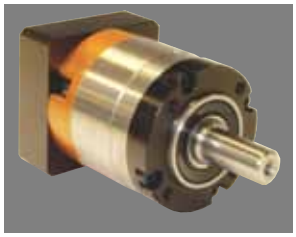
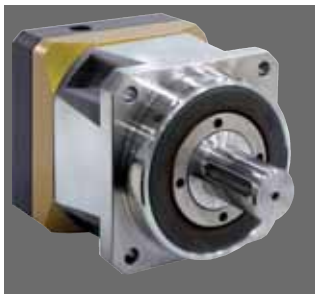
aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding





# Gearheads and Gearmotors

Parker核心代理商


**北京润诚时代科技有限公司**
**自动化事业部**
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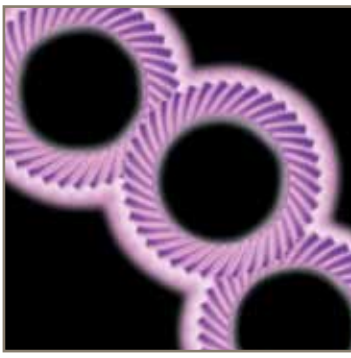


ENGINEERING YOUR SUCCESS.

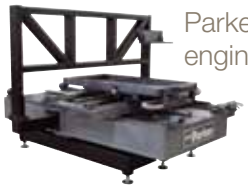
# Parker Hannifin Corporation

A Fortune 300 company with annual sales exceeding $10 billion and more than 400,000 customers in 43 countries, Parker Hannifin is the world's leading supplier of innovative motion control components and system solutions serving the industrial, mobile, and aerospace markets. We are the only manufacturer offering customers a choice of electromechanical, hydraulic, pneumatic, or computer-controlled motion systems.

### Total System Solutions

Parker's team of highly qualified application engineers, product development engineers, and system specialists can turn pneumatic, structural, and electromechanical products into an integrated system solution.

Moreover, our Selectable Levels of Integration™ allows you to choose the appropriate system, subsystem, or component to meet your specific need.



Parker offers complete engineered systems.

### First in Delivery, Distribution, and Support

In today's competitive, fast-moving economy, what good is an application that isn't ready on time? This is especially true when compressed design cycles make the quick delivery of critical components essential. With factories strategically located on five continents, Parker offers an unrivaled delivery record, getting solutions out our door and onto your floor faster than ever.

Parker also has the industry's largest global distribution network, with more than 8,600 distributors worldwide. Each of these locations maintains ample product inventory to keep your downtime to a minimum. And many distributors have in-house design capabilities to support your system and subsystem requirements.

Throughout the design process, Parker's factory-trained electromechanical engineers work hand in hand with you and day or night at 1-800-C-Parker. Our operators will connect you with a live, on-call representative who will identify replacement parts or services for all motion technologies.

Parker world headquarters in Cleveland

### Training

Parker's best-in-class technology training includes hands-on classes, Web-based instruction, and comprehensive texts for employees, distributors, and customers. Parker also provides computer-based training, PowerPoint presentations, exams, drafting and simulation software, and trainer stands.

### parkermotion.com

Our award-winning Web site is your single source for:

- **Product information**
- **Downloadable catalogs**
- **Motion-sizing software**
- **3D design files**
- **Training materials**
- **Product-configuration software**
- **RFQ capabilities**
- **Videos and application stories**

### 24/7 Emergency Breakdown Support

The Parker product information center is available any time of the day or night at 1-800-C-Parker. Our operators will connect you with a live, on-call representative who will identify replacement parts or services for all motion technologies.

## Table of Contents



*If you don't find exactly what you are looking for in this catalog, please contact us for information on other suitable Parker products or to have an application engineer discuss your requirements.*

## Visit our Website

Complete up-to-date technical assistance can be found on our web at www.parkermotion.com. This includes all the latest information on current products, new product introductions, local assistance and support, plus a comprehensive "Engineering Reference Library" including: complete product catalog data, product selection Wizards, performance charts and graphs, engineering data and calculations, CAD drawings, local service and support directory, on-line purchasing, application stories and videos.

## Welcome!

Thank you for your interest in the products offered by the Parker Hannifin Electromechanical Automation Division. This catalog presents Parker's electromechanical solutions for high-precision and high-speed automation. Our gearheads, motors, and integrated products are recognized around the world for their functionality, performance, and reliability.

Bayside pioneered the market for precision servo gearheads many years ago. Parker continues this tradition in quality and design with innovations like our Stealth Generation II Helical Planetary Gearhead, enhanced to provide superior performance for the most demanding applications. Our PV Series planetary gearhead combines power and versatility in an economical package. Our line of Frameless Motors, Servo Wheels, and other integrated products provide an ideal solution for machine designs that require high performance in small spaces.

As you read through this catalog, you will discover that Parker offers the widest variety of electromechanical solutions that are delivered in the shortest amount of time. Still, many customers require special solutions to satisfy unique or special requirements. Parker has been providing custom engineered solutions for over 30 years to satisfy those requirements. If your application cannot be fulfilled by the complement of products found in this catalog, please contact an authorized Parker Automation Technology Center or a factory applications engineer.

Parker is proud to present these high precision products to you. We invite you to discover the advantages that can be realized by relying on Parker for products and systems which represent the very best value in the electromechanical marketplace.

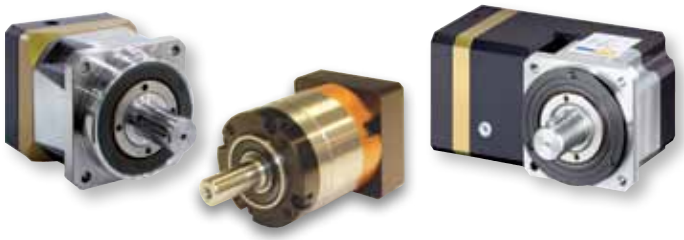
Sincerely,

Ken Sweet

Ken Sweet
General Manager

# Product Overview

## Planetary Gearheads



Our new Generation II Stealth® Series provides higher radial load, increased service life and ease of mounting than comparably sized planetary gearheads. The Stealth Generation II Helical Planetary Gearheads incorporate design enhancements to provide superior performance for the most demanding high performance applications. For larger frame sizes, Parker offers Generation I Stealth® Series gearheads in 142 to 220 mm and NEMA 56 frame sizes. For standard precision applications, the PV Series gearhead combines power and versatility in an economical package available in a wide range of options.

| Product Series | | Gear Geometry | Performance | Configuration | Frame Size | Nominal Continuous Torque Nm (in-lb) | Radial Load N (lbs) | Backlash arc-min | Page |
|---|---|---|---|---|---|---|---|---|---|
| Generation II Stealth® | PS | Helical Planetary | High Precision | In-Line | 60 – 115 mm | 27 – 230 (240 – 2047) | 1650 – 7500 (370 – 1683) | 8 – <3 | 12 |
| | PX | Helical Planetary | Mid Precision | In-Line | 60 – 115 mm NEMA 23 – 42 | 20 – 160 (178 – 1424) | 1550 – 6800 (348 – 1526) | 10 – <6 | 16 |
| | RS | Helical Planetary/ Spiral Bevel | High Precision | Right Angle | 60 – 115 mm | 13 – 220 (115 – 1958) | 1650 – 7500 (370 – 1683) | 14 – <6 | 20 |
| | RX | Helical Planetary/ Right Angle | Mid Precision | Right Angle | 60 – 115 mm NEMA 23 – 42 | 10 – 136 (89 – 1210) | 1550 – 6800 (348 – 1526) | 20 – <12 | 24 |
| Generation I Stealth® | PS | Helical Planetary | High Precision | In-Line | 180 – 220 mm | 294 – 1808 (2616 – 16,091) | 7900 – 58,000 (1775 – 13,020) | 8 – <3 | 30 |
| | PX | Helical Planetary | Mid Precision | In-Line | 142 mm NEMA 56 | 220 – 278 (1958 – 2474) | 6000 (1347) | 10 – <8 | 34 |
| | RS | Helical Planetary/ Spiral Bevel | High Precision | Right Angle | 180 – 220 mm | 141 – 1808 (1255 – 16,091) | 7900 – 58,000 (1775 – 13,020) | 10 – <4 | 36 |
| | PV | Planetary | Standard | In-Line | 40 – 115 mm NEMA 17 – 42 | 3.5 – 148 (31 – 1317) | 190 – 10,555 (43 – 2370) | 15 – <12 | 40 |

