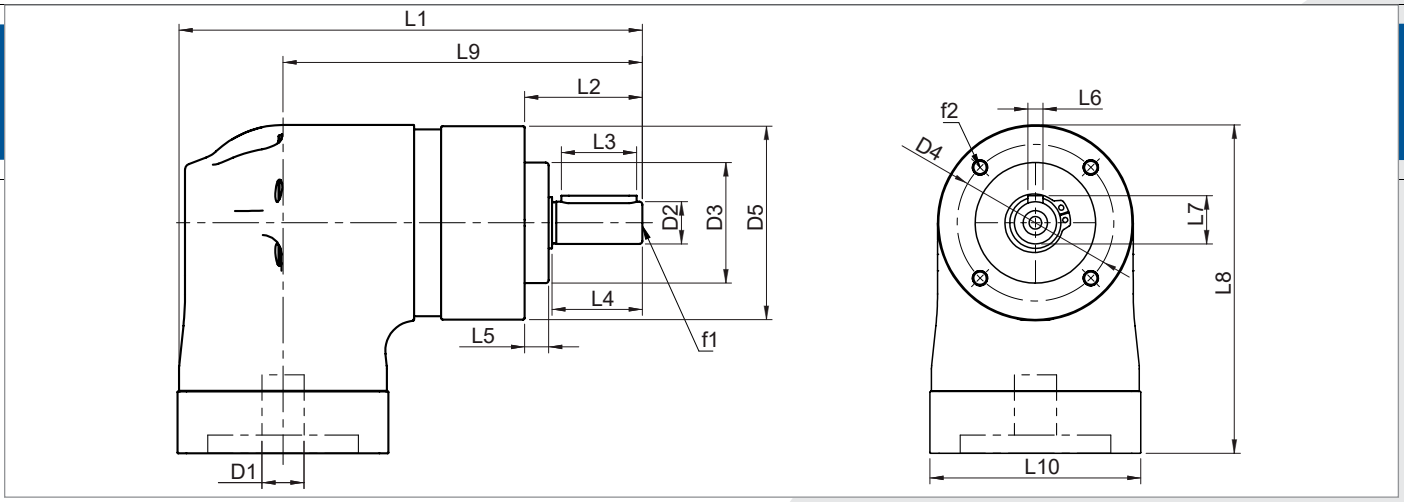
- NEMA output face
- Frame sizes from NEMA 17 to 42

PER-W Series - (Metric)

PER-W Series			64	84	118
Stock Ratios			5, 10, 50		
All Ratios Available			1-Stage Planetary: 3, 4, 5, 7, 10 2-Stage Planetary: 12, 16, 20, 25, 35, 40, 50, 70, 100 3-Stage Planetary: 120, 160, 200, 250, 350, 490, 700, 1000		
Nominal Output Torque (T_{2n})	Nm (lb-in)	3:1	16 (142)	33 (292)	82 (726)
		4, 5, 7:1	22 (195)	45 (398)	101 (894)
		10, 100, 1000:1	14 (124)	34 (301)	90 (797)
		all other ratios	30 (266)	71 (628)	149 (1319)
Max Acceleration Output Torque (T_{2B})	Nm (lb-in)	3:1	30 (266)	57 (504)	148 (1310)
		4, 5, 7:1	37 (327)	84 (743)	168 (1487)
		10, 100, 1000:1	21 (186)	65 (575)	155 (1372)
		all other ratios	37 (327)	89 (788)	181 (1602)
Emergency Output Torque (T_{2not})	Nm (lb-in)	3:1	72 (637)	160 (1416)	200 (1770)
		4, 5, 7:1	84 (743)	216 (1912)	480 (4248)
		10, 100, 1000:1	62 (549)	160 (1416)	410 (3629)
		all other ratios	84 (743)	216 (1912)	480 (4248)
Nominal Speed (n_{1n})	RPM	-	3300	2900	2400
Max Speed (n_{1max})		-	6000	6000	5000
Standard Output Backlash* (j)	arcmin	3:1 - 10:1	<12	<12	<10
		12:1 - 100:1	<14	<14	<12
		120:1 - 1000:1	<15	<15	<12
Allowable Radial Load (F_{rad}) 1)	N (lbs)	-	560 (126)	1300 (293)	2500 (563)
Allowable Axial Load (F_{axial})	N (lbs)	-	500 (113)	1000 (225)	1500 (338)
Torsional Stiffness* (C_{t21})	Nm/arcmin (lb-in/arcmin)	10, 100, 1000	2.8 (25)	5.4 (48)	10 (89)
		7, 70, 700	3.2 (28)	6.8 (60)	16 (142)
		all other ratios	3.9 (35)	9.1 (81)	19 (168)
Weight (m)	kg (lbs)	1-stage	3.0 (6.6)	5.6 (12)	15 (33)
		2-stage	3.3 (7.3)	6.4 (14)	17 (37)
		3-stage	3.6 (7.9)	7.2 (16)	19 (42)
Noise Level (L_{PA})	dB(A)	-	< 75	< 78	< 78
Mass Moment of Inertia (J_1)	kg cm^2 (lb-in^2) (lb-in^2)	3:1	0.95 (0.32)	5.4 (1.8)	22 (7.5)
		4:1, 12:1, 16:1	0.88 (0.30)	5.1 (1.7)	20 (6.8)
		5:1, 20:1, 25:1	0.86 (0.29)	5.1 (1.7)	20 (6.8)
		7:1, 35:1	0.85 (0.29)	5.0 (1.7)	19 (6.5)
		10:1, 40:1 - 100:1	0.84 (0.29)	4.9 (1.7)	19 (6.5)
		120:1 - 1000:1	0.84 (0.29)	4.9 (1.7)	19 (6.5)
Efficiency at Load			1-stage: 92% 2-stage: 90% 3-stage: 88%		
Service Life			>20,000		
Lubrication			Mineral Grease EP0		
Protection Rating			IP 64		
Operating Temperature Range			-20°C to 90°C		

1) Load applied at center of output shaft @100 RPM

* See page 224 for definitions



PER-W Series		64		84		118	
		mm	(in)	mm	(in)	mm	(in)
D1 max standard	motor shaft diameter	14	(0.551)	19	(0.748)	24	(0.945)
D2 k6	output shaft diameter	14	(0.551)	20	(0.787)	25	(0.984)
D3 h7	pilot diameter	40	(1.575)	55	(2.165)	80	(3.150)
D4	bolt circle	52	(2.047)	70	(2.756)	100	(3.937)
D5	housing diameter	64	(2.520)	84	(3.307)	118	(4.646)
f1	shaft thread	M5x12		M6x16		M10x22	
f2	mounting holes	M5x12		M6x14		M8x18	
L1 (1-stage)*	gearbox length	154	(6.063)	217.5	(8.563)	276.5	(10.886)
L1 (2-stage)*		176	(6.929)	250.5	(9.862)	316.5	(12.461)
L1 (3-stage)*		198	(7.795)	283.5	(11.161)	357.5	(14.075)
L2	shaft length	39	(1.535)	54	(2.126)	61	(2.402)
L3	key length	25	(0.984)	36	(1.417)	45	(1.772)
L4	usable shaft length	30	(1.181)	45	(1.772)	50	(1.969)
L5	pilot height	8	(0.315)	8	(0.315)	10	(0.394)
L6	key width	5	(0.197)	6	(0.236)	8	(0.315)
L7	key height	16	(0.630)	22.5	(0.886)	28	(1.102)
L8**	gearbox height	108.6	(4.276)	153	(6.024)	183.5	(7.224)
L9 (1-stage)	length to input centerline	119.3	(4.697)	171	(6.732)	216.5	(8.524)
L9 (2-stage)		141.3	(5.563)	204	(8.031)	256.5	(10.098)
L9 (3-stage)		163.3	(6.429)	237	(9.331)	297.5	(11.713)
L10	adapter size	70	(2.756)	90	(3.543)	120	(4.724)

* depending on the motor, value can vary

TYPE CODES FOR PER-W SERIES (METRIC)

Example: PER - W - 084 - 005 G - M0000 - H0000 - C0000

Gearbox Series
PER

Gearbox Style
W = Metric output shaft

Gearbox Size
064, 084, 118

Ratio
3, 4, 5, 7, 10, 12, 16, 20, 25, 35, 40, 50, 70, 100, 120, 160, 200, 250, 350, 490, 700, 000=1000

Options Available for This Product
G = Key on output shaft per DIN6885

Motor Code
Assigned by GAM

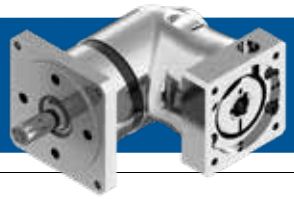
Output Code
Assigned by GAM

Configuration Code
Assigned by GAM

Shaft (Outer Diameter) Tolerances (mm)			
Over	To (incl.)	h7	k6
6	10	0 -0.015	+0.010 +0.001
10	18	0 -0.018	+0.012 +0.001
18	30	0 -0.021	+0.015 +0.002
30	50	0 -0.025	+0.018 +0.002
50	80	0 -0.030	+0.021 +0.002
80	120	0 -0.035	+0.025 +0.003

PER

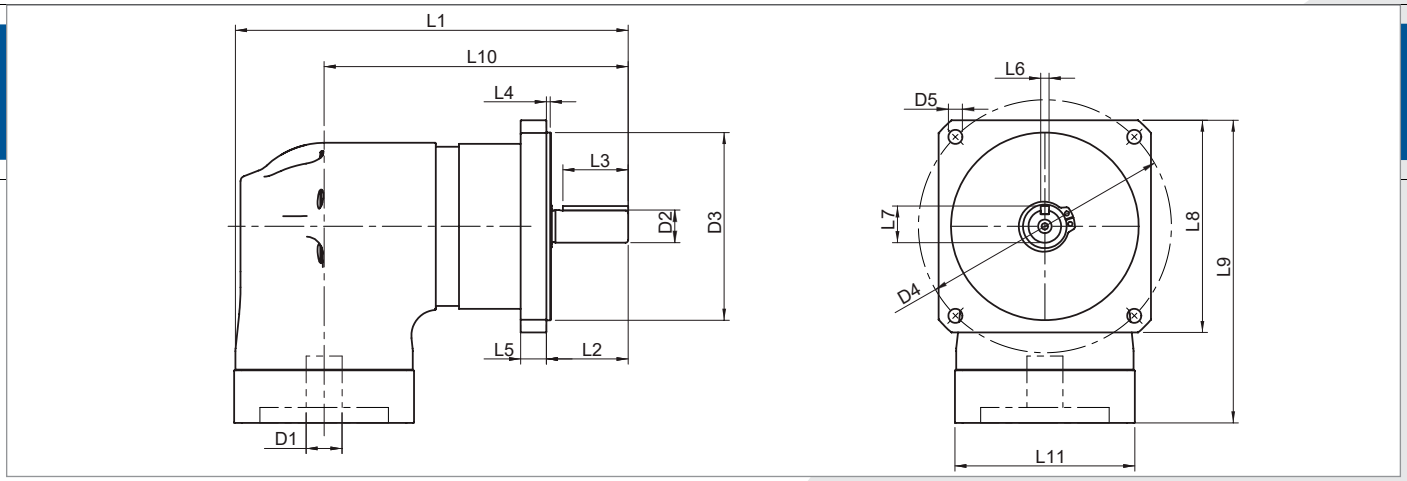
PER-N Series - (NEMA)



PER-N Series			34	42
Stock Ratios			5, 10, 50	
All Ratios Available			1-Stage Planetary: 3, 4, 5, 7, 10 2-Stage Planetary: 12, 16, 20, 25, 35, 40, 50, 70, 100 3-Stage Planetary: 120, 160, 200, 250, 350, 490, 700, 1000	
Nominal Output Torque (T_{2n})	Nm (lb-in)	3:1	16 (142)	33 (292)
		4, 5, 7:1	22 (195)	45 (398)
		10, 100, 1000:1	14 (124)	34 (301)
		all other ratios	30 (266)	71 (628)
Max Accel. Torque (T_{2B})	Nm (lb-in)	3:1	30 (266)	57 (504)
		4, 5, 7:1	37 (327)	84 (743)
		10, 100, 1000:1	21 (186)	65 (575)
		all other ratios	37 (327)	89 (788)
Emergency Output Torque (T_{2not})	Nm (lb-in)	3:1	72 (637)	160 (1416)
		4, 5, 7:1	84 (743)	216 (1912)
		10, 100, 1000:1	62 (549)	160 (1416)
		all other ratios	84 (743)	216 (1912)
Nominal Speed (n_{1n})	RPM	-	3300	2900
Max Input Speed (n_{1max})		-	6000	6000
Standard Output Backlash (j)	arcmin	3:1 - 10:1	< 12	< 12
		12:1 - 100:1	< 14	< 14
		120:1 - 1000:1	< 15	< 15
Allowable Radial Load (F_{rad}) 1)	N (lbs)	-	476 (107)	1105 (249)
Allowable Axial Load (F_{axial})	N (lbs)	-	425 (96)	850 (191)
Torsional Stiffness (C_{t21})	Nm/arcmin (lb-in/arc-min)	10, 100, 1000	2.8 (25)	5.4 (48)
		7, 70, 700	3.2 (28)	6.8 (60)
		all other ratios	3.9 (35)	9.1 (81)
Weight (m)	kg (lbs)	1-stage	3.0 (6.6)	5.6 (12)
		2-stage	3.3 (7.3)	6.4 (14)
		3-stage	3.6 (7.9)	7.2 (16)
Noise Level (L_{PA})	dB(A)	-	< 75	< 78
Mass Moment of Inertia (J_1)	kg cm^2 (lb-in^2)	3:1	0.95 (0.32)	5.4 (1.8)
		4:1, 12:1, 16:1	0.88 (0.30)	5.1 (1.7)
		5:1, 20:1, 25:1	0.86 (0.29)	5.1 (1.7)
		7:1, 35:1	0.85 (0.29)	5.0 (1.7)
		10:1, 40:1 - 100:1	0.84 (0.29)	4.9 (1.7)
		120:1 - 1000:1	0.84 (0.29)	4.9 (1.7)
Efficiency at Load			1-stage: 92% 2-stage: 90% 3-stage: 88%	
Service Life			>20,000	
Lubrication			Mineral Grease EP0	
Protection Rating			IP 64	
Operating Temperature Range			-20°C to 90°C	

1) Load applied at center of output shaft @100 RPM

* See page 224 for definitions



PER-N Series		34		42	
		mm	(in)	mm	(in)
D1 max standard	motor shaft diameter	14	(0.551)	19	(0.748)
D2 k6	output shaft diameter	12.70	(0.500)	19.05	(0.750)
D3 h7	pilot diameter	73.03	(2.875)	55.55	(2.187)
D4	bolt circle	98.43	(3.875)	125.72	(4.950)
D5	mounting holes	5.5	(0.217)	7.1	(0.280)
L1 (1-stage)*	gearbox length	153	(6.024)	203	(7.992)
L1 (2-stage)*		175	(6.890)	236	(9.291)
L1 (3-stage)*		197	(7.756)	268	(10.551)
L2	shaft length	31.80	(1.252)	31.80	(1.252)
L3	key length	27	(1.063)	29	(1.142)
L4	pilot height	1.7	(0.067)	2.4	(0.094)
L5	flange thickness	10	(0.394)	13	(0.512)
L6	key width	3.18	(0.125)	4.76	(0.187)
L7	key height / flat height	14.30	(0.563)	18.26	(0.719)
L8	output flange size	82.55	(3.250)	106.68	(4.200)
L9[2)]	gearbox height	117.8	(4.638)	164.3	(6.469)
L10 (1-stage)	length to input centerline	118.3	(4.657)	156.2	(6.150)
L10 (2-stage)		140.3	(5.524)	189.2	(7.449)
L10 (3-stage)		162.3	(6.390)	221.2	(8.709)
L11	adapter size	70	(2.756)	90	(3.543)

*depending on the motor, value can vary

TYPE CODES FOR PER-N SERIES (NEMA)

Example: PER - N - 023 - 005 G - M0000 - H0000 - C0000

Gearbox Series
PER

Gearbox Style
N = NEMA output

Gearbox Style
034, 042

Ratio
3, 4, 5, 7, 10, 12, 16, 20, 25, 35, 40, 50, 70, 100, 120, 160, 200, 250, 350, 490, 700, 000=1000

Options Available for This Product
G = Key on output shaft per DIN6885 flat on NEMA 17 and NEMA 23

Motor Code
Assigned by GAM

Output Code
Assigned by GAM

Configuration Code
Assigned by GAM

Shaft (Outer Diameter) Tolerances (mm)			
Over	To (incl.)	h7	k6
6	10	0 -0.015	+0.010 +0.001
10	18	0 -0.018	+0.012 +0.001
18	30	0 -0.021	+0.015 +0.002
30	50	0 -0.025	+0.018 +0.002
50	80	0 -0.030	+0.021 +0.002
80	120	0 -0.035	+0.025 +0.003

GAM Spiral Bevel Gearboxes

When you need a spiral bevel gearbox that you can count on, choose GAM. Our V Series spiral bevel gearboxes are highly configurable, reliable, and economical right angle solutions designed for use in a wide range of applications.

Features

- Precision cut spiral bevel gears are hardened and then lapped in pairs for ideal tooth contact and torque transmission
- 13 frame sizes with a multitude of shaft configurations, can be oriented in any direction to easily incorporate into your machine design
- Efficiency of 94% to 98%
- Backlash of 10 and 30 arcmin (reduced backlash versions available)
- Torques up to 4,440 Nm (39,297 lb-in)
- Frame sizes from 27 mm (1.06") to 350 mm (13.78")
- Power up to 267 kW (360 hp)

Performance Plus VP Series Miniature Gearboxes

The **Performance Plus VP Series** packs high performance in a small package with the highest torque density, range of ratios, and torque capacity on the market.

- Sizes 27, 33, and 45 mm
- Highest torque density for the size
- More ratios for the size: 1:1 to 4:1
- High efficiency 98%
- Nominal torque capacity of 1.3 to 16 Nm
- Hollow shaft output option (33 & 45 mm)
- High-strength aluminum housing
- Sealed and lubricated for life with synthetic oil
- VPC Series with integrated motor mount
- Ideal for medical and semiconductor applications

VP-Series
(27, 33 & 45 mm)

Miniature Applications

Our **miniature V Series** and **VP Series** are the best option available on the market for all your miniature automation applications, such as **medical** and **semiconductor**, when high performance is required and space is at a premium.

The housings are manufactured from high-strength aluminum for a gearbox that is light weight, dissipates heat efficiently, and resists corrosion.

Many Configurations: Adaptable to Any Application

Whether you need to multiply torque, decrease or increase motor speed, or simply turn a right angle, the modular design of our spiral bevel gearboxes means that they can be configured for virtually any application.

Power Transmission High quality and durability for reliable power transmission

Motion Control Precision positioning and an integrated motor mount and coupling for easy and economical motion control

Shaft Input

V-Series
(35 to 350 mm)

VP-Series
(27 to 45 mm)

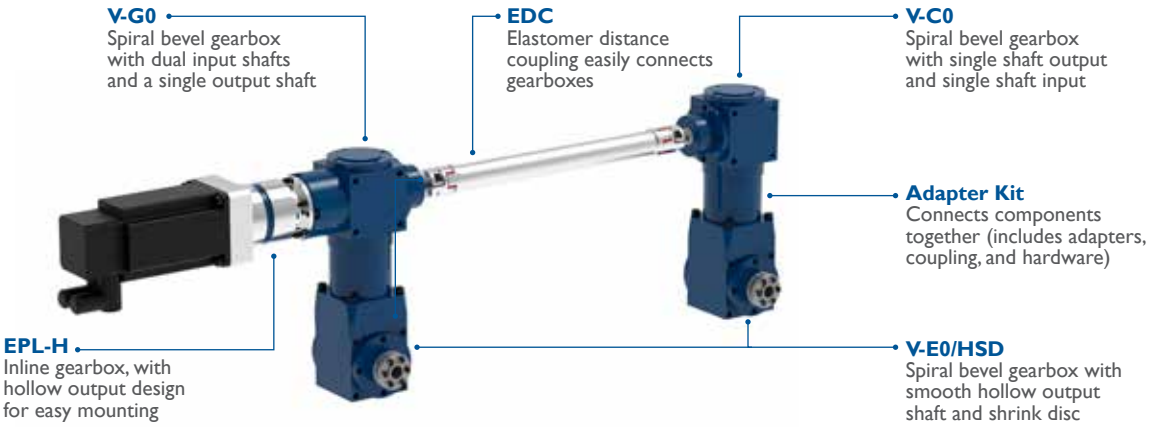
Integrated Motor Mount Input

VC-Series
(35 mm to 200 mm)

VPC-Series
(27 to 45 mm)

Application Example: Lift System

Combine V-Series gearboxes with each other and with other GAM products for a complete system.



Special Options for Special Applications

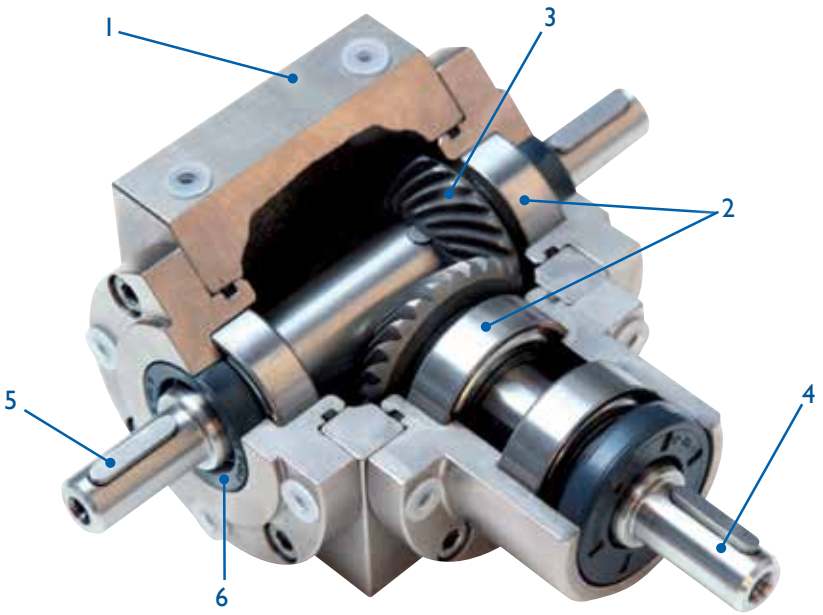
From stainless steel shafts, electrolytic nickel coated housings, VITON® seals, to NOTOX® lubrication, GAM V-Series can be designed for use in industries that have strict requirements including pharmaceutical, medical, chemical, and food processing. For applications in explosive environments, ATEX compliant gearbox solutions can be configured.

GAM V Series Spiral Bevel Gearboxes

V Series spiral bevel gearboxes are highly configurable, reliable, and economical right angle solutions designed for use in a wide range of applications.

Precision cut spiral bevel gears are hardened and then lapped in pairs for ideal tooth contact and torque transmission, enabling 94-98% efficiencies and backlash between 10 and 30 arcmin (reduced backlash versions available).

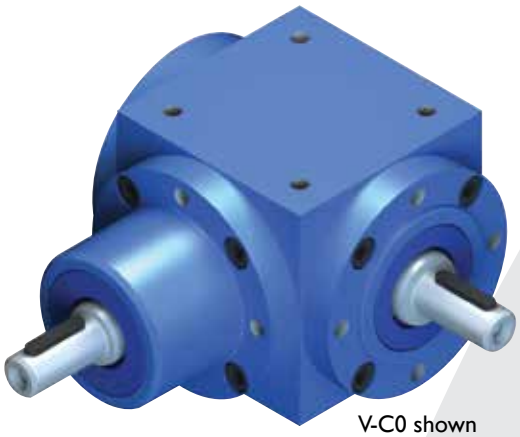
Offered in 11 frame sizes, they can be constructed with a multitude of shaft configurations, and oriented in any direction to easily integrate into your machine design.



1. **Housing**
   Sturdy cast iron housing (Aluminum in sizes 35 mm to 45 mm) - all 6 sides can be used for mounting
2. **Bearings**
   Deep groove ball bearings handle axial and radial loading. (Reinforced and taper roller options available)
3. **Spiral Bevel Gearing**
   Precision cut, hardened, and lapped in pairs for ideal tooth contact. Mathematically precise ratios from 1:1 to 6:1
4. **Input**
   Available with shaft input or integrated motor adapter and coupling to easily mount to any IEC, NEMA, or servo motor
5. **Output**
   Solid shaft with key or keyed hollow shaft are standard. (Smooth shaft or shrink disc clamping available)
6. **Seals**
   Lubricated for life and protected with high quality NBR seals. (Viton® and FPM seals available)

V-Series

- Sizes 65 to 350 mm
- Ratios 1:1 to 6:1 (varies by size)
- Single or dual input shafts
- Single, dual, or hollow output shafts



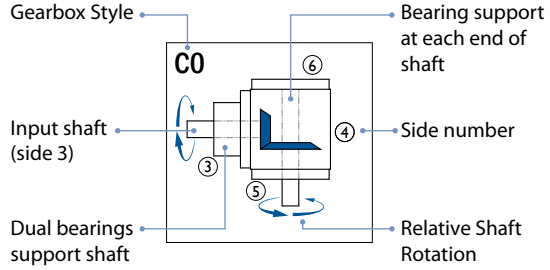
V-C0 shown

V-Series (mini)

- Sizes 35 and 45 mm
- Ratios 1:1 to 4:1 (varies by size)
- Single or dual input shafts
- Single, dual, or keyed hollow output shafts

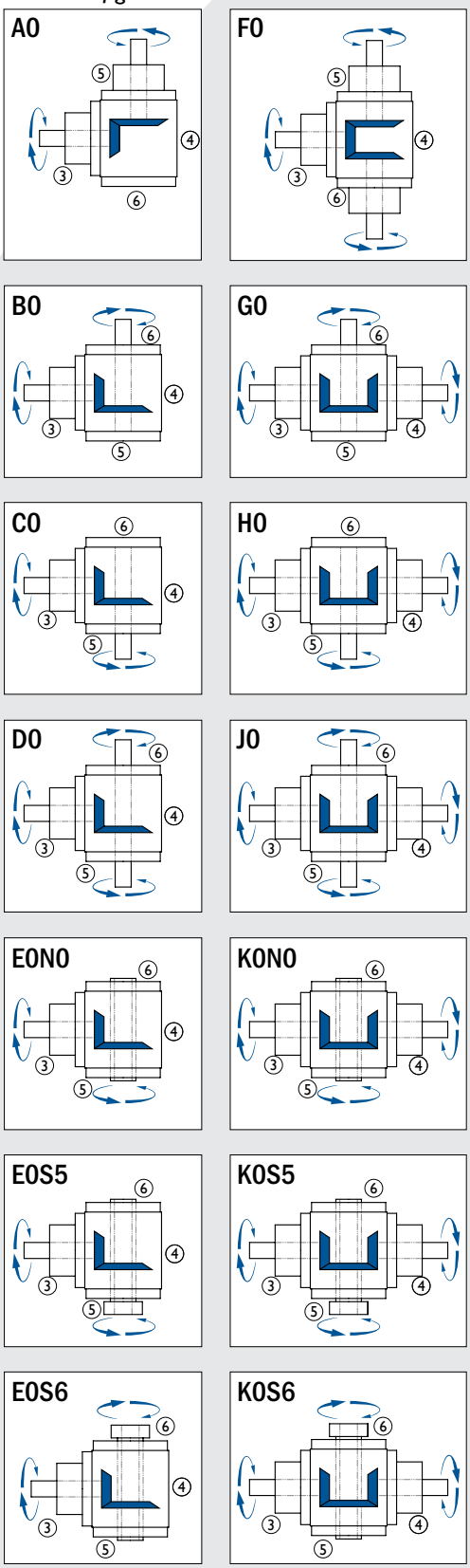
V-C0 (mini) shown

Configuration Diagram



Standard Configurations

Other configurations available



NOTE: Some model names have changed **E0** to **E0N0**, **K0** to **K0N0**, **E0/HSD** to **E0S5** or **E0S6**, **K0/HSD** to **K0S5** or **K0S6**.

V Series Technical Specifications

		Model	V-Series (mini)*				V-Series					
		Size	035		045		065		090		120	
		Ratios Available	1:1		1,2,3,4:1		1, 1.5, 2, 3:1		1, 1.5, 2, 3, 4, 5, 6:1			
Ratio		Input Speed (RPM)	Output Torque (Nm)	Power (kW)	Output Torque (Nm)	Power (kW)	Output Torque (Nm)	Power (kW)	Output Torque (Nm)	Power (kW)	Output Torque (Nm)	Power (kW)
1:1		50	4.5	0.025	9	0.05	18	0.1	50	0.28	130	0.72
		250	4.5	0.124	9	0.248	17	0.47	44	1.21	123	3.39
		500	4	0.22	8	0.441	15	0.83	40	2.2	115	6.34
		750	3.6	0.298	7.3	0.603	13	1.07	37	3.06	103	8.51
		1000	3.5	0.386	7	0.772	12	1.32	34	3.75	92	10.14
		1500	3	0.496	6	0.992	11	1.82	32	5.29	82	13.56
		2400	2.4	0.635	4.5	1.19	10	2.65	28	7.41	70	18.52
		3000	2	0.661	4	1.323	10	3.31	27	8.93	66	21.82
1.5:1		50	-	-	-	-	18	0.07	45	0.16	113	0.41
		250	-	-	-	-	17	0.31	40	0.74	108	1.99
		500	-	-	-	-	15	0.55	37	1.36	105	3.85
		750	-	-	-	-	13	0.72	35	1.93	94	5.18
		1000	-	-	-	-	12	0.88	32	2.35	86	6.32
		1500	-	-	-	-	11	1.21	29	3.2	78	8.6
		2400	-	-	-	-	10	1.76	26	4.59	65	11.46
		3000	-	-	-	-	10	2.2	25	5.51	61	13.45
2:1		50	-	-	7	0.019	18	0.05	37	0.1	107	0.29
		250	-	-	6.5	0.09	17	0.23	36	0.5	98	1.35
		500	-	-	6	0.165	15	0.41	34	0.94	92	2.54
		750	-	-	5.7	0.236	13	0.54	32	1.32	86	3.55
		1000	-	-	5.5	0.303	12	0.66	31	1.71	81	4.46
		1500	-	-	5	0.413	11	0.91	27	2.23	73	6.03
		2400	-	-	4.75	0.628	10	1.32	24	3.17	61	8.07
		3000	-	-	4.5	0.744	10	1.65	23	3.8	56	9.26
3:1		50	-	-	5.5	0.01	14	0.03	37	0.07	110	0.21
		250	-	-	5	0.046	13	0.12	36	0.33	95	0.87
		500	-	-	4.5	0.083	13	0.24	34	0.63	90	1.66
		750	-	-	4.2	0.116	12	0.33	32	0.88	87	2.4
		1000	-	-	4	0.147	12	0.44	31	1.14	82	3.01
		1500	-	-	3.5	0.193	11	0.61	27	1.49	74	4.08
		2400	-	-	3.4	0.3	10	0.88	24	2.12	63	5.56
		3000	-	-	3	0.331	10	1.1	23	2.54	58	6.39
4:1		50	-	-	4.5	0.006	-	-	37	0.05	90	0.12
		250	-	-	4.5	0.031	-	-	36	0.25	87	0.6
		500	-	-	4.25	0.059	-	-	34	0.47	84	1.16
		750	-	-	4.2	0.087	-	-	32	0.66	82	1.69
		1000	-	-	4	0.11	-	-	31	0.85	79	2.18
		1500	-	-	3.75	0.155	-	-	27	1.12	74	3.06
		2400	-	-	3.6	0.238	-	-	25	1.65	67	4.43
		3000	-	-	3.5	0.289	-	-	23	1.9	60	4.96
5:1		50	-	-	-	-	-	-	37	0.04	95	0.1
		250	-	-	-	-	-	-	36	0.2	92	0.51
		500	-	-	-	-	-	-	34	0.37	89	0.98
		750	-	-	-	-	-	-	32	0.53	86	1.42
		1000	-	-	-	-	-	-	31	0.68	80	1.76
		1500	-	-	-	-	-	-	27	0.89	72	2.38
		2400	-	-	-	-	-	-	25	1.32	65	3.44
		3000	-	-	-	-	-	-	23	1.52	60	3.97
6:1		50	-	-	-	-	-	-	33	0.03	66	0.06
		250	-	-	-	-	-	-	30	0.14	71	0.33
		500	-	-	-	-	-	-	29	0.27	69	0.63
		750	-	-	-	-	-	-	29	0.4	68	0.94
		1000	-	-	-	-	-	-	29	0.53	66	1.22
		1500	-	-	-	-	-	-	27	0.74	64	1.75
		2400	-	-	-	-	-	-	25	1.09	57	2.53
		3000	-	-	-	-	-	-	23	1.25	54	2.95
Standard Backlash***	arcmin	All Ratios	<15		<15		<20		<20		<20	
Allowable Radial Loading**	N	Models B0, C0, D0, G0, H0, J0	70		400		750		1250		1900	
Allowable Axial Loading	N		35		200		375		625		950	
Allowable Radial Loading**	N	Models E0, E0/HSD, K0, K0/HSD	Contact GAM		Contact GAM		Contact GAM		1250		2100	
Allowable Axial Loading	N		Contact GAM		Contact GAM		Contact GAM		625		1050	
Allowable Radial Loading**	N	Models A0, M0, F0, or input shafts	70		Contact GAM		450		700		1150	
Allowable Axial Loading	N		35		Contact GAM		225		350		575	
Efficiency at Load			94-98%									
Service Life / Housing Material			10,000 hours / Aluminum				15,000 hours / Cast Iron					
Lubrication			Synthetic Oil				Synthetic Oil					

* Formerly L Series **Load applied at the center of output shaft @ 100 RPM *** See page 224 for definitions

V Series Technical Specifications

	Model	V-Series											
	Size	140		160		200		230		260		350	
	Ratios Available	1, 1.5, 2, 3, 4, 5, 6:1											
Ratio	Input Speed (RPM)	Output Torque (Nm)	Power (kW)	Output Torque (Nm)	Power (kW)	Output Torque (Nm)	Power (kW)	Output Torque (Nm)	Power (kW)	Output Torque (Nm)	Power (kW)	Output Torque (Nm)	Power (kW)
1:1	50	220	1.21	380	2.09	750	4.13	1270	7	1750	9.64	4440	24.47
	250	215	5.92	350	9.64	710	19.56	970	26.73	1540	42.44	3440	94.52
	500	208	11.46	330	18.19	620	34.17	820	45.19	1320	72.75	2820	155.41
	750	196	16.2	310	25.63	555	45.88	735	60.76	1170	96.72	2370	195.92
	1000	184	20.28	290	31.96	510	56.21	650	71.65	1050	115.73	1910	210.53
	1500	162	26.78	260	42.99	450	74.4	530	87.63	950	157.07	1620	267.84
	2400	140	37.03	218	57.67	-	-	-	-	-	-	-	-
	3000	120	39.68	-	-	-	-	-	-	-	-	-	-
1.5:1	50	210	0.76	355	1.29	750	2.73	1330	4.89	1700	6.18	4500	16.34
	250	204	3.76	330	6.07	690	12.7	1120	20.57	1490	27.43	3650	67.11
	500	200	7.34	315	11.56	615	22.57	920	33.9	1300	47.72	3070	112.63
	750	190	10.47	295	16.26	550	30.31	825	45.47	1170	64.48	2560	141.42
	1000	175	12.87	280	20.59	505	37.13	765	56.21	1050	77.19	2560	188.55
	1500	155	17.08	252	27.78	437	48.17	655	72.2	950	104.71	1870	206.19
	2400	126	22.22	205	36.15	360	63.49	518	91.35	900	158.72	-	-
	3000	113	24.91	185	40.78	330	72.75	450	99.2	860	189.58	-	-
2:1	50	200	0.55	355	0.98	750	2.07	1330	3.66	1650	4.55	4640	12.79
	250	190	2.62	320	4.41	680	9.7	1225	16.88	1460	20.12	3930	54.15
	500	180	4.96	300	8.27	610	16.81	970	26.73	1280	35.27	3430	94.52
	750	166	6.86	280	11.57	540	22.32	890	36.79	1170	48.36	3130	129.37
	1000	152	8.38	270	14.88	500	27.56	820	45.19	1050	57.87	2820	155.41
	1500	138	11.41	245	20.25	425	35.13	715	59.11	950	78.53	2420	200.06
	2400	111	14.68	193	25.53	342	45.24	605	80.02	850	112.43	-	-
	3000	100	16.53	170	28.11	310	51.25	530	87.63	810	133.92	-	-
3:1	50	180	0.34	305	0.57	690	1.29	870	1.63	1360	2.55	4240	7.79
	250	177	1.62	280	2.56	630	5.76	825	7.58	1220	11.16	3730	34.26
	500	174	3.2	260	4.79	600	11.04	765	14.07	1110	20.43	3230	59.34
	750	167	4.6	250	6.89	580	15.98	700	19.29	1050	28.93	2950	81.29
	1000	160	5.87	245	8.99	555	20.37	635	23.33	990	36.34	2620	96.26
	1500	146	8.05	230	12.68	515	28.38	540	29.76	900	49.6	2220	122.35
	2400	130	11.46	202	17.81	445	39.24	450	39.68	821	72.39	1820	160.48
	3000	110	12.12	190	20.94	420	46.29	400	44.09	780	85.97	-	-
4:1	50	170	0.23	280	0.39	580	0.8	980	1.35	1320	1.82	3030	4.17
	250	162	1.12	270	1.86	550	3.79	870	5.99	1250	8.61	2820	19.43
	500	154	2.12	260	3.58	525	7.23	795	10.95	1180	16.26	2520	34.72
	750	148	3.06	250	5.17	510	10.54	735	15.19	1100	22.73	2320	47.95
	1000	136	3.75	240	6.61	485	13.36	675	18.6	1050	28.93	2110	58.14
	1500	120	4.96	220	9.09	455	18.81	600	24.8	900	37.2	1910	78.95
	2400	111	7.34	200	13.23	400	26.45	495	32.74	780	51.58	1720	113.75
	3000	103	8.51	180	14.88	350	28.93	440	36.37	700	57.87	-	-
5:1	50	150	0.17	290	0.32	525	0.58	990	1.09	1330	1.47	3230	3.56
	250	143	0.79	270	1.49	505	2.78	920	5.07	1290	7.11	2920	16.09
	500	136	1.5	250	2.76	470	5.18	830	9.15	1200	13.23	2420	26.67
	750	130	2.15	240	3.97	440	7.27	770	12.73	1100	18.19	2170	35.88
	1000	124	2.73	225	4.96	420	9.26	715	15.76	990	21.82	1920	42.33
	1500	115	3.8	215	7.11	380	12.57	635	21	880	29.1	1710	56.54
	2400	105	5.56	198	10.48	340	17.99	550	29.1	760	40.21	1490	78.83
	3000	100	6.61	180	11.9	300	19.84	510	33.73	700	46.29	-	-
6:1	50	120	0.11	197	0.18	306	0.28	625	0.57	951	0.87	2120	1.95
	250	121	0.56	199	0.92	311	1.44	610	2.82	940	4.35	2020	9.28
	500	119	1.09	187	1.72	304	2.79	590	5.42	878	8.06	1820	16.72
	750	117	1.61	176	2.43	289	3.98	565	7.78	792	10.91	1760	24.25
	1000	112	2.06	164	3.01	258	4.74	540	9.92	702	12.93	1710	31.41
	1500	107	2.95	143	3.95	237	6.54	490	13.5	594	16.36	1510	41.61
	2400	104	4.58	136	5.98	218	9.6	410	18.08	524	23.12	1290	56.88
	3000	94	5.18	129	7.09	208	11.45	366	20.17	495	27.27	-	-
arcmin	All Ratios	<20		<20		<20		<20		<20		<20	
N	Models B0, C0, D0, G0, H0, J0	3000		5000		8000		15000		22000		34200	
N		1500		2500		4000		7500		11000		17100	
N	Models E0, E0/HSD, K0, K0/HSD	3000		5300		9000		15500		22000		34200	
N		1500		2650		4500		7750		11000		17100	
N	Models A0, M0, F0, or input shafts	1700		2850		5000		11250		17500		34200	
N		850		1425		2500		5625		8750		17100	
Efficiency at Load		94-98%											
Service Life / Housing Material				10,000 hours / Aluminum				15,000 hours / Cast Iron					
Lubrication				Synthetic Oil				Synthetic Oil					

V Series Inertia & Weight: A0, B0, C0, D0, E0N0, E0S5, E0S6

Model		V-Series (mini)*				V-Series					
		035		045		065		090		120	
	Size	1:1		1,2,3,4:1		1, 1.5, 2, 3:1		1, 1.5, 2, 3, 4, 5, 6:1			
Input Speed	Ratios Avail.	Mass Moment of Inertia (kg cm^2)	Weight (g)	Mass Moment of Inertia (kg cm^2)	Weight (g)	Mass Moment of Inertia (kg cm^2)	Weight (kg)	Mass Moment of Inertia (kg cm^2)	Weight (kg)	Mass Moment of Inertia (kg cm^2)	Weight (kg)
A0	1:1	0.0204	230	0.0630	510	0.3888	2.3	2.5590	5.1	10.4976	12.6
	1.5:1	-	-	-	-	0.2406	2.3	1.4822	5.1	4.8409	12.6
	2:1	-	-	0.0340	510	0.1839	2.3	1.1437	5.1	3.6465	12.6
	3:1	-	-	0.0310	510	0.1036	2.3	0.8884	5.1	2.3159	12.6
	4:1	-	-	0.0300	510	-	-	0.3631	5.1	1.2164	12.6
	5:1	-	-	-	-	-	-	0.3248	5.1	0.7516	12.6
	6:1	-	-	-	-	-	-	0.3062	5.1	0.6766	12.6
B0	1:1	0.0219	225	0.1380	500	0.4231	2.2	3.3543	5.4	15.3022	12.3
	1.5:1	-	-			0.3111	2.2	2.1833	5.4	7.4441	12.3
	2:1	-	-	0.0550	500	0.2330	2.2	1.3652	5.4	4.9747	12.3
	3:1	-	-	0.0390	500	0.1001	2.2	1.0465	5.4	3.0123	12.3
	4:1	-	-	0.0350	500	-	-	0.4607	5.4	1.6729	12.3
	5:1	-	-	-	-	-	-	0.3933	5.4	1.0539	12.3
	6:1	-	-	-	-	-	-	0.3502	5.4	0.8982	12.3
C0	1:1	0.0219	225	0.1380	500	0.4231	2.2	3.3543	5.4	15.3022	12.3
	1.5:1	-	-			0.3111	2.2	2.1833	5.4	7.4441	12.3
	2:1	-	-	0.0550	500	0.2330	2.2	1.3652	5.4	4.9747	12.3
	3:1	-	-	0.0390	500	0.1001	2.2	1.0465	5.4	3.0123	12.3
	4:1	-	-	0.0350	500	-	-	0.4607	5.4	1.6729	12.3
	5:1	-	-	-	-	-	-	0.3933	5.4	1.0539	12.3
	6:1	-	-	-	-	-	-	0.3502	5.4	0.8982	12.3
D0	1:1	0.0224	230	0.1400	530	0.4330	2.3	3.3827	5.5	15.5996	12.5
	1.5:1	-	-	-	-	0.3155	2.3	2.1959	5.5	7.5762	12.5
	2:1	-	-	0.0550	530	0.2355	2.3	1.3723	5.5	5.0490	12.5
	3:1	-	-	0.0390	530	0.1012	2.3	1.0496	5.5	3.0453	12.5
	4:1	-	-	0.0350	530	-	-	0.4625	5.5	1.6915	12.5
	5:1	-	-	-	-	-	-	0.3945	5.5	1.0712	12.5
	6:1	-	-	-	-	-	-	0.3510	5.5	0.9065	12.5
E0N0	1:1	0.0149	210	0.1310	460	0.4754	2.1	3.2507	5	15.1939	12
	1.5:1	-	-	-	-	0.3634	2.1	2.1372	5	7.3959	12
	2:1	-	-	0.0550	460	0.2853	2.1	1.3393	5	4.9476	12
	3:1	-	-	0.0390	460	0.1524	2.1	1.0350	5	3.0003	12
	4:1	-	-	0.0350	460	-	-	0.4542	5	1.6661	12
	5:1	-	-	-	-	-	-	0.3892	5	1.0550	12
	6:1	-	-	-	-	-	-	0.3473	5	0.8952	12
E0S5/6	1:1	-	-	-	-	0.6012	2.1	3.9213	5.2	16.9812	12.3
	1.5:1	-	-	-	-	0.4892	2.1	2.4353	5.2	8.1903	12.3
	2:1	-	-	-	-	0.4111	2.1	1.5069	5.2	5.3944	12.3
	3:1	-	-	-	-	0.2782	2.1	1.1095	5.2	3.1988	12.3
	4:1	-	-	-	-	-	-	0.4961	5.2	1.7778	12.3
	5:1	-	-	-	-	-	-	0.4160	5.2	1.1265	12.3
	6:1	-	-	-	-	-	-	0.3660	5.2	0.9449	12.3

NOTE: Some model names have changed **E0** to **E0N0**, **K0** to **K0N0**, **E0/HSD** to **E0S5** or **E0S6**, **K0/HSD** to **K0S5** or **K0S6**.