## MultiDrive Gearheads

Stealth® MultiDrive (MD) offers three different output options for true flexibility. MultiDrive models include low-ratio, dual-shaft and hollow-shaft options in a compact, right angle package. With 5 frame sizes and multiple ratios to choose from,you are guaranteed to find a Stealth® MultiDrive to fit your servo motor application.

| Product Series | Gear Geometry | Performance | Configuration | Frame Size | Continuous Torque Nm (in-lb) | Radial Load N (lbs) | Backlash arc-min | Page |
|---|---|---|---|---|---|---|---|---|
| RT | Helical | High Precision | Right Angle Hollow Shaft | 90 – 220 mm | 23 – 565 (204 – 5178) | 2800 – 7500 (692 – 1685) | <14 – <6 | 50 |
| RD | Helical | High Precision | Right Angle Double Shaft | 90 – 220 mm | 30 – 150 (266 – 1328 | 2800 – 7500 (692 – 1685) | <14 – <6 | 50 |
| RB | Helical | High Precision | Right Angle Low Ratio | 90 – 220 mm | 35 – 190 (266 – 1682) | 2800 – 7500 (692 – 1685) | <14 – <6 | 50 |

# NEMA Gearheads

NEMA gearheads feature a high-efficiency spur gear design, in a light, compact package, and are ideal for applications requiring smooth operation and low starting torque. Ratios from 3:1 to 100:1 are available.

| Product Series | Gear Geometry | Performance | Configuration | Frame Size | Continuous Torque Nm (in-lb) | Radial Load N | Backlash arc-min | Page |
|---|---|---|---|---|---|---|---|---|
| **NE** | Spur Gear | Economy | In-Line | NEMA 23 – 42 | 6 – 40 (50 – 350) | 90 – 890 (20 – 200) | 10 – 30 | 58 |

# Integral Solution Gearmotors

Stealth® Gearmotors represent the first time a brushless servo motor and a helical planetary gearhead have been integrated into a single product. Previously, engineers needing a gear drive with servo motor were forced to purchase the gearhead and motor separately. Parker Bayside manufactures precision gearheads and gearmotors under one roof.

| Product Series | Gear Geometry | Performance | Configuration | Frame Size | Continuous Torque Nm (in-lb) | Feedback | Backlash arc-min | Page |
|---|---|---|---|---|---|---|---|---|
| **GM** | Helical Planetary | Mid-Precision | In-Line | 60 – 142 mm NEMA 23 – 56 | 3 – 60 | Encoder/ Resolver | < 10 | Consult Factory |
| **DX** | Planetary | Mid-Precision | In-Line | 6 and 8 inch dia. Wheel Drive | 26 – 48 | Encoder | — | 62 |

# Application Examples

## Plastic Bottle Extrusion

The manufacturer of high-performance plastic extrusion equipment needed a drop-in replacement gearhead for an existing worm gearbox used with their motor without having to alter the design of their machine. The gearhead/motor combination is being used to drive the machine's rollers, controlling the speed at which the plastic is extruded into high-quality plastic sheets. The smoothness of the rollers is critical to the quality of the plastic sheets being produced.

**Application Challenges:**

*High Transmission Error and Velocity Ripple*

The customer used worm gearheads to control the rollers. Worm gears exhibit a sliding action of involute gears instead of a rolling action, contributing to the lack of smoothness of the machine rollers. Due to the high transmission error and velocity ripple from the worm drive, the rollers operated at differing speeds. This produced small lines and imperfections on the plastic sheets, rendering it unusable.

*High Wear and Low Efficiency*

The high level of rubbing (sliding action) between the worm and wheel teeth in the worm gearhead caused a high gear-tooth-wear rate and a lower efficiency (70%) than other major gear types.

**Parker SOLUTION:**

Stealth PS Gearhead and RT MultiDrive (hollow shaft) Gearhead were used in combination to provide the required 120:1 ratio. The result was high-quality plastics sheets that exceeded the customer's specifications.

The Stealth's all-helical planetary design (HeliCrown Gear Tooth) features extremely high gear tooth accuracy, minimizing transmission error and velocity ripple. The HeliCrown design features extremely high efficiency (95%) while minimizing tooth wear by providing a pure rolling action. Parker's Plasma Nitriding heat-treating process further heightens the gear tooth's wear resistance.

The MultiDrive gearhead features a space-saving bore (hollow shaft) option, eliminating compliance that occurs when coupling a gearhead shaft to the rollers being driven. This solution can be used for a variety of applications, including packaging, food, semiconductor, automotive and medical.

## Food/Packaging Automation

A manufacturer of machines for gluing, fill, sealing and diverting food containers for the food-processing industry had a requirement for the motor and gearhead to be mounted above the food plane. Certain modifications were also needed for the gearhead to make it safe for the food environment, and capable to withstand frequent washdowns.

**Gearhead Design Considerations:**

- **Lubrication – must be USDA food grade approved in case of incidental contact to food**
- **Sealing –must prevent any leaking as well as prevent any ingress of the fluid during washdown**
- **Finish – special FDA-approved finish must be used making it very durable and resistant to chipping, oxidizing or rusting**
- **Output Shaft – stainless steel prevents any rust from developing and contaminating the processing food.**

**Parker SOLUTION:**

*Stealth PS planetary gearhead with standard F01 food grade special option*

Stealth PS planetary gearhead with standard food grade option provides the gearhead with standard modifications including special lubrication, viton seals, special finish and a stainless steel output shaft.

Since this food grade modification is a standard option, delivery is only one week over the standard gearhead lead time. (Note: Similar standard modifications exist for vacuum, clean room, high temperature and radiation.)

# High-Speed Milling

High-speed milling machines are commonplace in industries such as aerospace and automotive because they allow large structural components to be machined from one piece rather than assembled from many smaller subcomponents. For a customer that manufactures high-speed milling machines, spindle heads are operating at speeds ranging from 18,000 to 40,000 RPM, so that the cutting is above the resonant frequency of the machine. Because of this, many characteristics become more critical than with their standard machines. The extremely large size of the spindle head also posed problems for the manufacturer in trying to keep it accurately positioned during the milling stage.

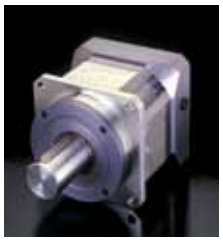
**Application Challenge:**

*Low Stiffness*

The spindle head was moved rotationally by 2 bull gears, driving a large ring gear. Because of the system characteristics, it was difficult to keep the spindle head absolutely stiff during the milling process. The problems associated with low stiffness are:

- **Poor surface finish**
- **Accuracy errors**
- **Excessive tool chatter**
- **Reduced tool life**

**Parker SOLUTION:**



Two Stealth® PS Helical Planetary Gearheads were used in tandem to create a stiff platform for the spindle machine head. One gearhead, acting as the master, and the other as the slave, were attached to the bull gears to simultaneously turn the ring gear that positioned the machine head. While the master gearhead moved the ring, the slave was taking up the backlash. In this way, the precision gears allowed for the spindle to be moved accurately, while the two gearhead combination maintained maximum system stiffness.

Parker's Stealth PS gearhead features an all-helical planetary gear design. Helical gears have a much higher tooth-contact ratio and greater face width than straight-spur gears, providing higher loads, smoother tooth engagement and quieter operation. The Stealth's HeliCrown Gear Tooth design provides extremely high gear tooth accuracy, while minimizing tooth wear. Parker Bayside's Plasma Nitriding heat-treating process further heightens the gear tooth's wear resistance.

This solution can also be used in the aerospace and automotive industries.

# High-, Mid- and Standard-Precision Planetary Gearheads

*Helical planetary technology is superb for low-backlash, high-stiffness and high-accuracy requirements, making the Parker Generation II Stealth® line of helical planetary gearheads ideal for these high-and medium-level performance applications. The introduction of the PV Series gearhead completes the Parker gear family by offering a standard-grade gearhead with the highest radial load capacity available today in a cost-effective solution. Whether you need high-, medium- or standard-grade performance, Parker can match the need. All Parker gearheads are proudly manufactured in the USA in our state-of-the-art facility which, displays the best use of Lean manufacturing practices. For more information go to parkermotion.com.*

## Generation II Stealth® PS/PX/RS/RX:

*Our new Generation II Stealth® series provides higher radial load, increased service life and ease of mounting*

The Generation II Stealth® Helical Planetary Gearheads incorporate design enhancements to provide superior performance for the most demanding high performance applications.

Stealth Generation II incorporates dual angular contact bearings providing higher radial load capacities while maintaining high input speeds. Design enhancements also include full complement needle bearings allowing for increased service life and extended warranties. Internal design changes and optimized gearing geometries allow for one oil fill level for any orientation, resulting in shortened part number designation and simplified order placement.

Universal mounting kits provide common mounting kits across multiple product lines to promote quicker deliveries and ease of mounting to any servo motor. Applications that require either high precision (PS/RS Series Gearheads) or mid-range precision (PX/RX Series Gearheads) utilize the same mounting kit part numbers within the same frame size.

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

**Features & Benefits**

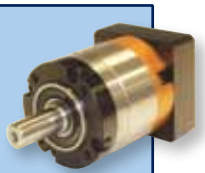
- **Higher radial load capacity: widely spaced angular contact output bearings**
- **Increased service life: full complement of planet needle bearings**
- **Universal mounting kits: quicker deliveries and easier mounting**
- **High torque and low backlash: helical planetary gearing**
- **High stiffness: Integral ring gear and rigid sun gear**
- **Higher gear wear resistance: plasma nitriding heat treating**
- **PX models are optionally available with flange mounting for easy installation. (Contact factory for flange mount availability for RX models.)**

## Other Planetary Gearheads:

**Generation I Stealth® PS, PX and RS Gearheads**

For larger frame sizes, Parker offers Generation I Stealth® Series gearheads in 142 to 220 mm and NEMA 56 frame sizes.

**PV Series Precision Gearheads**



The PV Series gearhead combines power and versatility in an economical package. It comes in a wide range of options including dimensional output face crossovers to the Parker Bayside PX, Alpha LP, Neugart PLE, Stober PE and Standard NEMA gearheads.

# Standard Options for Planetary Gearheads

**Gearheads Ready to Mount to Linear Actuators**

Most belt driven linear slides need a gearhead to reduce inertia. Parker has pre-engineered in-line and right-angle gearheads to mount directly to most popular linear slides, eliminating the need for couplings or adapters.

**Input Shaft Speed Reducer/Speed Increaser for Increased Design Flexibility**

Parker gearheads are available with an input-shaft option. The input-shaft option allows more design flexibility, as options like brakes, encoders, or safety couplings can be used between the motor and the gearhead. This option also allows you to operate the gearhead as a speed increaser.

**Mil-Spec Gearheads**

Parker has extensive experience in military and aerospace applications. The Stealth Bomber, M1 Tank and the Space Shuttle all use Parker gearheads. Parker's quality system has been approved by NASA and the US Government to MIL-I-45208A.

**Special Environments**

Put a Parker gearhead anywhere! Parker can supply gearheads to operate in the harshest environments:

**Vacuum** - Available as a standard option to $10^{-6}$ Torr vacuum ratings.

**Clean Room** - Special gearheads for Class 10,000 clean room applications.

**High Temperature** - Special lubricants and seals for temperatures up to 250° C.

**Radiation** - Gearheads customized to operate within radioactive environments.

Food Grade/Washdown - Gearheads customized to operate within food-handling and washdown environments.

# Planetary Gearhead Selection Overview

| Product Series | | Gear Geometry | Performance | Configuration | Frame Size | Nominal Continuous Torque Nm (in-lb) | Radial Load N (lbs) | Backlash arc-min | Page |
|---|---|---|---|---|---|---|---|---|---|
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| | **PV** | Planetary | Standard | In-Line | 40 – 115 mm NEMA 17 – 42 | 3.5 – 148 (31 – 1317) | 190 – 10,555 (43 – 2370) | 15 – <12 | 40 |

# Helical Planetary Gearhead Features

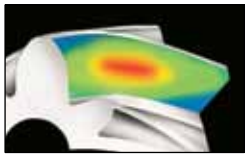
## Parker planetary gearheads incorporate the latest technology enhancements...

- **Latest technology in seals to reduce heat and wear**
- **Oil lubrication reduces friction and operating temperature, increasing gear life**

### Helical Planetary Design

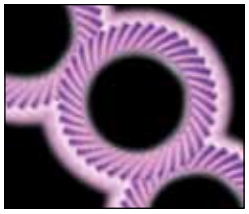
Helical gears have more tooth contact and greater face width than spur gears. This results in higher loads, smoother tooth engagement, quieter operation and lower backlash.

### HeliCrown®



Parker developed the HeliCrown gear tooth to further optimize Stealth's® performance. Since most vibration occurs at the entry and exit points of a gear tooth, HeliCrown eliminates metal only in these areas, without sacrificing gear strength, producing a quieter and stronger gear.

### Plasma Nitriding



Parker's in-house Plasma Nitriding process results in an ideal gear tooth. The surface is very hard (65 Rc) and the core is strong, but flexible (36 Rc). The result is a wear-resistant gear tooth that can withstand heavy shock, ensuring high accuracy for the life of the gearhead.

### ServoMount®

Parker's ServoMount design features a balanced input gear supported by a floating bearing. This unique design compensates for motor shaft runout and misalignment, ensuring TRUE alignment of the input sun gear with the planetary section and allowing input speeds up to 6,000 RPM. ServoMount ensures error-free installation to any motor, in a matter of minutes.