V Series Inertia & Weight: A0, B0, C0, D0, E0N0, E0S5, E0S6

Model		V-Series											
		140		160		200		230		260		350	
	Size	1, 1.5, 2, 3, 4, 5, 6:1											
Input Speed	Ratios Avail.	Mass Moment of Inertia (kg cm²)	Weight (kg)	Mass Moment of Inertia (kg cm²)	Weight (kg)	Mass Moment of Inertia (kg cm²)	Weight (kg)	Mass Moment of Inertia (kg cm²)	Weight (kg)	Mass Moment of Inertia (kg cm²)	Weight (kg)	Mass Moment of Inertia (kg cm²)	Weight (kg)
A0	1:1	26.2670	19	29.6710	28.5	121.2522	52	Contact GAM	79	814.2000	85	Contact GAM	269
	1.5:1	11.8569	19	19.6374	28.5	57.6950	52	Contact GAM	79	305.9333	85	Contact GAM	269
	2:1	8.6762	19	12.3589	28.5	36.3095	52	Contact GAM	79	194.2750	85	Contact GAM	269
	3:1	6.4356	19	8.9516	28.5	18.8322	52	Contact GAM	79	85.0833	85	Contact GAM	269
	4:1	1.8432	19	6.5358	28.5	14.2651	52	Contact GAM	79	46.7738	85	Contact GAM	269
	5:1	1.5320	19	2.2733	28.5	6.1470	52	Contact GAM	79	37.2840	85	Contact GAM	269
	6:1	1.3708	19	2.0901	28.5	5.3881	52	Contact GAM	79	31.8083	85	Contact GAM	269
B0	1:1	36.0994	18.5	31.5527	28	174.7000	48	Contact GAM	76	827.4400	85	Contact GAM	280
	1.5:1	18.7513	18.5	32.0243	28	103.5829	48	Contact GAM	76	168.2622	85	Contact GAM	280
	2:1	12.2785	18.5	20.1006	28	71.6215	48	Contact GAM	76	281.3350	85	Contact GAM	280
	3:1	7.9547	18.5	12.0803	28	34.1931	48	Contact GAM	76	117.2211	85	Contact GAM	280
	4:1	2.6978	18.5	8.4198	28	22.7181	48	Contact GAM	76	66.6638	85	Contact GAM	280
	5:1	2.2113	18.5	3.6887	28	12.8770	48	Contact GAM	76	50.0136	85	Contact GAM	280
	6:1	1.8426	18.5	2.9407	28	10.0616	48	Contact GAM	76	40.7039	85	Contact GAM	280
C0	1:1	36.0994	18.5	31.5527	28	174.7000	48	Contact GAM	76	827.4400	85	Contact GAM	280
	1.5:1	18.7513	18.5	32.0243	28	103.5829	48	Contact GAM	76	168.2622	85	Contact GAM	280
	2:1	12.2785	18.5	20.1006	28	71.6215	48	Contact GAM	76	281.3350	85	Contact GAM	280
	3:1	7.9547	18.5	12.0803	28	34.1931	48	Contact GAM	76	117.2211	85	Contact GAM	280
	4:1	2.6978	18.5	8.4198	28	22.7181	48	Contact GAM	76	66.6638	85	Contact GAM	280
	5:1	2.2113	18.5	3.6887	28	12.8770	48	Contact GAM	76	50.0136	85	Contact GAM	280
	6:1	1.8426	18.5	2.9407	28	10.0616	48	Contact GAM	76	40.7039	85	Contact GAM	280
D0	1:1	37.0815	19	32.5820	28.5	177.8173	50	Contact GAM	78	841.8500	88	Contact GAM	287
	1.5:1	19.1878	19	32.4818	28.5	104.9684	50	Contact GAM	78	383.5556	88	Contact GAM	287
	2:1	12.5241	19	20.3579	28.5	72.4008	50	Contact GAM	78	284.9375	88	Contact GAM	287
	3:1	8.0639	19	12.1947	28.5	34.5395	50	Contact GAM	78	52.2667	88	Contact GAM	287
	4:1	2.7592	19	8.4841	28.5	22.9130	50	Contact GAM	78	67.5644	88	Contact GAM	287
	5:1	2.2506	19	3.7299	28.5	13.0016	50	Contact GAM	78	50.5900	88	Contact GAM	287
	6:1	1.8698	19	2.9693	28.5	10.1482	50	Contact GAM	78	41.1042	88	Contact GAM	287
E0N0	1:1	32.6630	18	34.3851	27	201.3904	48	Contact GAM	71	828.6900	82	Contact GAM	259
	1.5:1	17.2240	18	33.1416	27	109.0267	48	Contact GAM	71	413.2622	82	Contact GAM	259
	2:1	11.4194	18	20.6658	27	76.4341	48	Contact GAM	71	287.8975	82	Contact GAM	259
	3:1	7.5729	18	12.3315	27	35.2209	48	Contact GAM	71	120.1100	82	Contact GAM	259
	4:1	2.4830	18	8.5611	27	23.3588	48	Contact GAM	71	68.2888	82	Contact GAM	259
	5:1	2.0739	18	3.7791	27	13.8070	48	Contact GAM	71	51.0536	82	Contact GAM	259
	6:1	1.7471	18	3.0048	27	10.7075	48	Contact GAM	71	41.4261	82	Contact GAM	259
E0S5/6	1:1	39.0643	18.7	40.6750	27.5	222.4124	49.3	Contact GAM	72	892.3400	84.9	Contact GAM	264
	1.5:1	20.0691	18.7	35.9371	27.5	118.3707	49.3	Contact GAM	72	441.5511	84.9	Contact GAM	264
	2:1	13.0198	18.7	22.2382	27.5	81.6896	49.3	Contact GAM	72	303.8100	84.9	Contact GAM	264
	3:1	8.2842	18.7	13.0304	27.5	37.5567	49.3	Contact GAM	72	127.1800	84.9	Contact GAM	264
	4:1	2.8831	18.7	8.9542	27.5	24.6726	49.3	Contact GAM	72	72.2656	84.9	Contact GAM	264
	5:1	2.3299	18.7	4.0307	27.5	14.6479	49.3	Contact GAM	72	53.5988	84.9	Contact GAM	264
	6:1	1.9249	18.7	3.1795	27.5	11.2914	49.3	Contact GAM	72	43.1936	84.9	Contact GAM	264

NOTE: Some model names have changed **E0** to **E0N0**, **K0** to **K0N0**, **E0/HSD** to **E0S5** or **E0S6**, **K0/HSD** to **K0S5** or **K0S6**.

Model		V-Series (mini)*				V-Series					
		035		045		065		090		120	
	Size	1:1		1,2,3,4:1		1, 1.5, 2, 3:1		1, 1.5, 2, 3, 4, 5, 6:1			
Input Speed	Ratios Avail.	Mass Moment of Inertia ($kg\ cm^2$)	Weight (g)	Mass Moment of Inertia ($kg\ cm^2$)	Weight (g)	Mass Moment of Inertia ($kg\ cm^2$)	Weight (kg)	Mass Moment of Inertia ($kg\ cm^2$)	Weight (kg)	Mass Moment of Inertia ($kg\ cm^2$)	Weight (kg)
F0	1:1	0.0306	290	0.0630	700	0.5832	2.7	3.8385	6.3	15.7464	15
	1.5:1	-	-			0.3270	2.7	2.0508	6.3	7.1737	15
	2:1	-	-	0.0340	700	0.2325	2.7	1.4636	6.3	4.9587	15
	3:1	-	-	0.0310	700	0.1252	2.7	1.0305	6.3	2.8991	15
	4:1	-	-	0.0300	700	-	-	0.4430	6.3	1.5444	15
	5:1	-	-	-	-	-	-	0.3760	6.3	0.9615	15
	6:1	-	-	-	-	-	-	0.3418	6.3	0.8224	15
G0	1:1	0.0321	285	0.0210	660	0.6175	2.6	4.6338	6.9	20.5510	14.7
	1.5:1	-	-	-	-	0.4653	2.6	3.0968	6.9	9.9522	14.7
	2:1	-	-	0.0870	660	0.3683	2.6	2.1890	6.9	7.3090	14.7
	3:1	-	-	0.0700	660	0.1821	2.6	1.7927	6.9	4.7450	14.7
	4:1	-	-	0.0660	660	-	-	0.7438	6.9	2.5612	14.7
	5:1	-	-	-	-	-	-	0.6669	6.9	1.6009	14.7
	6:1	-	-	-	-	-	-	0.6206	6.9	1.4290	14.7
H0	1:1	0.0321	285	0.0210	660	0.6175	2.6	4.6338	6.9	20.5510	14.7
	1.5:1	-	-	-	-	0.4653	2.6	3.0968	6.9	9.9522	14.7
	2:1	-	-	0.0870	660	0.3683	2.6	2.1890	6.9	7.3090	14.7
	3:1	-	-	0.0700	660	0.1821	2.6	1.7927	6.9	4.7450	14.7
	4:1	-	-	0.0660	660	-	-	0.7438	6.9	2.5612	14.7
	5:1	-	-	-	-	-	-	0.6669	6.9	1.6009	14.7
	6:1	-	-	-	-	-	-	0.6206	6.9	1.4290	14.7
J0	1:1	.0326	290	0.2030	690	0.6274	2.7	4.6622	7	20.8484	14.9
	1.5:1	-	-	-	-	0.4697	2.7	3.1094	7	10.0843	14.9
	2:1	-	-	0.0880	690	0.3708	2.7	2.1961	7	7.3833	14.9
	3:1	-	-	0.0700	690	0.1832	2.7	1.7958	7	4.7780	14.9
	4:1	-	-	0.0660	690	-	-	0.7456	7	2.5798	14.9
	5:1	-	-	-	-	-	-	0.6681	7	1.6128	14.9
	6:1	-	-	-	-	-	-	0.6217	7	1.4373	14.9
K0N0	1:1	0.0251	270	0.1940	620	0.6698	2.5	4.5302	6.5	20.4427	14.4
	1.5:1	-	-	-	-	0.5176	2.5	3.0507	6.5	9.9040	14.4
	2:1	-	-	0.0860	620	0.4206	2.5	2.1631	6.5	7.2819	14.4
	3:1	-	-	0.0690	620	0.2344	2.5	1.7812	6.5	4.7330	14.4
	4:1	-	-	.0650	620	-	-	0.7373	6.5	2.5544	14.4
	5:1	-	-	-	-	-	-	0.6628	6.5	1.5966	14.4
	6:1	-	-	-	-	-	-	0.6180	6.5	1.4260	14.4
K0S5/6	1:1	-	-	-	-	0.7956	2.5	5.2008	6.7	22.2300	14.7
	1.5:1	-	-	-	-	0.6434	2.5	3.3488	6.7	10.6984	14.7
	2:1	-	-	-	-	0.5464	2.5	2.3307	6.7	7.7287	14.7
	3:1	-	-	-	-	0.3602	2.5	1.8557	6.7	4.9315	14.7
	4:1	-	-	-	-	-	-	0.7792	6.7	2.6661	14.7
	5:1	-	-	-	-	-	-	0.6896	6.7	1.6681	14.7
	6:1	-	-	-	-	-	-	0.6367	6.7	1.4757	14.7

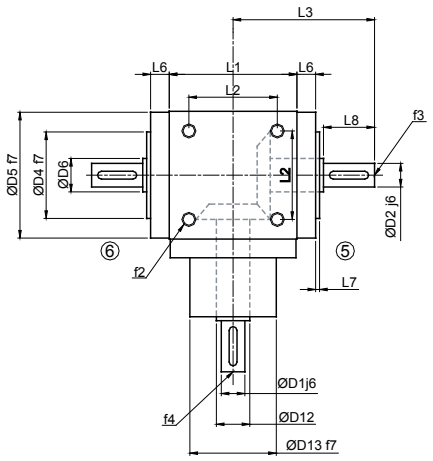
NOTE: Some model names have changed **E0** to **E0N0**, **K0** to **K0N0**, **E0/HSD** to **E0S5** or **E0S6**, **K0/HSD** to **K0S5** or **K0S6**.

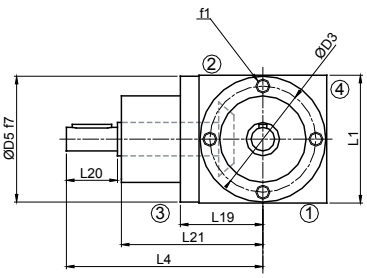
V Series Inertia & Weight: F0, G0, H, J0, K0N0, K0S5, K0S6

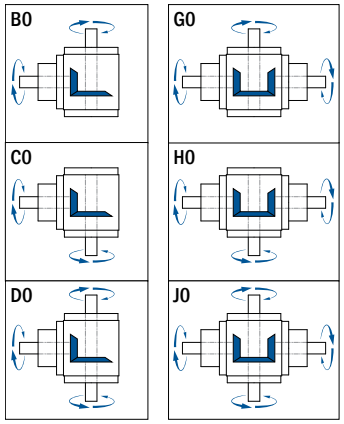
Model		V-Series											
		140		160		200		230		260		350	
	Size	1, 1.5, 2, 3, 4, 5, 6:1											
Input Speed	Ratios Avail.	Mass Moment of Inertia (kg cm²)	Weight (kg)	Mass Moment of Inertia (kg cm²)	Weight (kg)	Mass Moment of Inertia (kg cm²)	Weight (kg)	Mass Moment of Inertia (kg cm²)	Weight (kg)	Mass Moment of Inertia kg cm²	Weight (kg)	Mass Moment of Inertia (kg cm²)	Weight (kg)
F0	1:1	39.4005	23	44.5065	35	181.8783	60	Contact GAM	97	1221.3000	105	Contact GAM	340
	1.5:1	17.6940	23	26.2309	35	84.6400	60	Contact GAM	97	486.8667	105	Contact GAM	340
	2:1	11.9596	23	16.0678	35	51.4661	60	Contact GAM	97	296.0500	105	Contact GAM	340
	3:1	7.8949	23	10.6000	35	25.5685	60	Contact GAM	97	130.3167	105	Contact GAM	340
	4:1	2.6641	23	7.3620	35	18.0543	60	Contact GAM	97	72.2175	105	Contact GAM	340
	5:1	2.0574	23	2.8667	35	8.5721	60	Contact GAM	97	53.5680	105	Contact GAM	340
	6:1	1.7356	23	2.5022	35	7.0721	60	Contact GAM	97	43.1167	105	Contact GAM	340
G0	1:1	49.2329	22.7	46.3882	34.5	235.3261	58	Contact GAM	100	1234.5400	109	Contact GAM	372
	1.5:1	24.7711	22.7	45.0681	34.5	134.3330	58	Contact GAM	100	293.2622	109	Contact GAM	372
	2:1	17.6713	22.7	28.2506	34.5	92.7745	58	Contact GAM	100	373.8350	109	Contact GAM	372
	3:1	12.9310	22.7	19.3835	34.5	46.2891	58	Contact GAM	100	157.0711	109	Contact GAM	372
	4:1	3.7202	22.7	13.9274	34.5	33.1941	58	Contact GAM	100	87.9938	109	Contact GAM	372
	5:1	3.2180	22.7	5.3686	34.5	16.5990	58	Contact GAM	100	71.0136	109	Contact GAM	372
	6:1	2.8486	22.7	4.6187	34.5	13.7656	58	Contact GAM	100	61.2039	109	Contact GAM	372
H0	1:1	49.2329	22.7	46.3882	34.5	235.3261	58	Contact GAM	100	1234.5400	109	Contact GAM	372
	1.5:1	24.7711	22.7	45.0681	34.5	134.3330	58	Contact GAM	100	293.2622	109	Contact GAM	372
	2:1	17.6713	22.7	28.2506	34.5	92.7745	58	Contact GAM	100	373.8350	109	Contact GAM	372
	3:1	12.9310	22.7	19.3835	34.5	46.2891	58	Contact GAM	100	157.0711	109	Contact GAM	372
	4:1	3.7202	22.7	13.9274	34.5	33.1941	58	Contact GAM	100	87.9938	109	Contact GAM	372
	5:1	3.2180	22.7	5.3686	34.5	16.5990	58	Contact GAM	100	71.0136	109	Contact GAM	372
	6:1	2.8486	22.7	4.6187	34.5	13.7656	58	Contact GAM	100	61.2039	109	Contact GAM	372
J0	1:1	50.2150	23.2	47.4175	35	238.4434	60	Contact GAM	102	1248.9500	112	Contact GAM	379
	1.5:1	25.2076	23.2	45.5256	35	135.7185	60	Contact GAM	102	508.5556	112	Contact GAM	379
	2:1	17.9169	23.2	29.0079	35	93.5538	60	Contact GAM	102	377.4375	112	Contact GAM	379
	3:1	13.0402	23.2	19.4979	35	46.6355	60	Contact GAM	102	92.1167	112	Contact GAM	379
	4:1	3.7816	23.2	13.9917	35	33.3890	60	Contact GAM	102	88.8944	112	Contact GAM	379
	5:1	3.2573	23.2	5.4098	35	16.7236	60	Contact GAM	102	71.5900	112	Contact GAM	379
	6:1	2.8758	23.2	4.6473	35	13.8522	60	Contact GAM	102	61.6042	112	Contact GAM	379
K0	1:1	45.7965	22.2	49.2206	34	262.0165	58	Contact GAM	95	1235.7900	106	Contact GAM	351
	1.5:1	23.2438	22.2	46.1854	34	139.7777	58	Contact GAM	95	538.2622	106	Contact GAM	351
	2:1	16.8122	22.2	29.3158	34	97.5871	58	Contact GAM	95	380.3975	106	Contact GAM	351
	3:1	12.5492	22.2	19.6347	34	47.3169	58	Contact GAM	95	159.9600	106	Contact GAM	351
	4:1	3.5054	22.2	14.0687	34	33.8348	58	Contact GAM	95	89.6188	106	Contact GAM	351
	5:1	3.0806	22.2	5.4590	34	17.5290	58	Contact GAM	95	72.0536	106	Contact GAM	351
	6:1	2.7531	22.2	4.6828	34	14.4115	58	Contact GAM	95	61.9261	106	Contact GAM	351
K0/HSD	1:1	52.1978	22.9	55.5105	34.5	283.0385	59.3	Contact GAM	96	1299.4400	108.9	Contact GAM	356
	1.5:1	26.0089	22.9	48.9809	34.5	149.1208	59.3	Contact GAM	96	566.5511	108.9	Contact GAM	356
	2:1	18.4126	22.9	30.8882	34.5	102.8426	59.3	Contact GAM	96	396.3100	108.9	Contact GAM	356
	3:1	13.2605	22.9	20.3336	34.5	49.6527	59.3	Contact GAM	96	167.0300	108.9	Contact GAM	356
	4:1	3.9055	22.9	14.4618	34.5	35.1486	59.3	Contact GAM	96	93.5956	108.9	Contact GAM	356
	5:1	3.3366	22.9	5.7106	34.5	18.3699	59.3	Contact GAM	96	74.5988	108.9	Contact GAM	356
	6:1	2.9309	22.9	4.8575	34.5	14.9954	59.3	Contact GAM	96	63.6936	108.9	Contact GAM	356

NOTE: Some model names have changed **E0** to **E0N0**, **K0** to **K0N0**, **E0/HSD** to **E0S5** or **E0S6**, **K0/HSD** to **K0S5** or **K0S6**.

V Series Dimensions: B0, C0, D0, G0, H0, J0 / A0, F0

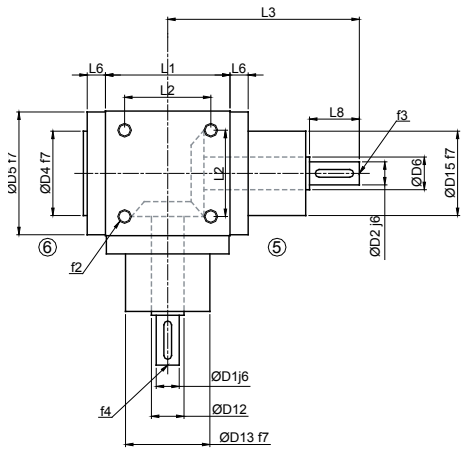


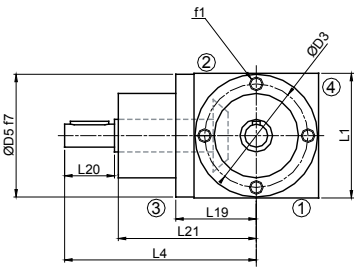


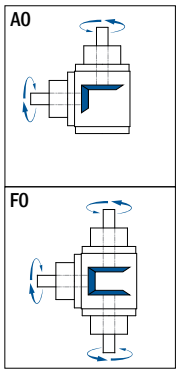


	Dimension	Model	V-Series (mini)*					V-Series											
		Description	035	045				065				090				120			
			mm	mm				mm				mm				mm			
Major Dimensions (Applies to all models)	D3	Bolt Circle	29	39				54				75				100			
	D4 f7	Small Pilot Diameter	22	32				44				60				80			
	D5 f7	Pilot Diameter	35	45				64				89				119			
	f2	Housing Thread	M3x8	M4x8				M6x12				M8x14				M10x16			
	L1	Housing Size	35	45				65				90				120			
	L2	Housing Bolt Location	25	30				45				70				100			
	L19	Centerline to Input Pilot	23	30.5				42				55				75			
Input Dimensions that change based on ratio	-	Ratio	1:1	1:1 - 2:1	3:1	4:1	5:1 - 6:1	1:1 - 2:1	3:1	4:1	5:1 - 6:1	1:1 - 2:1	3:1	4:1	5:1 - 6:1	1:1 - 2:1	3:1	4:1	5:1 - 6:1
	D1 j6	Input Shaft Diameter	6	10	10	10	-	12	12	-	-	18	12	12	12	25	20	20	15
	-	Input Shaft Key Width	2	3	3	3	-	4	4	-	-	6	4	4	4	8	6	6	5
	-	Input Shaft Key Length	10	18	18	18	-	20	20	-	-	28	28	28	28	36	36	36	28
	-	Input Shaft Key Height	0.9	1.2	1.2	1.2	-	1.5	1.5			2.5	1.5	1.5	1.5	3	2.5	2.5	2
	D12	Input Step Diameter	10	15	15	15	-	17	17	-	-	25	20	20	20	30	25	25	20
	D13 f7	Input Hub Pilot Diameter	22	32	32	32	-	44	44	-	-	60	60	60	60	80	80	80	70
	f4	Input Shaft Thread (DIN 332)	M3	M3	M3	M3	-	M4	M4	-	-	M6	M4	M4	M4	M10	M6	M6	M5
	L4	Centerline to End of Input Shaft	59	78	78	78	-	100	100	-	-	122	122	132	132	162	162	172	162
	L20	Input Shaft Length	15	23	23	23	-	26	26	-	-	35	35	35	35	45	45	45	35
	L21	Centerline to Input Hub	43	53	53	53	-	72	72	-	-	85	85	95	95	115	115	125	125
Applies to models B0, C0, D0, G0, H0, J0	D2 j6	Output Shaft Diameter	6	10				12				18				25			
	-	Output Shaft Key Width	2	3				4				6				8			
	-	Output Shaft Key Length	10	18				20				28				36			
	-	Output Shaft Key Height	0.9	1.2				1.5				2.5				3			
	D6	Output Step Diameter	10	15				17				30				35			
	f1	Output Flange Thread	M3x5	M4x8				M6x9.5				M8x10				M10x12			
	f3	Output Shaft Thread (DIN 332)	M3	M3				M4				M6				M10			
	L3	Output Shaft to Centerline	40	57.5				72				95				122			
	L6	Pilot Height	5.5	8				9.5				10				12			
	L7	Small Pilot Height	1.5	2				2				2				3			
	L8	Output Shaft Length	15	23				26				35				45			
Applies to models A0, F0	D2 j6	Output Shaft Diameter	6	10				12				18				25			
	-	Output Shaft Key Width	2	3				4				6				8			
	-	Output Shaft Key Length	10	18				20				28				36			
	-	Output Shaft Key Height	0.9	1.2				1.5				2.5				3			
	D6	Output Step Diameter	10	15				17				30				30			
	D15 f7	Output Hub Pilot Diameter	22	32				44				60				80			
	f1	Output Flange Thread	M3x5	M4x8				M6x9.5				M8x10				M10x15			
	f3	Output Shaft Thread (DIN 332)	M3	M3				M4				M6				M10			
	L3	Output Shaft to Centerline	59	78				100				122				162			
	L6	Pilot Height	5.5	8				9.5				10				15			
	L8	Output Shaft Length	15	23				26				35				45			

V Series Dimensions: B0, C0, D0, G0, H0, J0 / A0, F0



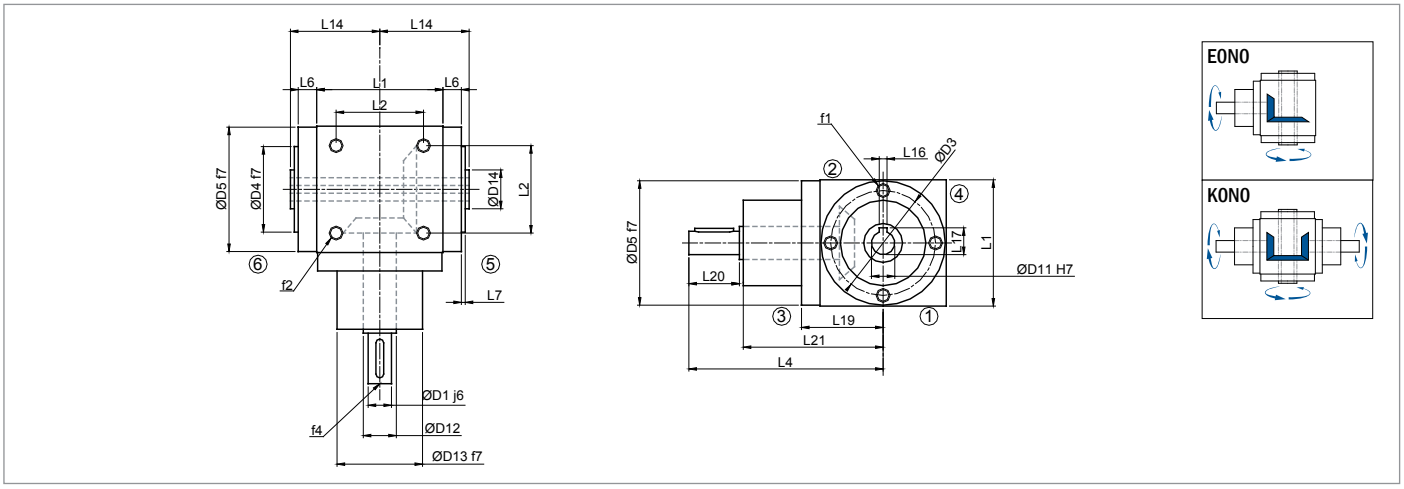




	Dimension	V-Series																							
		140				160				200				230				260				350			
		mm				mm				mm				mm				mm				mm			
Major Dimensions (Applies to all models)	D3	115				135				175				200				230				305*			
	D4 f7	90				110				120				150				160				250			
	D5 f7	135				159				199				225				255				345			
	f2	M10x20				M12x24				M12x24				M16x20				M16x32				M20x26**			
	L1	140				160				200				230				260				350			
	L2	110				120				160				180				220				285			
	L19	85				95				120				135				150				198			
Input Dimensions that change based on ratio	-	1:1 - 2:1	3:1	4:1	5:1 - 6:1	1:1 - 2:1	3:1	4:1	5:1 - 6:1	1:1 - 2:1	3:1	4:1	5:1 - 6:1	1:1 - 2:1	3:1	4:1	5:1 - 6:1	1:1 - 2:1	3:1	4:1	5:1 - 6:1	1:1 - 2:1	3:1	4:1	5:1 - 6:1
	D1 j6	32	28	24	24	35	28	24	24	42	35	35	28	55	40	40	35	60	45	45	45	80	65	65	55
	-	10	8	8	8	10	8	8	8	12	10	10	8	16	12	12	10	18	14	14	14	22	18	18	16
	-	45	45	45	45	50	50	50	50	70	63	63	63	80	70	70	63	100	80	80	80	160	125	125	90
	-	3	3	3	3	3	3	3	3	3	3	3	3	2.5	3	3	3	4	3.5	3.5	3.5	5	4	4	4
	D12	40	40	40	40	40	40	40	40	55	40	40	30	60	50	50	45	65	65	65	65	90	90	90	72
	D13 f7	90	90	85	85	110	100	100	100	120	120	120	110	150	140	140	140	160	160	160	160	250	250	250	250
	f4	M12	M10	M8	M8	M12	M10	M8	M8	M16	M12	M12	M10	M20	M16	M16	M16	M20	M16	M16	M16	M20	M20	M20	M20
	L4	180	180	195	195	212	212	232	232	273	261	261	261	305	310	310	300	380	360	360	360	570	540	540	510
	L20	50	50	50	50	60	60	60	60	80	68	68	68	90	80	80	70	110	90	90	90	170	140	140	110
	L21	128	128	143	143	150	150	170	170	190	190	190	190	213	228	228	228	265	265	265	265	395	395	395	395
Applies to models B0, C0, D0, G0, H0, J0	D2 j6	32				35				42				55				60				80			
	-	10				10				12				16				18				22			
	-	45				50				70				80				100				160			
	-	3				3				3				4				4				5			
	D6	50				40				55				60				65				90			
	f1	M10x12				M12x15				M12x17				M16x17				M16x20				M20x30			
	f3	M12				M12				M16				M20				M20				M20			
	L3	137				160				203				230				268				410			
	L6	12				15				17				17				20				30			
	L7	3				3				3				4				4				20			
	L8	50				60				80				90				110				170			
Applies to models A0, F0	D2 j6	32				35				42				55				60				80			
	-	10				10				12				16				18				22			
	-	45				50				70				80				100				160			
	-	3				3				3				4				4				5			
	D6	40				40				55				60				65				90			
	D15 f7	90				110				120				150				160				250			
	f1	M10x15				M12x15				M12x20				M16x20				M16x20				-			
	f3	M12				M12				M16				M20				M20				M20			
	L3	180				212				273				305				380				570			
	L6	15				15				20				20				20				23			
	L8	50				60				80				90				110				170			

*Does not apply to A0, F0 **All 6 sides of the housing

V Series Dimensions: EONO, EOS5, EOS6 KONO, KOS5, KOS6

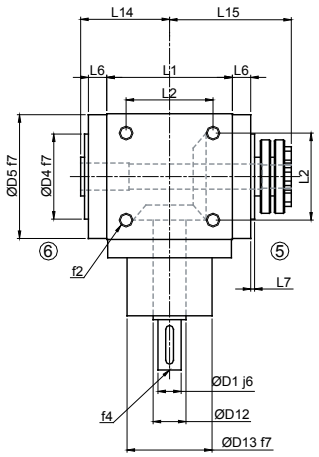


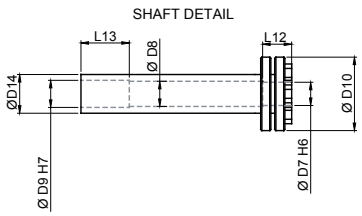
	Dimension	Model	V-Series (mini)*					V-Series											
		Description	035	045				065				090				120			
			mm	mm				mm				mm				mm			
Major Dimensions (Applies to all models)	D3	Bolt Circle	29	39				54				75				100			
	D4 f7	Small Pilot Diameter	22	32				44				60				80			
	D5 f7	Pilot Diameter	35	45				64				89				119			
	f2	Housing Thread	M3x8	M4x8				M6x12				M8x14				M10x16			
	L1	Housing Size	35	45				65				90				120			
	L2	Housing Bolt Location	25	30				45				70				100			
	L19	Centerline to Input Pilot	23	30.5				42				55				75			
Input Dimensions that change based on ratio	-	Ratio	1:1	1:1 - 2:1	3:1	4:1	5:1 - 6:1	1:1 - 2:1	3:1	4:1	5:1 - 6:1	1:1 - 2:1	3:1	4:1	5:1 - 6:1	1:1 - 2:1	3:1	4:1	5:1 - 6:1
	D1 j6	Input Shaft Diameter	6	10	10	10	-	12	12	-	-	18	12	12	12	25	20	20	15
	-	Input Shaft Key Width	2	3	3	3	-	4	4	-	-	6	4	4	4	8	6	6	5
	-	Input Shaft Key Length	10	18	18	18	-	20	20	-	-	28	28	28	28	36	36	36	28
	-	Input Shaft Key Height	0.9	1.2	1.2	1.2	-	1.5	1.5			2.5	1.5	1.5	1.5	3	2.5	2.5	2
	D12	Input Step Diameter	10	15	15	15	-	17	17	-	-	25	20	20	20	30	25	25	20
	D13 f7	Input Hub Pilot Diameter	22	32	32	32	-	44	44	-	-	60	60	60	60	80	80	80	70
	f4	Input Shaft Thread (DIN 332)	M3	M3	M3	M3	-	M4	M4	-	-	M6	M4	M4	M4	M10	M6	M6	M5
	L4	Centerline to End of Input Shaft	59	78	78	78	-	100	100	-	-	122	122	132	132	162	162	172	162
	L20	Input Shaft Length	15	23	23	23	-	26	26	-	-	35	35	35	35	45	45	45	35
	L21	Centerline to Input Hub	43	53	53	53	-	72	72	-	-	85	85	95	95	115	115	125	125
Applies to models EONO and KONO	D11 H7	Hollow Shaft Diameter	6	10				12				18				25			
	D14	Extended Shaft Diameter	10	15				20				30				40			
	f1	Output Flange Thread	M3x5	M4x8				M6x9.5				M8x10				M10x12			
	L6	Pilot Height	5.5	8				9.5				10				12			
	L7	Small Pilot Height	1.5	2				2				2				3			
	L14	Hollow Shaft to Centerline	26.5	34.5				46				62				80			
	L16 JS9	Hollow Shaft Key Width	2	3				4				6				8			
	L17	Hollow Shaft Height with Keyway	7	11.4				13.8				20.8				28.3			
Applies to models EOS5/6, KOS5/6	D7 H6 **	Smooth Hollow Shaft Diameter 1	-	-				12				18				25			
	D8	Opened up inner Diameter	-	-				13				19				26			
	D9 H7 ***	Smooth Hollow Shaft Diameter 2	-	-				14				20				27			
	D10	Shrink Disc OD	-	-				38				50				60			
	D14	Extended Shaft Diameter	-	-				20				30				40			
	f1	Output Flange Thread	-	-				M6x9.5				M8x10				M10x12			
	L6	Pilot Height	-	-				9.5				10				12			
	L7	Small Pilot Height	-	-				2				2				3			
	L12	Stub Shaft Length	-	-				15				18				22			
	L13	Hollow Bore 1 Depth 1	-	-				25				28				32			
	L14	Hollow Shaft to Centerline	-	-				46				62				80			
	L15	Shrink Disc to Centerline	-	-				63				87				107			

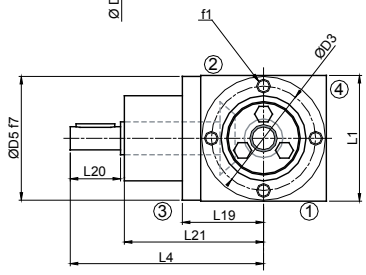
NOTE: Some model names have changed **E0** to **EONO**, **K0** to **KONO**, **E0/HSD** to **EOS5** or **EOS6**, **K0/HSD** to **KOS5** or **KOS6**.

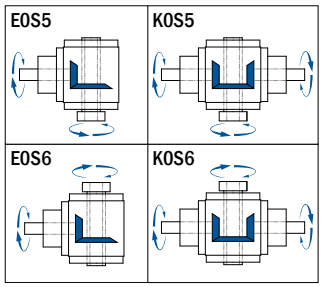
*Formerly L-Series **Mating shaft should have j6 tolerance ***Mating shaft should have h6 tolerance

V Series Dimensions: EONO, EOS5, EOS6 KONO, KOS5, KOS6









	Dimension	V-Series																							
		140				160				200				230				260				350			
		mm				mm				mm				mm				mm				mm			
Major Dimensions (Applies to all models)	D3	115				135				175				200				230				305*			
	D4 f7	90				110				120				150				160				250			
	D5 f7	135				159				199				225				255				345			
	f2	M10x20				M12x24				M12x24				M16x20				M16x32				M20x26**			
	L1	140				160				200				230				260				350			
	L2	110				120				160				180				220				285			
	L19	85				95				120				135				150				198			
Input Dimensions that change based on ratio	-	1:1 - 2:1	3:1	4:1	5:1 - 6:1	1:1 - 2:1	3:1	4:1	5:1 - 6:1	1:1 - 2:1	3:1	4:1	5:1 - 6:1	1:1 - 2:1	3:1	4:1	5:1 - 6:1	1:1 - 2:1	3:1	4:1	5:1 - 6:1	1:1 - 2:1	3:1	4:1	5:1 - 6:1
	D1 j6	32	28	24	24	35	28	24	24	42	35	35	28	55	40	40	35	60	45	45	45	80	65	65	55
	-	10	8	8	8	10	8	8	8	12	10	10	8	16	12	12	10	18	14	14	14	22	18	18	16
	-	45	45	45	45	50	50	50	50	70	63	63	63	80	70	70	63	100	80	80	80	160	125	125	90
	-	3	3	3	3	3	3	3	3	3	3	3	3	2.5	3	3	3	4	3.5	3.5	3.5	5	4	4	4
	D12	40	40	40	40	40	40	40	40	55	40	40	30	60	50	50	45	65	65	65	65	90	90	90	72
	D13 f7	90	90	85	85	110	100	100	100	120	120	120	110	150	140	140	140	160	160	160	160	250	250	250	250
	f4	M12	M10	M8	M8	M12	M10	M8	M8	M16	M12	M12	M10	M20	M16	M16	M16	M20	M16	M16	M16	M20	M20	M20	M20
	L4	180	180	195	195	212	212	232	232	273	261	261	261	305	310	310	300	380	360	360	360	570	540	540	510
	L20	50	50	50	50	60	60	60	60	80	68	68	68	90	80	80	70	110	90	90	90	170	140	140	110
	L21	128	128	143	143	150	150	170	170	190	190	190	190	213	228	228	228	265	265	265	265	395	395	395	395
Applies to models E0 and K0	D11 H7	32				35				42				55				60				80			
	D14	50				55				70				80				80				105			
	f1	M10x12				M12x15				M12x17				M16x17				M16x20				M20x30			
	L6	12				15				17				17				20				30			
	L7	3				3				3				4				4				20			
	L14	90				103				125				142.5				160				240			
	L16 JS9	10				10				12				16				18				22			
	L17	35.3				38.3				45.3				59.3				64.4				85.4			
Applies to models E0/HSD5, K0/HSD5	D7 H6**	32				35				42				55				60				80			
	D8	33				36				43				56				61				81			
	D9 H7***	34				37				44				57				62				82			
	D10	80				80				100				138				138				170			
	D14	50				55				70				80				80				105			
	f1	M10x12				M12x15				M12x17				M16x17				M16x20				M20x30			
	L6	12				15				17				17				20				30			
	L7	3				3				3				4				4				20			
	L12	25				25				35				40				40				45			
	L13	40				40				55				60				60				65			
	L14	90				103				125				142.5				160				240			
	L15	122				135				162				182.5				200				293			

NOTE: Some model names have changed **E0** to **E0NO**, **K0** to **K0NO**, **E0/HSD** to **E0S5** or **E0S6**, **K0/HSD** to **K0S5** or **K0S6**.

w** **Mating shaft should have j6 tolerance** *** **Mating shaft should have h6 tolerance**

V Series Type Code

TYPE CODES FOR V SERIES

Example: V - 090 - 001 - C0 - 9.9 - M0000-H0000-C0000

Gearbox Series
V - Spiral Bevel

Gearbox Size
035, 045, 065, 090, 120, 140, 160, 200, 230, 260, 350

Ratio
1, 1.5, 2, 3, 4, 5, 6:1
Varies by size, see **Table 1a**

Gearbox Model (Output Configuration)
A0, B0, C0, D0, E0N0, E0S5, E0S6, F0, G0, H0, J0, K0N0, K0S5, K0S6, M0
Varies by size, see **Table 1b**

Mounting Side
Standard: 9 (tapped holes on all sides)
Available: 1, 2, 3, 4, 5, 6

Mounting Configuration
1, 2, 3, 4, 5, 6
9 (universal mounting, no breather)

Motor Code
Assigned by GAM

Output Code
Assigned by GAM

Configuration Code
Assigned by GAM

Table 1a: Available Ratios

Ratio	Frame Size										
	035	045	065	090	120	140	160	200	230	260	350
1:1	x	x	x	x	x	x	x	x	x	x	x
1.5:1			x	x	x	x	x	x	x	x	x
2:1		x	x	x	x	x	x	x	x	x	x
3:1		x	x	x	x	x	x	x	x	x	x
4:1		x		x	x	x	x	x	x	x	x
5:1				x	x	x	x	x	x	x	x
6:1				x	x	x	x	x	x	x	x

Table 1b: Available Models

Output Type	Frame Size	
	035/045	065 to 350
Shaft	A0, B0, C0, D0, F0, G0, H0	
Keyed Hollow	E0N0, K0N0	
Smooth Hollow with Shrink Disk		E0S5, E0S6, K0S5, K0S6

Table 2: Nominal Input Speed Limits

A breather may be required for applications with nominal input speeds (n1) greater than those listed in this table. If a breather is required, please specify the mounting configuration (see Table 3) and the breather location (see Table 4).