### "The Helical Advantage"

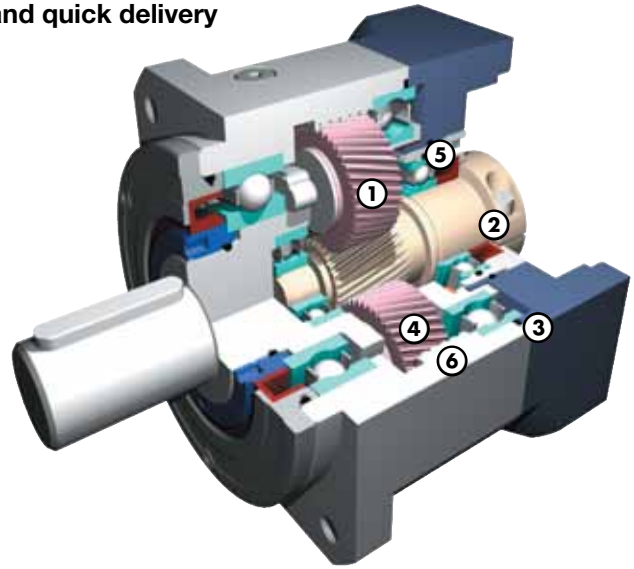
Parker planetary gearheads are a superior design with construction integrity to deliver power, speed and accuracy – quietly and efficiently.

| | |
|---|---|
| **Power...** | 30% more torque than comparably sized gearheads |
| **Speed...** | up to 6,000 RPM input speeds |
| **Accuracy...** | Less than 3 arc-minutes backlash |
| **Quiet...** | Less than 68 dB noise |
| **Efficiency...** | Over 97% efficiency |

# Parker Stealth® planetary gearhead features

**Features unique to Generation II Stealth® gearheads**

- **Widely spaced angular contact bearings provide higher radial load capacity**
- **Full compliment of needle bearings for increased service life**
- **Universal mounting kits offer easier mounting and quick delivery**




**Common features for all Generation I & II Stealth® gearheads**

① **Helical Planetary** – Provides smooth, quiet operation, high torque and high accuracy.

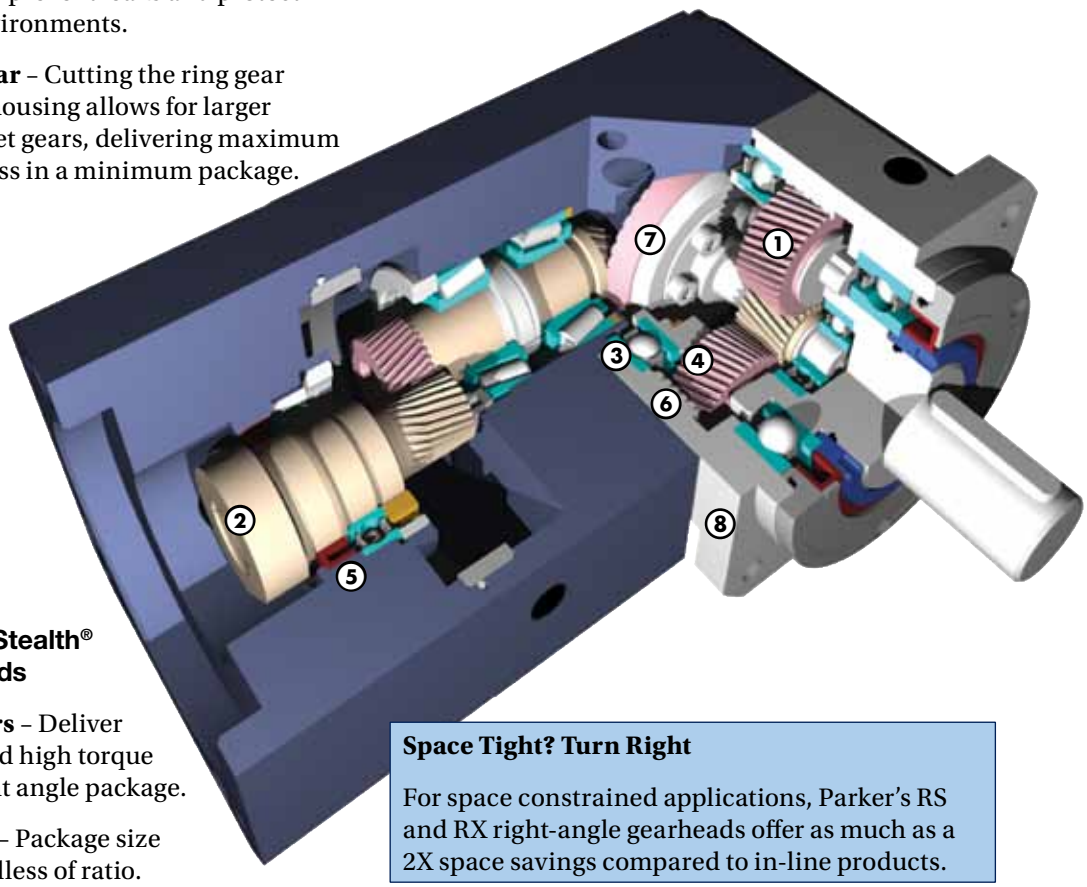
② **ServoMount®** – Motor-mounting design ensures error-free installation and the balanced pinion allows higher input speeds.

③ **Precision Bearings** – Provide high speed and high radial and axial load capacity.

④ **HeliCrown®** – Parker's proprietary gear tooth geometry ensures quieter operation and higher loads than conventional gears.

⑤ **Sealed Unit** – Vition seals and O-Rings provide IP65 protection to prevent leaks and protect against harsh environments.

⑥ **Integral Ring Gear** – Cutting the ring gear directly into the housing allows for larger bearing and planet gears, delivering maximum power and stiffness in a minimum package.




**Features unique to Stealth® right-angle gearheads**

⑦ **Spiral Bevel Gears** – Deliver high efficiency and high torque in a compact, right angle package.

⑧ **Compact Design** – Package size is the same regardless of ratio.

**Space Tight? Turn Right**

For space constrained applications, Parker's RS and RX right-angle gearheads offer as much as a 2X space savings compared to in-line products.

# Generation II Stealth® Series

## PS Generation II Performance Specifications

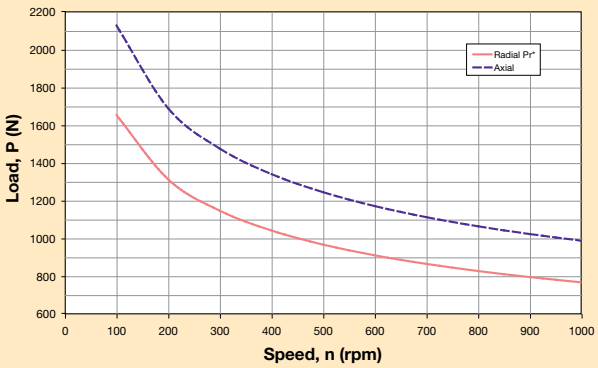
| Parameter | Units | Ratio | PS60 Gen II | PS90 Gen II | PS115 Gen II | PS142 Gen II |
|---|---|---|---|---|---|---|
| **Nominal Output Torque** [1] $T_{nom\ r}$ | Nm (in-lb) | 3,15,30 | 27 (239) | 76 (673) | 172 (1522) | 300 (2656) |
| | | 4,5,7,20,25,40,50,70 | 37 (327) | 110 (974) | 230 (2036) | 430 (3807) |
| | | 10,100 | 32 (283) | 93 (823) | 205 (1814) | 310 (2745) |
| **Maximum Acceleration Output Torque** [2] $T_{acc\ r}$ | Nm (in-lb) | 3,15,30 | 34 (300) | 105 (930) | 225 (1990) | 450 (3984) |
| | | 4,5,7,20,25,40,50,70 | 48 (425) | 123 (1090) | 285 (2525) | 645 (5711) |
| | | 10,100 | 37 (325) | 112 (990) | 240 (2125) | 465 (4117) |
| **Emergency Stop Output Torque** [3] $T_{em\ r}$ | Nm (in-lb) | 3,15,30 | 80 (710) | 260 (2300) | 600 (5310) | 1100 (9739) |
| | | 4,5,7,20,25,40,50,70 | 70 (620) | 230 (2035) | 500 (4425) | 970 (8588) |
| | | 10,100 | 60 (530) | 200 (1770) | 430 (3805) | 830 (7349) |
| **Nominal Input Speed** $N_{nom\ r}$ | RPM | 3 | 3000 | 2500 | 2000 | 1500 |
| | | 4,5 | 3500 | 3000 | 2500 | 2000 |
| | | 7,10,15 | 4000 | 3500 | 3000 | 2500 |
| | | 20,25,30 | 4500 | 4000 | 3500 | 3000 |
| | | 40,50 | 4800 | 4400 | 3800 | 3200 |
| | | 70,100 | 5200 | 4800 | 4200 | 3600 |
| **Maximum Input Speed** $N_{max\ r}$ [4] | RPM | 3 – 100 | 6000 | 5500 | 4500 | 4000 |
| **Maximum Radial Load** $Pr_{max}$ [5, 7] | N (lbs) | | 1650 (370) | 4800 (1080) | 7500 (1685) | 10,000 (2247) |
| **Maximum Axial Load** $Pa_{max}$ [6] | N (lbs) | | 2100 (475) | 3600 (810) | 6800 (1530) | 8800 (1976) |
| **Service Life** | h | | 20,000 | | | |
| **Standard Backlash** [8] | arc-min | 3 – 10 | <6 | <6 | <4 | <4 |
| | | 15 – 100 | <8 | <8 | <6 | <6 |
| **Low Backlash** [8] | arc-min | 3 – 10 | <4 | <4 | <3 | <3 |
| | | 15 – 100 | <6 | <6 | <5 | <5 |
| **Efficiency at Nominal Torque** | % | 3 – 10 | 97 | 97 | 97 | 97 |
| | | 15 – 100 | 94 | 94 | 94 | 94 |
| **Noise Level at 3000 RPM** [9] | db | 3 – 100 | <62 | <62 | <65 | <66 |
| **Torsional Stiffness** | Nm/arc-min (in-lb/arc-min) | 3 – 100 | 3 (27) | 12 (105) | 27 (240) | 50 (438) |
| **Maximum Allowable Case Temperature** | ° C | 3 – 100 | -20 to 90 | | | |
| **Lubrication** | | 3 – 100 | Per Maintenance Schedule | | | |
| **Mounting Position** | | 3 – 100 | Any | | | |
| **Direction of Rotation** | | 3 – 100 | Same as Input | | | |
| **Degree of Protection** | | | IP65 | | | |
| **Maximum Weight** | kg (lbs) | 3 – 10 | 1.3 (2.9) | 3.0 (6.6) | 7.0 (15.4) | 14.0 (30.0) |
| | | 15 – 100 | 1.7 (3.7) | 5.0 (11.0) | 10.0 (22.0) | 20.0 (43.0) |

1) At nominal speed Nnom r.
2) Parker MotionSizer sizing software available for free download at parkermotion.com.
3) Maximum of 1000 stops.
4) For intermittent operation.
5) Max radial load applied to the center of the shaft at 100 rpm.
6) Max axial load at 100 rpm.
7) For combined radial and axial load consult factory.
8) Measured at 2% of rated torque.
9) Measure at 1m.

# PS Generation II Output Shaft Load Rating

**Formulas below graphs are used to calculate radial load (Prx) at any distance "X" from the gearhead mounting surface:**

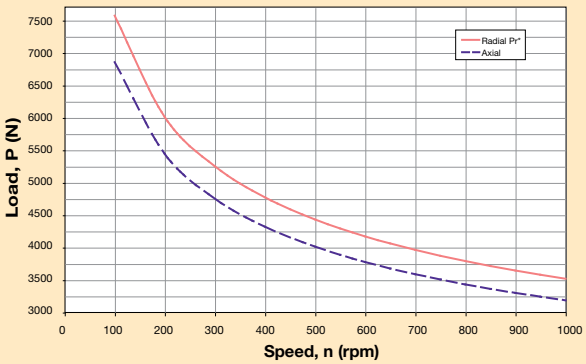
### PS60




**Prx = Pr * 75 mm / (49 + X)**

**Prx = Pr * 2.95 in / (1.93 in + X)**

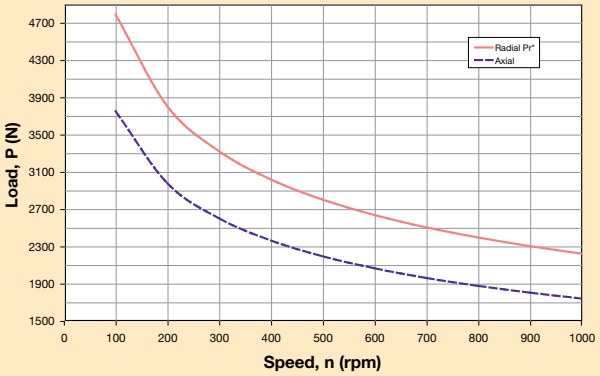
### PS115




**Prx = Pr * 124 mm / (81 + X)**

**Prx = Pr * 4.88 in / (3.19 in + X)**

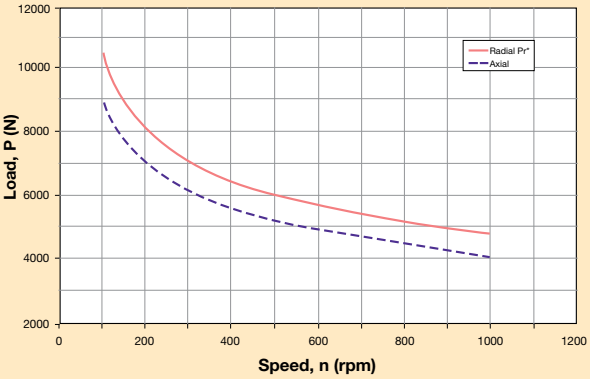
### PS90




**Prx = Pr * 96 mm / (62 + X)**

**Prx = Pr * 3.78 in / (2.44 in + X)**

### PS142




**Prx = Pr * 156 mm / (93 + X)**

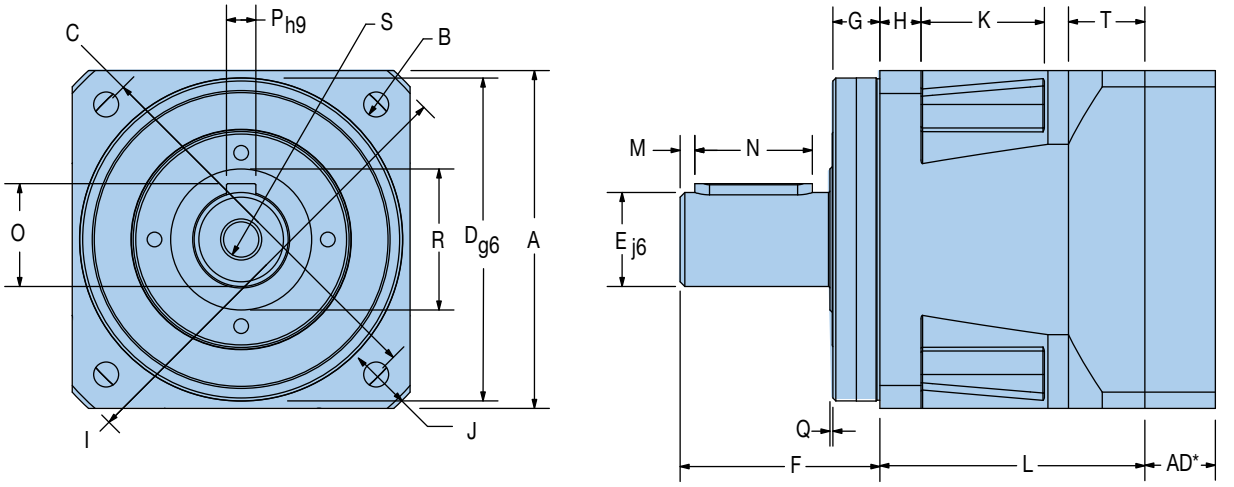
**Prx = Pr * 6.14 in / (3.66 in + X)**

* Radial load applied to center of the shaft.