Duty Cycle	Speed (RPM)	Frame Size										
		035*	045*	065	090	120	140	160	200	230	260	350
S1	Breather may be required for Nominal Input Speed	-	-	>2200	>1500	>1100	>900	>800	>600	>500	>400	>400
S5	Breather may be required for Nominal Input Speed	-	-	>3000	>2200	>1700	>1400	>1200	>900	>700	>700	>500

* Size 035 and 045 do not require a breather at any speed.

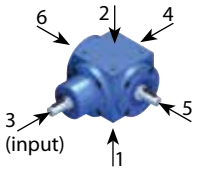
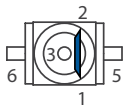
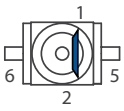
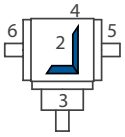
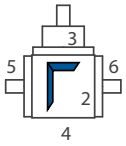
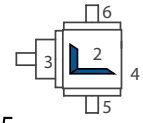
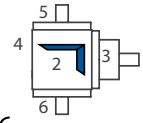


Table 3: Mounting Configuration

Gearbox supplied with universal mounting configuration, including tapped holes on all sides. If speeds exceed [maximum] per Table 2, the mounting configuration may be required. Contact GAM for assistance.

UP (for all views)

Mounting 1: Side 1 Down	Mounting 2: Side 2 Down	Mounting 3: Side 3 Down	Mounting 4: Side 4 Down	Mounting 5: Side 5 Down	Mounting 6: Side 6 Down	Mounting 9: Any Side Down
 1	 2	 3	 4	 5	 6	Universal Mounting *(not available with breather)* 9

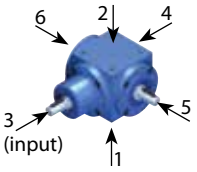
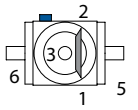
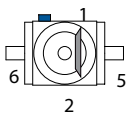
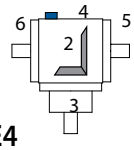
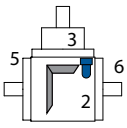
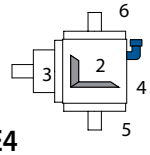
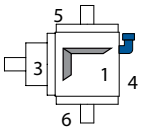
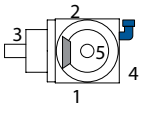
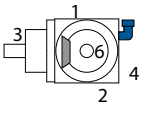
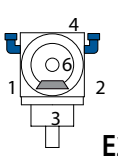
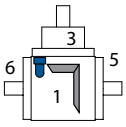
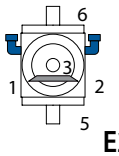
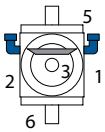
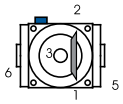
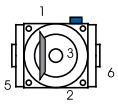
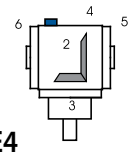
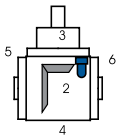
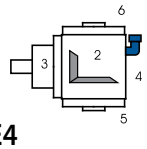
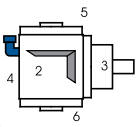
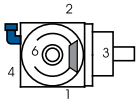
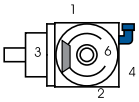
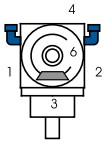
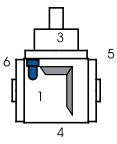
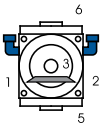
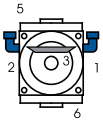


Table 4: Breather Location

Applications with input speeds greater than [maximum] speed per Table 1 may require a breather. Contact GAM for assistance.

UP (for all views)

	Mounting 1: Side 1 Down	Mounting 2: Side 2 Down	Mounting 3: Side 3 Down	Mounting 4: Side 4 Down	Mounting 5: Side 5 Down	Mounting 6: Side 6 Down
Shaft Output	 E2	 E1	 E4	 E2	 E4	 E4
	 E4	 E4	 E1 E2	 E1	 E1 E2	 E1 E2
Hollow Output	 E2	 E1	 E4	 E2	 E4	 E4
	 E4	 E4	 E1 E2	 E1	 E1 E2	 E1 E2

VC Series Bevel Gearbox with Motor Mount

GAM can.

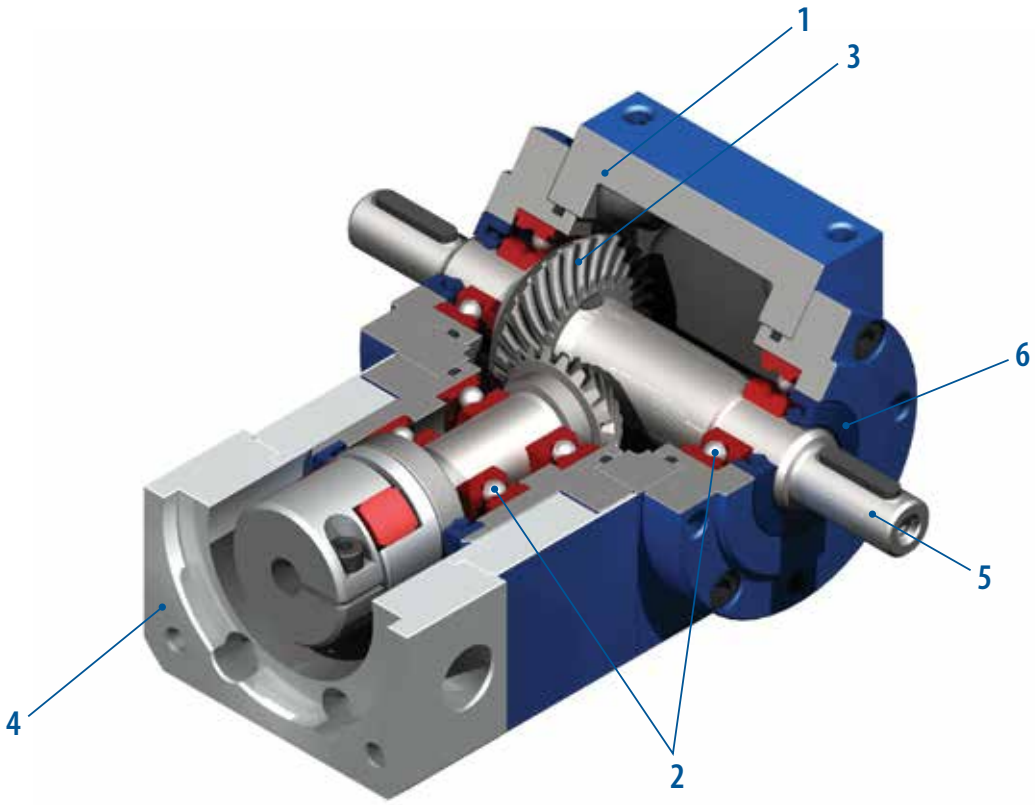
If you don't see exactly what you need, let us know. We can modify the VC Series gearboxes to meet your needs. Page 5 provides examples of GAM capabilities.

GAM VC Series Spiral Bevel Gearboxes

VC Series spiral bevel gearboxes have the same features as the V Series with the addition of an integrated motor mount. The durable, robust construction is designed for dynamic motion control applications.

Features

- 4 output styles in 8 sizes
- High efficiencies 94-98%
- Lubricated for life with synthetic oil
- Includes motor mount customized to your servo motor
- Ratios 1:1 to 100:1 (varies by size)

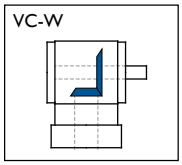


1. Housing
   Sturdy cast iron housing (Aluminum in size 35 mm and 45 mm) - all 6 sides can be used for mounting
2. Bearings
   Deep groove ball bearings handle axial and radial loading. (Reinforced and taper roller options available)
3. Spiral Bevel Gearing
   Precision cut, hardened, and lapped in pairs for ideal tooth contact. Mathematically precise ratios from 1:1 to 6:1
4. Input
   Available with shaft input or integrated motor adapter and coupling to easily mount to any IEC, NEMA, or servo motor
5. Output
   Solid shaft with key or keyed hollow shaft are standard. (Smooth shaft or shrink disc clamping available)
6. Seals
   Lubricated for life and protected with high quality NBR seals. (Viton® and FPM seals available)

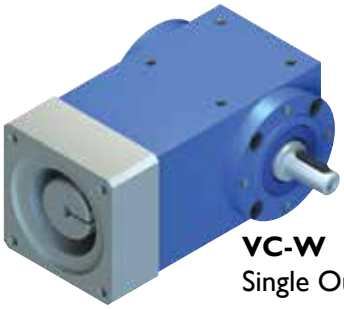
VC Series Configurations

VC Series
- Sizes 35 to 200 mm
- Ratios 1:1 to 6:1 (varies by size)

VC Series (High Ratio)
- Sizes 90 to 140 mm
- Ratios 7:1 to 100:1
- 2-stage with GAM EPL input stage

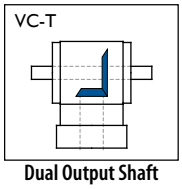


Single Output Shaft

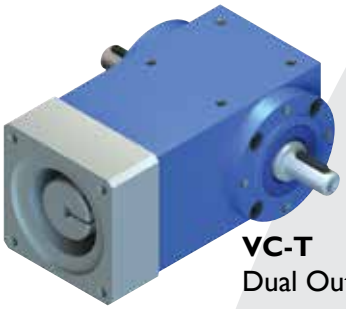


VC-W
Single Output Shaft

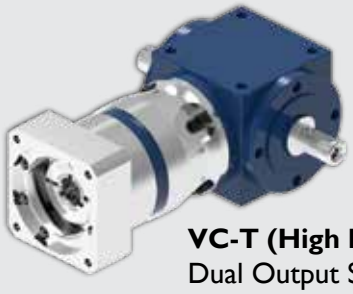
VC-W (High Ratio)
Single Output Shaft



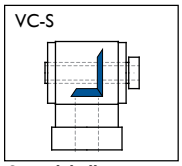
Dual Output Shaft



VC-T
Dual Output Shaft



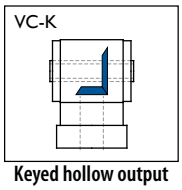
VC-T (High Ratio)
Dual Output Shaft



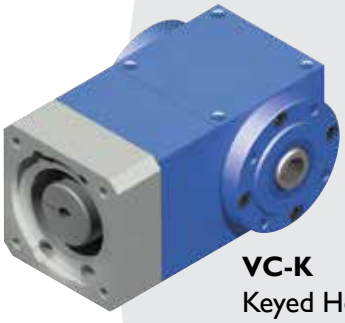
Smooth hollow output with zero backlash shrink disc

VC-S
Smooth Hollow Output
with zero-backlash shrink disk

VC-S (High Ratio)
Smooth Hollow Output
with zero-backlash shrink disk



Keyed hollow output

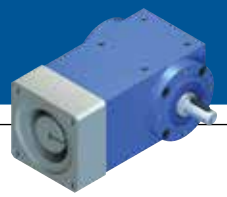


VC-K
Keyed Hollow Output

VC-K (High Ratio)
Keyed Hollow Output

VC-Series (mini)
Sizes 35 and 45 mm
(VC-W shown)

VC Series: Ratios 1:1 to 6:1



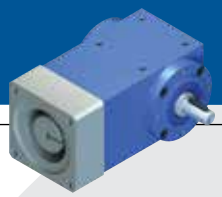
Technical Specifications

S5 Cyclical Operation - Ratios 1:1 to 6:1

VC Series			035*	045*	065	090	120	140	160	200
	S5 Cyclical Operation = 30% per hour with ambient temperature of -10 to +30 degrees C									
Ratios Available			1:1	1,2,3,4:1	1, 1.5, 2, 3:1	1, 1.5, 2, 3, 4, 5, 6:1			1, 1.5, 2, 3, 4, 5, 6:1	
Nominal Output Torque (T_{2n})	Nm (lb-in)	1:1	4.5 (40)	9 (80)	8 (71)	25 (221)	50 (443)	120 (1062)	180 (1593)	350 (3098)
		1.5:1	-	-	10 (89)	25 (221)	61 (540)	113 (1000)	185 (1637)	330 (2921)
		2:1	-	7 (62)	10 (89)	25 (221)	65 (575)	110 (974)	185 (1637)	320 (2832)
		3:1	-	5.5 (49)	8 (71)	23 (204)	58 (513)	110 (974)	190 (1682)	420 (3717)
		4:1	-	4.5 (40)	-	23 (204)	60 (531)	105 (929)	180 (1593)	350 (3098)
		5:1	-	-	-	23 (204)	60 (531)	100 (885)	180 (1593)	300 (2655)
		6:1	-	-	-	23 (204)	54 (478)	95 (841)	130 (1151)	210 (1859)
Max Acceleration Output Torque (T_{2B})	Nm (lb-in)	1:1	5.5 (49)	11 (97)	15 (133)	40 (354)	70 (620)	180 (1593)	350 (3098)	700 (6196)
		1.5:1	-	-	17 (150)	37 (327)	105 (929)	200 (1770)	330 (2921)	690 (6107)
		2:1	-	8.5 (75)	17 (150)	36 (319)	98 (867)	190 (1682)	320 (2832)	600 (5311)
		3:1	-	6.5 (58)	15 (133)	36 (319)	95 (841)	177 (1567)	280 (2478)	630 (5576)
		4:1	-	5.5 (49)	-	36 (319)	87 (770)	162 (1434)	270 (2390)	550 (4868)
		5:1	-	-	-	36 (319)	92 (814)	143 (1266)	270 (2390)	505 (4470)
		6:1	-	-	-	31 (274)	71 (628)	122 (1080)	200 (1947)	315 (2788)
Emergency Output Torque (T_{2NOT})	Nm (lb-in)	1:1	8 (71)	16 (142)	23 (204)	50 (443)	150 (1328)	260 (2301)	480 (4248)	980 (8674)
		1.5:1	-	-	25 (221)	50 (443)	140 (1239)	280 (2478)	500 (4426)	850 (7523)
		2:1	-	12.5 (111)	25 (221)	60 (531)	140 (1239)	280 (2478)	550 (4868)	800 (7081)
		3:1	-	10 (89)	20 (177)	60 (531)	140 (1239)	260 (2301)	400 (3540)	850 (7523)
		4:1	-	8 (71)	-	60 (531)	140 (1239)	260 (2301)	400 (3540)	800 (7081)
		5:1	-	-	-	50 (443)	120 (1062)	220 (1947)	380 (3363)	800 (7081)
		6:1	-	-	-	45 (398)	110 (974)	200 (1947)	350 (3098)	625 (5532)
Vent Filter may be required (n_1)	RPM	all ratios	-	-	-	>2200	>1700	>1400	>1200	>900
			-	-	-	if housing temperature > 50 degrees C (also depends on duty cycle, ambient temperature, and mounting orientation)				
Max Input Speed (n_{1max})	RPM	1:1	3000	3000	4400	3200	2400	2100	1800	1500
		1.5:1	-	-	6000	4800	3600	3000	2500	2250
		2:1	-	3000	6000	6000	4800	4200	3200	3000
		3:1	-	3000	6000	6000	6000	5000	4500	4000
		4:1	-	3000	-	6000	6000	6000	5000	4500
		5:1	-	-	-	6000	6000	6000	6000	5000
		6:1	-	-	-	6000	6000	6000	6000	6000
Standard Backlash* (j)	arcmin	all ratios	<15	<15	<20	<20	<20	<20	<20	<20
Reduced Backlash*(j)	arcmin	1:1 - 2:1	<8	<8	<6	< 6	< 6	< 6	< 6	< 6
		3:1 - 6:1	-	<8	<10	<10	<10	<10	<10	<10
Allowable Radial Load (F_{rad})	N (lbs)	nominal load @100 rpm output	Contact GAM		750 (169)	1250 (281)	2000 (450)	3000 (675)	5300 (1193)	8000 (1800)
Allowable Axial Load (F_{axial})	N (lbs)		Contact GAM		375 (84)	625 (141)	1000 (225)	1500 (338)	2650 (596)	4000 (900)
Weight (m) [3]	kg (lbs)	-	Contact GAM		See Page 164					
Efficiency at Load			94-98%							
Service Life / Housing Material			10,000 hours / Aluminum		15,000 hours / Cast Iron					
Lubrication			Synthetic Oil		Synthetic Oil					

* See page 224 for definitions

VC Series: Ratios 1:1 to 6:1



Technical Specifications

S1 Continuous Operation - Ratios 1:1 to 6:1

VC Series		035*	045*	065	090	120	140	160	200
	Thermal Limit	0.35 kw	0.60 kw	Housing Temperature <= 90 degrees C					
		Continuous Output Torque (T_n)							
Ratio	Input Speed	Nm (lb-in)							
1:1	4000 rpm	-	-	3.6 (32)	8 (71)	-	-	-	-
	3000 rpm	1.11 (9.8)	1.9 (16.9)	4.8 (42)	11 (97)	18 (159)	-	-	-
	2400 rpm	1.39 (12.3)	2.39 (21.1)	6 (51)	14 (124)	23 (204)	37 (327)	56 (496)	-
	1500 rpm	2.23 (19.7)	3.8 (33.8)	8 (71)	17 (150)	37 (327)	60 (531)	90 (797)	157 (1390)
1.5:1	4000 rpm	-	-	5.4 (48)	12 (106)	21 (186)	34 (301)	-	-
	3000 rpm	-	-	7.2 (64)	17 (150)	28 (248)	45 (398)	68 (602)	-
	2400 rpm	-	-	9 (80)	21 (186)	35 (310)	56 (496)	85 (752)	147 (1301)
	1500 rpm	-	-	10 (89)	25 (221)	56 (496)	90 (797)	136 (1204)	236 (2089)
2:1	4000 rpm	-	-	7.2 (64)	17 (150)	28 (248)	45 (398)	-	-
	3000 rpm	-	3.81 (33.7)	9.6 (85)	23 (204)	37 (327)	60 (531)	90 (797)	157 (1390)
	2400 rpm	-	4.77 (42)	10 (89)	24 (212)	46 (407)	75 (664)	113 (1000)	196 (1735)
	1500 rpm	-	7 (62)	10 (89)	27 (239)	73 (646)	120 (1062)	181 (1602)	314 (2779)
3:1	4000 rpm	-	-	7.2 (64)	21 (186)	42 (372)	68 (602)	102 (903)	177 (1567)
	3000 rpm	-	5.5 (49)	9.6 (85)	23 (204)	56 (496)	90 (797)	136 (1204)	235 (2080)
	2400 rpm	-	5.5 (49)	10 (89)	24 (212)	63 (558)	113 (1000)	170 (1505)	294 (2602)
	1500 rpm	-	5.5 (49)	10 (89)	27 (239)	74 (655)	130 (1151)	230 (2036)	472 (4178)
4:1	4000 rpm	-	-	-	21 (186)	52 (460)	85 (752)	136 (1204)	235 (2080)
	3000 rpm	-	4.5 (39.8)	-	23 (204)	60 (531)	103 (912)	180 (1593)	314 (2779)
	2400 rpm	-	4.5 (39.8)	-	25 (221)	67 (593)	111 (982)	200 (1770)	393 (3478)
	1500 rpm	-	4.5 (39.8)	-	27 (239)	74 (655)	120 (1062)	220 (1947)	455 (4027)
5:1	4000 rpm	-	-	-	21 (186)	52 (460)	90 (797)	160 (1416)	275 (2434)
	3000 rpm	-	-	-	23 (204)	60 (531)	100 (885)	180 (1593)	300 (2655)
	2400 rpm	-	-	-	25 (221)	65 (575)	105 (929)	198 (1752)	340 (3009)
	1500 rpm	-	-	-	27 (239)	72 (637)	115 (1018)	215 (1903)	380 (3363)
6:1	4000 rpm	-	-	-	21 (186)	45 (398)	85 (752)	115 (1018)	190 (1682)
	3000 rpm	-	-	-	23 (204)	54 (478)	95 (841)	130 (1151)	210 (1859)
	2400 rpm	-	-	-	25 (221)	59 (522)	102 (903)	137 (1213)	225 (1991)
	1500 rpm	-	-	-	27 (239)	64 (566)	108 (956)	145 (1283)	240 (2124)

VC Series: Ratios 7:1 to 100:1

Technical Specifications

S5 Cyclical Operation - Ratios 7:1 to 100:1

VC Series			090	120	140
	S5 Cyclical Operation = 30% per hour with ambient temperature of -10° to +30°C				
Ratios Available		Ratio	2-stage: 7, 10, 15, 20, 25, 30, 40, 50 | 3:-stage: 70, 100:1		
Nominal Output Torque (T_{2n})	Nm (lb-in)	7:1	47 (416)	120 (1062)	120 (1062)
		10:1	40 (354)	100 (885)	100 (885)
		15:1	34 (301)	102 (903)	168 (1487)
		20:1	36 (319)	103 (912)	191 (1690)
		25:1	34 (301)	89 (788)	142 (1257)
		30:1	36 (319)	106 (938)	174 (1540)
		40:1	36 (319)	88 (779)	164 (1451)
		50:1	36 (319)	92 (814)	146 (1292)
		70:1	50 (443)	129 (1142)	165 (1460)
		100:1	50 (443)	106 (938)	198 (1752)
Max Acceleration Output Torque (T_{2B})	Nm (lb-in)	7:1	100 (885)	180 (1593)	180 (1593)
		10:1	75 (664)	150 (1328)	150 (1328)
		15:1	70 (620)	155 (1372)	280 (2478)
		20:1	80 (708)	169 (1496)	300 (2655)
		25:1	60 (531)	140 (1239)	250 (2213)
		30:1	70 (620)	155 (1372)	280 (2478)
		40:1	70 (620)	155 (1372)	280 (2478)
		50:1	60 (531)	140 (1239)	250 (2213)
		70:1	105 (929)	180 (1593)	180 (1593)
		100:1	105 (929)	169 (1496)	320 (2832)
Emergency Output Torque (T_{2NOT})	Nm (lb-in)	7:1	130 (1151)	234 (2071)	234 (2071)
		10:1	98 (867)	195 (1726)	195 (1726)
		15:1	91 (805)	202 (1788)	364 (3221)
		20:1	104 (920)	220 (1947)	390 (3452)
		25:1	78 (690)	182 (1611)	325 (2876)
		30:1	91 (805)	202 (1788)	364 (3221)
		40:1	91 (805)	202 (1788)	364 (3221)
		50:1	78 (690)	182 (1611)	325 (2876)
		70:1	137 (1212)	234 (2071)	234 (2071)
		100:1	137 (1212)	220 (1947)	416 (3682)
Breather (Vent Filter) may be required (n_1)	RPM	All ratios	>2200	>1700	>1400
			if housing temperature > 50°C*		
Max Input Speed (n_{1max})	RPM	All ratios	6000	5000	5000
Standard Backlash*** (j)	arcmin	7:1, 10:1, 70:1	< 30 - 34		
		All other ratios	< 22 - 27		
Reduced Backlash*** (j)	arcmin	7:1, 10:1, 70:1	< 16 - 20		
		All other ratios	< 11 - 13		
Allowable Radial Load (F_{rad})**	N (lbs)		1250 (281)	2000 (450)	3000 (675)
Allowable Axial Load (F_{axial})**	N (lbs)		625 (141)	1000 (225)	1500 (338)
Efficiency at Load			87% - 89%		
Service Life / Housing Material			15,000 hours / Cast Iron		
Lubrication			Synthetic Oil		

* also depends on duty cycle, ambient temperature, and mounting orientation

** Nominal load @100 rpm output

*** See page 224 for definitions

Technical Specifications

S1 Continuous Operation - Ratios 7:1 to 100:1

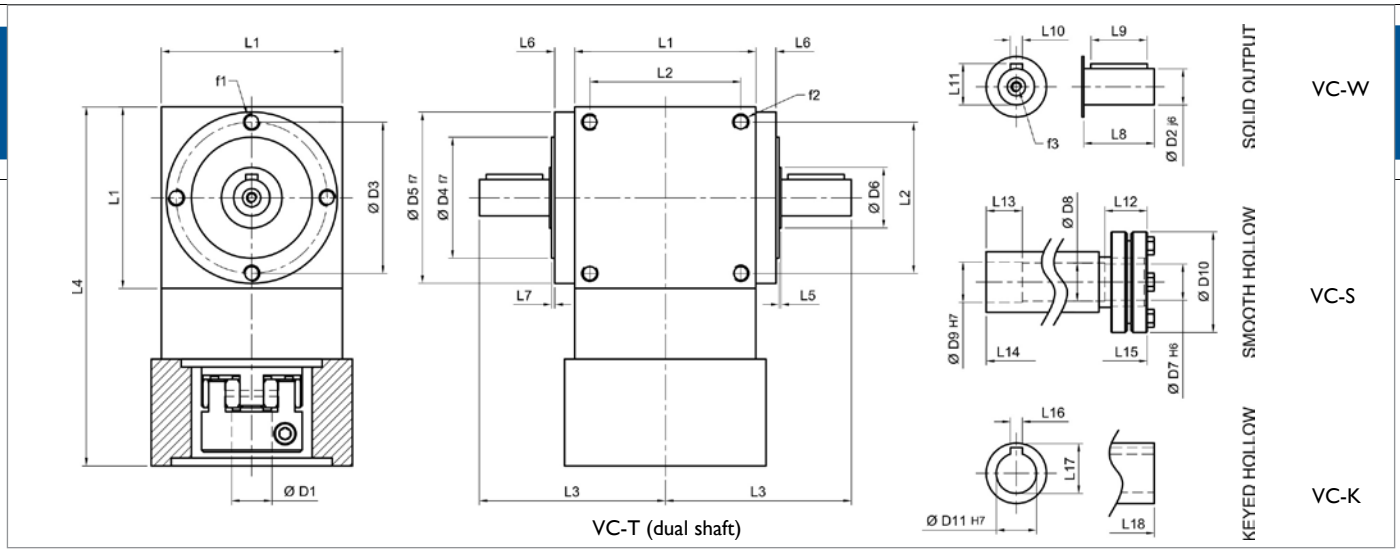
VC Series		090		120		140	
	Thermal Limit	Housing Temperature <= 90°C					
		Continuous Output Torque (T_n)					
Ratio	Input Speed	Nm (lb-in)					
7:1	4000 rpm	37	(327)	94	(832)	96	(850)
	3000 rpm	38	(336)	96	(850)	96	(850)
	2400 rpm	38	(336)	96	(850)	96	(850)
	1500 rpm	39	(345)	96	(850)	96	(850)
10:1	4000 rpm	32	(283)	80	(708)	80	(708)
	3000 rpm	32	(283)	80	(708)	80	(708)
	2400 rpm	32	(283)	80	(708)	80	(708)
	1500 rpm	32	(283)	80	(708)	80	(708)
15:1	4000 rpm	26	(230)	78	(690)	129	(1142)
	3000 rpm	27	(239)	82	(726)	133	(1177)
	2400 rpm	28	(248)	82	(726)	135	(1195)
	1500 rpm	28	(248)	84	(743)	138	(1221)
20:1	4000 rpm	28	(248)	80	(708)	149	(1319)
	3000 rpm	28	(248)	82	(726)	152	(1345)
	2400 rpm	29	(257)	82	(726)	153	(1354)
	1500 rpm	29	(257)	84	(743)	156	(1381)
25:1	4000 rpm	27	(239)	68	(602)	109	(965)
	3000 rpm	27	(239)	71	(628)	112	(991)
	2400 rpm	28	(248)	71	(628)	114	(1009)
	1500 rpm	28	(248)	73	(646)	116	(1027)
30:1	4000 rpm	28	(248)	83	(735)	136	(1204)
	3000 rpm	28	(248)	85	(752)	138	(1221)
	2400 rpm	29	(257)	85	(752)	139	(1230)
	1500 rpm	29	(257)	86	(761)	141	(1248)
40:1	4000 rpm	28	(248)	69	(611)	129	(1142)
	3000 rpm	28	(248)	70	(620)	131	(1159)
	2400 rpm	29	(257)	70	(620)	132	(1168)
	1500 rpm	29	(257)	71	(628)	133	(1177)
50:1	4000 rpm	28	(248)	72	(637)	115	(1018)
	3000 rpm	28	(248)	74	(655)	116	(1027)
	2400 rpm	29	(257)	74	(655)	117	(1035)
	1500 rpm	29	(257)	75	(664)	118	(1044)
70:1	4000 rpm	40	(354)	103	(912)	132	(1168)
	3000 rpm	40	(354)	103	(912)	132	(1168)
	2400 rpm	40	(354)	103	(912)	132	(1168)
	1500 rpm	40	(354)	104	(920)	132	(1168)
100:1	4000 rpm	29	(257)	85	(752)	158	(1398)
	3000 rpm	29	(257)	85	(752)	158	(1398)
	2400 rpm	29	(257)	85	(752)	159	(1407)
	1500 rpm	29	(257)	85	(752)	159	(1407)

Mass Moment of Inertia & Weight: VC-W & VC-T

VC Series			065		090		120		140		160		200	
Type	Ratio	Stage	Mass Moment of Inertia (kg cm²)	Weight (kg)	Mass Moment of Inertia (kg cm²)	Weight (kg)	Mass Moment of Inertia (kg cm²)	Weight (kg)	Mass Moment of Inertia (kg cm²)	Weight (kg)	Mass Moment of Inertia (kg cm²)	Weight (kg)	Mass Moment of Inertia (kg cm²)	Weight (kg)
W	1:1	1	0.4680	3.5	3.6690	6.9	16.9680	17.3	40.2700	25.5	37.0520	38	185.5200	60
	1.5:1	1	0.3190	3.5	2.7900	6.9	8.8473	17.3	22.7860	25.5	37.5230	38	119.4940	60
	2:1	1	0.2590	3.5	1.6950	6.9	6.7790	17.3	16.3860	25.5	25.4770	38	86.1880	60
	3:1	1	0.1940	3.5	1.3410	6.9	5.1172	17.3	11.4390		17.3860	38	55.8380	60
	4:1	1	-	-	1.2060	6.9	4.5420	17.3	9.7640	25.5	15.0700	38	43.3230	60
	5:1	1	-	-	1.1401	6.9	4.2271	17.3	9.2930	25.5	14.1140	38	40.0860	60
	6:1	1			1.0970	6.9	4.0430	17.3	8.9250	25.5	13.1640	38	36.8890	60
	7:1	2	-	-	1.0222	7.7	3.6142	18.1	3.9361	24.3	-	-	-	-
	10:1	2	-	-	0.9556	7.7	3.205	18.1	3.3627	24.3	-	-	-	-
	15:1	2	-	-	1.0855	7.7	4.1426	18.1	4.3074	24.3	-	-	-	-
	20:1	2	-	-	0.9414	7.7	3.1365	18.1	3.1868	24.3	-	-	-	-
	25:1	2	-	-	1.063	7.7	4.0801	18.1	4.1113	24.3	-	-	-	-
	30:1	2	-	-	0.9389	7.7	3.1232	18.1	3.1644	24.3	-	-	-	-
	40:1	2	-	-	0.9336	7.7	3.1122	18.1	3.1184	24.3	-	-	-	-
	50:1	2	-	-	0.9332	7.7	3.1075	18.1	3.1153	24.3	-	-	-	-
	70:1	3	-	-	0.9305	8.5	3.1021	20.2	3.1054	26.4	-	-	-	-
	100:1	3	-	-	0.9304	8.5	3.102	20.2	3.1049	26.4	-	-	-	-
T	1:1	1	0.4780	3.6	3.6974	7.0	17.2660	17.5	41.2520	26.0	38.0810	38.5	188.6320	62
	1.5:1	1	0.3230	3.6	2.8023	7.0	8.9795	17.5	23.2230	26.0	37.9810	38.5	120.8800	62
	2:1	1	0.2620	3.6	1.7020	7.0	6.8534	17.5	16.6310	26.0	25.7340	38.5	86.9670	62
	3:1	1	0.2380	3.6	1.3441	7.0	5.1502	17.5	11.5480	26.0	17.5000	38.5	56.1850	62
	4:1	1	-	-	1.2075	7.0	4.5610	17.5	9.8250	26.0	15.1340	38.5	43.5180	62
	5:1	1	-	-	1.1412	7.0	4.2390	17.5	9.3320	26.0	14.1550	38.5	40.2110	62
	6:1	1			1.0980	7.0	4.0511	17.5	8.9520	26.0	13.1930	38.5	36.9750	62
	7:1	2	-	-	1.039	7.8	3.7184	18.3	4.1568	24.8	-	-	-	-
	10:1	2	-	-	0.9638	7.8	3.256	18.3	3.4708	24.8	-	-	-	-
	15:1	2	-	-	1.092	7.8	4.1718	18.3	4.3726	24.8	-	-	-	-
	20:1	2	-	-	0.9437	7.8	3.1505	18.3	3.2252	24.8	-	-	-	-
	25:1	2	-	-	1.0658	7.8	4.0928	18.3	4.14	24.8	-	-	-	-
	30:1	2	-	-	0.9405	7.8	3.1305	18.3	3.1806	24.8	-	-	-	-
	40:1	2	-	-	0.9346	7.8	3.1169	18.3	3.1276	24.8	-	-	-	-
	50:1	2	-	-	0.9339	7.8	3.1107	18.3	3.1225	24.8	-	-	-	-
	70:1	3	-	-	0.9307	8.6	3.1032	20.4	3.1076	26.9	-	-	-	-
	100:1	3	-	-	0.9305	8.6	3.102	20.4	3.105	26.9	-	-	-	-

Mass Moment of Inertia & Weight: VC-S & VC-K

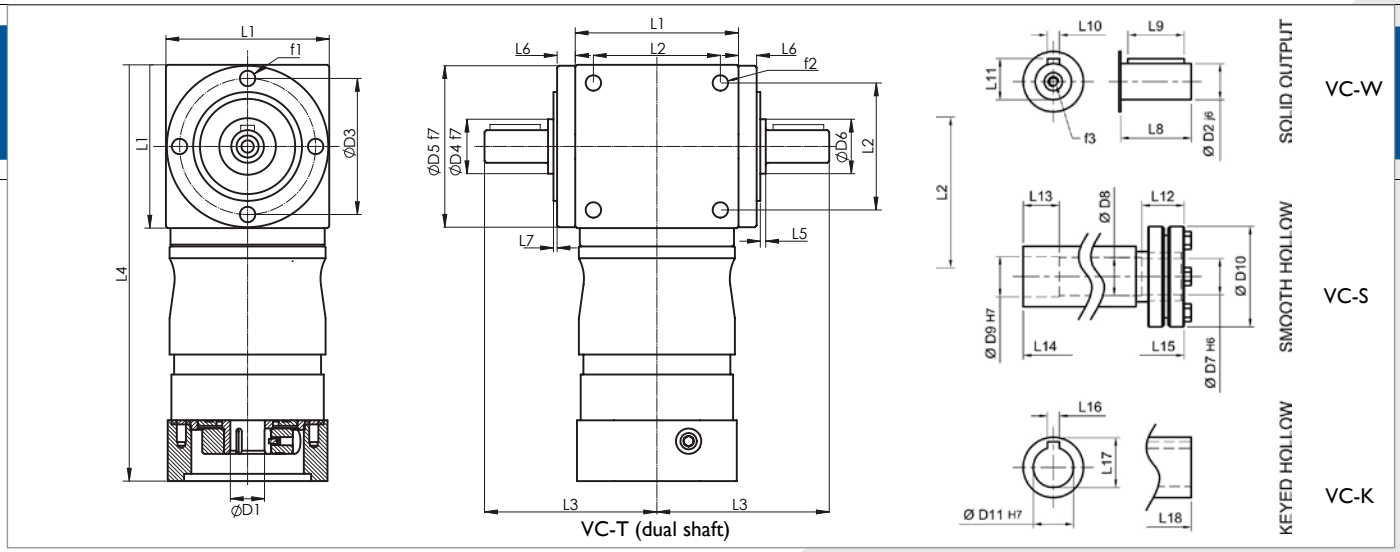
VC Series			065		090		120		140		160		200	
Type	Ratio	Stage	Mass Moment of Inertia (kg cm²)	Weight (kg)	Mass Moment of Inertia (kg cm²)	Weight (kg)	Mass Moment of Inertia (kg cm²)	Weight (kg)	Mass Moment of Inertia (kg cm²)	Weight (kg)	Mass Moment of Inertia (kg cm²)	Weight (kg)	Mass Moment of Inertia (kg cm²)	Weight (kg)
S	1:1	1	0.6460	3.4	4.2360	6.7	18.6470	17.3	43.2350	25.7	46.1740	37.6	233.2300	61.3
	1.5:1	1	0.4968	3.4	3.0420	6.7	9.5940	17.3	24.1040	25.7	41.4360	37.6	134.2820	61.3
	2:1	1	0.4370	3.4	1.8370	6.7	7.1990	17.3	17.1270	25.7	27.6150	37.6	96.2560	61.3
	3:1	1	0.3570	3.4	1.4040	6.7	5.3040	17.3	11.7690	25.7	18.3360	37.6	59.2020	61.3
	4:1	1	-	-	1.2412	6.7	4.6470	17.3	9.9490	25.7	15.6040	37.6	45.2780	61.3
	5:1	1	-	-	1.1630	6.7	4.2942	17.3	9.4120	25.7	14.4560	37.6	41.8570	61.3
	6:1	1	-	-	1.1130	6.7	4.0894	17.3	9.0070	25.7	13.4030	37.6	38.1180	61.3
	7:1	2	-	-	1.05	7.3	3.7466	17.8	4.1972	23.8	-	-	-	-
	10:1	2	-	-	0.9692	7.3	3.2698	17.8	3.4906	23.8	-	-	-	-
	15:1	2	-	-	1.0944	7.3	4.178	17.8	4.3814	23.8	-	-	-	-
	20:1	2	-	-	0.9451	7.3	3.1539	17.8	3.2302	23.8	-	-	-	-
	25:1	2	-	-	1.0666	7.3	4.0951	17.8	4.1432	23.8	-	-	-	-
	30:1	2	-	-	0.9411	7.3	3.132	17.8	3.1828	23.8	-	-	-	-
	40:1	2	-	-	0.935	7.3	3.1178	17.8	3.1288	23.8	-	-	-	-
	50:1	2	-	-	0.9342	7.3	3.1113	17.8	3.1233	23.8	-	-	-	-
	70:1	3	-	-	0.9308	8.1	3.1035	19.9	3.108	25.9	-	-	-	-
	100:1	3	-	-	0.9306	8.1	3.1022	19.9	3.1052	25.9	-	-	-	-
K	1:1	1	0.5200	3.4	3.5654	6.5	16.8600	17.0	36.8340	25.0	39.8840	37.0	212.2100	60.0
	1.5:1	1	0.3710	3.4	2.7440	6.5	8.7992	17.0	21.2590	25.0	38.6400	37.0	124.9400	60.0
	2:1	1	0.3110	3.4	1.6690	6.5	6.7520	17.0	15.5260	25.0	26.0420	37.0	91.0000	60.0
	3:1	1	0.2320	3.4	1.3294	6.5	5.1051	17.0	11.0570	25.0	17.6370	37.0	56.8660	60.0
	4:1	1	-	-	1.1992	6.5	4.5352	17.0	9.5490	25.0	15.2110	37.0	43.9640	60.0
	5:1	1	-	-	1.1360	6.5	4.2230	17.0	9.1560	25.0	14.2040	37.0	41.0160	60.0
	6:1	1	-	-	1.0940	6.5	4.0400	17.0	8.8300	25.0	13.2290	37.0	37.5350	60.0
	7:1	2	-	-	1.0363	7.5	3.7101	18.1	4.0666	24.5	-	-	-	-
	10:1	2	-	-	0.9625	7.5	3.2519	18.1	3.4266	24.5	-	-	-	-
	15:1	2	-	-	1.0914	7.5	4.17	18.1	4.3529	24.5	-	-	-	-
	20:1	2	-	-	0.9434	7.5	3.1495	18.1	3.2142	24.5	-	-	-	-
	25:1	2	-	-	1.0656	7.5	4.0922	18.1	4.133	24.5	-	-	-	-
	30:1	2	-	-	0.9404	7.5	3.13	18.1	3.1757	24.5	-	-	-	-
	40:1	2	-	-	0.9345	7.5	3.1167	18.1	3.1248	24.5	-	-	-	-
	50:1	2	-	-	0.9339	7.5	3.1106	18.1	3.1207	24.5	-	-	-	-
	70:1	3	-	-	0.9307	8.3	3.1031	20.2	3.1067	26.6	-	-	-	-
	100:1	3	-	-	0.9305	8.3	3.102	20.2	3.1046	26.6	-	-	-	-



VC Series Dimensions: Ratios 1:1 to 6:1

mm (in)		035	045	65	90	120	140	160	200
D1 min	motor shaft diameter	3 (0.118)	3 (0.118)	5 (0.197)	8 (0.315)	13 (0.512)	19 (0.748)	19 (0.748)	24 (0.945)
D1 max	motor shaft diameter	11 (0.433)	11 (0.433)	16 (0.630)	20 (0.787)	28 (1.102)	38.1 (1.500)	38.1 (1.500)	45 (1.772)
D2 j6	output shaft diameter	6 (0.236)	10 (0.393)	12 (0.472)	18 (0.709)	25 (0.984)	32 (1.260)	35 (1.378)	42 (1.654)
	output shaft key size	2 x 2 x 10	3 x 3 x 18	4 x 4 x 20	6 x 6 x 28	8 x 7 x 36	10 x 8 x 45	10 x 8 x 50	12 x 8 x 70
D3	mounting bolt circle 1	29 (1.142)	39 (1.535)	54 (2.126)	75 (2.953)	100 (3.937)	115 (4.528)	135 (5.315)	175 (6.890)
D4 f7	pilot diameter 1	22 (0.866)	32 (1.260)	44 (1.732)	60 (2.362)	80 (3.150)	90 (3.543)	110 (4.331)	120 (4.724)
D5 f7	pilot diameter 2	35 (1.378)	45 (1.772)	64 (2.520)	89 (3.504)	119 (4.685)	135 (5.315)	159 (6.260)	199 (7.835)
D6	shoulder diameter	10 (0.394)	15 (0.591)	17 (0.669)	30 (1.181)	35 (1.378)	50 (1.969)	40 (1.575)	55 (2.165)
D7 H6*	smooth hollow diameter 1	-	-	12 (0.472)	18 (0.709)	25 (0.984)	32 (1.260)	35 (1.378)	42 (1.654)
D8	opened up ID	-	-	13 (0.512)	19 (0.748)	26 (1.024)	33 (1.299)	36 (1.417)	43 (1.693)
D9 H7**	smooth hollow diameter 2	-	-	14 (0.551)	20 (0.787)	27 (1.063)	34 (1.339)	37 (1.457)	44 (1.732)
D10	shrink disc OD	-	-	38 (1.496)	50 (1.969)	60 (2.362)	80 (3.150)	80 (3.150)	100 (3.937)
D11 H7***	keyed hollow diameter	6 (0.236)	10 (0.393)	12 (0.472)	18 (0.709)	25 (0.984)	32 (1.260)	35 (1.378)	42 (1.654)
	hollow shaft key size	2 x 2	3 x 3	4 x 4	6 x 6	8 x 7	10 x 8	10 x 8	12 x 8
L1	housing size	35 (1.378)	45 (1.772)	65 (2.559)	90 (3.543)	120 (4.724)	140 (5.512)	160 (6.299)	200 (7.874)
L2	mounting bolt location 2	25 (0.984)	30 (1.181)	45 (1.772)	70 (2.756)	100 (3.937)	110 (4.331)	120 (4.724)	160 (6.299)
L3	output shaft to centerline	40 (1.575)	57.5 (2.264)	72 (2.835)	95 (3.740)	122 (4.803)	137 (5.394)	160 (6.299)	203 (7.992)
L4****	overall length	Contact GAM		134 (5.276)	185 (7.283)	230 (9.055)	266 (10.47)	295 (11.61)	362 (14.25)
L5	shoulder thickness	0.5 (0.020)	2 (0.079)	2 (0.079)	2 (0.079)	2 (0.079)	2 (0.079)	2 (0.079)	2 (0.079)
L6	output pilot height 2	5.5 (0.217)	8 (0.315)	9.5 (0.374)	10 (0.393)	12 (0.472)	12 (0.472)	15 (0.591)	17 (0.669)
L7	output pilot height 1	1.5 (0.059)	2 (0.079)	2 (0.079)	2 (0.079)	3 (0.118)	3 (0.118)	3 (0.118)	3 (0.118)
L8	output shaft length	15 (0.591)	23 (0.906)	26 (1.024)	35 (1.378)	45 (1.772)	50 (1.969)	60 (2.362)	80 (3.150)
L9	key length	10 (0.393)	18 (0.709)	20 (0.787)	28 (1.102)	36 (1.417)	45 (1.772)	50 (1.969)	70 (2.756)
L10	key width	2 (0.079)	3 (0.118)	4 (0.157)	6 (0.236)	8 (0.315)	10 (0.393)	10 (0.393)	12 (0.472)
L11	shaft height with key	6.8 (0.268)	11.1 (0.437)	13.5 (0.531)	20.5 (0.807)	28 (1.102)	35 (1.378)	38 (1.496)	45 (1.772)
L12	stub shaft length	-	-	17 (0.669)	25 (0.984)	27 (1.063)	32 (1.260)	32 (1.260)	37 (1.457)
L13	diameter 2 length	-	-	15 (0.591)	18 (0.709)	22 (0.866)	25 (0.984)	25 (0.984)	35 (1.378)
L14	hollow shaft to centerline	-	-	46 (1.811)	62 (2.441)	80 (3.150)	90 (3.543)	103 (4.055)	125 (4.921)
L15	shrink disc to centerline	-	-	63 (2.480)	87 (3.425)	107 (4.213)	122 (4.803)	135 (5.315)	162 (6.378)
L16	hollow key width	2 (0.079)	3 (0.118)	4 (0.157)	6 (0.236)	8 (0.315)	10 (0.393)	10 (0.393)	12 (0.472)
L17	hollow height with keyway	7 (0.276)	11.4 (0.449)	13.8 (0.543)	20.8 (0.819)	28.3 (1.114)	35.3 (1.390)	38.3 (1.508)	45.3 (1.783)
L18	hollow shaft to centerline	27 (1.063)	36.5 (1.437)	46 (1.811)	62 (2.441)	80 (3.150)	90 (3.543)	103 (4.055)	125 (4.921)
f1	mounting holes 1	M3 x 5	M4 x 8	M6 x 12	M8 x 14	M10 x 16	M10 x 20	M12 x 24	M12 x 24
f2	mounting holes 2	M3 x 5	M4 x 8	M6 x 9.5	M8 x 10	M10 x 12	M10 x 12	M12 x 15	M12 x 17
f3	shaft thread DIN 332	M3	M3	M4	M6	M10	M12	M12	M16

* Mating shaft should have j6 tolerance ** Mating shaft should have h6 tolerance *** Mating shaft should have g6 tolerance ****Depending on motor, length may change



VC Series Dimensions: Ratios 7:1 to 100:1

mm (in)			90	120	140
D1 min	motor shaft diameter		3 (0.118)	3 (0.118)	3 (0.118)
D1 max standard	motor shaft diameter		19 (0.748)	24 (0.945)	24 (0.945)
D1 max available	motor shaft diameter		24 (0.945)	32 (1.181)	32 (1.181)
D2 j6	output shaft diameter		18 (0.709)	25 (0.984)	32 (1.260)
	output shaft key size		6 x 6 x 28	8 x 7 x 36	10 x 8 x 45
D3	mounting bolt circle 1		75 (2.953)	100 (3.937)	115 (4.528)
D4 f7	pilot diameter 1		60 (2.362)	80 (3.150)	90 (3.543)
D5 f7	pilot diameter 2		89 (3.504)	119 (4.685)	135 (5.315)
D6	shoulder diameter		30 (1.181)	35 (1.378)	50 (1.969)
D7 H6*	smooth hollow diameter 1		18 (0.709)	25 (0.984)	32 (1.260)
D8	opened up ID		19 (0.748)	26 (1.024)	33 (1.299)
D9 H7**	smooth hollow diameter 2		20 (0.787)	27 (1.063)	34 (1.339)
D10	shrink disc OD		50 (1.969)	60 (2.362)	80 (3.150)
D11 H7***	keyed hollow diameter		18 (0.709)	25 (0.984)	32 (1.260)
	hollow shaft key size		6 x 6	8 x 7	10 x 8
L1	housing size		90 (3.543)	120 (4.724)	140 (5.512)
L2	mounting bolt location 2		70 (2.756)	100 (3.937)	110 (4.331)
L3	output shaft to centerline		95 (3.740)	122 (4.803)	137 (5.394)
L4****	overall length	Ratios 7:1 - 50:1	230 (9.055)	283 (11.142)	314 (12.362)
		Ratios 70:1 - 100:1	263 (10.354)	323.5 (12.736)	354.5 (13.957)
L5	shoulder thickness		2 (0.079)	2 (0.079)	2 (0.079)
L6	output pilot height 2		10 (0.393)	12 (0.472)	12 (0.472)
L7	output pilot height 1		2 (0.079)	3 (0.118)	3 (0.118)
L8	output shaft length		35 (1.378)	45 (1.772)	50 (1.969)
L9	key length		28 (1.102)	36 (1.417)	45 (1.772)
L10	key width		6 (0.236)	8 (0.315)	10 (0.393)
L11	shaft height with key		20.5 (0.807)	28 (1.102)	35 (1.378)
L12	stub shaft length		25 (0.984)	27 (1.063)	32 (1.260)
L13	diameter 2 length		18 (0.709)	22 (0.866)	25 (0.984)
L14	hollow shaft to centerline		62 (2.441)	80 (3.150)	90 (3.543)
L15	shrink disc to centerline		87 (3.425)	107 (4.213)	122 (4.803)
L16	hollow key width		6 (0.236)	8 (0.315)	10 (0.393)
L17	hollow height with keyway		20.8 (0.819)	28.3 (1.114)	35.3 (1.390)
L18	hollow shaft to centerline		62 (2.441)	80 (3.150)	90 (3.543)
f1	mounting holes 1		M8 x 14	M10 x 16	M10 x 20
f2	mounting holes 2		M8 x 10	M10 x 12	M10 x 12
f3	shaft thread DIN 332		M6	M10	M12

* Mating shaft should have j6 tolerance ** Mating shaft should have h6 tolerance *** Mating shaft should have g6 tolerance ****Depending on motor, length may change

VC Series Type Code

TYPE CODES FOR VC SERIES

Example: VC - W - 090 - 002 S - M0000 - H0000 - C0000

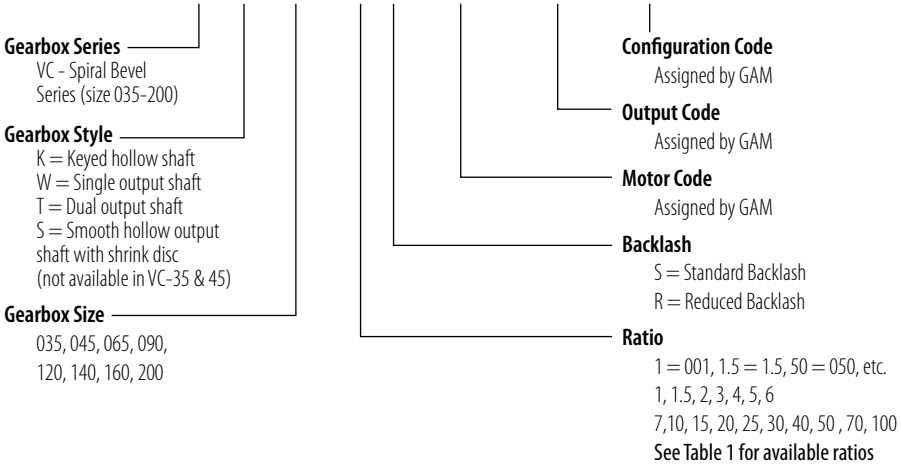


Table 1: Available Ratios

Ratio	Ratio for Type Code	Frame Size							
		035	045	065	090	120	140	160	200
1:1	001	x	x	x	x	x	x	x	x
1.5:1	1.5			x	x	x	x	x	x
2:1	002		x	x		x	x	x	x
3:1	003		x	x		x	x	x	x
4:1	004		x			x	x	x	x
5:1	005					x	x	x	x
6:1	006					x	x	x	x
7, 10, 15, 20, 30, 40, 50, 70, 100:1	007, 010, 015, 020, 030, 040, 050, 070, 100				x	x	x		

Table 2: Nominal Input Speed Limits

A breather may be required for applications with nominal input speeds (n1) greater than those listed in this table. If a breather is required, please specify the mounting configuration (see Table 3) and the breather location (see Table 4).

Duty Cycle	Speed (RPM)	Ratios	Frame Size							
			035*	045*	065*	090	120	140	160	200
S1	Breather may be required for Nominal Input Speed	1:1 to 6:1				>1500	>1100	>900	>800	>600
		7:1 to 100:1				Not required at any speed				
S5	Breather may be required for Nominal Input Speed	1:1 to 6:1				>2200	>1700	>1400	>1200	>900
		7:1 to 100:1				Not required at any speed				

* VC-035, 045, and 065 do not require a breather at any speed.

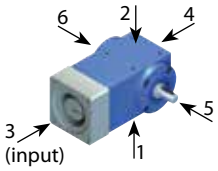
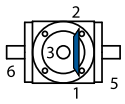
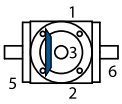
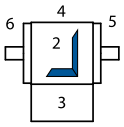
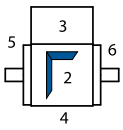
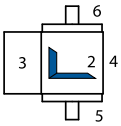
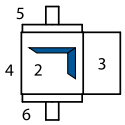


Table 3: Mounting Configuration

Gearbox supplied with universal mounting configuration, including tapped holes on all sides. If speeds exceed [maximum] per Table 2, the mounting configuration may be required. Contact GAM for assistance.

UP (for all views)

Mounting 1: Side 1 Down	Mounting 2: Side 2 Down	Mounting 3: Side 3 Down	Mounting 4: Side 4 Down	Mounting 5: Side 5 Down	Mounting 6: Side 6 Down	Mounting 9: Any Side Down
						Universal Mounting
1	2	3	4	5	6	9

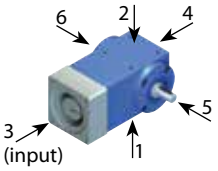
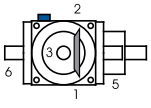
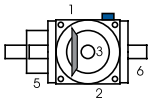
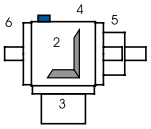
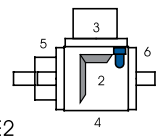
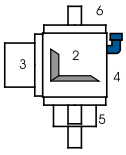
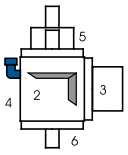
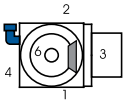
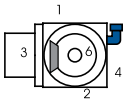
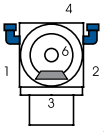
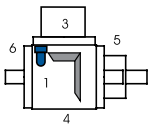
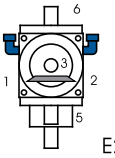
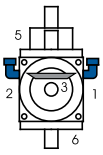
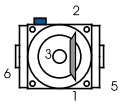
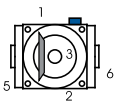
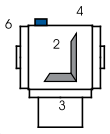
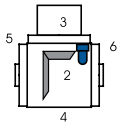
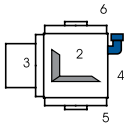
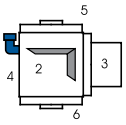
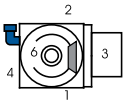
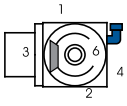
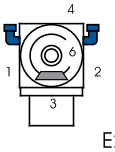
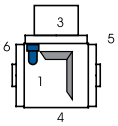
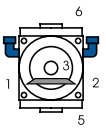
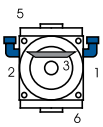


Table 4: Breather Location

Applications with input speeds greater than [maximum] speed per Table 1 may require a breather. Contact GAM for assistance.

UP (for all views)

	Mounting 1: Side 1 Down	Mounting 2: Side 2 Down	Mounting 3: Side 3 Down	Mounting 4: Side 4 Down	Mounting 5: Side 5 Down	Mounting 6: Side 6 Down
Shaft Output	 E2	 E1	 E4	 E2	 E4	 E4
	 E4	 E4	 E1 E2	 E1	 E1 E2	 E2 E1
Hollow Output	 E2	 E1	 E4	 E2	 E4	 E4
	 E4	 E4	 E1 E2	 E1	 E1 E2	 E2 E1

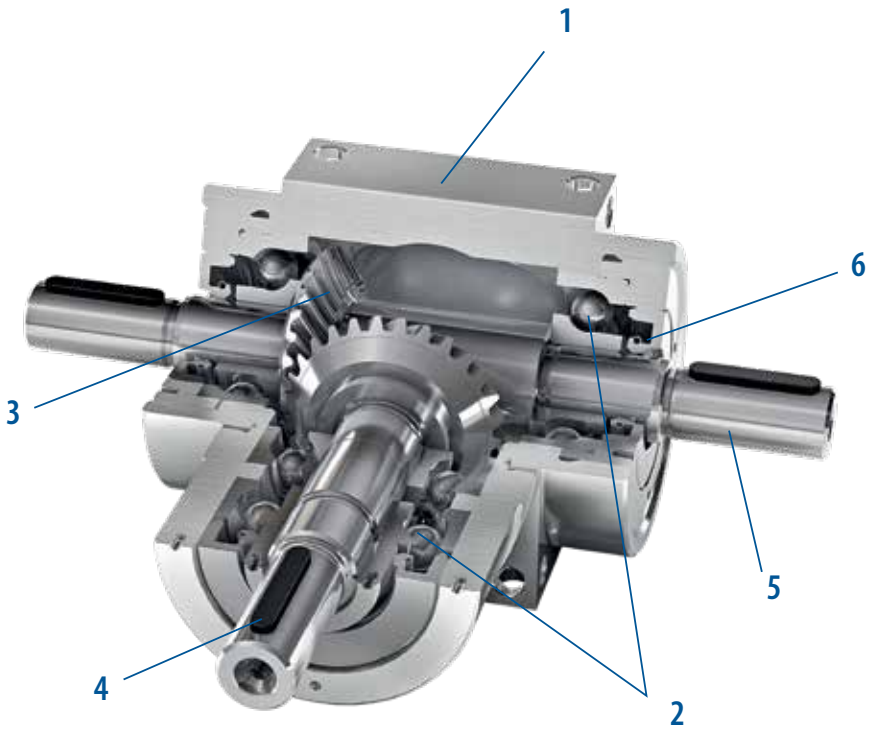
Recommended Output Couplings for VC-W or VC-T

	Recommended Output Coupling							
VC Series	035	045	065	090	120	140	160	200
bellows	KG-5 or KM-4	KG-10 or KM-12	KM-12 or 20	KLC-25 or 50	KLC-50 or 125	KLC-125 or KM-170	KM-170,270 or 400	KM-270,400 or 550
elastomer	EKC-5	EKM-8 or 15	EKC-5 or 25	EKC-35 or EKM-45	EKC-80 or 110	EKC-110 or EKM-200	EKM-200,300 or 400	EKM-300,500 or 700

GAM Performance Plus Miniature Spiral Bevel Gearboxes

The VP Series Performance Plus Miniature Bevel Gearboxes pack high performance in a small package with the highest torque density, range of ratios, and torque capacity on the market.

- Highest torque density for the size
- Sizes 27, 33, and 45 mm
- More ratios for the size: 1:1 to 4:1
- High Efficiency 98%
- Nominal Torque capacity of 1.3 to 16 Nm
- Hollow shaft output option (33 & 45 mm)
- High Strength aluminum housing
- Sealed and lubricated for life with synthetic oil
- VPC Series with integrated motor mount

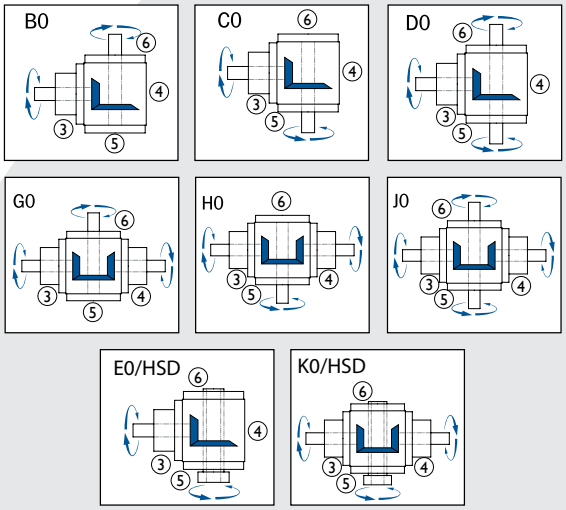


1. Housing
   Lightweight, high-strength aluminum - all 6 sides can be used for mounting
2. Bearings
   Deep groove ball bearings handle axial and radial loading
3. Spiral Bevel Gearing
   Case-hardened
4. Input
   Available with shaft input or integrated motor adapter and coupling to easily mount to any IEC, NEMA, or servo motor
5. Output
   Solid shaft with key or hollow shaft with shrink disc
6. Seals
   Protected with high quality NBR seals and lubricated for life with synthetic oil

VP Series with Shaft Input

VP-Series

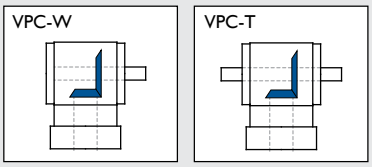
Available Models



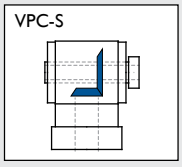
VPC Series with Integrated Motor Mount Input

VPC-Series

Available Models



Single Output Shaft | Dual Output Shaft



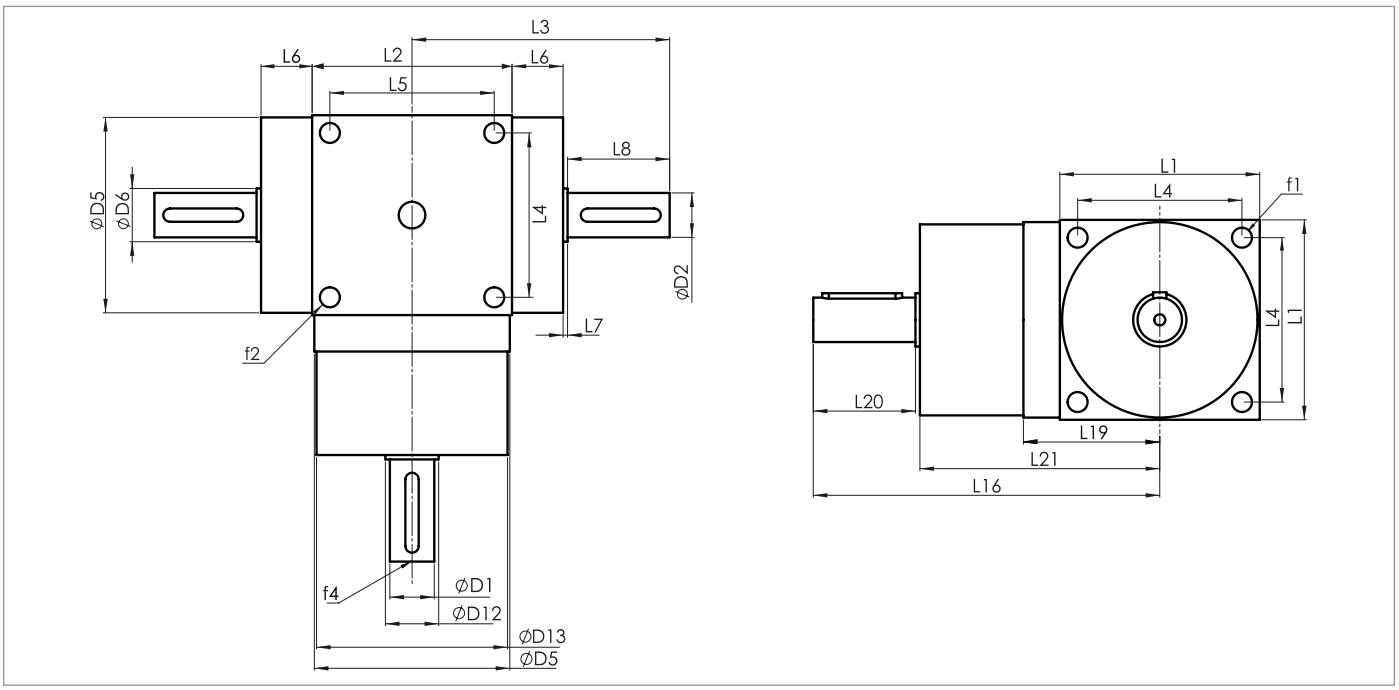
Smooth Hollow Output with Shrink Disc

VP & VPC Series		027		033		045	
Ratios Available		1, 1.5, 2, 3, 4:1					
Ratio	Input Speed (RPM)	Output Torque (Nm)	Power (kW)	Output Torque (Nm)	Power (kW)	Output Torque (Nm)	Power (kW)
1:1	10	3.5	0.004	5.0	0.005	16.0	0.017
	50	3.5	0.019	5.0	0.027	16.0	0.085
	100	3.5	0.037	4.9	0.052	15.9	0.170
	200	3.3	0.071	4.8	0.103	15.1	0.323
	500	3	0.160	4.6	0.246	14.6	0.780
	750	3	0.240	4.2	0.337	13.6	1.09
	1000	2.9	0.310	4.1	0.438	13.2	1.41
	1500	2.9	0.465	4	0.641	12.8	2.05
	2000	2.8	0.598	3.9	0.833	12.4	2.65
	2500	2.7	0.721	3.8	1.02	12.0	3.21
	3000	2.6	0.833	3.7	1.19	11.8	3.78
	4000	2.5	1.07	3.6	1.54	11.2	4.79
1.5:1	10	2.2	0.002	3.2	0.002	11.0	0.008
	50	2.2	0.008	3.2	0.011	11.0	0.039
	100	2.2	0.016	3.2	0.023	10.9	0.078
	200	2.1	0.030	3.1	0.044	10.7	0.152
	500	2.1	0.075	3.0	0.107	10.3	0.367
	750	2	0.107	2.9	0.155	9.9	0.529
	1000	1.9	0.135	2.8	0.199	9.6	0.684
	1500	1.9	0.203	2.7	0.288	9.4	1.00
	2000	1.8	0.256	2.6	0.370	8.9	1.27
	2500	1.7	0.303	2.5	0.445	8.7	1.55
	3000	1.7	0.363	2.4	0.513	8.4	1.80
	4000	1.6	0.456	2.3	0.655	8.0	2.28
2:1	10	-	-	2.3	0.001	8.5	0.005
	50	-	-	2.3	0.006	8.5	0.023
	100	-	-	2.3	0.012	8.4	0.045
	200	-	-	2.2	0.024	8.3	0.089
	500	-	-	2.2	0.059	8.0	0.214
	750	-	-	2.1	0.084	7.7	0.309
	1000	-	-	2.0	0.107	7.4	0.395
	1500	-	-	2.0	0.160	7.2	0.577
	2000	-	-	1.9	0.203	6.9	0.737
	2500	-	-	1.8	0.240	6.7	0.895
	3000	-	-	1.8	0.288	6.5	1.04
	4000	-	-	1.7	0.363	6.2	1.32
3:1	10	-	-	1.5	0.001	6.5	0.002
	50	-	-	1.5	0.003	6.5	0.012
	100	-	-	1.5	0.005	6.4	0.023
	200	-	-	1.5	0.011	6.3	0.045
	500	-	-	1.4	0.025	6.1	0.109
	750	-	-	1.4	0.037	5.9	0.158
	1000	-	-	1.3	0.046	5.7	0.203
	1500	-	-	1.3	0.069	5.5	0.294
	2000	-	-	1.2	0.085	5.3	0.378
	2500	-	-	1.2	0.107	5.1	0.454
	3000	-	-	1.1	0.118	5.0	0.534
	4000	-	-	1.1	0.157	4.7	0.670
4:1	10	-	-	1.3	0.000	5.0	0.001
	50	-	-	1.3	0.002	5.0	0.007
	100	-	-	1.3	0.003	4.9	0.013
	200	-	-	1.3	0.007	4.9	0.026
	500	-	-	1.2	0.016	4.7	0.063
	750	-	-	1.2	0.024	4.5	0.090
	1000	-	-	1.1	0.029	4.4	0.118
	1500	-	-	1.1	0.044	4.3	0.172
	2000	-	-	1.1	0.059	4.1	0.219
	2500	-	-	1.0	0.067	3.9	0.260
	3000	-	-	1.0	0.080	3.8	0.305
	4000	-	-	0.9	0.096	3.6	0.385

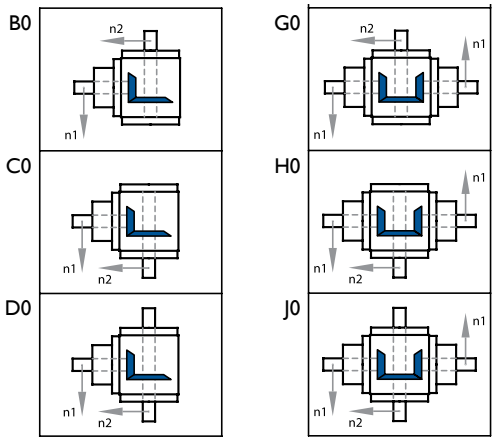
VP & VPC Series			027	033	045
Stock Ratios			1, 1.5, 2, 3, 4		
Nominal Output Torque (T_{2n})	Nm (lb-in)	1:1	3.5 (31)	5 (44)	16 (142)
		1.5:1	2.2 (19)	3.2 (28)	11 (97)
		2:1	- -	2.3 (20)	8.5 (75)
		3:1	- -	1.5 (13)	6.5 (58)
		4:1	- -	1.3 (12)	5 (44)
Max Acceleration Output Torque* (T_{2B})	Nm (lb-in)	1:1	5 (44)	7.5 (66)	25 (221)
		1.5:1	3.3 (29)	4.8 (42)	16.5 (146)
		2:1	- -	3.5 (31)	13 (115)
		3:1	- -	2 (18)	10 (89)
		4:1	- -	2 (18)	7.5 (66)
Emergency Output Torque** (T_{2not})	Nm (lb-in)	1:1	7 (62)	10 (89)	32 (283)
		1.5:1	4.4 (39)	6.4 (57)	22 (195)
		2:1	- -	4.6 (41)	17 (150)
		3:1	- -	3 (27)	13 (115)
		4:1	- -	2.6 (23)	10 (89)
Max Speed (n_{1max})	RPM	-	7500	7500	7500
Output Backlash† (j)	arcmin	-	≤15	≤15	≤15
Allowable Radial Load (F_{rad})***	N (lbs)	Input	120 (27)	160 (36)	320 (72)
		Output	150 (34)	200 (45)	400 (90)
Allowable Axial Load (F_{axial})***	N (lbs)	Input	60 (13)	80 (18)	160 (36)
		Output	75 (17)	100 (22)	200 (45)
Weight (m)	kg (lbs)	VP	0.16 (0.35)	0.22 (0.49)	0.55 (1.2)
		VPC	0.31 (0.68)	0.37 (0.82)	0.93 (2.1)
Noise Level (L_{PA})	dB(A)	-	≤70	≤70	≤70
Mass Moment of Inertia (J_1)	kg cm² (lb-in²)	1:1	Contact GAM	Contact GAM	Contact GAM
		1.5:1	Contact GAM	Contact GAM	Contact GAM
		2:1	Contact GAM	Contact GAM	Contact GAM
		3:1	Contact GAM	Contact GAM	Contact GAM
		4:1	Contact GAM	Contact GAM	Contact GAM
Efficiency at Load			>98%		
Service Life			> 15,000 hours		
Lubrication			Synthetic Oil, ISO VG 150		
Protection Rating			IP 64		
Operating Temperature Range			≤80°C		

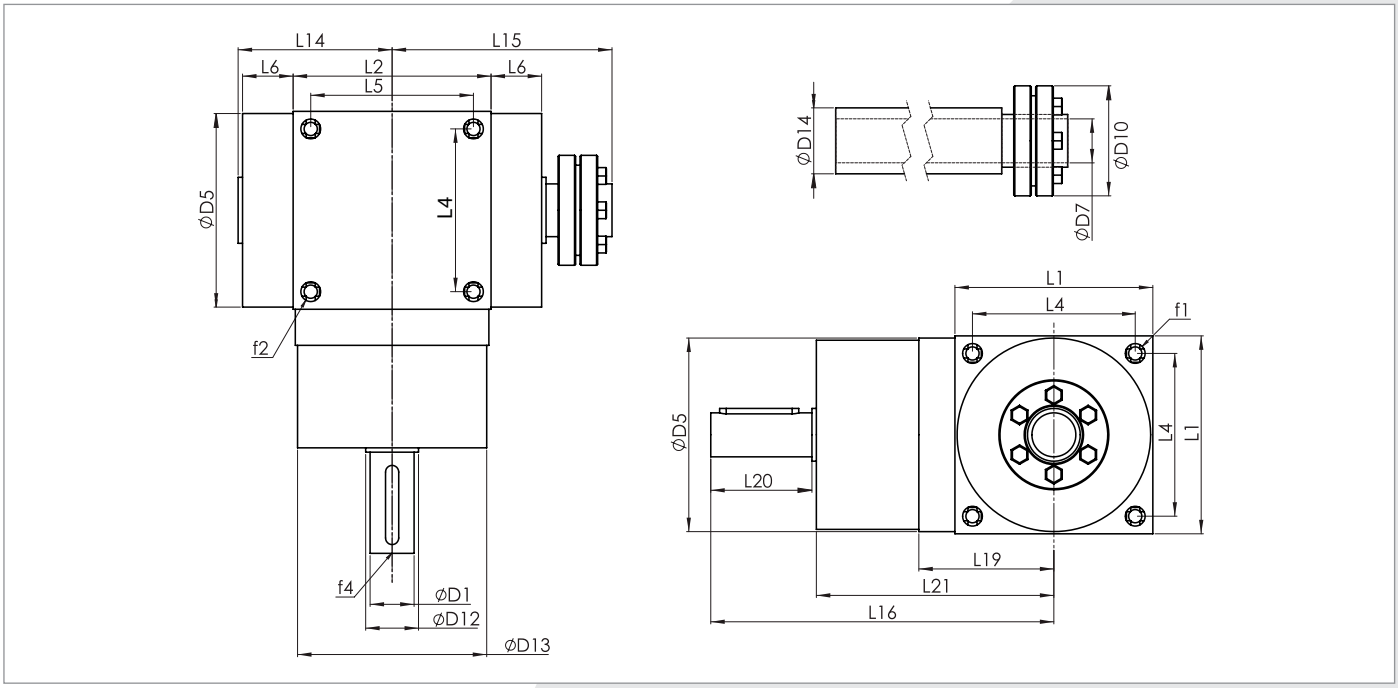
* At 1000 rpm maximum ** Permissible 1000 times maximum during service *** Load applied at center of output shaft @400 RPM

† See page 224 for definitions



Dimension	Model	VP-Series B0, C0, D0, G0, H0, J0 configurations		
	Description	027	033	045
		mm	mm	mm
D1 k6	Input Shaft Diameter	6	7	10
D2 k6	Output Shaft Diameter	6	7	10
D5 h7	Pilot Diameter	26	32	44
D6	Output Step Diameter	8	10	12
D12	Input Step Diameter	8	10	12
D13	Input Hub Pilot Diameter	25	28	43
f1	Output Flange Thread	8xM3	8xM3	8xM4
f2	Housing Thread	16xM3	24xM3	24xM4
f3	Output Shaft Thread	M2	M3	M3
f4	Input Shaft Thread (DIN 332)	M2	M3	M3
L1	Housing Size	27	33	45
L2	Housing Size	37	33	45
L3	Output Shaft to Centerline	33.5	40	50
L4	Mounting Bolt Location	22	27	37
L5	Mounting Bolt Location	25	27	37
L6	Pilot Height	3	7.5	11.5
L7	Small Pilot Height	1	1	1
L8	Output Shaft Length	13	15	23
L16	Centerline to End of Input Shaft	51	58	78
L19	Centerline to Input Pilot	18	21	31
L20	Input Shaft Length	13	15	23
L21	Centerline to Input Hub	37	42	54

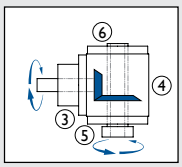




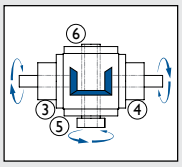
Dimension	Model	VP Series E0 and K0 Configuration*	
	Description	033	045
		mm	mm
D1 k6	Input Shaft Diameter	7	10
D5 h7	Pilot Diameter	32	44
D7 H7**	Hollow Shaft Diameter	6	10
D10	Shrink Disk OD	Consult GAM	Consult GAM
D12	Input Step Diameter	10	12
D13	Input Hub Pilot Diameter	28	43
D14 j6	Extended Shaft Diameter	8	12
f1	Output Flange Thread	8xM3	8xM4
f2	Housing Thread	24xM3	24xM4
f4	Input Shaft Thread (DIN 332)	M3	M3
L1	Housing Size	33	45
L2	Housing Size	33	45
L4	Mounting Bolt Location	27	37
L5	Mounting Bolt Location	27	37
L6	Pilot Height	7.5	11.5
L14	Hollow Shaft to Centerline	25	35
L15	Shrink Disk End to Centerline	35	50
L16	Centerline to End of Input Shaft	58	78
L20	Input Shaft Length	15	23
L21	Centerline to Input Hub	42	54

* Size 027 Not available with hollow output shaft
** Mating shaft should have j6 tolerance

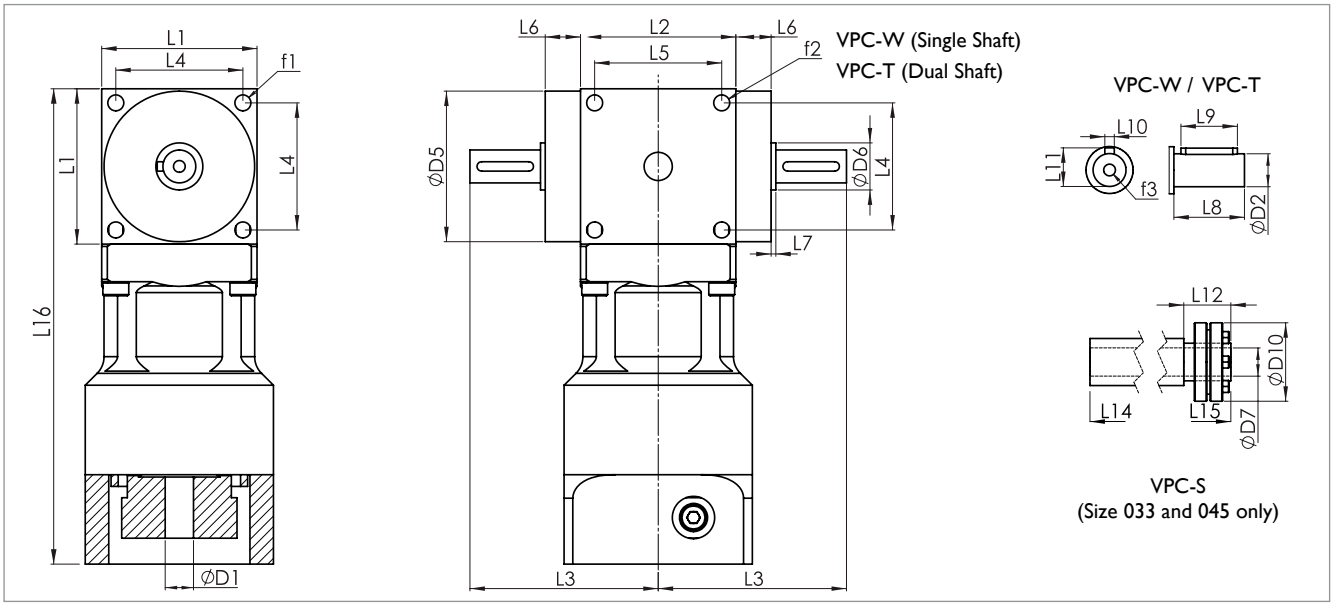
E0/HSD



K0/HSD



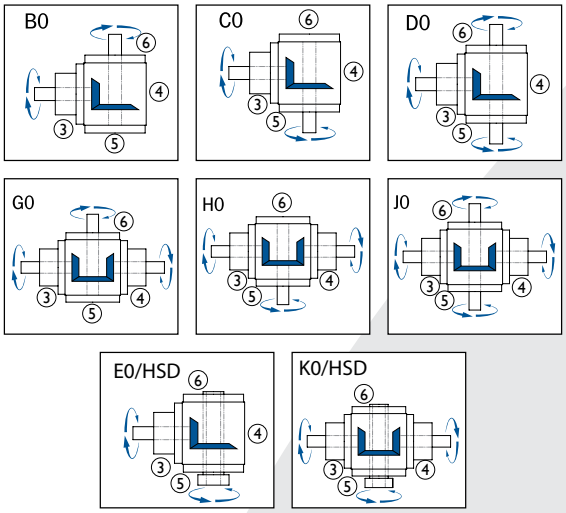
VPC Series



Dimension	Model	VPC-Series: VPC-T, VPC-W, VPC-S		
	Description	027	033	045
		mm	mm	mm
D1 min	Motor Shaft Diameter	6	6	6
D1 max		14	14	24
D2 k6	Output Shaft Diameter	6	7	10
D5 h7	Pilot Diameter	26	32	44
D6	Shoulder Diameter	8	10	12
D7 H7*	Smooth Hollow Diameter	-	6	10
D10	Shrink Disc OD	-	Consult GAM	Consult GAM
L1	Housing Size	27	33	45
L2	Housing Size	37	33	45
L3	Output Shaft To Centerline	33.5	40	50
L4	Mounting Bolt Location	22	27	37
L5	Mounting Bolt Location	25	27	37
L6	Output Pilot Height	3	7.5	11.5
L7	Small Pilot Height	1	1	1
L8	Output Shaft Length	13	15	23
L9	Key Length	10	12	18
L10	Key Width	2	2	3
L11	Shaft Height With Key	4	5	6
L12	Shaft Length	-	10	15
L14	Hollow Shaft To Centerline	-	25	35
L15	Shrink Disc End To Centerline	-	35	50
L16**	Overall Length	93	101	133
f1	Output Flange Mounting Holes	8xM3	8xM3	8xM4
f2	Housing Mounting Holes	16xM3	24xM3	24xM4
f3	Shaft Thread Din 332	M2	M3	M3

* Mating shaft should have j6 tolerance **Depending on motor, length may change

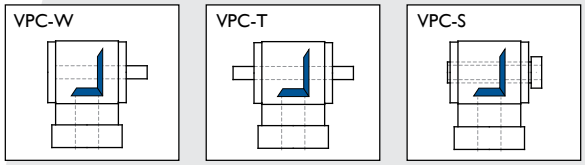
VP & VPC Series Type Codes



TYPE CODES FOR VP SERIES

Example: VP - C0 - 033 - 001 - 750 - S1 - M0000 - H0000 - C0000

- **Gearbox Series** — VP
- **Gearbox Model** — B0, C0, D0, F0, H0, J0, E0/H5D, K0/HSD (E0 and K0 not available on 027)
- **Gearbox Size** — 027, 033, 045
- **Ratio** — 001, 1.5, 002, 003, 004
- **Input Running Speed**
- **Duty Cycle** — S1 Continuous Speed, S5 Cyclic
- **Motor Code** — Assigned by GAM
- **Output Code** — Assigned by GAM
- **Configuration Code** — Assigned by GAM



Single Output Shaft | Dual Output Shaft | Smooth Hollow Output with Shrink Disc

TYPE CODES FOR VPC SERIES

Example: VPC - W - 090 - 002 G - 750 - S1 - M0000 - H0000 - C0000

- **Gearbox Series** — VP
- **Gearbox Style** — W = Single output shaft, T = Dual output shaft, S = Smooth hollow output shaft with shrink disc (not available in 027)
- **Gearbox Size** — 027, 033, 045
- **Ratio** — 001, 1.5, 002, 003, 004
- **Keyway on Output Shaft** — G = Keyway on output (-W & -T), H = No keyway on output (-S)
- **Input Running Speed**
- **Duty Cycle** — S1 Continuous Speed, S5 Cyclic
- **Motor Code** — Assigned by GAM
- **Output Code** — Assigned by GAM
- **Configuration Code** — Assigned by GAM

GAM Rack & Pinion

The GAM Helical Rack and Pinion series, along with our broad gearbox offering, provide a complete linear solution. Use our motion control engineering expertise to select the rack and pinion and match it with the right gearbox for your application.

- High precision helical rack for smooth, quiet operation
- Precision pinions easily mount to GAM gearboxes
- Pinion can be pre-mounted to the gearbox
- Racks and pinions are matched to GAM gearboxes for easy selection
- GAM engineering expertise to select the best solution for your application

Whether you need components or a complete package, GAM has the rack and pinion solution for your application.

What is Rack & Pinion?

A linear actuator that converts the rotary motion of the (circular) pinion to linear motion at the (linear) rack.

Why use a Rack & Pinion System?

A rack and pinion system is the most cost-effective way for linear movements greater than 2 meters.

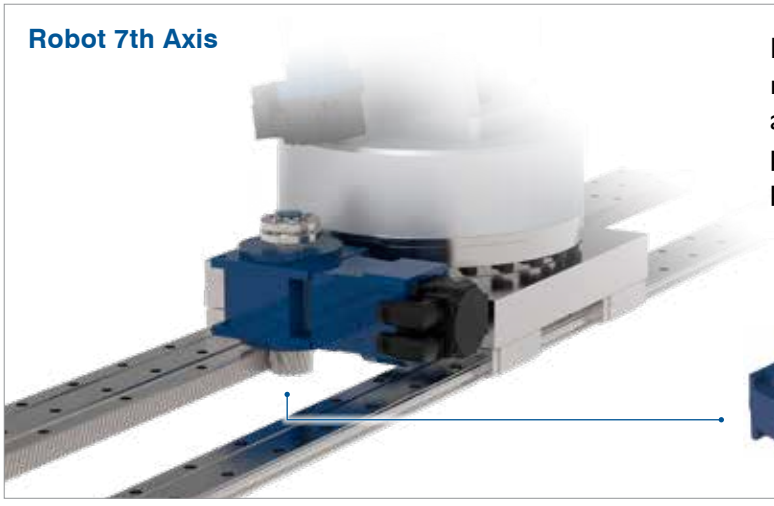
Why use a GAM Rack & Pinion System?