# Generation II Stealth® Series

## PS Generation II Dimensions

Free 3D Solid Models and drawings available at parkermotion.com




### Metric Frame Sizes

| Frame Size | A | | B | | C | | D | | E | | F | | G | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Square Flange | | Bolt Hole | | Bolt Circle | | Pilot Diameter | | Output Shaft Diameter | | Output Shaft Length | | Pilot Thickness | |
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| PS60 | 62 | 2.441 | 5.5 | 0.217 | 70 | 2.756 | 50 | 1.969 | 16 | 0.630 | 40 | 1.575 | 11 | 0.433 |
| PS90 | 90 | 3.543 | 6.5 | 0.256 | 100 | 3.937 | 80 | 3.150 | 22 | 0.866 | 52 | 2.047 | 15 | 0.591 |
| PS115 | 115 | 4.528 | 8.5 | 0.335 | 130 | 5.118 | 110 | 4.331 | 32 | 1.260 | 68 | 2.677 | 16 | 0.630 |
| PS142 | 142 | 5.591 | 11.0 | 0.433 | 165 | 6.496 | 130 | 5.118 | 40 | 1.575 | 102 | 4.016 | 20 | 0.787 |

| Frame Size | H | | I | | J | | K | | L1 | | L2 | | M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Flange Thickness | | Housing Diameter | | Housing Recess | | Recess Length | | Length (3–10 Ratios) | | Length (15–100 Ratios) | | Distance from Shaft End | |
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| PS60 | 8 | 0.315 | 80 | 3.150 | 5 | 0.197 | 24 | 0.945 | 59.8 | 2.354 | 94.8 | 3.732 | 2 | 0.079 |
| PS90 | 10 | 0.394 | 116 | 4.567 | 6.5 | 0.256 | 33 | 1.299 | 69.5 | 2.736 | 113 | 4.449 | 3 | 0.118 |
| PS115 | 14 | 0.551 | 152 | 5.984 | 7.5 | 0.295 | 42 | 1.654 | 90.2 | 3.551 | 143.4 | 5.646 | 5 | 0.197 |
| PS142 | 15 | 0.591 | 185 | 7.283 | 10.0 | 0.394 | 45 | 1.772 | 103.7 | 4.083 | 170.7 | 6.720 | 5 | 0.197 |

| Frame Size | N | | O | | P | | Q | | R | | S | T | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Keyway Length | | Key Height | | Keyway Width | | Shoulder Height | | Shoulder Diameter | | Tap & Depth (end of shaft) | Rear Housing Thickness | |
| | mm | in | mm | in | mm | in | mm | in | mm | in | | mm | in |
| PS60 | 25 | 0.984 | 18 | 0.709 | 5 | 0.197 | 1 | 0.039 | 22 | 0.866 | M5x8 | 20.3 | 0.799 |
| PS90 | 32 | 1.260 | 24.5 | 0.965 | 6 | 0.236 | 1 | 0.039 | 35 | 1.378 | M8x16 | 20 | 0.787 |
| PS115 | 40 | 1.575 | 35 | 1.378 | 10 | 0.394 | 1.5 | 0.059 | 50 | 1.969 | M12x25 | 26 | 1.024 |
| PS142 | 63 | 2.480 | 43 | 1.693 | 12 | 0.472 | 2.5 | 0.098 | 78 | 3.071 | M16x32 | 31 | 1.220 |

### PS Generation II Universal Mounting Kit*

Adapter Length "AD" Dimension

| Frame Size | Motor Shaft Length | | Gearhead Adapter Length | |
|---|---|---|---|---|
| | mm | in | mm | in |
| 60 | 16 – 35<br>35.1 – 41 | 0.630 – 1.378<br>1.382 – 1.614 | 16.5<br>22.5 | 0.65<br>0.886 |
| 90 | 20 – 40<br>40.1 – 48 | 0.787 – 1.575<br>1.579 – 1.890 | 20<br>28.5 | 0.787<br>1.122 |
| 115 | 22 – 50<br>50.1 – 61 | 0.866 – 1.969<br>1.972 – 2.402 | 24<br>35 | 0.945<br>1.378 |
| 142 | 26 – 62<br>62.1 – 82 | 1.023 – 2.441<br>2.445 – 3.228 | 30<br>50 | 1.181<br>1.969 |

* Know your motor and need our mounting kit part number? See page 29 or use our Motor Mounting Search Tool on our website at: www.parkermotion.com

### PS Generation II Inertia

All moment of inertia values are as reflected at the input of the gearhead

| Ratio | Units* | PS60 | PS90 | PS115 | PS142 |
|---|---|---|---|---|---|
| 3 | kg-cm² | 0.2500 | 0.9700 | 3.4000 | 14.8000 |
| | in-lb-sec² | 0.000221 | 0.000858 | 0.003009 | 0.013098 |
| 4 | kg-cm² | 0.1700 | 0.6700 | 2.2000 | 9.8000 |
| | in-lb-sec² | 0.000150 | 0.000593 | 0.001947 | 0.008673 |
| 5 | kg-cm² | 0.1500 | 0.5100 | 1.7000 | 7.0000 |
| | in-lb-sec² | 0.000133 | 0.000451 | 0.001505 | 0.006195 |
| 7 | kg-cm² | 0.1400 | 0.4100 | 1.3000 | 5.3000 |
| | in-lb-sec² | 0.000124 | 0.000363 | 0.001151 | 0.004691 |
| 10 | kg-cm² | 0.1400 | 0.3700 | 1.1000 | 4.4000 |
| | in-lb-sec² | 0.000124 | 0.000327 | 0.000974 | 0.003894 |
| 15 | kg-cm² | 0.1500 | 0.5200 | 0.1700 | 6.4000 |
| | in-lb-sec² | 0.150000 | 0.000460 | 0.000150 | 0.005664 |
| 20 | kg-cm² | 0.1500 | 0.5100 | 1.7000 | 6.4000 |
| | in-lb-sec² | 0.000133 | 0.000451 | 0.001505 | 0.005664 |
| 25 | kg-cm² | 0.1500 | 0.5100 | 1.7000 | 6.4000 |
| | in-lb-sec² | 0.000133 | 0.000451 | 0.001505 | 0.005664 |
| 30, 40, 50, 70, 100 | kg-cm² | 0.1300 | 0.3700 | 1.1000 | 4.2000 |
| | in-lb-sec² | 0.000115 | 0.000327 | 0.000974 | 0.003717 |

* Note: 1 kg-cm² = 0.000885 in-lb-sec²

# Generation II Stealth® Series

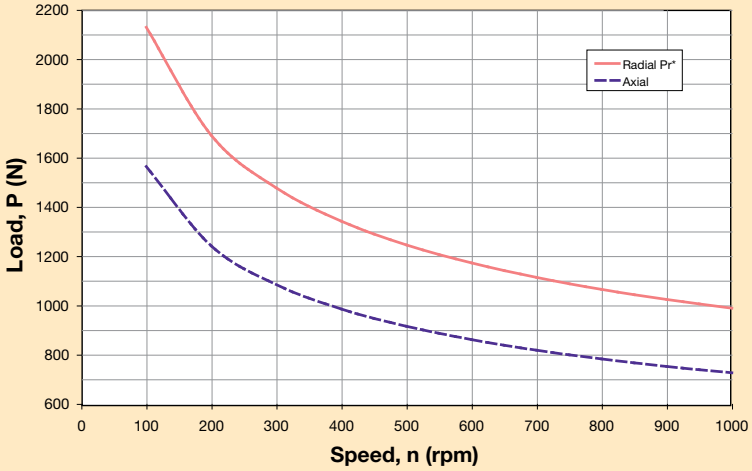
## PX Generation II Performance Specifications

| Parameter | Units | Ratio | PX60 Gen II | | PX90 Gen II | | PX115 Gen II | |
|---|---|---|---|---|---|---|---|---|
| **Nominal Output Torque** [1] $T_{nom\ r}$ | Nm (in-lb) | 3,15,30 | 20 | (177) | 56 | (496) | 120 | (1062) |
| | | 4,5,7,20,25,40,50,70 | 32 | (283) | 66 | (584) | 152 | (1345) |
| | | 10,100 | 25 | (221) | 60 | (531) | 160 | (1416) |
| **Maximum Acceleration Output Torque** [2] $T_{acc\ r}$ | Nm (in-lb) | 3,15,30 | 27 | (240) | 84 | (743) | 180 | (1593) |
| | | 4,5,7,20,25,40,50,70 | 39 | (345) | 98 | (867) | 228 | (2018) |
| | | 10,100 | 30 | (265) | 90 | (797) | 192 | (1700) |
| **Emergency Stop Output Torque** [3] $T_{em\ r}$ | Nm (in-lb) | 3,15,30 | 64 | (565) | 208 | (1840) | 480 | (4248) |
| | | 4,5,7,20,25,40,50,70 | 56 | (495) | 184 | (1628) | 400 | (3540) |
| | | 10,100 | 48 | (425) | 160 | (1416) | 344 | (3044) |
| **Nominal Input Speed** $N_{nom\ r}$ | RPM | 3 | 3000 | | 2500 | | 2000 | |
| | | 4,5 | 3500 | | 3000 | | 2500 | |
| | | 7,10,15 | 4000 | | 3500 | | 3000 | |
| | | 20,25,30 | 4500 | | 4000 | | 3500 | |
| | | 40,50 | 4800 | | 4400 | | 3800 | |
| | | 70,100 | 5200 | | 4800 | | 4200 | |
| **Maximum Input Speed** $N_{max\ r}$ [4] | RPM | 3 – 100 | 6000 | | 5500 | | 4500 | |
| **Maximum Radial Load** $Pr_{max}$ [5, 7] | N (lbs) | | 1550 | (348) | 2800 | (630) | 5500 | (1235) |
| **Maximum Axial Load** $Pa_{max}$ [6] | N (lbs) | | 2100 | (475) | 3600 | (810) | 6800 | (1530) |
| **Service Life** | h | | 20,000 | | | | | |
| **Standard Backlash** [8] | arc-min | 3 – 10 | <10 | | <9 | | <8 | |
| | | 15 – 100 | <12 | | <11 | | <10 | |
| **Low Backlash** [8] | arc-min | 3 – 10 | <8 | | <7 | | <6 | |
| | | 15 – 100 | <10 | | <9 | | <8 | |
| **Efficiency at Nominal Torque** | % | 3 – 10 | 97 | | 97 | | 97 | |
| | | 15 – 100 | 94 | | 94 | | 94 | |
| **Noise Level at 3000 RPM** [9] | db | 3 – 100 | <62 | | <62 | | <65 | |
| **Torsional Stiffness** | Nm/arc-min (in-lb/arc-min) | 3 – 100 | 2.5 | (22) | 10 | (90) | 22 | (195) |
| **Maximum Allowable Case Temperature** | ° C | 3 – 100 | -20 to 90 | | | | | |
| **Lubrication** | | 3 – 100 | Per Maintenance Schedule | | | | | |
| **Mounting Position** | | 3 – 100 | Any | | | | | |
| **Direction of Rotation** | | 3 – 100 | Same as Input | | | | | |
| **Degree of Protection** | | | IP65 | | | | | |
| **Maximum Weight** | kg (lbs) | 3 – 10 | 1.0 | (2.2) | 3.0 | (6.6) | 7.0 | (15.4) |
| | | 15 – 100 | 2.0 | (4.4) | 5.0 | (11.0) | 10.0 | (22.0) |

1) At nominal speed Nnom r.
2) Parker MotionSizer sizing software available for free download at parkermotion.com.
3) Maximum of 1000 stops.
4) For intermittent operation.
5) Max radial load applied to the center of the shaft at 100 rpm.
6) Max axial load at 100 rpm.
7) For combined radial and axial load consult factory.
8) Measured at 2% of rated torque.
9) Measure at 1m.