GAM matches the high quality rack and pinion with the best precision gearboxes for your application.

Applications

ISO Quality	Module	Tooth Thickness Tolerance (µm)	Application Examples
6	2.0 - 4.0	-20 ~ 0	• Wood, Plastic, Composite, Aluminium Working Machines • Machine Tools, Water Cutting Machines, Plasma Cutting Machines, Laser Cutting Machines, Tube Bending Systems
10	2.0 - 4.0	-90 ~ 0	• Lifting Axis, Handling, Welding Robots

Robot 7th Axis



Drive a robot 7th axis with a GAM rack and pinion system. Pinions are designed to optimize the performance of the system when paired with GAM servo gearboxes

Dyna Series + Rack & Pinion
High performance right angle hypoid gearbox with helical pinion and rack

GAM Rack & Pinion Systems

Pair GAM gearboxes with our rack and pinion for a complete linear motion control system.

- Pinions are hardened and work with either ISO 6 or 10 hardened rack
- Optional mounting tool and felt gear (for lubrication) available

Inline Systems

SPH-SP / PHGH-S

SPH-FP / PHGH-W

EPL-AP / PHGH-K

EPL-FP / PHGH-B

Right Angle Systems

DS-FP / PHGH-W

DS-HP / PHGH-D

EPR-AP / PHGH-K

EPR-FP / PHGH-B

Inline Gearbox	Pinion*	Module	Number of Teeth	Maximum Speed ** (m/min)	Feed Force† (kN)
SPH-SP-060	PHGH-20-15-S16-06	2	15	200	3.2
SPH-SP-075	PHGH-20-18-S22-06	2	18	240	4.2
SPH-SP-100	PHGH-20-23-S32-06	2	23	307	6.4
SPH-SP-140	PHGH-30-20-S40-06	3	20	400	10.7
SPH-SP-180	PHGH-40-20-S55-06	4	20	533	24.5
SPH-FP-075	PHGH-20-16-W50-06	2	16	213	4.2
SPH-FP-100	PHGH-20-19-W63-06	2	19	253	6.4
SPH-FP-140	PHGH-30-16-W80-06	3	16	320	14.7
EPL-AP-070	PHGH-20-18-K16-06	2	18	240	1.9
EPL-AP-090	PHGH-20-20-K22-06	2	20	267	2.8
EPL-AP-120	PHGH-20-30-K32-06	2	30	333	4.6
EPL-AP-155	PHGH-30-22-K40-06	3	22	330	12.4
EPL-FP-064	PHGH-20-26-B31.5-06	2	26	347	1.2
EPL-FP-090	PHGH-20-33-B50-06	2	33	440	2.7
EPL-FP-110	PHGH-20-40-B63-06	2	40	444	4.5
EPL-FP-140	PHGH-30-16-W80-06	3	16	240	10.5

Right Angle Gearbox	Pinion*	Module	Number of Teeth	Maximum Speed ** (m/min)	Feed Force† (kN)
DS-FP-055	PHGH-20-16-W50-06	2	16	284	2.9
DS-FP-075	PHGH-20-16-W50-06	2	16	284	5.8
DS-FP-090	PHGH-20-19-W63-06	2	19	296	9.6
DS-FP-115	PHGH-30-16-W80-06	3	16	320	13.3
DS-FP-140	PHGH-30-19-W80-06	3	19	317	18
DS-FP-190	PHGH-40-20-W125-06	4	20	400	30.1
DS-HP-055	PHGH-20-15-D20-06	2	15	267	3.1
DS-HP-075	PHGH-20-18-D25-06	2	18	320	5.2
DS-HP-090	PHGH-20-23-D30-06	2	23	358	8.1
DS-HP-115	PHGH-30-20-D40-06	3	20	400	11.6
DS-HP-140	PHGH-40-20-D55-06	4	20	444	20
DS-HP-190	PHGH-40-20-D70-06	4	20	400	30.1
EPR-AP-070	PHGH-20-18-K16-06	2	18	240	1.8
EPR-AP-090	PHGH-20-20-K22-06	2	20	267	2.7
EPR-AP-120	PHGH-20-30-K32-06	2	30	333	4.6
EPR-AP-155††	PHGH-30-22-K40-06	3	22	330	12.4
EPR-FP-064	PHGH-20-26-B31.5-06	2	26	347	1.2
EPR-FP-090	PHGH-20-33-B50-06	2	33	440	2.4
EPR-FP-110	PHGH-20-40-B63-06	2	40	444	4
EPR-FP-140††	PHGH-30-16-W80-06	3	16	240	10.5

* See pages 184-188 for pinion information
** 3:1 ratio with maximum input speed
† At 1 m/s, may vary based on speed and ratio
†† Contact GAM for availability

GHGH Series Helical Rack (Quality Q6)

Type Code

Rack Series		Module		Length		Precision Grade
GHGH	-	**20**	-	**10**	-	**06**
Helical Teeth Right Hand Helix Ground Induction Hardened		20 = Mod 2 30 = Mod 3 40 = Mod 4		10 = 1 m (standard)		ISO 6

Part Numbers

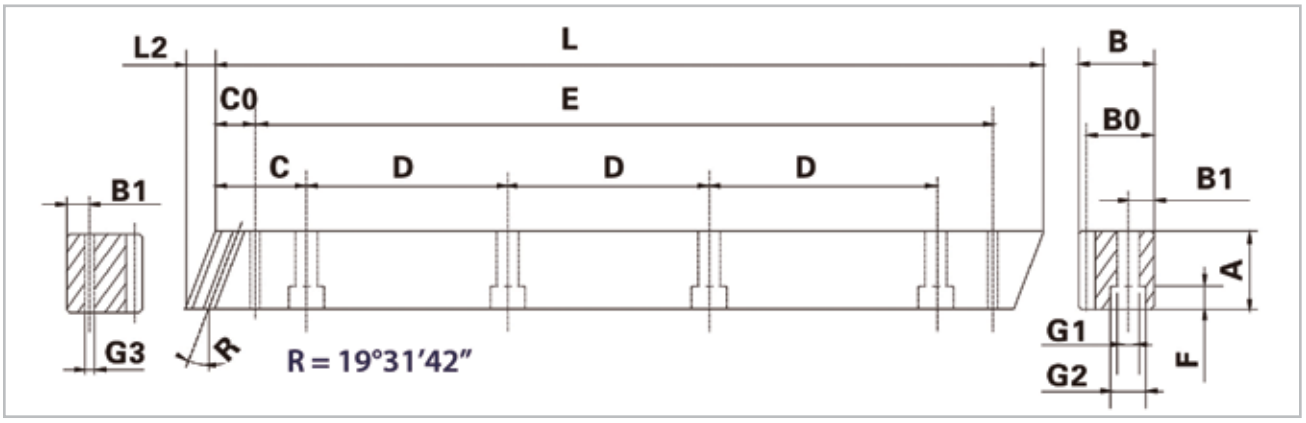
Module	2.0	3.0	4.0
Type Code	GHGH-20-10-06	GHGH-30-10-06	GHGH-40-10-06
Part Number	84020003	84020004	84020001

Specifications

Quality	ISO Q6	Hardness	50 - 55 HRC
Helix Angle	Right Hand 19° 31′ 42″	Teeth Finish	Ground
Pressure Angle	20°	Side/End Finish	Ground
Material	1045	Heat Treatment	Induction Hardened

Tolerance

Module	2.0	3.0	4.0
Tooth Thickness Tolerance (µm)	-20	-10	-20
Single Pitch Error (µm)	≤8	≤9	≤10
Total Pitch Error (µm)	≤36	≤36	≤36



Dimensions (mm)

Type Code	Module	No. of Teeth	L	L2	A	B	B0	C	D	No of Holes	B1	G1	G2	F	C0	E	G3	Weight (kg)
GHGH-20-10-06	2	150	1000	8.50	24	24	22	62.50	125	8	8	7	11	7	31.7	936.60	5.7	4.1
GHGH-30-10-06	3	100	1000	10.30	29	29	26	62.50	125	8	9	10	15	9	35	930.00	7.7	6.0
GHGH-40-10-06	4	75	1000	13.80	39	39	35	62.50	125	8	12	10	15	9	33.3	933.40	7.7	10.8

GHFH Series Helical Rack (Quality Q10)

Type Code

Rack Series		Module		Length		Precision Grade
GHFH	-	**20**	-	**10**	-	**10**
Helical Teeth Right Hand Helix Finish Milled Induction Hardened		15 = Mod 1.5 20 = Mod 2 30 = Mod 3 40 = Mod 4		10 = 1 m (standard)		ISO 10

Part Numbers

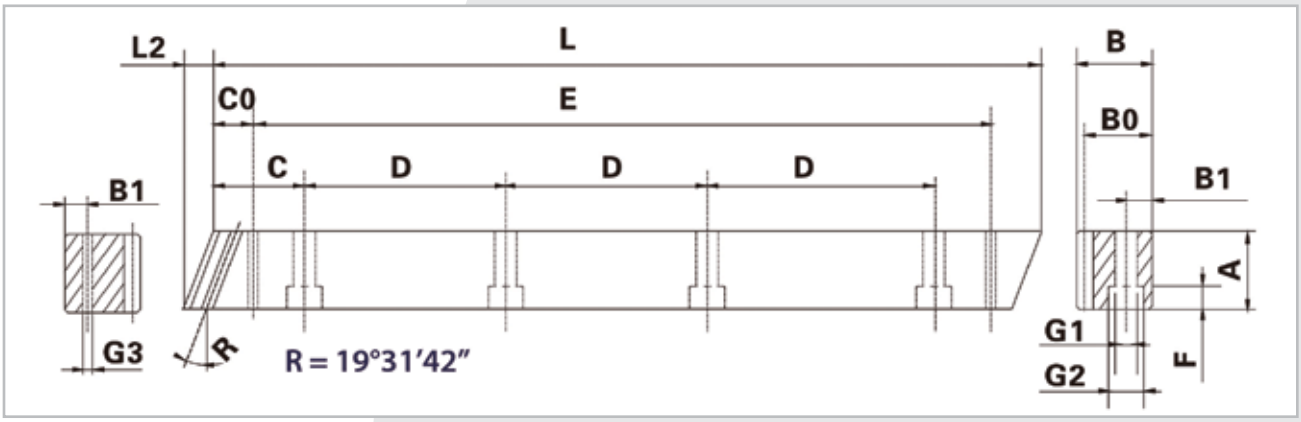
Module	1.5	2.0	3.0	4.0
Type Code	GHFH-15-10-10	GHFH-20-10-10	GHFH-30-10-10	GHFH-40-10-10
Part Number	84020012	84020005	84020006	84020007

Specifications

Quality	ISO Q10	Hardness	50 - 55 HRC
Helix Angle	Right Hand 19° 31′ 42″	Teeth Finish	Finish Milled
Pressure Angle	20°	Side/End Finish	Finish Milled
Material	1045	Heat Treatment	Induction Hardened

Tolerance

Module	1.5	2.0	3.0	4.0
Tooth Thickness Tolerance (µm)	-124	-124	-124	-124
Single Pitch Error (µm)	≤37	≤37	≤39	≤43
Total Pitch Error (µm)	≤148	≤148	≤162	≤175



Dimensions (mm)

Type Code	Module	No. of Teeth	L	L2	A	B	B0	C	D	No of Holes	B1	G1	G2	F	C0	E	G3	Weight (kg)
GHFH-15-10-10	1.5	200	1000	6.00	17	17	15.5	62.50	125	8	8	6	9.5	7	31.7	936.60	5.7	2.6
GHFH-20-10-10	2	150	1000	8.50	24	24	22	62.50	125	8	8	7	11	7	31.7	936.60	5.7	4.1
GHFH-30-10-10	3	100	1000	10.30	29	29	26	62.50	125	8	9	10	15	9	35.0	930.00	7.7	6.0
GHFH-40-10-10	4	75	1000	13.80	39	39	35	62.50	125	8	12	10	15	9	33.3	933.40	7.7	10.8

Rack Installation

These are the three main steps to installing GAM rack. See the GAM Rack Installation Instructions for more detailed installation information. Installation of multiple rack pieces end-to-end requires an opposite tooth installation gauge:

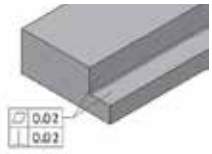
Helical Tooth Installation Gauge

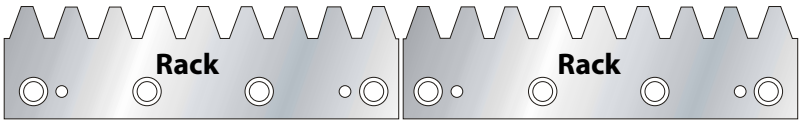
Module	1.5	2.0	3.0	4.0
Type Code	GHGH-15-02-Gauge	GHGH-20-02-Gauge	GHGH-30-02-Gauge	GHGH-40-02-Gauge
Part Number	84030012	84030005	84030004	84030003
Dimensions HxWxL (mm)	17 x 17 x 200	24 x 24 x 200	29 x 29 x 200	39 x 39 x 200

Step 1

Put the racks on the base, end to end, without the screw

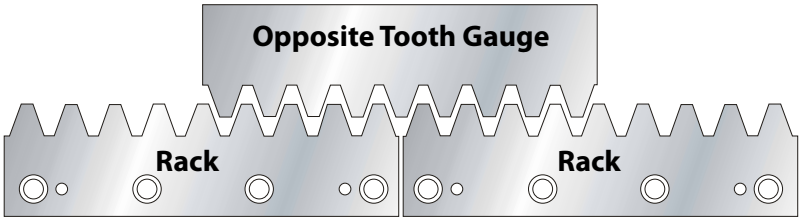
NOTE: *Ensure the installation mounting surface is clean and clear of debris and within tolerance (perpendicularity and flatness ≤ 0.02 mm)*





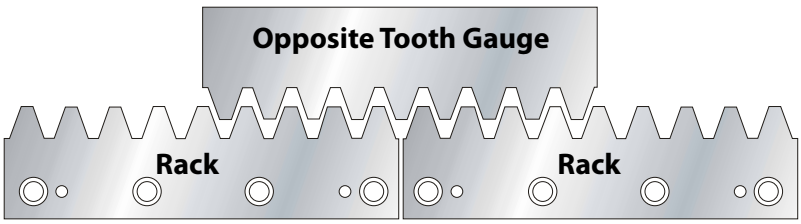
Step 2

Put the Rack Gauge across the ends of the joined racks and adjust the pitch. The ends of the racks each form half a tooth.



Step 3

Bolt the racks to the base in sequence. Install dowel pins.

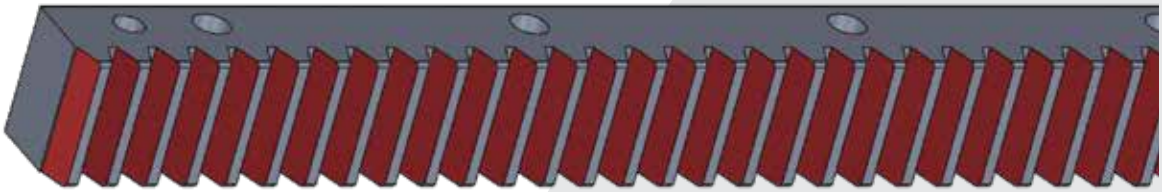


Rack & Pinion Alignment

For best performance, the rack and pinion must be installed with proper tooth engagement. To check this, we recommend using a red gear-marking compound to check the gear mesh contact pattern ***under load conditions***.

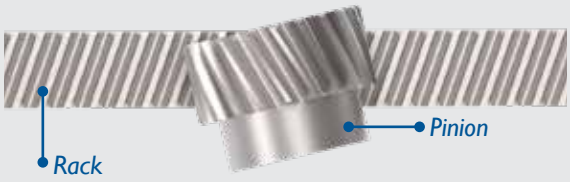
Correct

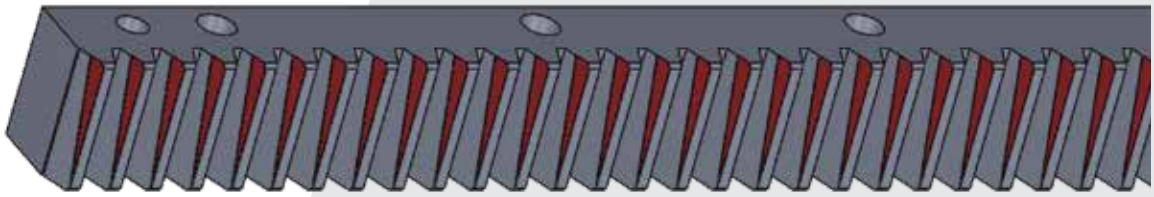
Red compound distributed evenly indicates contact is even across the face of the tooth



Not Parallel

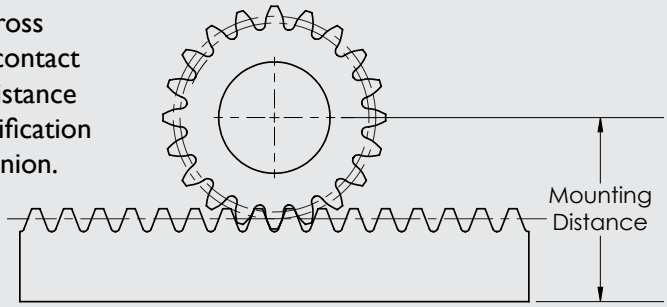
Red compound forming a triangular shape across the face of the tooth indicates the pinion and rack are not parallel. Adjust the pinion so the face of the pinion and the side of the rack are parallel. The axis of the pinion should be perpendicular to the rack

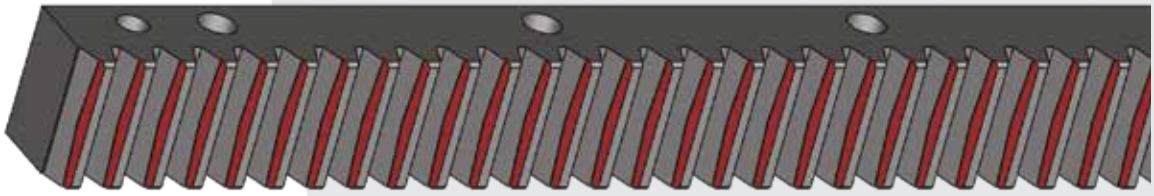




Incorrect Mounting Distance

Red compound appearing only on the top half across the face of the tooth indicates insufficient tooth contact between the rack and pinion. Adjust the center distance between the rack and the pinion. The pinion specification tables include the center distance for each size pinion.





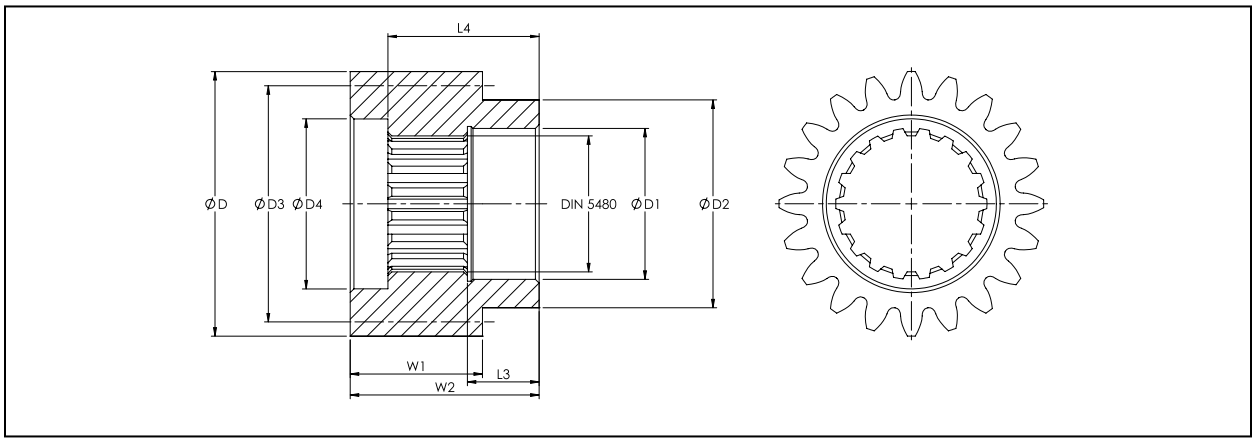
PHGH-S Pinion (Spline)

GAM Spline Pinions connect to the output shaft of the gearbox with a spline connection.

Pinion Series		Module (M)		Number of Teeth (z)		Pinion Type	Spline Diameter		Quality
PHGH	-	**20**	-	**18**	-	**S**	**22**	-	**06**
4140 Steel Helical Teeth Left Hand Helix Ground Induction Hardened		20 = Mod 2 30 = Mod 3 40 = Mod 4				Spline	See Table		ISO 6

Specifications

Type Code	Part Number	Module (M)	No. of Teeth (z)	Spline Diameter (DIN 5480)	Travel per Rotation (mm)	Max Feed Force (kN)	Mounting Distance (mm)	Use with GAM Gearbox
PHGH-20-15-S16-06	84010014	2	15	N16x0.8x18x7H	100.00	11.1	39.10	SPH-SP-060
PHGH-20-18-S22-06	84010015	2	18	N22x1.25x16x7H	120.00	11.9	42.10	SPH-SP-075
PHGH-20-23-S32-06	84010016	2	23	N32x1.25x24x7H	153.33	12.9	47.40	SPH-SP-100
PHGH-30-20-S40-06	84010017	3	20	N40x2x18x7H	200.00	22.2	59.20	SPH-SP-140
PHGH-40-20-S55-06	84010018	4	20	N55x2x26x7H	266.67	39.1	79.04	SPH-SP-180



Dimensions

Type Code	Spline Dia DIN 5480	D (mm)	D1 (mm) F7	D2 (mm)	D3 Pitch (mm)	Dw Working Pitch (mm)	D4 (mm)	W1 (mm)	W2 (mm)	L3 (mm)	L4 (mm)	x Shift Coefficient
PHGH-20-15-S16-06	N16x0.8x18x7H	38.2	16	25	31.831	34.200	20	26	32	11	26.5	0.59
PHGH-20-18-S22-06	N22x1.25x16x7H	44.2	22	30	38.197	40.200	25	26	33	12	27.5	0.50
PHGH-20-23-S32-06	N32x1.25x24x7H	54.8	32	40	48.808	50.800	35	26	34	13	27	0.50
PHGH-30-20-S40-06	N40x2x18x7H	72.4	40	55	63.662	66.400	45	31	51	20	41	0.46
PHGH-40-20-S55-06	N55x2x26x7H	96.08	55	75	84.883	88.080	60	41	54	20	44	0.40

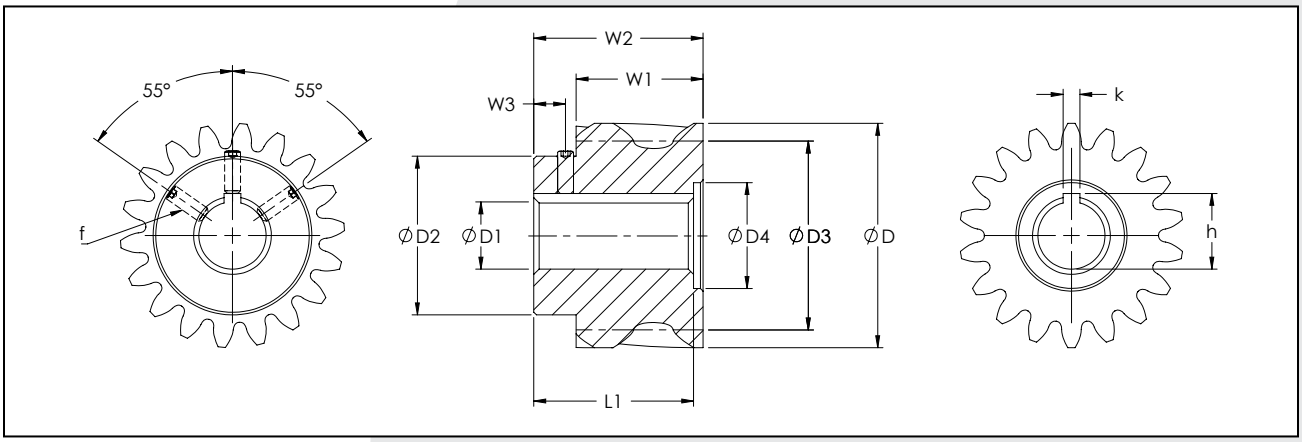
PHGH-K Pinion (Keyed Shaft)

GAM Keyed Pinions connect to the output shaft of the gearbox with a key

Pinion Series		Module		Number of Teeth		Pinion Type	Shaft Diameter		Quality
PHGH	-	**20**	-	**18**	-	**K**	**16**	-	**06**
4140 Steel Helical Teeth Left Hand Helix Ground Induction Hardened		15 = Mod 1.5 20 = Mod 2 30 = Mod 3 40 = Mod 4				Keyed Shaft	Diameter (mm)		ISO 6

Specifications

Type Code	Part Number	Module (M)	No. of Teeth (z)	D1 Shaft Diameter (mm) [in.]	Travel per Rotation (mm)	Max Feed Force (kN)	Mounting Distance (mm)	Use with GAM Gearbox
PHGH-15-20-K0.375-06	84010001	1.5	20	9.53 [0.375]	100	1.3	31.4	PE-N-023
PHGH-20-18-K0.500-06	84010002	2	18	12.7 [0.500]	120	2.8	41.10	PE-N-034
PHGH-20-18-K16-06	84010010	2	18	16	120.00	12.88	41.10	EPL-A-070 / EPR-A-070
PHGH-20-20-K22-06	84010011	2	20	22	133.33	13.37	43.22	EPL-A-090 / EPR-A-090
PHGH-20-30-K32-06	84010012	2	30	32	200.00	15.02	53.83	EPL-A-120 / EPR-A-120
PHGH-30-22-K40-06	84010013	3	22	40	220.00	20.05	61.01	EPL-A-155 / EPR-A-155



Dimensions

Type Code	D (mm)	D1 (mm) [in]	D2 (mm)	D3 Pitch (mm)	D4 (mm)	W1 (mm)	W2 (mm)	W3 (mm)	L1 (mm)	f (mm)	k (mm)	h (mm)
PHGH-15-20-K0.375-06	34.83	9.53 H6 [$0.375^{+0.0004}_{0}$]	25	31.83	18	19	27.5	6.5	24.5	(3) M3 x 0.5 SHSS 8 mm Long	-	-
PHGH-20-18-K0.500-06	42.4	12.7 H6 [$0.500^{+0.0004}_{0}$]	30	38.20	20	24	32	6	30.2	(3) M3 x 0.5 SHSS 8 mm Long	3.175	14.3
PHGH-20-18-K16-06	42.4	16 F7	25	38.20	25	28	34.5	-	29	-	5	18.3
PHGH-20-20-K22-06	46.4	22 F7	36	42.44	30	28	42.5	-	37	-	6	24.8
PHGH-20-30-K32-06	67.7	32 F7	55	63.66	45	28	66	-	59	-	10	35.3
PHGH-30-22-K40-06	76	40 F7	62	70.03	50	28	93	-	83	-	12	43.3

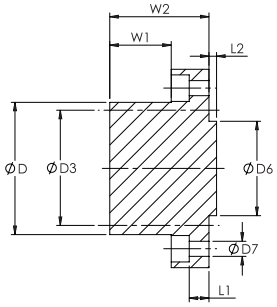
PHGH-W Pinion (Welded Flange)

GAM Welded Flange Pinions mount to flange-output gearboxes.

Pinion Series		Module (M)		Number of Teeth (z)		Pinion Type	Flange Bolt Circle		Quality
PHGH	-	**20**	-	**16**	-	**W**	**50**	-	**06**
4140 Steel Helical Teeth Left Hand Helix Ground Induction Hardened		20 = Mod 2 30 = Mod 3 40 = Mod 4		Per Table		Welded Flange	Diameter (mm)		ISO 6

Specifications

Type Code	Part Number	Module (M)	No. of Teeth (z)	D5 Bolt Circle ISO 9409 Flange (mm)	Travel per Rotation (mm)	Max Feed Force (kN)	Mounting Distance (mm)	Fig	Use with GAM Gearbox
PHGH-20-16-W50-06	84010022	2	16	50	106.67	14.8	38.98	1	SPH-F-075 / DS-F-055 / DS-F-075
PHGH-20-19-W63-06	84010023	2	19	63	126.67	15.7	42.16	2	SPH-F-100 / DS-F-090
PHGH-30-16-W80-06	84010024	3	16	80	160.00	27.7	51.46	3	SPH-F-140 / EPL-F-140 / DS-F-115
PHGH-30-19-W80-06	84010025	3	19	80	190.00	29.5	56.24	3	DS-F-140
PHGH-40-20-W125-06	84010026	4	20	125	266.67	55.5	77.44	3	DS-F-190



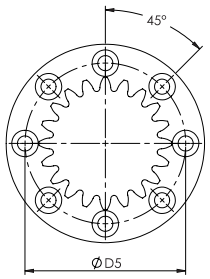


Fig 1

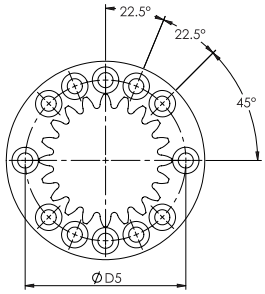


Fig 2

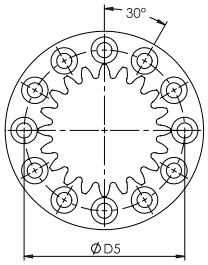


Fig 3

Dimensions

Type Code	Figure	D (mm)	D3 (mm)	D5 Bolt Circle (mm)	D6 (mm) k6	D7 (mm)	W1 (mm)	W2 (mm)	L1 (mm)	L2 (mm)
PHGH-20-16-W050-06	1	37.95	33.953	50	31.5	6.6	26	41	8.5	5
PHGH-20-19-W063-06	2	44.30	40.319	63	40	6.6	26	41	8.5	5
PHGH-30-16-W080-06	3	56.90	50.930	80	50	9	32.5	52.5	12	5
PHGH-30-19-W080-06	3	66.50	60.479	80	50	9	32.5	52.5	12	5
PHGH-40-10-W125-06	3	92.90	84.883	125	80	11	45	70	15	6

PHGH-B Pinion (Bolt-Through)

GAM Bolt-Through Pinions mount to flange-output gearboxes.

Pinion Series		Module		Number of Teeth		Pinion Type	Bolt Circle		Quality
PHGH	-	**20**	-	**26**	-	**B**	**31.5**	-	**06**
4140 Steel Helical Teeth Left Hand Helix Ground Induction Hardened		20 = Mod 2				Bolt-Through	Diameter (mm)		ISO 6

Specifications

Type Code	Part Number	Module (M)	No. of Teeth (z)	D5 Bolt Circle (ISO 9409 Flange) (mm)	Travel per Rotation (mm)	Max Feed Force (kN)	Mounting Distance (mm)	Fig	Use with GAM Gearbox
PHGH-20-26-B31.5-06	84010019	2	26	31.5	173.334	13.4	50.40	1	EPL-F-064 / EPR-F-064 DS-F-055
PHGH-20-33-B50-06	84010020	2	33	50	220.000	18.4	57.80	1	EPL-F-090 / EPR-F-090
PHGH-20-40-B63-06	84010021	2	40	63	266.667	14.8	65.20	2	EPL-F-110 / EPR-F-110

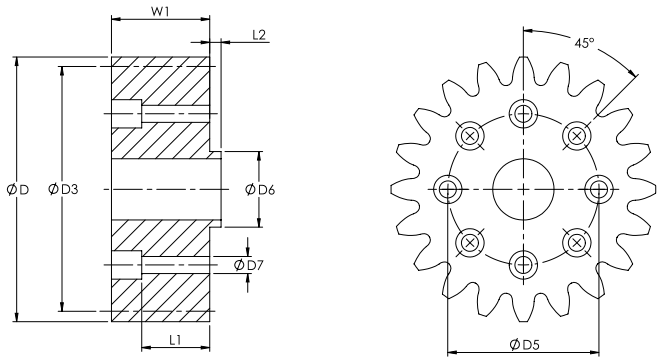


Fig. 1 Fig. 2

Dimensions

Type Code	Figure	D (mm)	D3 Pitch Dia (mm)	Dw Working Pitch (mm)	D5 Bolt Circle (mm)	D6 (mm)	D7 (mm)	W1 (mm)	L1 (mm)	L2 (mm)	x Shift Coefficient
PHGH-20-26-B31.5-06	1	60.80	55.174	56.800	31.5	20	5.5	26	14	3	0.4065
PHGH-20-33-B050-06	1	75.60	70.028	71.599	50	31.5	6.6	26	12	3	0.3928
PHGH-20-40-B063-06	2	90.40	84.883	86.400	63	40	6.6	26	12	3	0.3792

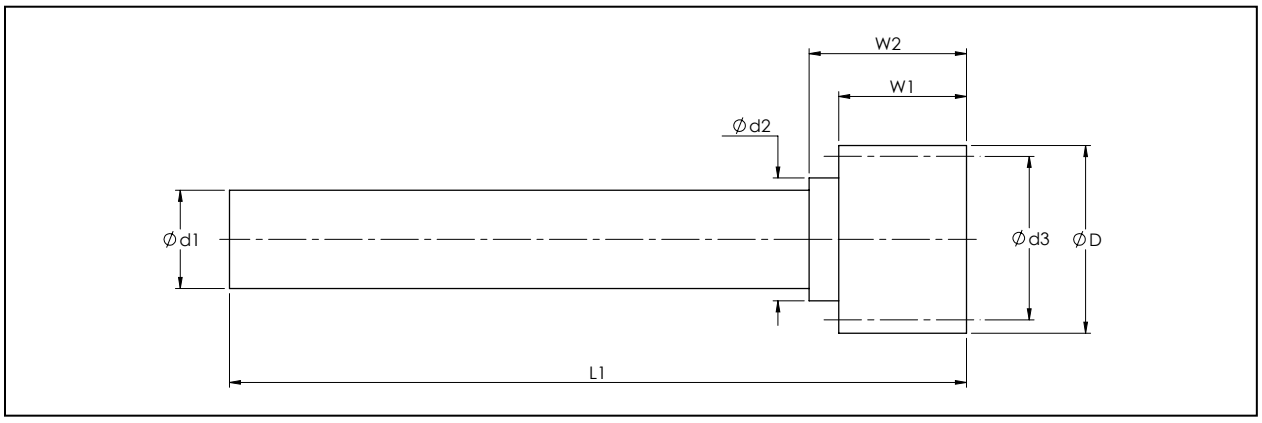
PHGH-D Pinion (Shaft)

GAM Shaft Pinions mount to hollow output shaft gearboxes

Pinion Series		Module (M)		Number of Teeth (z)		Pinion Type	Shaft Diameter		Quality
PHGH	**-**	**20**	**-**	**18**	**-**	**D**	**25**	**-**	**06**
4140 Steel Helical Teeth Left Hand Helix Ground Induction Hardened		20 = Mod 2 30 = Mod 3 40 = Mod 4				Shaft	Diameter (mm)		ISO 6

Specifications

Type Code	Part Number	Module (M)	No. of Teeth (z)	D1 Shaft Diameter (mm)	Travel per Rotation (mm)	Max Feed Force (kN)	Mounting Distance (mm)	Use with GAM Gearbox
PHGH-20-15-D20-06	84010027	2	15	20	100.00	11.1	39.10	DS-H-055
PHGH-20-18-D25-06	84010028	2	18	25	120.00	11.9	42.10	DS-H-075
PHGH-20-23-D30-06	84010029	2	23	30	153.33	12.9	47.40	DS-H-090
PHGH-30-20-D40-06	84010030	3	20	40	200.00	22.2	59.20	DS-H-115
PHGH-40-20-D55-06	84010031	4	20	55	266.67	39.1	79.04	DS-H-140
PHGH-40-20-D70-06	84010032	4	20	70	266.67	39.1	79.04	DS-H-190



Dimensions

Type Code	D (mm)	D1 (mm) F7	D2 (mm)	D3 Pitch (mm)	Dw Working Pitch (mm)	W1 (mm)	W2 (mm)	L1 (mm)	x Shift Coefficient
PHGH-20-15-D20-06	38.2	20	25	31.83	34.20	26	32	150	0.59
PHGH-20-18-D25-06	44.2	25	30	38.20	40.20	26	33	164	0.50
PHGH-20-23-D30-06	54.8	30	40	48.81	50.80	26	34	189	0.50
PHGH-30-20-D40-06	72.4	40	55	63.66	66.40	31	51	230	0.46
PHGH-40-20-D55-06	96.08	55	75	84.88	88.08	41	54	268	0.40
PHGH-40-20-D70-06	96.08	70	75	84.88	88.08	41	54	325	0.40

Rack Installation Gauge

These opposite tooth gauges assist with installing rack pieces end-to-end. Select the gauge that matches the module of your rack.

Helical Tooth Installation Gauge

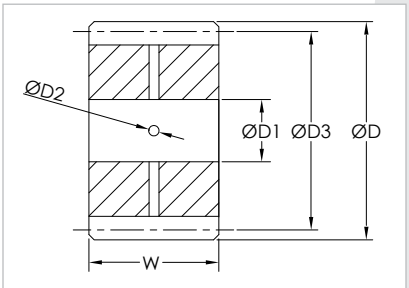
Module	1.5	2.0	3.0	4.0
Type Code	GHGH-15-02-Gauge	GHGH-20-02-Gauge	GHGH-30-02-Gauge	GHGH-40-02-Gauge
Part Number	84030012	84030005	84030004	84030003
Helix	Left Hand	Left Hand	Left Hand	Left Hand
Dimensions HxWxL (mm)	17 x 17 x 200	24 x 24 x 200	29 x 29 x 200	39 x 39 x 200

Felt Pinions

Use a felt pinion with your lubrication system to lubricate the rack and pinion. Felt pinions can be mounted to lubricate either the rack or the pinion.

Felt Pinions

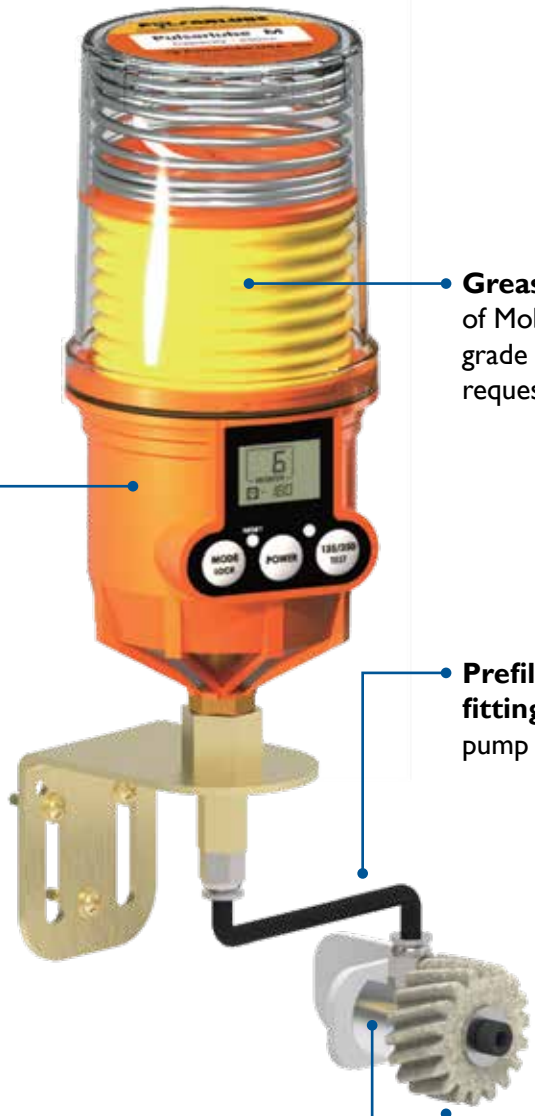
Module	2.0		3.0		4.0	
Type Code	PHFP-20-L	PHFP-20-R	PHFP-30-L	PHFP-30-R	PHFP-40-L	PHFP-40-R
Part Number	84030006	84030007	84030008	84030009	84030010	84030011
Helix	Left Hand	Right Hand	Left Hand	Right Hand	Left Hand	Right Hand
Mounts to	Rack	Pinion	Rack	Pinion	Rack	Pinion



Module	Number of Teeth (z)	D (mm)	D1 (mm)	D2 (mm)	D3 Pitch (mm)	W (mm)
2	18	42	12	2	38.2	25
3	18	63	12	3	57.3	30
4	18	84	12	4	76.4	40

GAM Lubrication System

For best performance, the rack and pinion must be kept lubricated. GAM makes this easy with a complete Lubrication System including everything from an easy-to-use automatic lubricator pump to a felt pinion to apply grease directly to the pinion or rack.



Grease Pack with 125 ml of Mobilux EP2 grease (food grade grease available on request)

PulsarLube Automatic Single Point Lubricator provides the proper amount of fresh lubricant at the right time, avoiding over- or under-lubricating. Includes mounting bracket and hardware

Prefilled tubing and all fittings to connect the pump to the pinion shaft

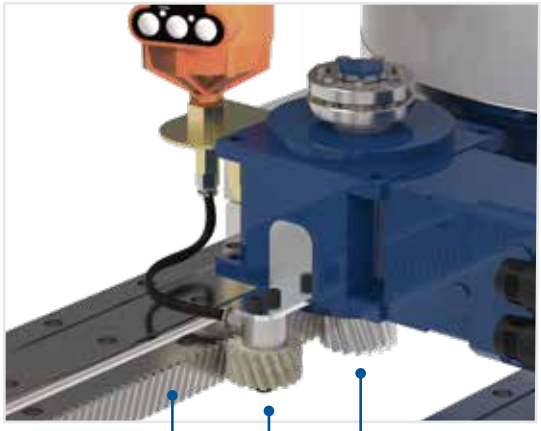
Pinion Shaft delivers grease at multiple points to the felt pinion while allowing the pinion to rotate.

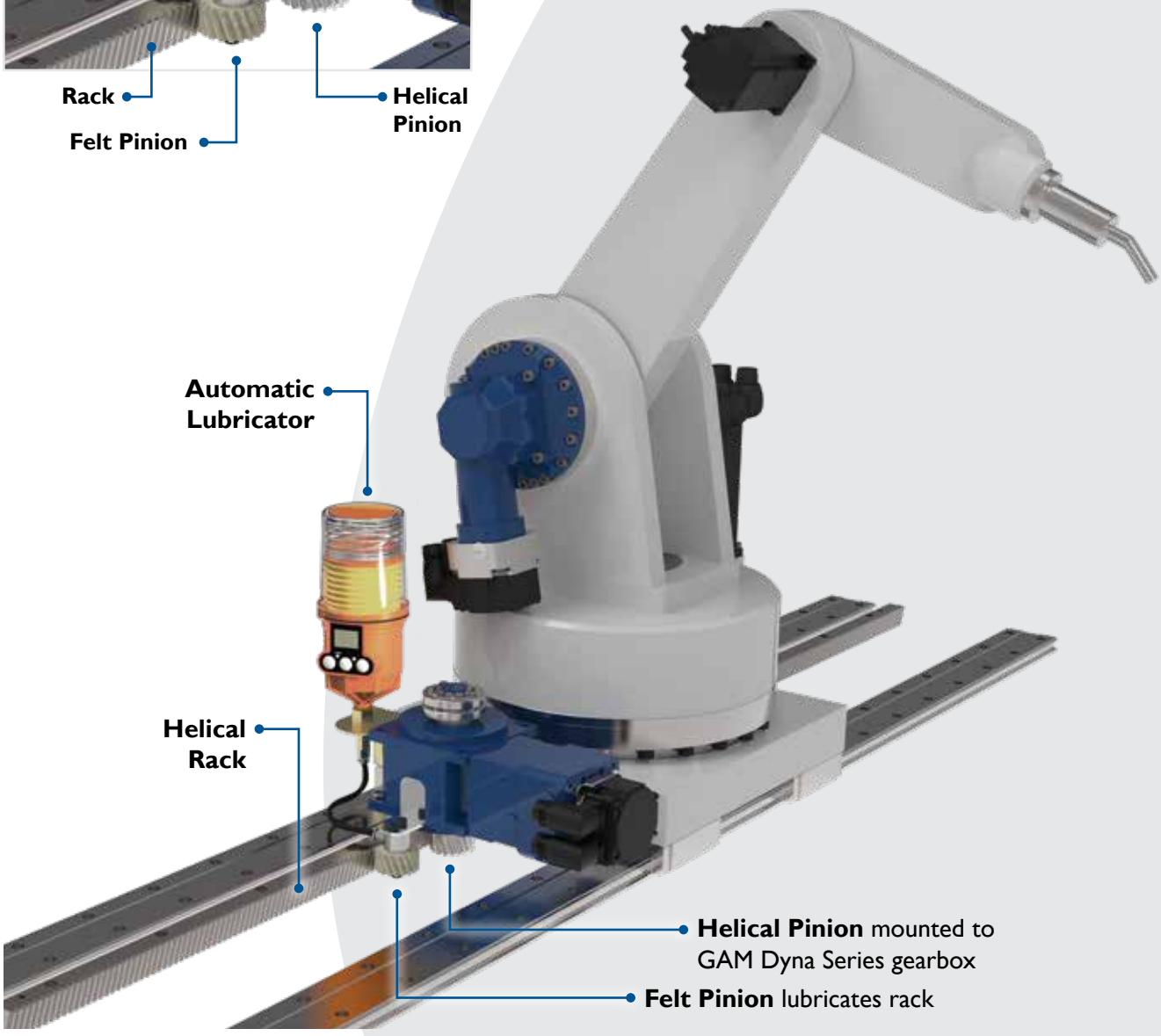
Optional custom mounting bracket available upon request

Felt Pinion with either a left-hand helix to lubricate the rack or right-hand helix to lubricate the pinion

Lubrication System used on rack of Robot 7th axis

Felt Pinion used to lubricate rack





Lubrication System Ordering Information

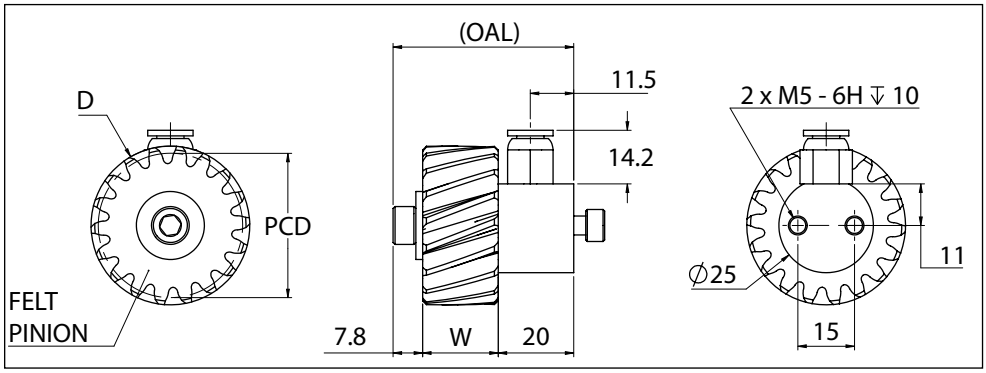
Order (1) Lubricator* and (1) Felt Pinion according to the module size of the rack and pinion system and whether the felt pinion will be lubricating the rack or the pinion.

Rack/Pinion Module	Lubricator* Part Number	Felt Pinion (Select 1)	
		Left Hand Helix (Lubricates Rack)	Right Hand Helix (Lubricates Pinion)
1.5		Contact GAM	
2.0	84050002	74030004	74030005
3.0	84050003	74030006	74030007
4.0	84050004	74030008	74030009

* Lubricator includes lubricator pump, all fittings, prefilled tubing, shaft for felt pinion, and a 125 ml EP2 grease pack

Dimensions (all dimension in mm)

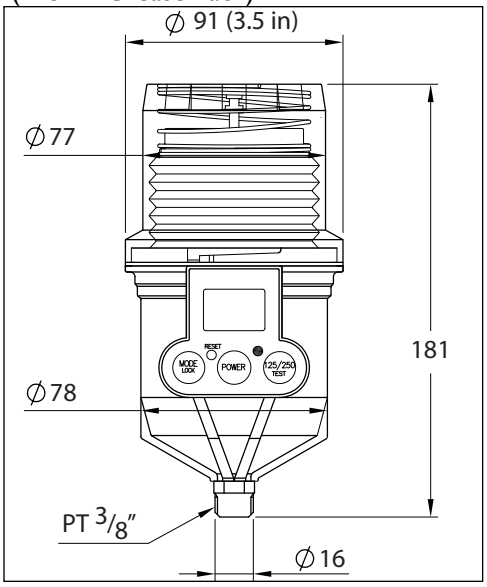
Felt Pinion & Shaft



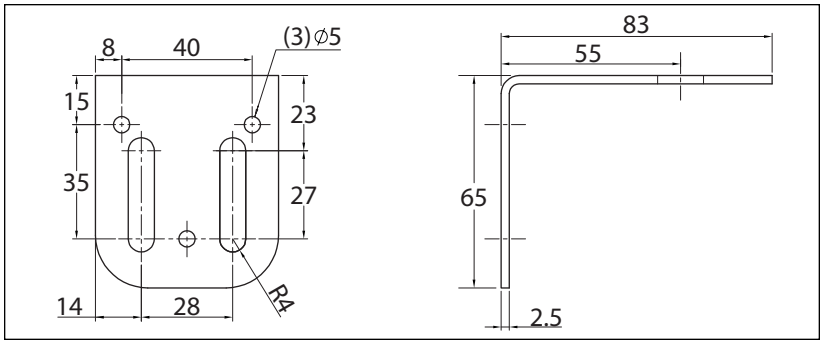
Module	D Pinion Diameter (mm)	W Pinion Length (mm)	OAL Overall Length (mm)	PCD Pitch Circle Diameter (mm)
1.5		Contact GAM		
2.0	42	25	47.8	38.2
3.0	63	30	57.8	57.3
4.0	84	40	67.8	76.4

Lubricator Pump

(125 ml Grease Pack)



Lubricator Mounting Bracket



Lubrication Dispensing Period Setting

Proper lubrication amount is dependent on the module and linear speed of the rack and pinion system. These two factors are used to determine the dispensing period (interval) setting for the automatic lubricator.
For single point lubrication with the GAM PulsarLube Automatic Lubricator, find the dispensing period setting as follows:

1. Using **Table 1**, find the row corresponding to the **Module** of your rack
2. Read across to find the column corresponding to the **Linear Velocity** of your system
3. Use the value in the **Interval** column for the **Dispensing Period** setting on the lubricator

Notes:

- For reference, **Table 2** shows the actual amount dispensed for each dispensing period setting on the PulsarLube Automatic Lubricator.
- If you are using a different brand of lubricator, **Table 3** lists the recommended range of lubrication for the given module and linear speed.
- To lubricate multiple points with one lubricator, contact GAM for available options.
- Replacement grease packs are available from GAM:

Replacement 125 ml Grease Packs	MOBILUX EP2 (standard)	FM222 (food grade)
Part Number	44060001	44060002

Table 1: Dispensing Period (Interval) Setting for 125 ml Grease Pack *(Standard)*

Rack Module		Linear Velocity									
		0 – 1 m/s		1 – 2 m/s		2 – 3 m/s		3 – 4 m/s		4 – 5 m/s	
Over	Up to/Incl.	Interval	cm^3/24h	Interval	cm^3/24h	Interval	cm^3/24h	Interval	cm^3/24h	Interval	cm^3/24h
-	2	12	0.35	12	0.35	12	0.35	12	0.35	12	0.35
2	3	12	0.35	12	0.35	12	0.35	12	0.35	12	0.35
3	4	12	0.35	12	0.35	12	0.35	6	0.69	6	0.69
4	5	12	0.35	12	0.35	6	0.69	6	0.69	3	1.39
5	6	12	0.35	12	0.35	6	0.69	3	1.39	2	2.08

Table 2: Dispensed Amount for Each Dispensing Period Setting *(125 ml Grease Pack)*

Dispensing Period:	H	1	2	3	6	12
Days:	15	30	60	90	180	360
Dispensed (cm^3/24h):	8.33	4.17	2.08	1.39	0.69	0.35

Table 3: Recommended Lubrication Range *(cm^3/24 hours)*

Rack Module		Linear Velocity				
		0 – 1 m/s	1 – 2 m/s	2 – 3 m/s	3 – 4 m/s	4 – 5 m/s
Over	Up to/Incl.	cm^3/24h	cm^3/24h	cm^3/24h	cm^3/24h	cm^3/24h
-	2	0.10 – 0.23	0.12 – 0.23	0.14 – 0.35	0.19 – 0.69	0.21 – 0.69
2	3	0.14 – 0.23	0.18 – 0.35	0.22 – 0.69	0.29 – 0.69	0.34 – 0.69
3	4	0.21 – 0.23	0.23 – 0.69	0.33 – 0.69	0.44 – 1.39	0.54 – 1.39
4	5	0.23 – 0.30	0.23 – 0.69	0.50 – 0.69	0.67 – 1.39	0.85 – 1.39
5	6	0.23 – 0.43	0.35 – 0.69	0.69 – 1.39	1.04 – 2.08	1.35 – 2.40

Rack & Pinion Terminology

Module

The module is the relative size of the rack and pinion as described by the pinion. It is the ratio of the diameter of a gear to the number of teeth on the gear. The module and number of teeth give the reference pitch diameter:

$$\text{Module (M)} = \frac{\text{Pitch Diameter}}{\text{Number of Teeth (z)}}$$

$$\text{Reference Pitch Diameter} = \text{Module } (M) \times \text{Number of Teeth } (z)$$

***NOTE**: The rack and pinion must have the same module.*

ISO Quality Number

The ISO Quality Number describes the accuracy of the gear including the tooth alignment and profile, spacing variation and radial runout among other things. GAM stocks Q6 and Q10 racks along with Q6 pinions.

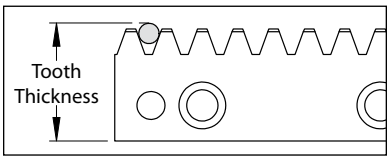
Gear Quality Number

ISO	DIN	AGMA	JIS
6	6	12	2
10	10	8	6

Tooth Thickness Tolerance

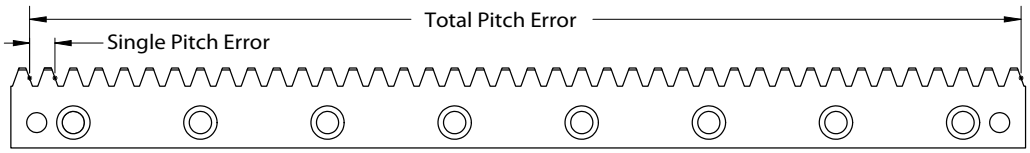
Tooth Thickness Tolerance is the relationship between tooth thickness and a measuring pin measurement.

- The tooth thickness of racks is usually measured via the pin measurement as tooth thickness can not be measured directly.
- A measuring pin is put into the teeth and measured to the back of the rack.



Pitch Error

Pitch: Distance between teeth as measured from a point on one rack tooth to the corresponding point on the next gear tooth.



Single Pitch Error: Error in the pitch between two teeth relative to the ideal.

Total Pitch Error: Cumulative pitch error over the length of the rack.

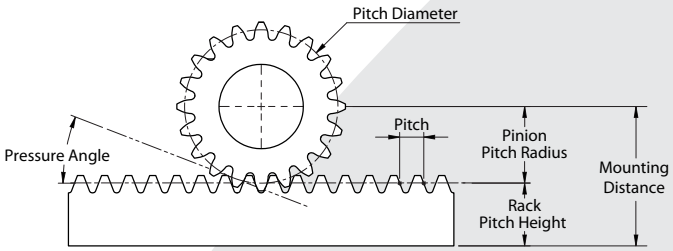
Tolerance	Module 2.0		Module 3.0		Module 4.0	
	ISO 6	ISO 10	ISO 6	ISO 10	ISO 6	ISO 10
Tooth Thickness Tolerance (µm)	-20	-124	-10	-124	-20	-124
Single Pitch Error (µm)	≤ 8	≤ 37	≤ 9	≤ 39	≤ 10	≤ 43
Total Pitch Error (µm)	≤ 36	≤ 148	≤ 36	≤ 162	≤ 36	≤ 175

Rack & Pinion Terminology

Circular Pitch: The distance from a point on one gear tooth to the corresponding point on the next gear tooth, measured along the pitch circle.

Pitch Circle: A circle transcribing the contact point on the teeth where the rack and pinion mesh correctly

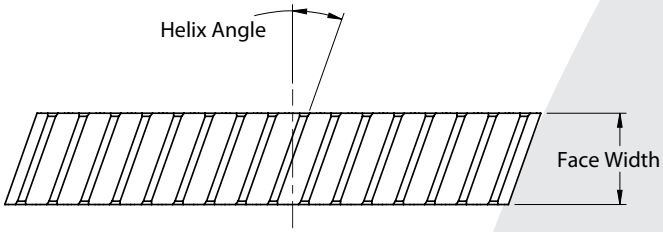
Pitch Diameter: The diameter of the gear's pitch circle.



Pressure Angle: The angle made by the sides of the tooth as it angles towards the top of the tooth. Mating gears and racks must have the same pressure angle.

Mounting Distance: Distance between the center of the pinion and the bottom of the rack that ensures proper mesh. The Mounting distance should stay consistent for the length of the rack.

Mounting Distance = Pitch Height of Rack + Pitch Radius of Pinion



Helix Angle: Angle of the rack or gear tooth. GAM racks and pinions use a common helix angle of 19°31'42"

Gear Strength & Durability

Gear strength and durability depends on transmitted forces and power.

$$\text{Power } (P_{kW}) = \text{Force } (F_N) \times \text{Linear Velocity } (V_{mm/s})$$

$$\text{Force } (F_N) = \frac{1000 \times \text{Torque } (T_{Nm})}{\text{Pitch Radius } (r_{mm})}$$

$$\text{Linear Velocity } (V_{mm/s}) = \frac{\pi r_{mm} \times N_{RPM}}{60}$$

$$\text{Power } (P_{kW}) = \frac{T_{Nm} \times N_{RPM}}{9550}$$

The feed force required by the application should be less than the feed force capacity of the pinion or gearbox-pinion system as listed in this catalog. The feed force rating should be derated by the Overload Factor (Ka) and the Life Factor (KL)

$$\text{Application Feed Force } (F) < \frac{K_L}{K_a} \times \text{Rated Feed Force } (F)$$

Overload Factor (K_a)

Impact from Prime Mover	Impact from Load Side		
	Uniform Load	Medium Impact	Heavy Impact
Uniform Load	1	1.25	1.75
Light Impact	1.25	1.5	2
Medium Impact	1.5	1.75	2.25

Life Factor (K_L)

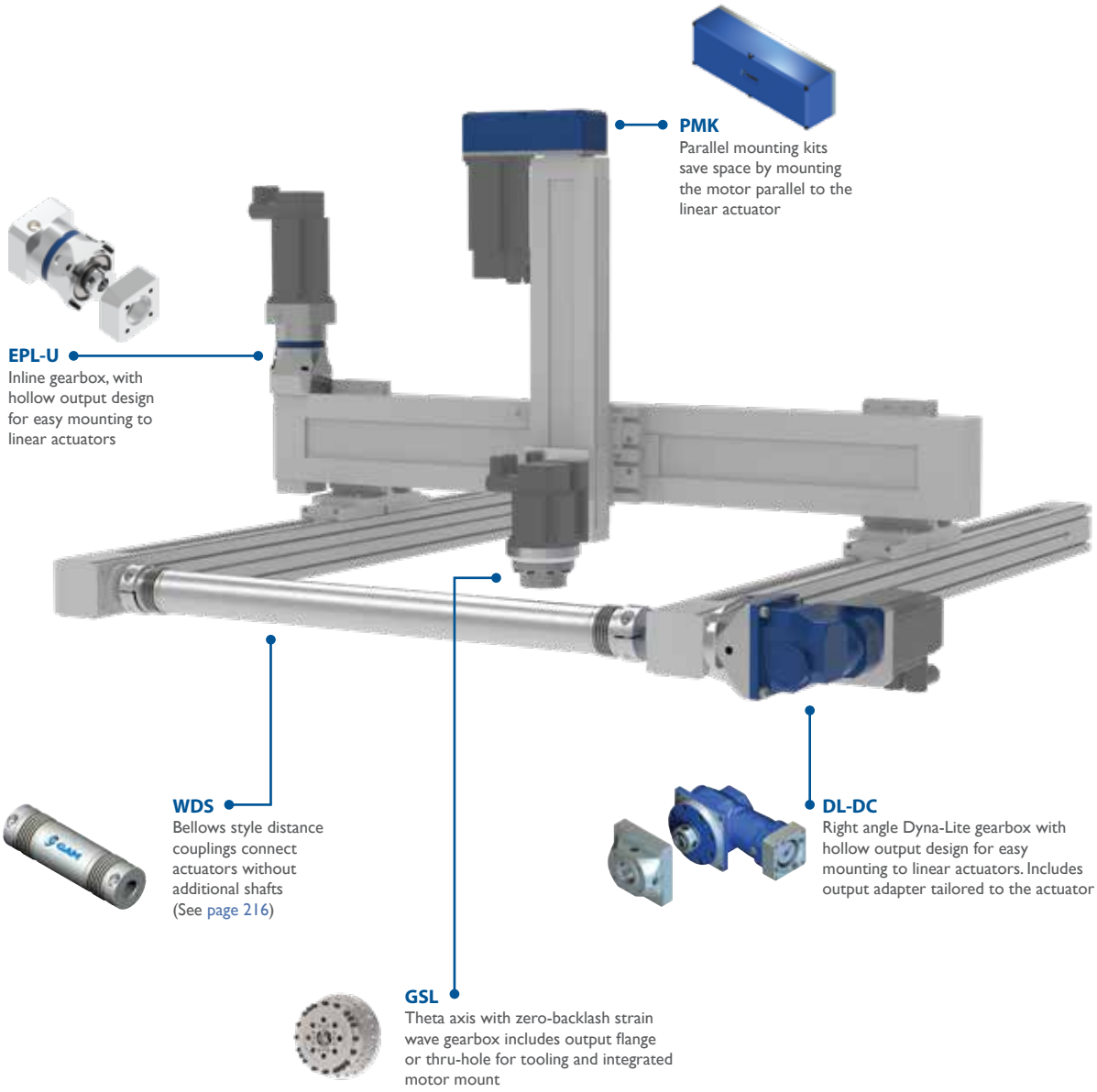
Number of Cycles	Hardness (HRC) ≥ 45
Under 10,000	1.5
~ 10^5	1.5
~ 10^6	1.1
~ 10^7	1.0

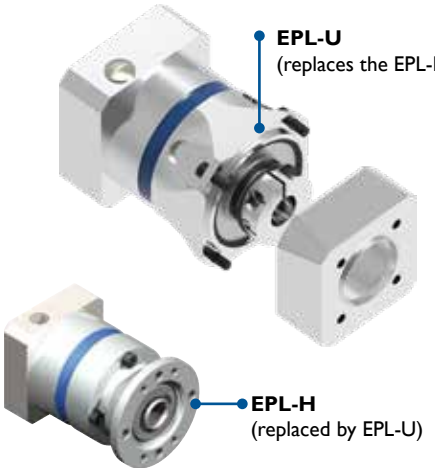
Everything Between the Motor and the Actuator

GAM Linear Mount Products take the hassle out of mounting your motor or gearbox to a linear ball screw or belt actuator. This unique product offering consists of motor mount kits, inline and right angle gearboxes, as well as couplings. For everything between the motor and actuator, GAM Can!

Application Example: Cartesian System

Build your own cartesian system with products designed specifically to simplify the process of designing and building your own cartesian systems. Components are designed and manufactured to work with any actuator

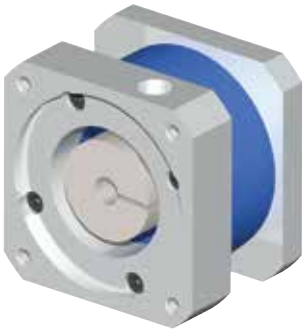




EPL-H
with Linear slide

EPL-U Gearboxes

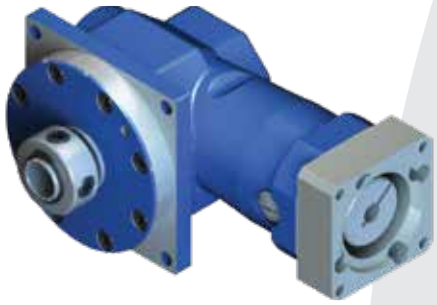
- Quick, simple, and low-cost solution used to mount onto any off-the-shelf linear belt or ball screw modules
- Unique design ready to mount to your module on the output
  - Hollow output with zero-backlash clamping ring and mounting plate for shaft input actuators
  - Shaft output and mounting plate for hollow input actuators
- Same backlash and efficiencies as EPL Series (see page 82)
- Right angle version EPR-U also available (see page 132)

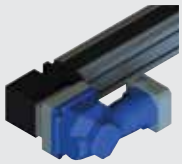


LSK
with linear slide

Linear Slide Kit (LSK)

- Customized assembly to mount any motor or gearbox to any linear slide
- In line motor mounting
- Coupling included
- Quick delivery





DL-DC
mounted to a module

DL-DC Right Angle Gearbox

- Right angle hypoid gearbox with unique hollow output and zero-backlash clamping ring
- Mount directly to any linear belt or ball screw module for a compact design
- Ratios from 3:1 up to 150:1
- Frame sizes from 55 mm to 90 mm (See page 118)

PMK
with linear slide

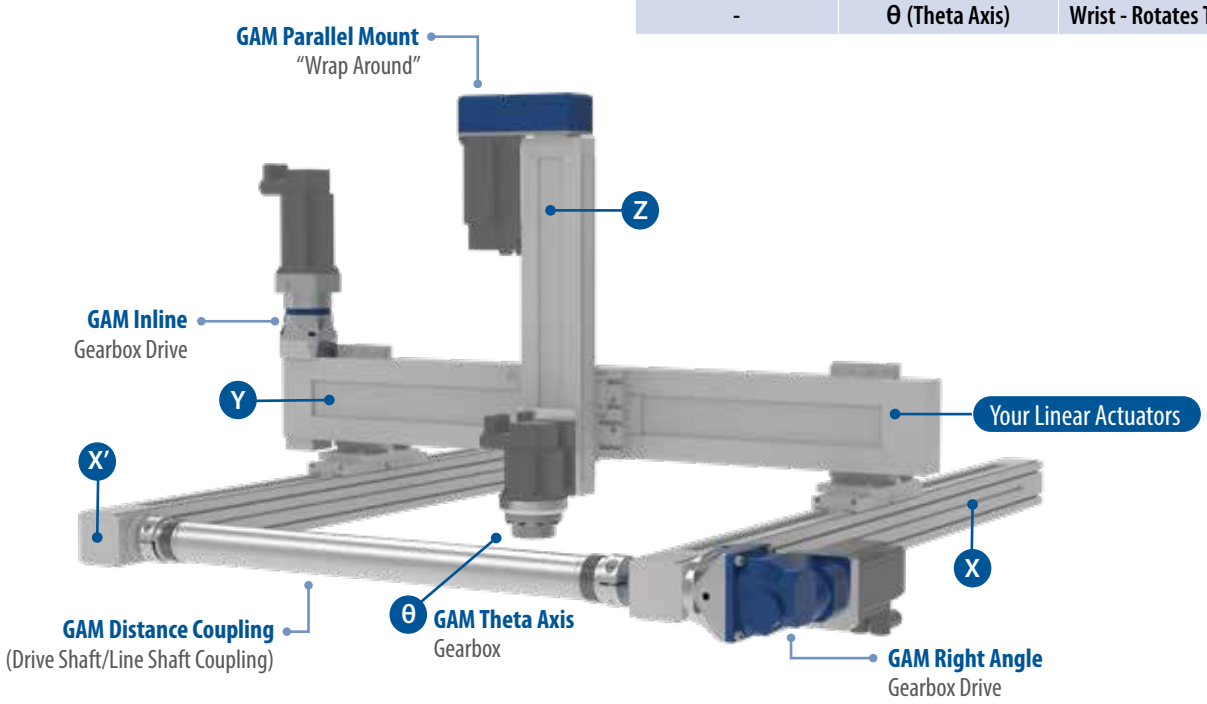
Parallel Mount Kit (PMK)

- Customized assembly to mount any motor or gearbox to any linear ball screw product
- Parallel motor mounting design
- Includes timing pulleys, belt, and hardware.
- Quick delivery

Linear Systems

Linear actuator systems, such as belt actuators or ball screw drives, can be combined to form X-Y tables, gantries, or cartesian robots. There are different ways to drive one or more of these actuators. GAM makes it easy with components designed to simplify mounting a gearbox, motor, or other mechanical system to the linear actuators.

Types of Linear Systems		
Number of Axes	Axes	System Style
3	X-X' / Y / Z	Cartesian Robot
2	X-X' / Y	X-Y Table
2	Y / Z	Gantry
1	Any	Linear Actuator
-	θ (Theta Axis)	Wrist - Rotates Tooling



3-Axis Cartesian Robot with Theta (Wrist) Axis

Driving Linear Actuators

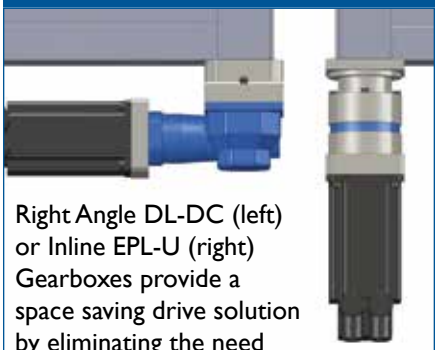
Once you've selected the best actuators for each axis of your application, you need to determine how to drive the actuators.

- What servo motors will you use?
- Do you require speed reduction between the motor and actuator?
- Do you have multiple actuators on a single axis (see X and X' above)?
- Will you be driving more than one actuator with a single drive?

GAM has multiple solutions for driving a single actuator and for driving multiple actuators from a single drive.

Driving a Single Actuator

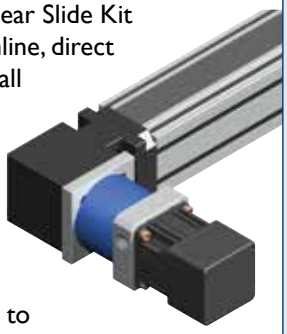
GEAR REDUCTION
Inline or Right Angle



Right Angle DL-DC (left) or Inline EPL-U (right) Gearboxes provide a space saving drive solution by eliminating the need for a coupling.

Includes zero-backlash clamping ring and adapter plate.

DIRECT DRIVE
Inline



Use the Linear Slide Kit (LSK) for inline, direct drive of a ball screw or belt actuator.

Includes adapter plates customized to the motor and actuator and zero-backlash bellows or elastomer coupling.

DIRECT DRIVE
Wrap-around

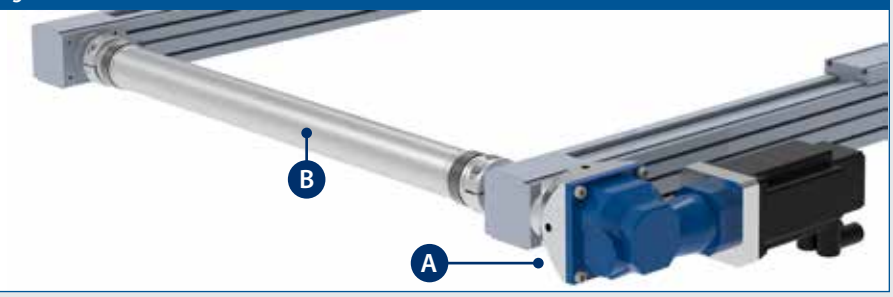
Use the Parallel Mounting Kit (PMK) for mounting a motor or gearbox parallel to a ball screw.

Customized to mount your motor and actuator.

Driving Multiple Actuators

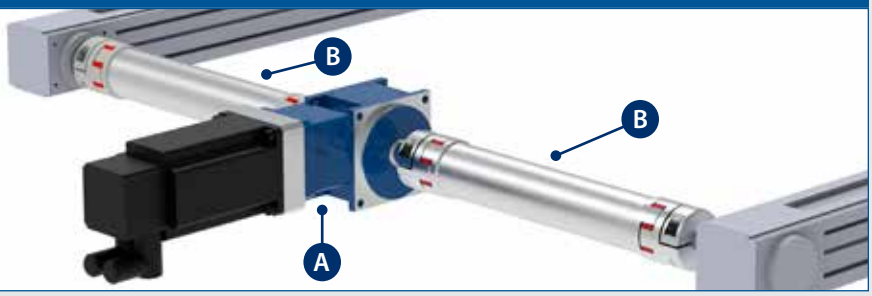
OUTSIDE DRIVE with Single Distance Coupling

Drive two actuators with one hollow output gearbox (A) on the actuator. Use a distance (line shaft/drive shaft) coupling (B) to drive the second actuator. No additional bearing support needed.



CENTER DRIVE with 2 Distance Couplings

Drive two actuators with one dual output gearbox (A). This can be a speed reducer or a 1:1 bevel gearbox. Use two distance (line shaft/drive shaft) couplings (B) to drive the actuators - no additional bearing support needed. This configuration allows for higher speeds due to the shorter couplings.



INSIDE DRIVE with Single Distance Coupling

Drive two actuators with a single dual output gearbox (A) mounted to one actuator and a distance (line shaft/drive shaft) coupling (B) to drive the second actuator - no additional bearing support needed. Mount the gearbox between the actuators for a more compact drive. The shorter coupling allows for higher speeds.

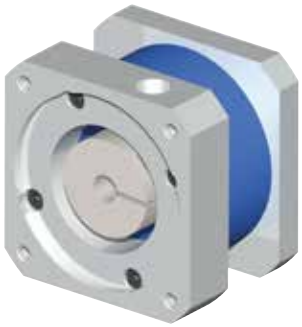
Linear Mount: Linear Slide Kit (LSK)

GAM can.

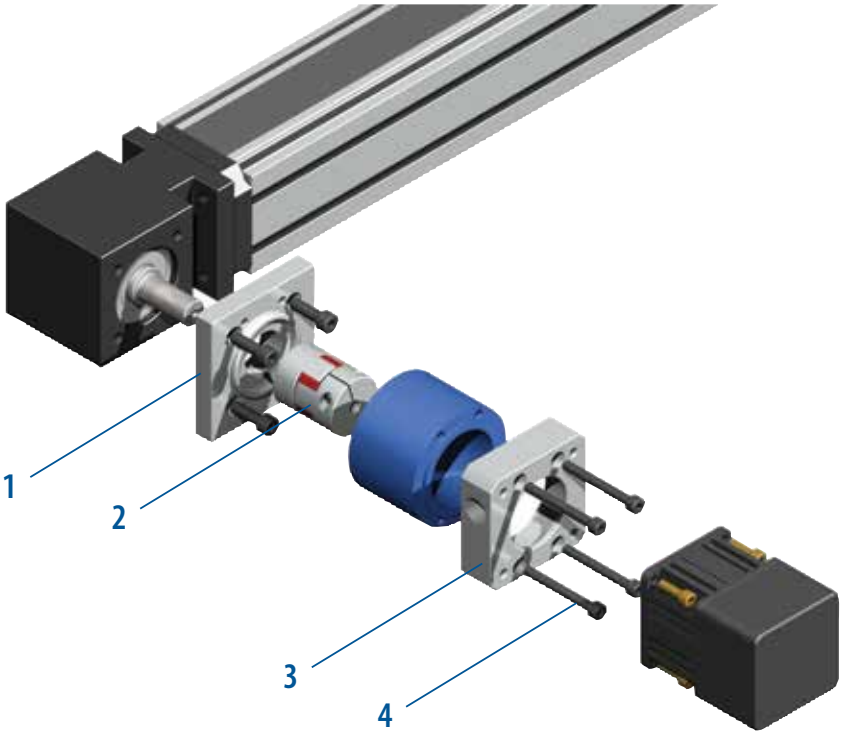
If you don't see exactly what you need, let us know. We can modify the LSK to meet your needs.

Linear Slide Kit (LSK)

Our no-hassle solution for mounting linear slides to motors and gearboxes is our LSK (Linear Slide Kit.) It can be customized to any motor or gearbox and linear slide. A coupling is included – bellows or elastomer. The LSK is readily available and comes complete with mounting hardware. You just need to tighten the bolts.



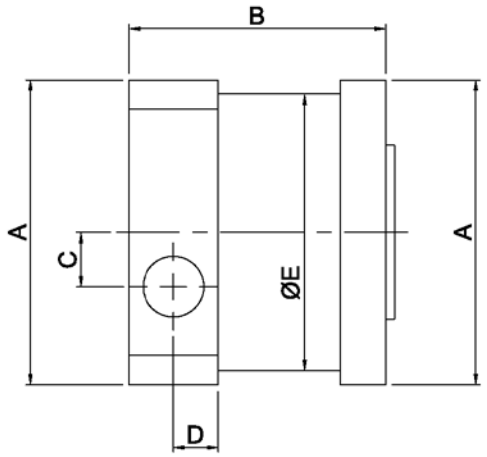
- A customized mounting solution without the long lead times
- Three sizes
- Quick delivery
- Reasonably priced
- GAM provides all engineering and design for your application

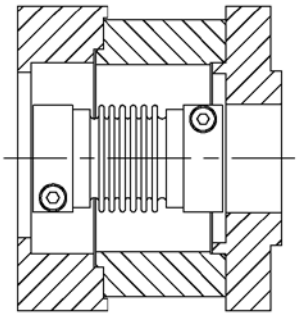


Just tell us what motor and what module you want to mount and GAM will take care of all the engineering.

1. Slide Adapter Flange
   Custom adapter for any linear slide module
2. Coupling
   Custom machined coupling with or without keyways
3. Motor Adapter Flange
   Custom adapter for any servo motor
4. Hardware
   All mounting hardware provided in kit

Linear Mount: Linear Slide Kit (LSK)





	Coupling Type	Rated Torque Nm (lb-in)	Min Shaft Diameter mm (in)	Max Shaft Diameter mm (in)	Coupling Stiffness 10^3 Nm/rad (lb-ft/deg)	Coupling Inertia 10^{-3} kgm^{-2} (lb-in^{-2})	A min mm (in)	B min mm (in)	E mm (in)
LSK21	Bellows	4 (35)	3 (0.12)	14* (0.55)	1.8 (23)	0.003 (0.01)	70 (2.75)	62 (2.44)	63.5 (2.50)
LSK22	Bellows	8 (71)	6 (0.24)	19.05* (0.75)	6.5 (84)	0.02 (0.07)	70 (2.75)	70 (2.75)	63.5 (2.50)
LSK23	Elastomer	8 (71)	6 (0.24)	16* (0.63)	0.16 (2.1)	0.01 (0.03)	70 (2.75)	62 (2.44)	63.5 (2.50)
LSK31	Elastomer	15 (133)	9.53 (0.375)	19.05* (0.75)	0.82 (10.6)	0.03 (0.10)	88.9 (3.50)	74 (2.91)	88.9 (3.50)
LSK32	Bellows	25 (221)	9.53 (0.375)	28* (1.10)	12 (154)	0.09 (0.31)	88.9 (3.50)	81 (3.19)	88.9 (3.50)
LSK33	Elastomer	30 (266)	12.7 (0.50)	26* (1.02)	1.4 (18)	0.09 (0.31)	88.9 (3.50)	74 (2.91)	88.9 (3.50)
LSK41	Bellows	50 (443)	15 (0.59)	35* (1.38)	22 (282)	0.22 (0.75)	120 (4.72)	86 (3.39)	114.3 (4.50)
LSK42	Elastomer	60 (531)	15 (0.59)	29* (1.14)	2.1 (27)	0.18 (0.62)	120 (4.72)	86 (3.39)	114.3 (4.50)
LSK43	Bellows	125 (1106)	16 (0.625)	44* (1.73)	44 (565)	0.75 (2.56)	120 (4.72)	95 (3.74)	114.3 (4.50)
LSK44	Elastomer	150 (1328)	22 (0.87)	38.1* (1.50)	3.6 (46)	0.38 (1.30)	120 (4.72)	105 (4.13)	114.3 (4.50)

*** An extra adapter may be required for a C-face mounting (motor or gearbox side only)**

TYPE CODES FOR LSK SERIES

Example: LSK-32K - M0000 - H0000 - C0000

LSK Size
2, 3, 4

Coupling Size / Style
1, 2, 3, 4

Keyways*
N = No Keyways
K = Keyways
*Full keyway not available for maximum shaft diameter. Contact GAM for other options

Motor Code
Assigned by GAM

Output Code
Assigned by GAM

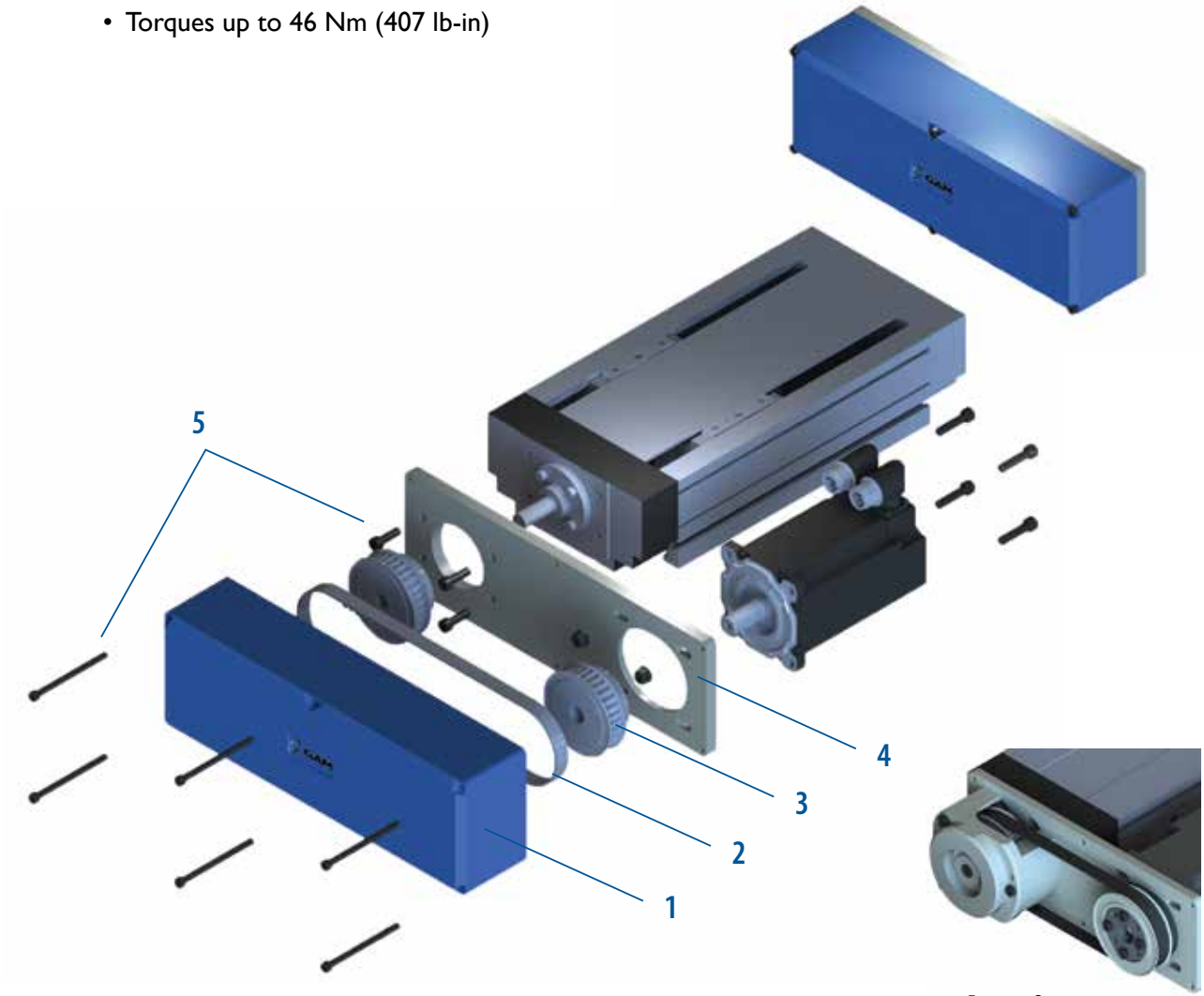
Configuration Code
Assigned by GAM

Parallel Mount Kit (PMK)

The innovative PMK (Parallel Mount Kit) series helps save space and reduce the overall length of an actuator by bringing the motor parallel to the ball screw. Unlike similar products available on the market, the PMK was designed for flexibility enabling you to connect any motor to any linear ball screw actuator.

Features

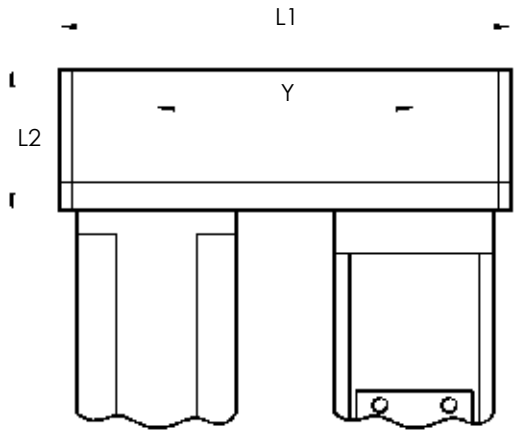
- 4 frame sizes
- Easily mounted horizontally or vertically
- Torques up to 46 Nm (407 lb-in)



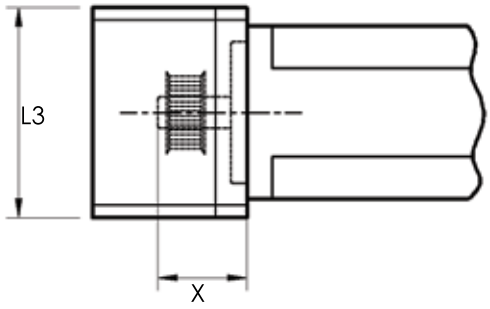
Bearing Support comes standard on all PMK31

1. Housing
   Machined aluminum and anodized
2. Belt
   High torque rubber timing belt
3. Pulleys
   Low inertia and custom machined
4. Adapter Flange
   Designed specifically for any linear ball screw actuator and motor
5. Hardware
   All mounting hardware provided in kit

Linear Mount: Parallel Mount Kit



Top View (Carriage Up)



Side View (Carriage Up)

Size	Maximum Output Torque Nm (lb-ins)	Shaft Diameter Range mm (in)		X Maximum Shaft Length mm (in)	Y Center to Center mm (in)	Maximum Motor Bolt Circle mm (in)	L1 mm (in)	L2 mm (in)	L3 mm (in)	Maximum Speed rpm	Pulley Ratio	Recommended Belt Pull** N (lb)	Belt Tension N (lb)	Inertia $x10^{-3}$ kgm^2 ($x10^{-3}$ lb-ft^2)
31	2.4 (21.2)	5 (0.197)	14 (0.551)	55 (2.165)	126 (4.961)	75 (2.953)	215 (8.465)	66 (2.598)	76.2 (3.000)	6000	1:1	70 (15.7)	35 (7.87)	0.11 (2.44)
41	7 (62.0)	8 (0.315)	22 (0.866)	70 (2.756)	180 (7.087)	100 (3.937)	290 (11.417)	85 (3.346)	101.6 (4.000)	6000	1:1	190 (42.7)	95 (21.4)	0.55 (13.1)
51	23 (203.6)	10 (0.394)	25.4 (1.000)	80 (3.150)	248 (9.764)	130 (5.118)	390 (15.354)	98 (3.858)	127 (5.000)	6000	1:1	452 (101.6)	226 (50.8)	1.49 (35.1)
61	46 (407.1)	14 (0.551)	38.1 (1.500)	90 (3.543)	280 (11.024)	165 (6.496)	450 (17.716)	111 (4.370)	152.4 (6.000)	6000	1:1	764 (171.8)	382 (85.9)	5.40 (128)

Notice

*The PMK adapter plate may not be flush with the bottom of the motor or actuator. If this an issue, please contact GAM.

**Belt pull required to tension the pulley assembly may exceed radial load capacity of the actuator and must be considered when selecting a PMK. Contact GAM for a bearing support option.

PMK Efficiency = 98%

TYPE CODES FOR PMK SERIES

Example: PMK31C - M0000 - H0000 - C0000

PMK Size
- 3 = 3" Frame
- 4 = 4" Frame
- 5 = 5" Frame
- 6 = 6" Frame

Pulley Torque Option
- 1

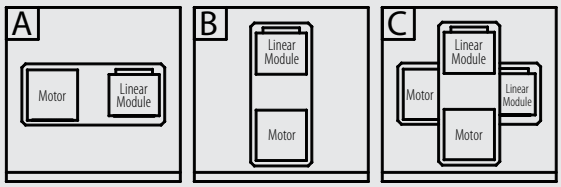
Pulley Ratio/Orientation
- A = 1:1 Horizontal
- B = 1:1 Vertical
- C = 1:1 Universal

Configuration Code
Assigned by GAM

Output Code
Assigned by GAM

Motor Code
Assigned by GAM

Mounting Orientation Options



* Universal Mounting Orientation "C" is standard unless unavailable.
* Note: View is normal to input of PMK (Carriage up)

PMK

Servo Couplings

GAM servo couplings have zero backlash and low inertia, and compensate for shaft misalignment in motion control applications. With 4 types of couplings in many configurations, GAM is your complete source for servo couplings.

Bellows Couplings

- Zero-backlash with high torsional stiffness
- Suitable for all motion control applications
- Compensate for shaft misalignment
- Torque capacity up to 4000 Nm

Elastomer Couplings

- Zero-backlash with vibration/resonance dampening
- Lower cost alternative for less precise applications
- Compensate for shaft misalignment
- Torque capacity up to 2000 Nm

Distance Couplings

- Zero-backlash
- Span large distances up to 20 ft
- Bellows or elastomer style compensate for misalignment
- Torque capacity up to 9000 Nm

Safety Couplings

- Mechanical crash protection: disengages at specific torque level
- Zero-backlash
- Torque capacity up to 2000 Nm

Couplings Selection Guide

		Max Torque Range					
		High (9,000 Nm - 1,500 Nm)		Medium (1,300 Nm - 550 Nm)		Low (125 Nm - 110 Nm)	
		Bellows Couplings	Elastomer Couplings	Bellows Couplings	Elastomer Couplings	Bellows Couplings	Elastomer Couplings
Standard Couplings	All Purpose	KM*	EKM	KP* KG*			
	Low Cost					KLC	EKC
Specialty Couplings	High Speed		ESM-A	KHS			
	Stainless Steel			KG-VA*			
	High Torque	KSD					
	High Torsional Stiffness	KSS KR*					
	For easy Installation	KGH		KPP* KPS*			
Distance Couplings	For easy Installation	WDS	EKHZ				
	Low Cost						EDC
Safety Couplings – Direct Drive	Radial Clamp	SKB-KP*	SKB-EK				
	Keyed	SKW-KP					
Safety Couplings – Indirect Drive	Radial Clamp	SKB		SKX-L			
	Conical Clamp			SKG			
	Keyed	SKW					

All GAM couplings are zero backlash, low inertia, and compensate for shaft misalignment

- **Bellows couplings**: Torsionally Stiff - Temperatures up to 300°C
- **Elastomer couplings:** Provide Vibration / Resonance Dampening - Temperatures up to 120°C
- **Safety couplings:** Adjustable torque settings, and single point 360° re-engagement

Couplings available same day

*EASY Clamp system for easy install / un-install

COUPLINGS

Coupling Series Overview

Bellows Couplings

KM Series (Most Popular)
- Designed for Dynamic Servo Applications
- Low inertia aluminum hubs, and EASY Clamp radial clamping
- Bore range: 3 mm - 85 mm
  Torque range: 0.4 Nm - 1300 Nm

KG-VA Series
- Stainless steel design for corrosion resistance
- 2 or 4 bellows options
- Bore range: 8 mm - 90 mm
  Torque range: 4 Nm - 1000 Nm

KP Series (Most Popular)
- Short length with high torsional stiffness
- Low inertia aluminum hubs, and EASY Clamp radial clamping
- Bore range: 3 mm - 75 mm
  Torque range: 2 Nm - 900 Nm

KGH Series
- Split hubs for easy installation when shafts cannot be moved
- 2 or 4 bellows options
- Bore range: 6 mm - 85 mm
  Torque range: 20 Nm - 1600 Nm

KLC Series (Most Popular)
- Low cost steel construction
- Three sizes available
- Bore range: 10 mm - 43 mm
  Torque range: 25 Nm - 125 Nm

KSD Series
- High clamping forces, high torque, self-centering conical bushings
- Maximum misalignment with short length
- Bore range: 6 mm - 102 mm
  Torque range: 10 Nm - 4000 Nm

KG Series (Most Popular)
- Steel construction
- Many sizes available with EASY Clamp radial clamping
- Bore range: 6 mm - 90 mm
  Torque range: 5 Nm - 1300 Nm

KHS Series
- High speeds up to 25,000 rpm
- Very low inertia, and high stiffness
- Bore Range: 6 mm - 60 mm
  Torque Range: 15 Nm - 600 Nm

KR Series
- Unique bellows design for high torsional stiffness
- EASY Clamp radial clamping hub for easy install/uninstall
- Bore range: 14 mm - 89 mm
  Torque range: 25 Nm - 1500 Nm

KPP Series
- Short length, plug-in design with high stiffness
- EASY Clamp system for easy install/uninstall
- Bore range: 6 mm - 70 mm
  Torque range: 10 Nm - 600 Nm

KSS Series
- Similar to the KR coupling, with short length and high torque
- Self-centering conical bushings for high clamping forces
- Bore range: 10 mm - 102 mm
  Torque range: 25 Nm - 2500 Nm

KPS Series
- Expandable split shaft design for hollow bore applications
- EASY Clamp system for easy install/uninstall
- Bore range: 3 mm - 70 mm
  Torque range: 2 Nm - 600 Nm

Coupling Series Overview

Elastomer Couplings

EKC Series (Most Popular)
- Low cost elastomer coupling for motion control applications
- Radial clamping hubs, zero backlash, & same day delivery avail.
- Bore range: 5 mm - 45 mm
  Torque range: 5 Nm - 110 Nm

EKM Series (Most Popular)
- Performance elastomer coupling for motion control applications
- Radial clamping hubs, zero backlash, & same day delivery avail.
- Bore range: 3 mm - 90 mm
  Torque range: 2 Nm - 2000 Nm

ESM-A Series
- High speeds and conical clamping hubs
- Excellent dampening capabilities
- Bore range: 6 mm - 85 mm
  Torque range: 10 Nm - 2000 Nm

Distance Couplings

EDC Series
- Low cost elastomer drive shaft coupling with split hubs
- Custom lengths up to 20 feet and quick standard delivery
- Bore range: 8 mm - 45 mm
  Torque range: 25 Nm - 110 Nm

WDS Series
- Bellows drive shaft coupling with split hubs
- Lengths up to 20 feet with high speeds and low inertia
- Bore Range: 6 mm - 85 mm
  Torque range: 15 Nm - 1600 Nm

Safety Couplings – Direct Drive

SKB-KP Series
- Radial clamping hubs, adjustable torque, and high stiffness
- Maximum misalignment and single point 360° re-engagement
- Bore range: 6 mm - 100 mm
  Torque range: 2 Nm - 2000 Nm

SKW-KP Series
- Keyed hub connection on safety element
- Maximum misalignment and single point 360° re-engagement
- Bore range: 6 mm - 140 mm
  Torque range: 2 Nm - 9000 Nm

SKB-EK Series
- Radial clamping hubs, and excellent dampening capabilities
- Adjustable torque, and single point 360° re-engagement
- Bore range: 6 mm - 100 mm
  Torque range: 2 Nm - 2000 Nm

Safety Couplings – Indirect Drive

SKB Series
- Single bolt radial clamping hub for easy installation
- Integrated ball bearing for high running accuracy and high radial/axial loads
- Bore range: 6 mm - 100 mm
  Torque range: 2 Nm - 2000 Nm

SKW Series
- Keyed hub connection
- Integrated ball bearing for high axial and radial loads
- Bore range: 6 mm - 110 mm
  Torque range: 2 Nm - 9000 Nm

SKX-L Series
- Single bolt radial clamping hub for easy installation
- Longer bearing journal for integrated slide bearing
- Bore range: 7 mm - 58 mm
  Torque range: 2 Nm - 800 Nm

SKG Series
- Conical clamping hub for high clamping forces
- Integrated bearing to support pulleys and sprockets
- Bore range: 12 mm - 44 mm
  Torque range: 2 Nm - 550 Nm

Hubs

Aluminum Radial Clamping Hub (also available in steel and stainless steel)

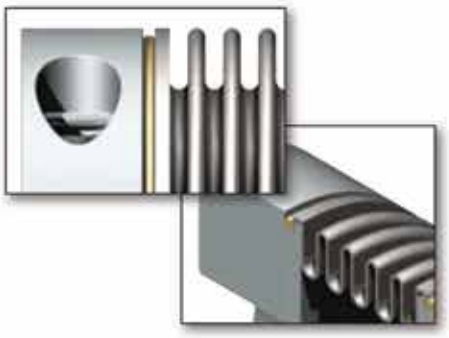
- High tensile strength, low weight aerospace aluminum provides very low inertia for better system performance.
- New EASY Clamp System prevents damage to hubs for easy shaft mounting and dismounting while compensating for tolerance differences between shaft and hub. (Available on select couplings.)
- Balancing Plug is positioned at a precise angle in the hub for balanced, high speed performance.
- Precision machined involutes (not a die cast).
- Zero backlash torque transmission is guaranteed.
- Only one clamping screw allows for fast installation.

Steel Conical Bushings (also available in aluminum for high torque, high speed applications up to 25,000 rpm)

- High clamping forces to insure safe transmission of torque and backlash free connection.
- Additional draw-off holes provide easy hub removal.
- Unique hub design offers shortest coupling length.
- Precision machined aluminum conical clamping ring insures a high speed balanced coupling up to 25,000 rpm at very high torque ranges.

Special Hub Designs

- Flange mounted versions allow custom mounting configurations directly to the machine.
- All metal pluggable versions offer easy mounting in high temperature applications up to 300°C (572°F).
- Expanding cone clamping hub is ideal for hollow shaft assembly.



Connection Methods

Brass Wire Press-Fit Connection

- Mechanically formed between hub and multi-layered bellow for a strong zero backlash connection.
- No glue connection insures connection in high temperature, chemical sensitive applications.

Welded Connection

- Micro plasma weld connection offers excellent weld consistency and even heat distribution resulting in high quality welds for a long lasting connection between hub and bellow.
- Ideal for high temperature applications where steel or stainless steel is required.

Torque Transmission Elements

Bellows

- Guarantees a zero backlash torque transmission with extremely high torsional stiffness while maintaining flexibility for compensation of misalignment.
- Low mass moment of inertia for increased system performance.
- Maintenance free up to temperatures of 300°C (572°F).
- Depending upon torsional stiffness requirements, lateral spring rates and lengths, standard bellows are available in 2, 4 and 6 corrugations. For longer lengths, custom manufacturing is available.

Elastomers

- Elastomers vary in hardness values from 98 Shore A (red) for maximum dampening capabilities to 72 Shore D (white) where higher stiffness is required.
- Excellent electrical insulator to prevent the transfer of electrical fields.
- Involute shaped teeth provide easy plug-in assembly for long and durable life.

Torque Tubes

- Available in aluminum, steel or stainless depending upon torque and length requirements.
- The different materials can accommodate different stiffness requirements at various lengths.

KM Series Bellows Couplings

Major Features

- Maximum flexibility in the angular, axial and lateral directions and high torsional stiffness.
- With EASY Clamp System for easy install and un-install.
- Same day delivery available

Material

- Stainless steel bellow; aluminum hubs

Technical Data/Dimensions

Size KM	Nominal Torque	Moment of Inertia	Torsion Resistance	Max. Lateral Misalignment	Mass	Screw Size	Torque to Tighten Screws	Outer Diameter*	Length	Bore Range*	
										Min.	Max.
	Nm (lb-in)	10^{-3}kgm^2 (lb-in^2)	Nm/arcmin (lb-ft/Deg)	mm (inch)	kg (lbs)		Nm (lb-in)	mm (inch)	mm (inch)	mm (inch)	mm (inch)
KM-0.4	0.4	0.0003	0.05	0.2	0.01	M2.5	1	16.5	30	3	6.35
	(4)	(0.001)	(2)	(0.008)	(0.02)		(9)	(0.650)	(1.181)	(0.118)	(0.250)
KM-0.9	0.9	0.0004	0.09	0.2	0.01	M2.5	1	16.5	31.5	3	6.35
	(8)	(0.001)	(4)	(0.008)	(0.02)		(9)	(0.650)	(1.240)	(0.118)	(0.250)
KM-2	2	0.003	0.23	0.2	0.03	M3	2	24.5/27.5	42	3	10/14
	(18)	(0.01)	(10)	(0.008)	(0.07)		(18)	(0.965)/(1.083)	(1.654)	(0.118)	(0.394)/(0.551)
KM-4	4	0.003	0.46	0.2	0.04	M3	2	24.5/27.5	43.5	5	10/14
	(35)	(0.01)	(20)	(0.008)	(0.09)		(18)	(0.965)/(1.083)	(1.713)	(0.197)	(0.394)/(0.551)
KM-7	7	0.014	1.1	0.25	0.08	M4	4	34	57	6	17
	(62)	(0.05)	(49)	(0.010)	(0.18)		(35)	(1.339)	(2.244)	(0.236)	(0.669)
KM-8	8	0.026	1.35	0.3	0.13	M5	7	39.5/44.5	60	6	19/24
	(71)	(0.09)	(60)	(0.012)	(0.29)		(62)	(1.555)/(1.752)	(2.362)	(0.236)	(0.748)/(0.945)
KM-12	12	0.03	2.05	0.25	0.14	M5	7	39.5/44.5	62	6	19/24
	(106)	(0.10)	(91)	(0.010)	(0.31)		(62)	(1.555)/(1.752)	(2.441)	(0.236)	(0.748)/(0.945)
KM-20	20	0.14	5.2	0.25	0.3	M6	14	56	70	9	30
	(177)	(0.48)	(230)	(0.010)	(0.66)		(124)	(2.205)	(2.756)	(0.354)	(1.181)
KM-35	35	0.14	5.8	0.25	0.3	M6	14	56	70	14	30
	(310)	(0.48)	(257)	(0.010)	(0.66)		(124)	(2.205)	(2.756)	(0.551)	(1.181)
KM-60	60	0.29	8.7	0.3	0.5	M8	35	66	77	15	34
	(531)	(0.99)	(385)	(0.012)	(1.10)		(310)	(2.598)	(3.031)	(0.591)	(1.339)
KM-80	80	0.79	14	0.3	0.8	M10	65	82	90	17	43
	(708)	(2.70)	(620)	(0.012)	(1.76)		(575)	(3.228)	(3.543)	(0.669)	(1.693)
KM-170	170	0.83	17	0.3	0.8	M10	65	82	92	22	43
	(1505)	(2.84)	(753)	(0.012)	(1.76)		(575)	(3.228)	(3.622)	(0.866)	(1.693)
KM-270	270	2.2	32	0.3	1.4	M12	115	101	100	27	55
	(2390)	(7.52)	(1417)	(0.012)	(3.09)		(1018)	(3.976)	(3.937)	(1.063)	(2.165)
KM-400	400	2.4	47	0.3	1.5	M12	115	101	106	32	55
	(3540)	(8.20)	(2081)	(0.012)	(3.31)		(1018)	(3.976)	(4.173)	(1.260)	(2.165)
KM-600	600	4.7	67	0.3	2.2	M14	180	122	120	35	70
	(5310)	(16.06)	(2967)	(0.012)	(4.85)		(1593)	(4.803)	(4.567)	(1.378)	(2.756)
KM-900	900	9	105	0.3	3.3	M14	200	133	143	40	75
	(7966)	(30.75)	(4649)	(0.012)	(7.28)		(1770)	(5.236)	(5.630)	(1.575)	(2.953)
KM-1300	1300	14	170	0.3	4.2	M16	290	157	145	60	85
	(11506)	(47.84)	(7528)	(0.012)	(9.26)		(2567)	(6.181)	(5.709)	(2.362)	(3.346)

*** Couplings available with an oversized bore have 2 values for Outer Diameter and Bore Range (Maximum). The second of the 2 values is for the oversized bore.**

KP Series Bellows Coupling

Major Features

- Higher torsional stiffness and a shorter overall length.
- Tightening only one screw per hub locks the coupling free of backlash.
- Advantageous for space constrained or blind assembly installations.
- With EASY Clamp System for easy install and un-install.

Material

- Stainless steel bellow; aluminum hubs

Technical Data/Dimensions

Size KP	Nominal Torque	Moment of Inertia	Torsion Resistance	Max. Lateral Misalignment	Mass	Screw Size	Torque to Tighten Screws	Outer Diameter	Length	Bore Range	
										Min.	Max.
	Nm (lb-in)	10^{-3}kgm^2 (lb-in^2)	Nm/arcmin (lb-ft/Deg)	mm (inch)	kg (lbs)		Nm (lb-in)	mm (inch)	mm (inch)	mm (inch)	mm (inch)
KP-2	2	0.0025	0.4	0.1	0.03	M3	2	24.5/27.5	35	3	10/14
	(18)	(0.009)	(18)	(0.004)	(0.07)		(18)	(0.965)/(1.083)	(1.378)	(0.118)	(0.394)/(0.551)
KP-5	5	0.0028	0.8	0.1	0.04	M3	2	24.5/27.5	36	6	10/14
	(44)	(0.010)	(35)	(0.004)	(0.09)		(18)	(0.965)/(1.083)	(1.417)	(0.236)	(0.394)/(0.551)
KP-7	7	0.012	1.7	0.15	0.08	M4	4	34	47	6	17
	(62)	(0.04)	(75)	(0.006)	(0.18)		(35)	(1.339)	(1.850)	(0.236)	(0.669)
KP-8	8	0.025	2.1	0.15	0.13	M5	7	39.5/44.5	51	6	19/24
	(71)	(0.09)	(93)	(0.006)	(0.29)		(62)	(1.555)/(1.752)	(2.008)	(0.236)	(0.748)/(0.945)
KP-12	12	0.028	2.6	0.15	0.13	M5	7	39.5/44.5	51	6	19/24
	(106)	(0.10)	(115)	(0.006)	(0.29)		(62)	(1.555)/(1.752)	(2.008)	(0.236)	(0.748)/(0.945)
KP-20	20	0.13	9	0.2	0.3	M6	14	56	61	9	30
	(177)	(0.44)	(399)	(0.008)	(0.66)		(124)	(2.205)	(2.402)	(0.354)	(1.181)
KP-25	25	0.064	4	0.15	0.18	M5	8	50	58	10	28
	(221)	(0.22)	(177)	(0.006)	(0.40)		(71)	(1.968)	(2.283)	(0.394)	(1.102)
KP-35	35	0.13	9	0.2	0.3	M6	14	56	61	14	30
	(310)	(0.44)	(399)	(0.008)	(0.66)		(124)	(2.205)	(2.402)	(0.551)	(1.181)
KP-60	60	0.27	14	0.2	0.4	M8	35	66	67	15	34
	(531)	(0.92)	(620)	(0.008)	(0.88)		(310)	(2.598)	(2.638)	(0.591)	(1.339)
KP-100	100	0.35	20	0.2	0.5	M8	35	71	68	22	38
	(885)	(1.20)	(886)	(0.008)	(1.10)		(310)	(2.795)	(2.677)	(0.866)	(1.496)
KP-170	170	0.76	28	0.2	0.8	M10	65	82	80	22	43
	(1505)	(2.60)	(1240)	(0.008)	(1.76)		(575)	(3.228)	(3.150)	(0.866)	(1.693)
KP-270	270	2	52	0.2	1.3	M12	115	101	87	27	55
	(2390)	(6.83)	(2303)	(0.008)	(2.87)		(1018)	(3.976)	(3.425)	(1.063)	(2.165)
KP-400	400	2.15	74	0.2	1.4	M12	115	101	91	32	55
	(3540)	(7.35)	(3277)	(0.008)	(3.09)		(1018)	(3.976)	(3.583)	(1.260)	(2.165)
KP-600	600	4.5	106	0.2	2.1	M14	180	122	100	35	70
	(5310)	(15.38)	(4694)	(0.008)	(4.63)		(1593)	(4.803)	(3.937)	(1.378)	(2.756)
KP-900	900	9	156	0.2	3.5	M14	200	133	127	40	75
	(7966)	(30.75)	(6908)	(0.008)	(7.72)		(1770)	(5.236)	(5.000)	(1.575)	(2.953)

Coupling must be selected so nominal torque is higher than highest operational torque of the application (i.e., during acceleration).
Bore diameters smaller than the minimum are possible but reliable transmission of nominal torque cannot be guaranteed.

KLC Series Bellows Couplings

Major Features

- Bellows coupling with radial clamping hubs.
- Short overall length.
- Welded hub bellow connection.
- Same day delivery available.
- Low cost.

Material

- Stainless steel bellow; steel hubs

Technical Data/Dimensions

Size KLC	Nominal Torque	Moment of Inertia	Torsion Resistance	Max. Lateral Misalignment	Mass	Screw Size	Torque to Tighten Screws	Outer Diameter	Length	Bore Range	
										Min.	Max.
	Nm (lb-in)	10^{-3}kgm^2 (lb-in^2)	Nm/arcmin (lb-ft/Deg)	mm (inch)	kg (lbs)		Nm (lb-in)	mm (inch)	mm (inch)	mm (inch)	mm (inch)
KLC-25	25	0.09	3.5	0.2	0.22	M5	10	50	61	10	28
	(221)	(0.31)	(154.9)	(0.008)	(0.5)		(89)	(1.969)	(2.402)	(0.394)	(1.102)
KLC-50	50	0.22	6.5	0.2	0.43	M6	18	60	67	15	34
	(443)	(0.75)	(287.7)	(0.008)	(0.9)		(159)	(2.362)	(2.638)	(0.591)	(1.339)
KLC-125	125	0.75	12	0.2	0.9	M8	40	77	81	16	43
	(1106)	(2.56)	(531.1)	(0.008)	(2)		(354)	(3.031)	(3.189)	(0.63)	(1.693)

Type Code for Bellows and Elastomer Couplings

Series	Size		Bore 1*	Key		Bore 2*	Key		Configuration Code
KM	35	-	15000	N	-	00750	N	- 0 -	C0000
See bellows and elastomer coupling tables for available series and sizes			Bore diameter in 00.000 mm or inches. For example 15000 = 15 mm 00750 = 0.750 in	N = No Keyway K = Keyway		Bore diameter in 00.0000 mm or inches. For example 15000 = 15.000 mm 00750 = 00.750 in	K = Keyway N = No Keyway	(Used if C-Code is assigned)	Assigned by GAM

*See coupling tables for minimum and maximum bore available. For couplings with 2 bores of different sizes, list the larger bore first (Bore 1).

KG Series Bellows Coupling

Major Features

- Bellows coupling with radial clamping hubs.
- With EASY Clamp System for easy install and un-install.
- Short overall length.
- Also available in stainless steel versions (KG-VA)

Material

- Stainless steel bellow; steel hubs

Technical Data/Dimensions

Size KG	Nominal Torque	Moment of Inertia	Torsion Resistance	Max. Lateral Misalignment	Mass	Screw Size	Torque to Tighten Screws	Outer Diameter	Length	Bore Range	
										Min.	Max.
	Nm (lb-in)	10^{-3}kgm^2 (lb-in^2)	Nm/arcmin (lb-ft/Deg)	mm (inch)	kg (lbs)		Nm (lb-in)	mm (inch)	mm (inch)	mm (inch)	mm (inch)
KG-5	5	0.004	0.9	0.1	0.06	M3	2	24	29	6	11
	(44)	(0.014)	(39.8)	(0.004)	(0.13)		(18)	(0.945)	(1.142)	(0.236)	(0.433)
KG-10	10	0.019	2.1	0.15	0.14	M4	5	34	38	8	16
	(88)	(0.065)	(92.9)	(0.006)	(0.31)		(44)	(1.339)	(1.496)	(0.315)	(0.630)
KG-20	20	0.044	3.4	0.15	0.22	M5	10	39.5	43	10	20
	(177)	(0.15)	(150)	(0.006)	(0.49)		(89)	(1.555)	(1.693)	(0.394)	(0.787)
KG-40	40	0.18	9	0.2	0.5	M6	16	56	55	12	28
	(354)	(0.62)	(398)	(0.008)	(1.1)		(142)	(2.205)	(2.165)	(0.472)	(1.102)
KG-80	80	0.44	14	0.2	0.9	M8	40	66	61	14	35
	(708)	(1.49)	(620)	(0.008)	(2.0)		(354)	(2.598)	(2.402)	(0.551)	(1.378)
KG-140	140	0.74	20	0.2	1.1	M8	40	71	62	18	40
	(1239)	(2.51)	(885)	(0.008)	(2.4)		(354)	(2.795)	(2.441)	(0.709)	(1.575)
KG-220	220	1.22	28	0.2	1.5	M10	80	82	73	20	42
	(1947)	(4.14)	(1239)	(0.008)	(3.3)		(708)	(3.228)	(2.874)	(0.787)	(1.654)
KG-350	350	2.60	52	0.2	2.4	M12	135	101	82	22	50
	(3098)	(8.81)	(2301)	(0.008)	(5.3)		(1195)	(3.976)	(3.228)	(0.866)	(1.969)
KG-700	700	5.40	106	0.2	3.4	M12	135	122	85	42	64
	(6196)	(18.3)	(4691)	(0.008)	(7.5)		(1195)	(4.803)	(3.346)	(1.654)	(2.520)
KG-1300	1300	24.8	225	0.1	8.5	M16	300	157	111	50	90
	(11506)	(81.36)	(9957)	(0.004)	(18.7)		(2655)	(6.181)	(4.370)	(1.969)	(3.543)

Coupling must be selected so nominal torque is higher than highest operational torque of the application (i.e., during acceleration). Bore diameters smaller than the minimum are possible but reliable transmission of nominal torque cannot be guaranteed.

Low Cost Servo Coupling
EKC Series Elastomer Coupling

Major Features

- Low cost elastomer coupling for motion control applications
- Quick standard delivery (same day delivery available)
- Star-shaped elastomer element with involute tooth profile and high shore hardness ensures zero backlash over life of product.
- Elastomer spider compensates for small shaft misalignments.
- Available to purchase online!

Material

- Anodized aluminum hubs
- Polyurethane 98 Shore A spiders available

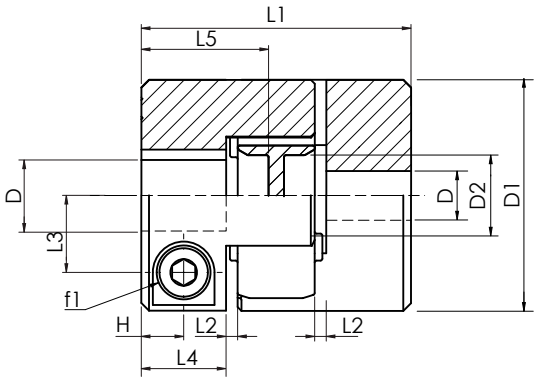
98 Shore A (Red) Spider

Technical Data/Dimensions

Coupling Size	Rated Torque* Nm (lb-in)	Elastomer	Elastomer Color (Red is standard)	Moment of Inertia 10^{-3}kgm^2 (lb-in^2)	Torsion Resistance Nm/arcmin (lb-ft/deg)	Max. Lateral Misalignment mm (inch)	Mass kg (lbs)	Torque to Tighten Screws Nm (lb-in)	Bore Range (D) min. mm (inch)	Bore Range (D) max. mm (inch)	Standard Bore Sizes
EKC-5	5 (44)	98 Sh A	Red	0.0060 (0.0204)	0.013 (0.58)	0.09 (0.0035)	0.045 (0.1)	5.65 (50)	5 (0.1969)	15 (0.5906)	6, 8, 10, 11, 12, 14 0.25", 0.375", 0.5"
EKC-25	25 (221)	98 Sh A	Red	0.0407 (0.1390)	0.182 (8.06)	0.06 (0.0024)	0.14 (0.31)	13.00 (115)	8 (0.3150)	20 (0.7874)	10, 11, 12, 14, 16, 19, 20 0.375", 0.5", 0.625", 0.75"
EKC-35	35 (310)	98 Sh A	Red	0.1667 (0.5696)	0.447 (19.78)	0.1 (0.0039)	0.28 (0.62)	13.00 (115)	13 (0.5118)	28 (1.1024)	14, 16, 19, 20, 24, 28 0.5", 0.625", 0.75", 1"
EKC-80	80 (708)	98 Sh A	Red	0.3825 (1.3071)	0.577 (25.53)	0.11 (0.0043)	0.53 (1.17)	27.68 (245)	19 (0.7480)	38.1 (1.5)	19, 20, 24, 28, 32, 35 0.75", 1", 1.25", 1.375", 1.5"
EKC-110	110 (974)	98 Sh A	Red	1.1026 (3.7677)	1.102 (48.76)	0.12 (0.0047)	0.96 (2.12)	27.68 (245)	24 (0.9449)	45 (1.7717)	24, 28, 32, 35, 38, 40 1", 1.25", 1.375", 1.5"

*Higher torques permissible at larger bores

NOTE: Coupling must be selected so rated torque is higher than highest operational torque of the application (i.e., during acceleration).



Dimension	EKC-5	EKC-25	EKC-35	EKC-80	EKC-110
	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)
L1: Overall Length	35 (1.38)	66 (2.6)	78 (3.07)	90 (3.54)	114 (4.49)
L2: Gap	1.5 (0.06)	2 (0.08)	2 (0.08)	2.5 (0.10)	3 (0.12)
L3: Radial Bolt Location	10 (0.39)	14.5 (0.57)	20 (0.79)	25 (0.98)	30 (1.18)
L4: Hub Thickness	11 (0.43)	25 (0.98)	30 (1.18)	35 (1.38)	45 (1.77)
L5: Engagement	16.5 (0.65)	31.5 (1.24)	37.5 (1.475)	43 (1.69)	55 (2.165)
D1: Hub OD	30 (1.18)	40 (1.57)	55 (2.17)	65 (2.56)	80 (3.15)
D1*: Overall OD (w/ bolts)	32 (1.26)	45 (1.77)	57 (2.24)	72 (2.83)	83 (3.27)
D2: Elastomer ID	10.5 (0.41)	18 (0.71)	27 (1.06)	30 (1.18)	38 (1.5)
H: Axial Bolt Location	5 (0.2)	11 (0.43)	10.5 (0.41)	11.5 (0.45)	15.5 (0.61)
f1: Screw Size	M4	M6	M6	M8	M8

Coupling must be selected so nominal torque is higher than highest operational torque of the application (i.e., during acceleration). Bore diameters smaller than the minimum are possible but reliable transmission of nominal torque cannot be guaranteed.

EKM Series Elastomer Couplings

Major Features

- Easy-to-mount radial clamping hubs.
- Star-shaped elastomer element with involute tooth profile and high shore hardness ensures zero backlash over life of product.
- Electrically insulating and dampens oscillation resonance.
- Elastomer spider compensates for small shaft misalignments.
- Same day delivery available.

Material

- Aluminum hubs; polyurethane 72 Shore D spider (white)
- Aluminum hubs; polyurethane 98 Shore A spider (red)

Technical Data/Dimensions

Size EKM	Nominal Torque	Elastomer Hardness Shore	Moment of Inertia	Torsion Resistance	Max. Lateral Misalignment	Mass	Screw* Size	Torque to Tighten Screws	Outer Diameter*	Length	Bore Range* min.	Bore Range* max.
	Nm (lb-in)		10^{-3}kgm² (lb-in²)	Nm/arcmin (lb-ft/Deg)	mm (inch)	kg (lbs)		Nm (lb-in)	mm (inch)	mm (inch)	mm (inch)	mm (inch)
MEKM-2	2	98 Sh-A	0.0002	0.002	0.1	0.01	M2	0.5	14	22	3, 4 or 5 mm	
	(18)		(0.001)	(0.09)	(0.004)	(0.02)		(4)	(0.551)	(0.866)		
MEKM-5	5	98 Sh-A	0.001	0.004	0.1	0.02	M2.5	1	20	30	5, 6, 8 mm or .250"	
	(44)		(0.003)	(0.18)	(0.004)	(0.04)		(9)	(0.787)	(1.181)		
MEKM-7	7	98 Sh-A	0.006	0.013	0.1	0.05	M4	2.5	30	35	8, 10, 12 mm or .375"	
	(62)		(0.021)	(0.58)	(0.004)	(0.11)		(22)	(1.181)	(1.378)		
EKM-8	8	98 Sh-A	0.01	0.04	0.1	0.06	M4	4	32	40	8	15
	(71)		(0.03)	(1.8)	(0.004)	(0.13)		(35)	(1.260)	(1.575)	(0.315)	(0.591)
EKM-15	15	98 Sh-A	0.03	0.24	0.1	0.12	M5	8	40	50	10	19
	(133)		(0.10)	(10.6)	(0.004)	(0.26)		(71)	(1.575)	(1.968)	(0.394)	(0.748)
EKM-20	20	72 Sh-D	0.03	0.34	0.07	0.12	M5	8	40	50	12	19
	(177)		(0.10)	(15.1)	(0.003)	(0.26)		(71)	(1.575)	(1.968)	(0.472)	(0.748)
EKM-30	30	98 Sh-A	0.09	0.41	0.1	0.21	M6/M5	14/8	50	58	13	26/30
	(266)		(0.31)	(18.2)	(0.004)	(0.46)		(124)/(71)	(1.968)	(2.283)	(0.512)	(1.024)/(1.181)
EKM-45	45	72 Sh-D	0.09	0.58	0.07	0.21	M6	14	50	58	18	26
	(398)		(0.31)	(25.7)	(0.003)	(0.46)		(124)	(1.968)	(2.283)	(0.709)	(1.024)
EKM-60	60	98 Sh-A	0.18	0.61	0.1	0.32	M8	35	60	62	15	29
	(531)		(0.62)	(27.0)	(0.004)	(0.71)		(310)	(2.362)	(2.441)	(0.591)	(1.142)
EKM-90	90	72 Sh-D	0.18	0.9	0.07	0.32	M8/M6	35/14	60	62	20	29/32
	(797)		(0.62)	(39.9)	(0.003)	(0.71)		(310)/(124)	(2.362)	(2.441)	(0.787)	(1.142)/(1.259)
EKM-150	150	98 Sh-A	0.38	1.05	0.1	0.52	M10/M8	67/35	70	73	22/30	33/38
	(1328)		(1.30)	(46.5)	(0.004)	(1.15)		(593)/(310)	(2.756)	(2.874)	(0.866)/(1.181)	(1.299)/(1.496)
EKM-200	200	72 Sh-D	0.38	1.5	0.07	0.52	M10/M8	67/35	70	73	26	33/38
	(1770)		(1.30)	(66.4)	(0.003)	(1.15)		(593)/(310)	(2.756)	(2.874)	(1.024)	(1.299)/(1.496)
EKM-300	300	98 Sh-A	1.0	2	0.12	0.9	M12/M10	115/67	85	86	30/38	42/46
	(2655)		(3.42)	(88.6)	(0.005)	(1.98)		(1018)/(593)	(3.346)	(3.386)	(1.181)/(1.496)	(1.654)/(1.811)
EKM-400	400	72 Sh-D	1.0	2.85	0.1	0.9	M12/M10	115/67	85	86	35	42/46
	(3540)		(3.42)	(126.2)	(0.004)	(1.98)		(1018)/(593)	(3.346)	(3.386)	(1.378)	(1.654)/(1.811)
EKM-500	500	98 Sh-A	2.2	5.8	0.15	1.5	M12	115	100	94	38	56
	(4425)		(7.52)	(256.8)	(0.006)	(3.3)		(1018)	(3.937)	(3.701)	(1.496)	(2.205)
EKM-700	700	98 Sh-A	5.2	8	0.15	2.5	M14	185	120	109	40	70
	(6196)		(17.77)	(354.2)	(0.006)	(5.5)		(1637)	(4.724)	(4.291)	(1.575)	(2.756)
EKM-1000	1000	72 Sh-D	5.2	12	0.1	2.5	M14	185	120	109	48	70
	(8851)		(17.77)	(531.4)	(0.004)	(5.5)		(1637)	(4.724)	(4.291)	(1.89)	(2.756)
EKM-2000	2000	98 Sh-A	50	21	0.15	14	M16	290	160	124	50	90
	(17702)		(170.86)	(929.9)	(0.006)	(31)		(2567)	(6.300)	(4.882)	(1.969)	(3.543)

* Couplings available with an oversized bore have 2 values for Outer Diameter, Bore Range, and Screw Size. The second of the 2 values is for the oversized bore.

WDS Series Bellows Drive Shaft Coupling

Major Features

- Bellows drive shaft coupling with split hubs.
- Customized lengths up to 20 feet.
- High speeds, very low inertia.
- Compensation of high radial loads for prevention of premature bearing failure.

Material

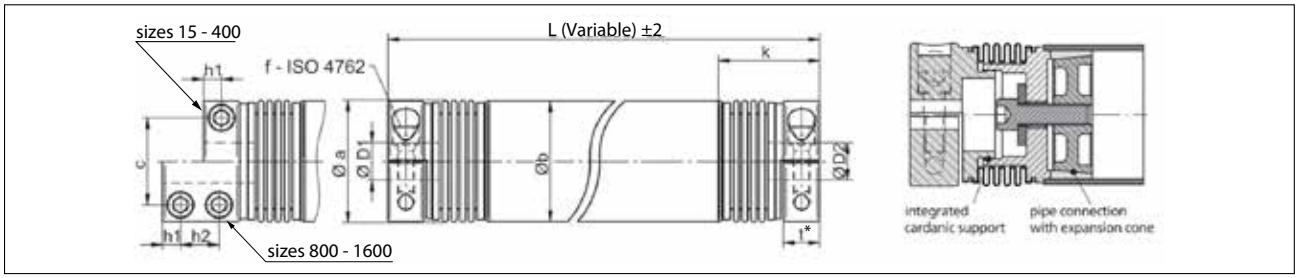
- Aluminum hubs (size 15-400)
- Steel hubs (size 800-1600)
- Stainless steel bellow; aluminum tubing

Technical Data

Size	Nominal Torque	Torsional Stiffness Nm/arcmin (lb-ft/deg)				Moment of Inertia 10^{-3}kgm^2 (lb-in^2)				Maximum Speed (Approx.) rpm				Weight (Approximate) kg (lbs)			
	Nm (lb-in)	1 m	2 m	3 m	4 m	1 m	2 m	3 m	4 m	1 m	2 m	3 m	4 m	1 m	2 m	3 m	4 m
WDS-15	15 (133)	0.4 (18)	0.2 (8.9)	0.15 (6.6)	-	0.2 (0.68)	0.4 (1.4)	0.6 (2.1)	- -	3900	880	370	-	0.9 (2.0)	1.5 (3.3)	2.3 (5.1)	-
WDS-50	50 (442)	1.5 (66)	0.8 (35)	0.6 (27)	0.5 (22)	0.9 (3.1)	1.5 (5.5)	2.3 (7.5)	- (9.9)	6000	1300	550	300	1.8 (4.0)	3 (6.6)	4.3 (9.5)	5.5 (12)
WDS-100	100 (885)	2.6 (115)	1.5 (66)	1.0 (44)	0.8 (35)	1.8 (6.2)	2.9 (9.9)	4.1 (14)	5.3 (18)	7300	1600	670	360	2.5 (5.5)	4 (8.8)	5.5 (12)	7 (15)
WDS-200	200 (1770)	5.9 (261)	3.5 (155)	2.5 (111)	1.9 (84)	5.3 (18)	9.1 (31)	13 (44)	17 (58)	8000	2100	900	500	3.8 (8.4)	6 (13)	8 (18)	10 (22)
WDS-400	400 (3540)	17 (752)	10 (443)	7.5 (332)	6.0 (266)	12 (41)	21 (72)	31 (106)	40 (137)	8000	2700	1100	600	7 (15)	11 (24)	15 (33)	19 (42)
WDS-800	800 (7081)	26 (1151)	16 (708)	11 (487)	9 (398)	32 (109)	48 (164)	64 (219)	80 (273)	8000	3400	1400	760	15 (33)	20 (44)	25 (55)	30 (66)
WDS-1600	1600 (14161)	61 (2701)	37 (1637)	27 (1195)	21 (929)	116 (396)	150 (513)	190 (649)	230 (786)	8000	4800	2000	1100	31 (68)	38 (84)	44 (97)	51 (112)

Coupling must be selected so nominal torque is higher than highest operational torque of the application (i.e., during acceleration).
Bore diameters smaller than the minimum are possible but reliable transmission of nominal torque cannot be guaranteed.

Dimensions (mm)



Size	Øa	Øb	c	f - tightening torque**	h1	h2	k	t*	Lmin	ØD1/D2 min	ØD1/D2 max**
WDS-15	36	35	21	2x M5 - 8 Nm	9	-	54	18	108	6	15
WDS-50	58	50	36	2x M8 - 35 Nm	13	-	67	26	132	9	25
WDS-100	75	60	47	2x M10 - 65 Nm (50)*	13	-	69	26	136	12.5	31 (35)**
WDS-200	89	80	56	2x M12 - 115 Nm (80)*	14	-	77	28	152	19	34 (42)**
WDS-400	109	100	72	2x M14 - 180 Nm (140)*	15	-	84	30	165	24	48 (55)**
WDS-800	123	120	80	4x M12 - 115 Nm	13	22	101	45	200	24	65
WDS-1600	158	160	108	4x M16 - 290 Nm	18	30	125	64	250	35	85

Øa: bolt head interfering edge
*Minimum shaft engagement = t ± 1 mm **Larger hub bore diameter requires reduced tightening torque, shown in parentheses

EDC Series Elastomer Drive Shaft Coupling

Major Features

- Elastomer drive shaft coupling.
- Customized lengths up to 20 feet.
- Low cost and quick standard delivery
- Elastomer compensates for small shaft misalignments.

Material

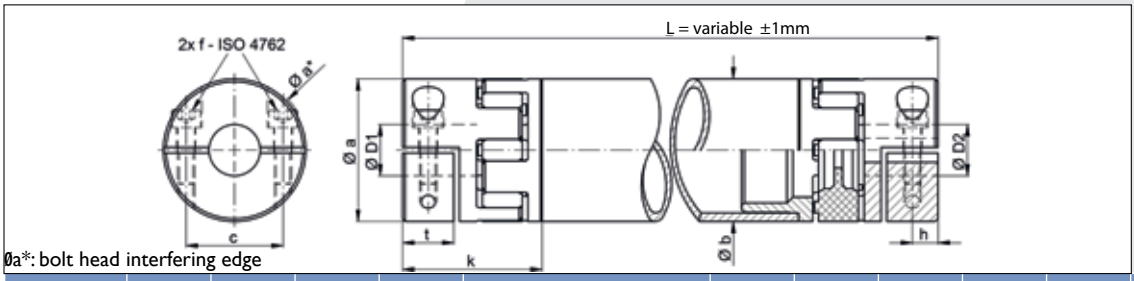
- Anodized aluminum hubs.
- Polyurethane 98 Shore A elastomer (red).

Technical Data

Size	Nominal Torque	Torsional Stiffness Nm/arcmin (lb-ft/deg)				Moment of Inertia 10^{-3}kgm^2 (lb-in^2)				Maximum Speed (Approx.) rpm				Weight (Approximate) kg (lbs)			
	Nm (lb-in)	0.5 m	1 m	2 m	3 m	0.5 m	1 m	2 m	3 m	0.5 m	1 m	2 m	3 m	0.5 m	1 m	2 m	3 m
EDC-25	25 (221)	0.14 (6.2)	0.11 (4.9)	0.08 (3.5)	0.06 (2.7)	0.11 (0.38)	0.21 (0.72)	0.39 (1.33)	0.57 (1.95)	3500	1700	380	160	0.56 (1.2)	0.90 (2.0)	1.59 (3.5)	2.28 (5.0)
EDC-35	35 (310)	0.37 (16)	0.30 (13)	0.22 (9.7)	0.17 (7.5)	0.39 (1.3)	0.67 (2.3)	1.24 (4.2)	1.81 (6.2)	3500	2500	550	240	0.95 (2.1)	1.45 (3.2)	2.46 (5.4)	3.47 (7.6)
EDC-80	80 (708)	0.51 (23)	0.44 (19)	0.35 (15)	0.29 (13)	0.82 (2.8)	1.41 (4.8)	2.60 (8.9)	3.78 (13)	3500	3500	1370	580	1.60 (3.5)	2.33 (5.1)	3.78 (8.3)	5.23 (11.5)
EDC-110	110 (974)	1.02 (45)	0.92 (41)	0.76 (34)	0.65 (29)	2.24 (7.7)	3.90 (13)	7.23 (25)	10.56 (36)	3500	3500	950	400	2.70 (6.0)	3.83 (8.4)	6.10 (13.4)	8.37 (18.5)

Coupling must be selected so nominal torque is higher than highest operational torque of the application (i.e., during acceleration).
Bore diameters smaller than the minimum are possible but reliable transmission of nominal torque cannot be guaranteed.

Dimensions (mm)



Øa*: bolt head interfering edge

Size	Øa	Øa*	Øb	c	f - tightening torque	h	k	t	Lmin	ØD1/D2 min	ØD1/D2 max
EDC-25	40	45	35	29	2x M6 - 13 Nm	9	49.8	17.5	141.6	8	20
EDC-35	55	57	50	36	2x M6 - 13 Nm	10.5	56.6	20.5	158.2	13	28
EDC-80	65	72	60	47	2x M8 - 32 Nm	11.5	63.5	23	196	19	38.1
EDC-110	80	83	80	60	2x M8 - 32 Nm	15.5	81.2	31	243.4	24	45

Type Code for Distance Couplings

Series	Size		Bore 1*	Key		Bore 2*	Key		Overall Length		Configuration Code
EDC	25	-	15000	N	-	00750	N	-	687	-	C0000
See distance coupling tables for available sizes			Bore diameter in 00.000 mm or inches. For example 15000 = 15 mm 00750 = 0.750 in	N = No Keyway K = Keyway		Bore diameter in 00.0000 mm or inches. For example 15000 = 15.000 mm 00750 = 00.750 in	K = Keyway N = No Keyway		in mm		Assigned by GAM

*See coupling tables for minimum and maximum bore available. For couplings with 2 bores of different sizes, list the larger bore first (Bore 1).

SKB-KP Direct Drive Bellows Safety Coupling

Major Features

- Bellows safety coupling with radial clamping hubs.
- Upon disengagement, coupling will re-engage automatically at only one point per revolution and retain the drive's reference point.
- Bellow compensates for axial, lateral and angular misalignment.
- Adjustable disengagement torque.

Material

- Stainless steel bellow; aluminum and steel hubs; steel safety element

Technical Data/Dimensions

Size SKB-KP	Disengagement Torque Range		Moment of Inertia	Torsion Resistance	Max. Lateral Misalignment	Mass	Screw Size	Torque to Tighten Screws		Outer Diameter	Length	Switching Distance	Bore Range Elastomer End øD1		Bore Range Safety Element øD2	
													min.	max.	min.	max.
	Nm (lb-in)		10^{-3}kgm² (lb-in²)	Nm/ arcmin (lb-ft/Deg)	mm (inch)	kg (lbs)		*Al Hub Nm (lb-in)	**Steel Hub Nm (lb-in)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)
SKB-KP-6	2	6	0.13	2.1	0.15	0.45	M5	7	10	52.5	81	0.9	6	19	6	16
	(18)	(53)	(0.44)	(93)	(0.006)	(0.99)		(62)	(89)	(2.067)	(3.189)	(0.035)	(0.236)	(0.748)	(0.236)	(0.630)
SKB-KP-12	6	12	0.13	2.1	0.15	0.45	M5	7	10	52.5	81	0.9	8	19	8	16
	(53)	(106)	(0.44)	(93)	(0.006)	(0.99)		(62)	(89)	(2.067)	(3.189)	(0.035)	(0.315)	(0.748)	(0.315)	(0.630)
SKB-KP-15	8	15	0.5	9	0.2	1	M6	14	18	69	94.5	1.2	9	30	10	25.4
	(71)	(133)	(1.71)	(399)	(0.008)	(2.20)		(124)	(159)	(2.717)	(3.720)	(0.047)	(0.354)	(1.181)	(0.394)	(1.000)
SKB-KP-30	13	30	0.5	9	0.2	1	M6	14	18	69	94.5	1.2	12	30	12	25.4
	(115)	(266)	(1.71)	(399)	(0.008)	(2.20)		(124)	(159)	(2.717)	(3.720)	(0.047)	(0.472)	(1.181)	(0.472)	(1.000)
SKB-KP-45	22	45	0.5	9	0.2	1	M6	14	18	69	94.5	1.2	16	30	14	25.4
	(195)	(398)	(1.71)	(399)	(0.008)	(2.20)		(124)	(159)	(2.717)	(3.720)	(0.047)	(0.630)	(1.181)	(0.551)	(1.000)
SKB-KP-60	25	60	1.5	20	0.2	1.9	M8	35	40	88	107	1.6	15	38	18	35
	(221)	(531)	(5.13)	(886)	(0.008)	(4.19)		(310)	(354)	(3.465)	(4.213)	(0.063)	(0.591)	(1.496)	(0.709)	(1.378)
SKB-KP-100	40	100	1.5	20	0.2	1.9	M8	35	40	88	107	1.6	20	38	18	35
	(354)	(885)	(5.13)	(886)	(0.008)	(4.19)		(310)	(354)	(3.465)	(4.213)	(0.063)	(0.787)	(1.496)	(0.709)	(1.378)
SKB-KP-150	60	150	1.5	20	0.2	1.9	M8	35	40	88	107	1.6	25	38	24	35
	(531)	(1328)	(5.13)	(886)	(0.008)	(4.19)		(310)	(354)	(3.465)	(4.213)	(0.063)	(0.984)	(1.496)	(0.945)	(1.378)
SKB-KP-230	80	230	5.5	28	0.2	3.8	M10	65	80	115	132	1.8	25	43	24	44
	(708)	(2036)	(18.79)	(1240)	(0.008)	(8.38)		(575)	(708)	(4.528)	(5.197)	(0.071)	(0.984)	(1.693)	(0.945)	(1.732)
SKB-KP-330	130	330	5.5	28	0.2	3.8	M10	65	80	115	132	1.8	32	43	32	44
	(1151)	(2921)	(18.79)	(1240)	(0.008)	(8.38)		(575)	(708)	(4.528)	(5.197)	(0.071)	(1.260)	(1.693)	(1.260)	(1.732)
SKB-KP-500	200	500	14	52	0.2	6.8	M12/M14	115	220	137	152.5	2.5	35	55	28	58
	(1770)	(4425)	(47.84)	(2303)	(0.008)	(14.99)		(1018)	(1947)	(5.394)	(6.003)	(0.098)	(1.378)	(2.165)	(1.102)	(2.283)
SKB-KP-800	350	800	16	106	0.2	7.2	M14	200	220	137	169	2.5	42	70	40	58
	(3098)	(7081)	(54.67)	(4694)	(0.008)	(15.87)		(1770)	(1947)	(5.394)	(6.654)	(0.098)	(1.654)	(2.756)	(1.575)	(2.283)
SKB-KP-1000	500	1000	80	80	0.3	20	M14/M16	185	290	181	236	3.7	50	75	42	100
	(4425)	(8851)	(273.37)	(3542)	(0.012)	(44.09)		(1637)	(2567)	(7.126)	(9.291)	(0.146)	(1.968)	(2.953)	(1.654)	(3.937)
SKB-KP-2000	800	2000	88	140	0.3	21	M16	290	290	181	239	3.7	65	85	45	100
	(7081)	(17702)	(300.71)	(6199)	(0.012)	(46.30)		(2567)	(2567)	(7.126)	(9.409)	(0.146)	(2.559)	(3.346)	(1.772)	(3.937)

SKB-EK Direct Drive Elastomer Safety Coupling

Major Features

- Elastomer safety coupling with radial EASY Clamp System hubs.
- Upon disengagement, coupling will re-engage automatically at only one point per revolution and retain the drive's reference point.
- Star-shaped elastomer element with involute tooth profile and high shore hardness ensures zero backlash over life of product.
- Electrically insulating and dampens oscillation resonance.

Material

- Aluminum and steel hubs; elastomer spider; steel safety element

Technical Data/Dimensions

Size SKB-EK	Disengagement Torque Range		Moment of Inertia	Torsion Resistance	Max. Lateral Misalignment	Mass	Screw Size	Torque to Tighten Screws		Outer Diameter	Length	Switching Distance	Bore Range Elastomer End øD1		Bore Range Safety Element øD2	
													min.	max.	min.	max.
	Nm (lb-in)		10^{-3}kgm^2 (lb-in^2)	Nm/arcmin (lb-ft/Deg)	mm (inch)	kg (lbs)		*Al Hub Nm (lb-in)	**Steel Hub Nm (lb-in)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)
SKB-EK-6	2	6	0.13	0.24	0.1	0.44	M5	8	10	52.5	77	0.9	8	20	6	16
	(18)	(53)	(0.44)	(11)	(0.004)	(0.97)		(71)	(89)	(2.067)	(3.031)	(0.035)	(0.315)	(0.787)	(0.236)	(0.630)
SKB-EK-12	6	12	0.13	0.24	0.1	0.44	M5	8	10	52.5	77	0.9	8	20	8	16
	(53)	(106)	(0.44)	(11)	(0.004)	(0.97)		(71)	(89)	(2.067)	(3.031)	(0.035)	(0.315)	(0.787)	(0.315)	(0.630)
SKB-EK-15	8	15	0.5	0.61	0.1	1	M6	14	18	69	91.5	1.2	12	32	10	25.4
	(71)	(133)	(1.71)	(27)	(0.004)	(2.20)		(124)	(159)	(2.717)	(3.602)	(0.047)	(0.472)	(1.260)	(0.394)	(1.000)
SKB-EK-30	13	30	0.5	0.61	0.1	1	M6	14	18	69	91.5	1.2	12	32	12	25.4
	(115)	(266)	(1.71)	(27)	(0.004)	(2.20)		(124)	(159)	(2.717)	(3.602)	(0.047)	(0.472)	(1.260)	(0.472)	(1.000)
SKB-EK-45	22	45	0.5	0.61	0.1	1	M6	14	18	69	91.5	1.2	14	32	14	25.4
	(195)	(398)	(1.71)	(27)	(0.004)	(2.20)		(124)	(159)	(2.717)	(3.602)	(0.047)	(0.551)	(1.260)	(0.551)	(1.000)
SKB-EK-60	25	60	1.5	1.05	0.1	2	M8	35	40	88	107	1.6	16	38	18	35
	(221)	(531)	(5.13)	(46)	(0.004)	(4.41)		(310)	(354)	(3.465)	(4.213)	(0.063)	(0.630)	(1.496)	(0.709)	(1.378)
SKB-EK-100	40	100	1.5	1.05	0.1	2	M8	35	40	88	107	1.6	19	38	18	35
	(354)	(885)	(5.13)	(46)	(0.004)	(4.41)		(310)	(354)	(3.465)	(4.213)	(0.063)	(0.748)	(1.496)	(0.709)	(1.378)
SKB-EK-150	60	150	1.5	1.05	0.1	2	M8	35	40	88	107	1.6	22	38	24	35
	(531)	(1328)	(5.13)	(46)	(0.004)	(4.41)		(310)	(354)	(3.465)	(4.213)	(0.063)	(0.866)	(1.496)	(0.945)	(1.378)
SKB-EK-230	80	230	5.6	2	0.12	4.2	M12/M10	115	80	115	134	1.8	24	43	24	42
	(708)	(2036)	(19.14)	(89)	(0.005)	(9.26)		(1018)	(708)	(4.528)	(5.276)	(0.071)	(0.945)	(1.693)	(0.945)	(1.654)
SKB-EK-330	130	330	5.6	2	0.12	4.2	M12/M10	115	80	115	134	1.8	32	43	32	42
	(1151)	(2921)	(19.14)	(89)	(0.005)	(9.26)		(1018)	(708)	(4.528)	(5.276)	(0.071)	(1.260)	(1.693)	(1.260)	(1.654)
SKB-EK-500	200	500	17	8	0.15	8.6	M14	185	220	137	167.5	2.5	30	70	28	58
	(1770)	(4425)	(58.09)	(354)	(0.006)	(18.96)		(1637)	(1947)	(5.394)	(6.594)	(0.098)	(1.181)	(2.756)	(1.102)	(2.283)
SKB-EK-800	350	800	17	8	0.15	8.6	M14	185	220	137	167.5	2.5	42	70	40	58
	(3098)	(7081)	(58.09)	(354)	(0.006)	(18.96)		(1637)	(1947)	(5.394)	(6.594)	(0.098)	(1.654)	(2.756)	(1.575)	(2.283)
SKB-EK-1000	500	1000	79	12	0.1	19.5	M14/M16	185	290	181	204	3.7	48	70	42	100
	(4425)	(8851)	(269.95)	(531)	(0.004)	(42.99)		(1637)	(2567)	(7.126)	(8.031)	(0.146)	(1.890)	(2.756)	(1.654)	(3.937)
SKB-EK-2000	800	2000	116	21	0.15	27.9	M16	290	290	181	219	3.7	50	90	42	100
	(7081)	(17702)	(396.39)	(929.9)	(0.006)	(61.51)		(2567)	(2567)	(7.126)	(8.622)	(0.146)	(1.968)	(3.543)	(1.654)	(3.937)

SKB Series Indirect Drive Safety Coupling

Major Features

- Pulley safety coupling with self-centering conical hub and integrated bearing.
- Upon disengagement, coupling will re-engage automatically at only one point per revolution and retain the drive's reference point.
- Integrated bearing for high axial and radial loading to support pulleys, gears or sprockets.
- Adjustable disengagement torque.

Material

- Steel hubs; steel safety element

Size SKB	Disengagement Torque Range Nm (lb-in)		Moment of Inertia 10^{-3}kgm² (lb-in²)	Mass kg (lbs)	Screw Size	Torque to Tighten Screws Nm (lb-in)	Thread Size for Pulley	Outer Diameter mm (inch)	Length mm (inch)	Switching Distance mm (inch)	Bore Range min. mm (inch)	Bore Range max. mm (inch)
SKB-6	2	6	0.09	0.36	M5	10	6xM3	52	41	0.9	6	16
	(18)	(53)	(0.31)	(0.79)		(89)		(2.047)	(1.614)	(0.035)	(0.236)	(0.630)
SKB-12	6	12	0.09	0.36	M5	10	6xM3	52	41	0.9	8	16
	(53)	(106)	(0.31)	(0.79)		(89)		(2.047)	(1.614)	(0.035)	(0.315)	(0.630)
SKB-15	8	15	0.36	0.8	M6	18	6xM4	69	48	1.2	10	25.4
	(71)	(133)	(1.23)	(1.76)		(159)		(2.717)	(1.890)	(0.047)	(0.394)	(1.000)
SKB-30	13	30	0.36	0.8	M6	18	6xM4	69	48	1.2	12	25.4
	(115)	(266)	(1.23)	(1.76)		(159)		(2.717)	(1.890)	(0.047)	(0.472)	(1.000)
SKB-45	22	45	0.36	0.8	M6	18	6xM4	69	48	1.2	14	25.4
	(195)	(398)	(1.23)	(1.76)		(159)		(2.717)	(1.890)	(0.047)	(0.551)	(1.000)
SKB-60	25	60	1.1	1.5	M8	40	6xM6	87	55.5	1.6	18	35
	(221)	(531)	(3.76)	(3.31)		(354)		(3.425)	(2.185)	(0.063)	(0.709)	(1.378)
SKB-100	40	100	1.1	1.5	M8	40	6xM6	87	55.5	1.6	18	35
	(354)	(885)	(3.76)	(3.31)		(354)		(3.425)	(2.185)	(0.063)	(0.709)	(1.378)
SKB-150	60	150	1.1	1.5	M8	40	6xM6	87	55.5	1.6	24	35
	(531)	(1328)	(3.76)	(3.31)		(354)		(3.425)	(2.185)	(0.063)	(0.945)	(1.378)
SKB-230	80	230	4.2	3.3	M10	80	6xM8	113	71.5	1.8	24	44
	(708)	(2036)	(14.35)	(7.28)		(708)		(4.449)	(2.815)	(0.071)	(0.945)	(1.732)
SKB-330	130	330	4.2	3.3	M10	80	6xM8	113	71.5	1.8	32	44
	(1151)	(2921)	(14.35)	(7.28)		(708)		(4.449)	(2.815)	(0.071)	(1.260)	(1.732)
SKB-500	200	500	12.2	6.2	M14	220	8xM8	136	87.5	2.5	28	58
	(1770)	(4425)	(41.69)	(13.67)		(1947)		(5.354)	(3.445)	(0.098)	(1.102)	(2.283)
SKB-800	350	800	12.2	6.2	M14	220	8xM8	136	87.5	2.5	40	58
	(3098)	(7081)	(41.69)	(13.67)		(1947)		(5.354)	(3.445)	(0.098)	(1.575)	(2.283)
SKB-1000	500	1000	76	20	M16	290	12xM10	181	142	3.7	42	100
	(4425)	(8851)	(259.70)	(44.09)		(2567)		(7.126)	(5.591)	(0.146)	(1.654)	(3.937)
SKB-2000	800	2000	76	20	M16	290	12xM10	181	142	3.7	48	100
	(7081)	(17702)	(259.70)	(44.09)		(2567)		(7.126)	(5.591)	(0.146)	(1.890)	(3.937)
SKB-3000	1500	3000	76	20	M16	290	12xM10	181	142	3.7	60	100
	(13276)	(26552)	(259.70)	(44.09)		(2567)		(7.126)	(5.591)	(0.146)	(2.362)	(3.937)

Coupling must be selected so nominal torque is higher than highest operational torque of the application (i.e., during acceleration).
Bore diameters smaller than the minimum are possible but reliable transmission of nominal torque cannot be guaranteed.

SKG Series Indirect Drive Safety Coupling

Major Features

- Pulley safety coupling with self-centering conical hub and integrated bearing.
- Upon disengagement, coupling will re-engage automatically at only one point per revolution and retain the drive's reference point.
- Integrated bearing for high axial and radial loading to support pulleys, gears or sprockets.
- Adjustable disengagement torque.

Material

- Aluminum and steel hubs; steel safety element

Size SKG	Disengagement Torque Range Nm (lb-in)		Moment of Inertia 10^{-3}kgm² (lb-in²)	Mass kg (lbs)	Screw Size	Torque to Tighten Screws Nm (lb-in)	Outer Diameter mm (inch)	Length mm (inch)	Thread Size for Pulley	Switching Distance mm (inch)	Bore Range min. mm (inch)	Bore Range max. mm (inch)
SKG-4	2	4	0.2	0.5	M4	4	60	40	4xM4	1	12	18
	(18)	(35)	(0.68)	(1.10)		(35)	(2.362)	(1.575)		(0.039)	(0.472)	(0.709)
SKG-9	4	9	0.2	0.5	M4	4	60	40	4xM4	1	12	18
	(35)	(80)	(0.68)	(1.10)		(35)	(2.362)	(1.575)		(0.039)	(0.472)	(0.709)
SKG-18	9	18	0.2	0.5	M4	4	60	40	4xM4	1	12	18
	(80)	(159)	(0.68)	(1.10)		(35)	(2.362)	(1.575)		(0.039)	(0.472)	(0.709)
SKG-23	9	23	0.7	1.1	M5	8	77	54	4xM6	1.4	18	25.5
	(80)	(204)	(2.39)	(2.43)		(71)	(3.031)	(2.126)		(0.055)	(0.709)	(1.004)
SKG-35	18	35	0.7	1.1	M5	8	77	54	4xM6	1.4	18	25.5
	(159)	(310)	(2.39)	(2.43)		(71)	(3.031)	(2.126)		(0.055)	(0.709)	(1.004)
SKG-75	25	75	0.7	1.1	M5	8	77	54	4xM6	1.4	18	25.5
	(221)	(664)	(2.39)	(2.43)		(71)	(3.031)	(2.126)		(0.055)	(0.709)	(1.004)
SKG-100	50	100	1.8	1.9	M6	12	92	55	4xM6	1.4	22	39
	(443)	(885)	(6.15)	(4.19)		(106)	(3.622)	(2.165)		(0.055)	(0.866)	(1.535)
SKG-170	65	170	3	2.4	M6	12	105	66	4xM6	1.7	22	39
	(575)	(1505)	(10.25)	(5.29)		(106)	(4.134)	(2.598)		(0.067)	(0.866)	(1.535)
SKG-270	100	270	10.4	5	M8	35	135	85	4xM6	2.2	29	44
	(885)	(2390)	(35.54)	(11.02)		(310)	(5.315)	(3.346)		(0.087)	(1.142)	(1.732)
SKG-550	200	550	10.7	5.3	M8	35	135	85	4xM6	2.2	29	44
	(1770)	(4868)	(36.56)	(11.68)		(310)	(5.315)	(3.346)		(0.087)	(1.142)	(1.732)

Coupling must be selected so nominal torque is higher than highest operational torque of the application (i.e., during acceleration). Bore diameters smaller than the minimum are possible but reliable transmission of nominal torque cannot be guaranteed.

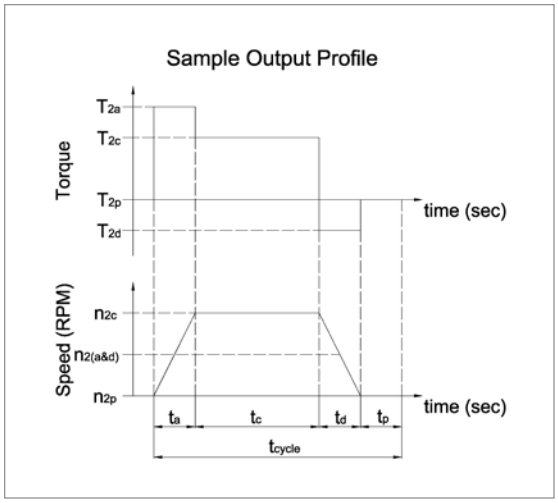
Type Code for Safety Couplings

Series		Size		Bore 1* (Coupling End)	Key		Bore 2** (Safety Element)	Key		Disengagement Torque		Configuration Code
SKB-KP	-	**30**	-	**15000**	**N**	-	**00750**	**N**	-	**25**	-	**C0000**
See safety coupling tables for available series and sizes				Bore diameter in 00.000 mm or inches. For example 15000 = 15 mm 00750 = 0.750 in	N = No Keyway K = Keyway		Bore diameter in 00.0000 mm or inches. For example 15000 = 15.000 mm 00750 = 00.750 in	K = Keyway N = No Keyway		in Nm		Assigned by GAM

*See coupling tables for minimum and maximum bore available. For couplings with 2 bores of different sizes, list the larger bore first (Bore 1).

** Bore 2 used for Direct type safety couplings only

Determination of the Duty Cycle (ED)



$$ED = \frac{t_a + t_c + t_d}{t_{cycle}}$$

If ED < 60% and $(t_a + t_c + t_d) < 20$ minutes, perform a cycle operation selection (S5)

If ED > 60% or $(t_a + t_c + t_d) > 20$ minutes, perform a continuous operation selection (S1)

Index	
1	Input
2	Output
a	Acceleration
B	Maximum Acceleration
c	Constant
d	Deceleration
m	Mean
max	Maximum
n	Nominal
p	Pause

Symbol	Unit	Description
ED	%	Duty Cycle
fs	-	Shock Factor
i	-	Ratio
J	kg-cm2	Moment of Inertia
n	RPM	Speed
t	s	Time
T	Nm	Torque
Zh	-	Number of Cycles
η	%	Efficiency

Selection of Optimum Gearbox for a Continuous Operation (S1)

Data needed before selection can be performed:

1. Output profile
2. Desired ratio (i)

Calculations to be performed:

1. Mean Output Speed

$$n_{2m} = \frac{n_{2a}t_a + n_{2c}t_c + n_{2d}t_d}{t_a + t_c + t_d} = _____$$

2. Root – Mean Output Torque

$$T_{2m} = \sqrt[3]{\frac{n_{2a}t_a T_{2a}^3 + n_{2c}t_c T_{2c}^3 + n_{2d}t_d T_{2d}^3}{n_{2a}t_a + n_{2c}t_c + n_{2d}t_d}} = _____$$

Selection Criteria for Gearbox:

1. Mean Output Speed must not exceed the nominal speed rating of the gearbox.

$$n_{2m}\, i \le n_{1n}$$

2. Mean Output Torque must not exceed the nominal torque rating of the gearbox.

$$T_{2m} \le T_{2n}$$

See technical data tables for values of n_{1n} and T_{2n}

Selection of Optimum Gearbox for a Cycle Operation (S5)

Data needed before selection can be performed:

1. Maximum Torque of the motor (T_{1B})
2. Output profile
3. Desired ratio (i)
4. Inertia of the load (J_L)*
5. Inertia of the motor (J_{motor})*

*optional

Calculation to be performed:

1. Shock Factor (fs)

$$Zh = \frac{3600}{t_{cycle}}$$

	Zh	<	1000	=>	fs = 1.0
1000	<	Zh	< 1500	=>	fs = 1.1
1500	<	Zh	< 2000	=>	fs = 1.3
2000	<	Zh	< 3000	=>	fs = 1.6
3000	<	Zh	<	=>	fs = 2.0

2. Maximum Output Torque

$T_{2max} = T_{1B}\ i\ fs\ \eta =$ _____

Selection Criteria for Gearbox:

1. Maximum Output Speed must not exceed the maximum speed rating of the gearbox. $n_{2c}\ i \le n_{1max}$
2. Maximum Output Torque must not exceed the maximum torque rating of the gearbox. $T_{2max} \le T_{2B}$
3. (optional) Match inertia of the motor to the inertia of the load. $J_{motor} \approx J_1 + \frac{J_L}{i^2}$

See technical data tables for values of η, n_{1max}, T_{2B}, and J_1

Sizing and Selecting for Couplings and Safety Couplings

Sizing

1. Determine torque (M_N)

$$M_N = M_a \frac{J_{load}}{J_{load} + J_{drive}} 2.5$$

M_N	Nominal Torque of Coupling
M_a	Acceleration Torque of Motor
C	
f	Resonant frequency [Hz]
J_{mot}	Motor inertia + 1/2 coupling inertia [kgm^2]
J_{moch}	Load inertia + 1/2 coupling inertia [kgm^2]
	In general $f_{coupling} \ge 2\ f_{drive}$

2. Verify resonant frequency

$$f_{coupling} = \sqrt{C_{coupling}}$$

$$f_{drive} = \frac{1}{2\pi} \sqrt{C_{drive} \cdot \frac{(J_{drive} + J_{load})}{(J_{load}\ J_{load})}}$$

3. Apply operating temperature safety factor only for elastomer couplings

Operating Temperature	< 50°C	50°C - 70°C	70°C - 90°C	90°C - 110°C	> 110°C
Multiply M_N by	1	1.3	1.6	1.8	2

Selecting:

1. Determine series of coupling
2. Determine size of coupling based on MN
3. Verify shaft diameters are within range

Ordering Examples:

(When ordering, please include shaft sizes and tolerances)

Standard Coupling KM-20

D1 = 14 mm k6

D2 = 1.00″ +0/-.0005″, x 1/8″ keyway

Safety Coupling SKB-30

D1 = 19 mm k6

TA (disengagement torque) = 25 Nm

Drive Shaft Coupling WDS-100

D1 = .500″ +/- .0005″

D2 = 32 mm k6

Distance Between Shafts = 915 mm

TECHNICAL

Accuracy in Gearboxes and Couplings: Definitions

When looking at gearbox accuracy, there are a number of key parameters to consider. Knowing these parameters and understanding what impact they have on accuracy is critical to designing a system that meets specifications and achieves optimal performance.

Torsional Stiffness

What is it?

The torsional stiffness is defined as the quotient of the externally applied torque and the resulting twisting angle or "wind up" at the output of the gearbox. The value for torsional stiffness is typically given by the manufacturer. It is measured as torque per angle (Nm/arcmin). For couplings, it may be referred to as torsional resistance.

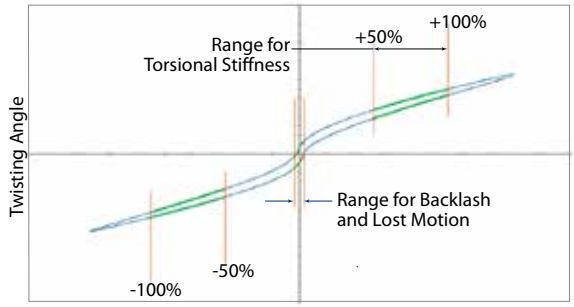
How is it determined?

To determine the torsional stiffness, the gearbox is loaded with a continuously increasing torque up to the nominal torque capacity while the input shaft is locked. This is repeated in the opposite direction. The applied torque and angle of deflection at the output flange are measured (see the hysteresis curve, figure 6).

Torsional stiffness is taken from the slope of the hysteresis curve at 50% to 100% of the nominal torque. Because the curve is relatively flat in this range, the torsional stiffness is close to constant. In addition, many applications have an applied torque that falls in this range. Similarly, you can look at torsional stiffness in other components. In couplings, it is often referred to as "torsional resistance."

$$\text{Torsional Stiffness} = \frac{\text{Applied Torque}}{\text{Deflection at output at 50\%-100 \% of Nominal Torque}}$$

Gearbox Hysteresis Curve for ±100% Nominal Torque



How can I use it?

Torsional stiffness for a system is calculated using the sum of the inverse of torsional stiffness for each component. Total torsional stiffness will be less than any of the individual components.

$$\frac{1}{C_{total}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \ldots + \frac{1}{C_n}$$

For example:

EPL-W-064 10:1 Gearbox .... C = 1.3 Nm/arcmin

EKM-15 Coupling ..... C = 0.24 Nm/arcmin

$$\frac{1}{C_{total}} = \frac{1}{1.3} + \frac{1}{0.24} = 0.20 \text{ Nm/arcmin}$$

Backlash

What is it?

Torsional backlash is the error of the output shaft position in relation to the input shaft at zero torque. In a gearbox it is primarily clearance between the mating gear teeth.

How is determined?

The measurement of backlash is done by rotating the output of a gearbox in both directions with the input shaft locked. The torsional backlash can also be observed in the hysteresis curve at 0 Nm of torque.

Backlash = Maximum deflection – Minimum deflection at 0 Nm of torque

How can I use it?

Backlash is used to determine the precision of a gearbox. The lower the backlash, the better the precision. It can be combined with torsional stiffness to determine the total lost motion of an application.

Lost Motion

What is it?

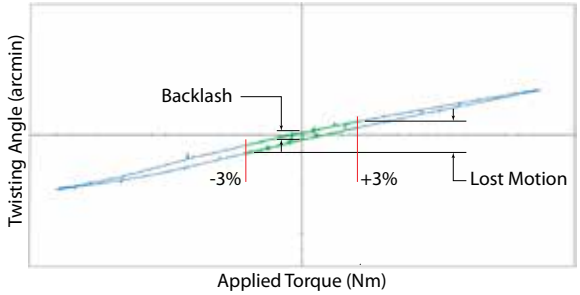
Lost Motion, also called positioning error, is the deflection resulting from internal gearbox forces. In a gearbox, it can be caused by settling in the components, such as bearings, and torsional deflection of the components. It is a combination of backlash and torsional stiffness. It is measured as an angle (arcmin)

How is it determined?

Similar to torsional stiffness, the gearbox is loaded with a continuously increasing torque up to the nominal torque capacity while the input shaft is locked. This is repeated in the opposite direction. The resulting twisting angle is measured at +/-3% of nominal torque. However, in most cases it is calculated for a specific torque rather than being a published value.

Lost Motion = Maximum deflection – Minimum deflection at +/- 3% of $T_{nominal}$

Gearbox Hysteresis Curve (detail of ±3% of Nominal Torque



How can I use it?

Practically, total lost motion can be calculated for an application by summing lost motion due to backlash and lost motion due to torsional stiffness at a specific applied torque.

$$\text{Total Lost Motion at applied torque} = \text{Backlash} + \frac{\text{Applied Torque}}{\text{Torsional Stiffness}}$$

Total lost motion can be calculated for each component and summed to get the total lost motion for the system.

Angular Transmission Accuracy

What is it?

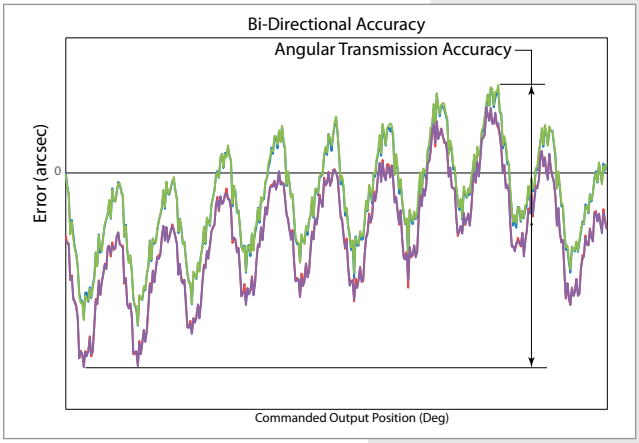
The angular transmission accuracy defines the maximum transmission error (maximum amplitude of the variation) of the actual output position relative to the theoretical output position according to the ratio. It is the error during motion (as opposed to the end points) and looks at how close the motion is to the theoretical perfection motion. It is measured as an angle (arcsec).

How is it measured?

To measure angular transmission accuracy, the gearbox is rotated without load. The input and output positions are recorded. This is done multiple times in each direction. The range of error over a full revolution of the output is the angular transmission accuracy.

$$\text{Angular Transmission Accuracy} = \text{Maximum Position Variation} - \text{Minimum Position Variation}$$

Measurement of angular transmission accuracy



How can I use it?

Angular transmission accuracy becomes a factor when an application requires precision during the rotation rather than just end-to-end. For example, a gearbox rotates a part while a robot performs an operation on it. With high angular transmission accuracy, the gearbox can provide continuous coordinated motion with the robot.

Accuracy and Repeatability

Positioning precision is determined by the accuracy and repeatability of the mechanism such as a gearbox.

Positioning Accuracy

The positioning accuracy is determined by the difference between the target position and the actual position. It is influenced by angular transmission accuracy, backlash, and torsional stiffness.

For torque ≤ 3% nominal torque:

$$\text{Positional Accuracy} = \text{Angular transmission accuracy} + \text{Backlash}$$

For torque > 3% nominal torque:

$$\text{Positional Accuracy} = \text{Angular Transmission Accuracy} + \frac{\text{Applied Torque}}{\text{Torsional Stiffness}}$$

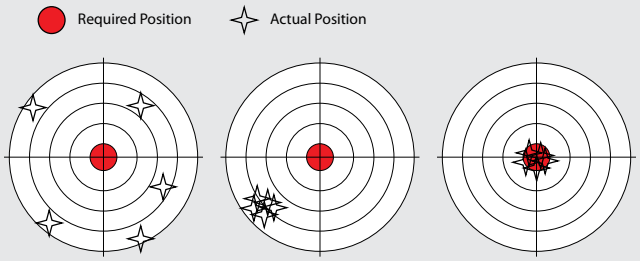
Positioning Repeatability

Repeatability refers to the deviation when the gearbox is repeatedly turned to the same position under the same load.

In the repeatability, the errors from the angular transmission accuracy and the torsional stiffness are constant, so that any deviation is solely the result of lost motion.

For torque (T) = 0 Nm, Repeatability = backlash

For torque (T) ≥ 0 Nm, Repeatability ≤ lost motion



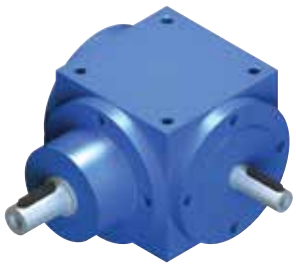
Poor positioning accuracy, poor repeatability

Poor positioning accuracy, good repeatability

Good positioning accuracy, good repeatability

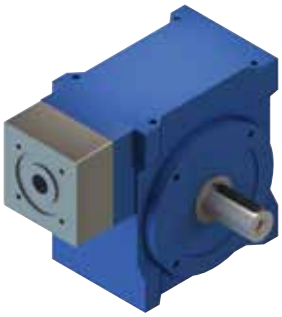
Our Extensive Product Range

GAM has access to a wide variety of complementary motion control and power transmission products which expands our product range even further and makes your machine design experience easier and more efficient.



VS - Spiral Bevel Speed Increaser

- Available in 6 frame sizes from 90 mm up to 260 mm
- Ratios 1.5:1 to 2:1
- Multiple shaft configurations offered

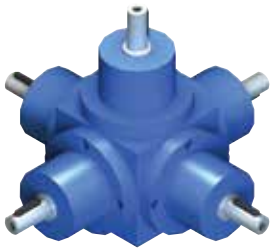


SLC - Servo Worm Gearbox

- Available in 5 frame sizes
- Input adapter suitable for servo motors
- Ratios 5:1 to 26:1
- Also available with shaft input (S-Series) which has 9 frame sizes and ratios 5:1 to 83:1

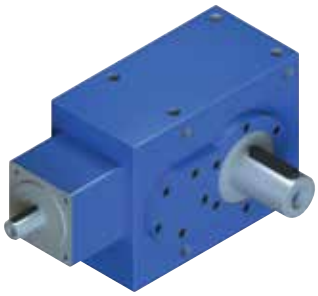
VL - Spiral Bevel with IEC Flange Input

- Available in 8 frame sizes from 65 mm up to 260 mm
- Input adapter suitable for IEC motor
- Keyed hollow input shaft
- Multiple shaft configurations offered



V - Multi-shaft

- The modular design of the V-Series makes it possible to produce a wide range of variations
- Multi-plane shaft configurations
- Ratios 1.5:1 to 6:1



KS - Helical Bevel Gearbox

- Compact design available in 8 frame sizes
- Shaft input or adapter suitable for servo motors
- Ratios 15:1 to 75:1
- Nominal torques up to 7500 Nm

Notes

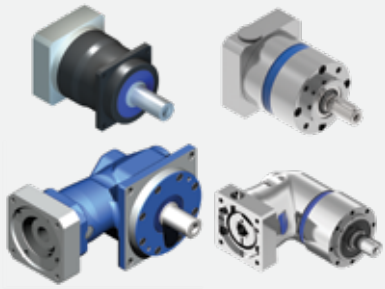
Broadest automation product range on the market

GAM is your complete source for innovative products used in automation technology.

Robotic Gearboxes

Zero-backlash gearboxes for robotics and high-precision applications with revolutionary zero-backlash planetary, cycloidal, or strain-wave (harmonic) gearing

Servo Gearboxes



In-line and right angle gearboxes for precision servo applications in a wide variety of configurations and frame sizes. Off-the-shelf or custom, GAM has the gearbox for your application

Bevel Gearboxes

Precision spiral bevel gearboxes, from miniature to extremely large, with multiple shaft configuration options for servo or precision power transmission applications

Servo Couplings

Bellows, elastomer, safety, or distance (line shaft) couplings are all zero-backlash and custom bored

Rack & Pinion Systems

Helical rack and pinion pair with GAM gearboxes for optimal system performance in a complete linear system.

GAM rack available separately

Linear Mounts

Everything Between the Motor and the Actuator: GAM linear mounts make it easy to connect any motor to any actuator.

GAM, a U.S. company, is your complete source for robotic and servo gear reducers, rack and pinion systems, servo couplings, linear mounting kits, and other precision mechanical drive solutions used in automation technology.

With one of the largest product offerings in the motion control industry as well as the engineering expertise and manufacturing capabilities to develop customized solutions, GAM can help with your application.

U.S. manufacturing, being flexible to meet the needs of customer requests, and great service are what set us apart from the rest.

GAM Can.

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