# PX Generation II Output Shaft Load Rating

## PX60 / PX23

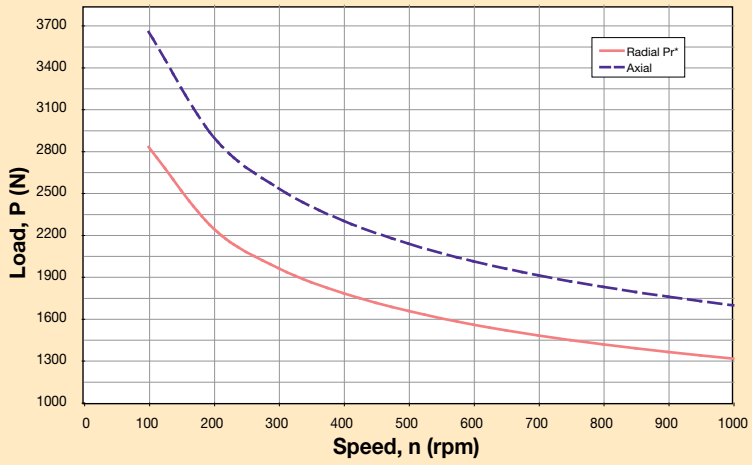



**Formulas to calculate radial load (Prx) at any distance "X" from the gearhead mounting surface:**

**Prx = Pr * 78 mm / (63 + X)**

**Prx = Pr * 3.07 in / (2.48 in + X)**

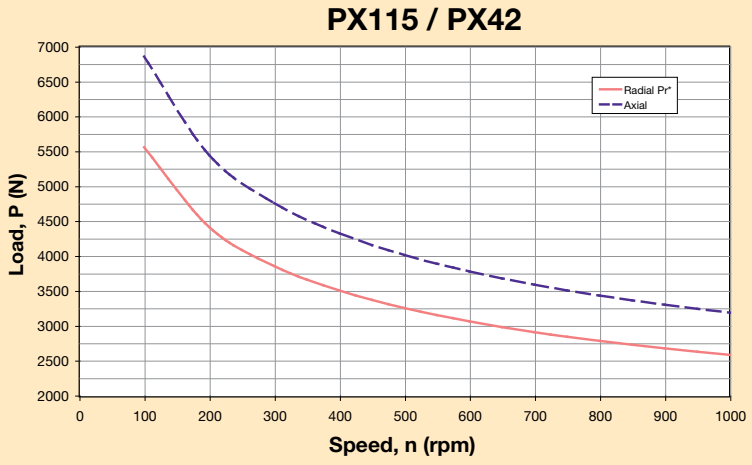
## PX90 / PX34




**Prx = Pr * 95 mm / (73 + X)**

**Prx = Pr * 3.74 in / (2.87 in + X)**

## PX115 / PX42




**Prx = Pr * 115 mm / (73 + X)**

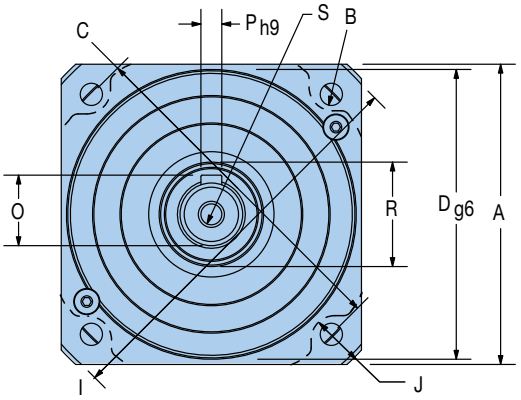
**Prx = Pr * 4.53 in / (3.43 in + X)**

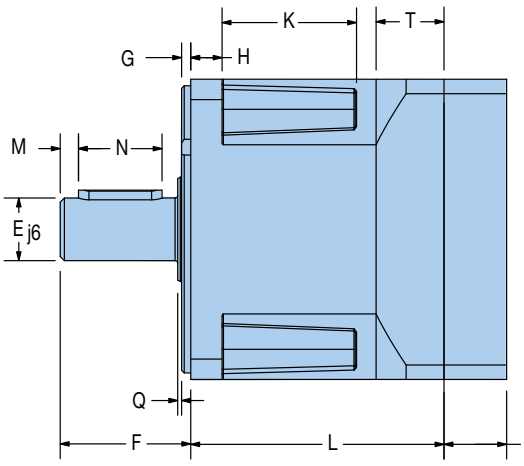
* Radial load applied to center of the shaft.

# Generation II Stealth® Series

## PX Generation II Dimensions

Free 3D Solid Models and drawings available at parkermotion.com




*"AD" Adapter Length dimensions listed on page 17.

### Metric Frame Sizes

| Frame Size | A | | B | | C | | D | | E | | F | | G | | H | | I | | J | | K | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Square Flange | | Flange Bolt Hole | | Flange Bolt Circle | | Pilot Diameter | | Output Shaft Diameter | | Output Shaft Length | | Pilot Thickness | | Flange Thickness | | Housing Diameter | | Housing Recess | | Recess Length | |
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| PX60 | 62 | 2.441 | 5.5 | 0.217 | 70 | 2.756 | 50 | 1.969 | 16 | 0.630 | 25 | 0.984 | 2.5 | 0.098 | 8 | 0.315 | 82 | 3.228 | 5 | 0.197 | 24 | 0.945 |
| PX90 | 90 | 3.543 | 6.5 | 0.256 | 100 | 3.937 | 80 | 3.150 | 20 | 0.787 | 40 | 1.575 | 3 | 0.118 | 10 | 0.394 | 116 | 4.567 | 6.5 | 0.256 | 33 | 1.299 |
| PX115 | 115 | 4.528 | 8.5 | 0.335 | 130 | 5.118 | 110 | 4.331 | 24 | 0.945 | 50 | 1.969 | 3.5 | 0.138 | 14 | 0.551 | 152 | 5.984 | 7.5 | 0.295 | 42 | 1.654 |

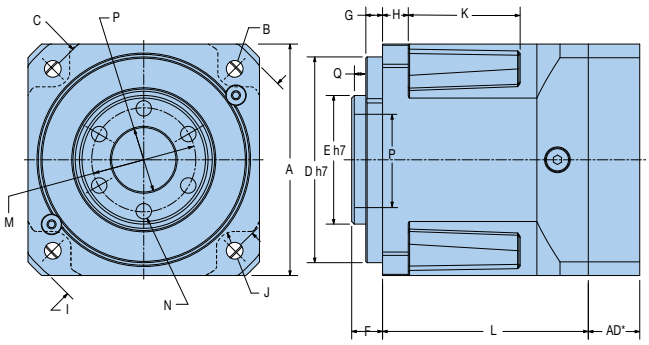
| Frame Size | L1 | | L2 | | M | | N | | O | | P | | Q | | R | | S | T | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Length Single Stage | | Length Double Stage | | Distance from Shaft End | | Keyway Length | | Key Height | | Keyway Width | | Shoulder Height | | Shoulder Diameter | | Tap & Depth (end of shaft) | Rear Housing Thickness | | |
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | | mm | in | |
| PX60 | 70.3 | 2.768 | 105.3 | 4.146 | 3 | 0.118 | 16 | 0.630 | 18 | 0.709 | 5 | 0.197 | 1 | 0.039 | 21 | 0.827 | M5x8 | 20.3 | 0.799 | |
| PX90 | 80 | 3.150 | 123.5 | 4.862 | 5 | 0.197 | 28 | 1.102 | 22.5 | 0.886 | 6 | 0.236 | 1 | 0.039 | 29 | 1.142 | M8x16 | 20 | 0.787 | |
| PX115 | 97 | 3.819 | 150.2 | 5.913 | 7 | 0.276 | 32 | 1.260 | 27 | 1.063 | 8 | 0.315 | 1.5 | 0.059 | 36 | 1.417 | M8x16 | 26 | 1.024 | |

### NEMA Frame Sizes

| Frame Size | B | | C | | D | | E | | F | | N | | O | | P | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bolt Hole | | Bolt Circle | | Pilot Diameter | | Output Shaft Diameter | | Output Shaft Length | | Keyway Length | | Keyway Depth | | Keyway Width | |
| | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm |
| PX23 | 0.2 | 4.953 | 2.625 | 66.675 | 1.5 | 38.100 | 0.38 | 9.525 | 1 | 25.400 | — | — | — | — | — | — |
| PX34 | 0.22 | 5.512 | 3.88 | 98.425 | 2.88 | 73.025 | 0.5 | 12.700 | 1.25 | 31.750 | 1.06 | 27.000 | 0.07 | 1.829 | 0.13 | 3.251 |
| PX42 | 0.28 | 7.137 | 4.95 | 125.730 | 2.19 | 55.550 | 0.63 | 15.875 | 1.5 | 38.100 | 1.14 | 29.007 | 0.09 | 2.388 | 0.19 | 4.775 |

PX23 has a flat on output shaft, not a keyway
NOTE: NEMA Sizes have 20% lower torque/stiffness ratings due to smaller output shaft diameter.

# PX Flange Mount Option Dimensions




Dimensions A through D and H through L2 are the same as the metric frame dimensions shown on the previous page 18.

| Frame Size | E | | F | | G | |
|---|---|---|---|---|---|---|
| | Output Hollow Shaft Diameter | | Output Hollow Shaft Depth | | Pilot Thickness | |
| | mm | in | mm | in | mm | in |
| PX60-T01 | 32 | 1.26 | 7.5 | 0.30 | 2.5 | 0.10 |
| PX90-T01 | 50 | 1.97 | 12 | 0.47 | 6.5 | 0.26 |
| PX115-T01 | 70 | 2.76 | 14.5 | 0.57 | 8.5 | 0.33 |

| Frame Size | M | | N | P | | Q | |
|---|---|---|---|---|---|---|---|
| | Shaft Bolt Circle | | Tap Size | Shaft Pilot Diameter | | Shaft Pilot Depth | |
| | mm | in | | mm | in | mm | in |
| PX60-T01 | 25 | 0.984 | M5 x 0.8 | 18 | 0.709 | 4 | 0.157 |
| PX90-T01 | 40 | 1.575 | M6 x 1 | 25 | 0.984 | 5 | 0.197 |
| PX115-T01 | 55 | 2.165 | M8 x 1.25 | 40 | 1.575 | 5.5 | 0.217 |

## PX Generation II Universal Mounting Kits*

Adapter Length "AD" Dimension

| Frame Size | Motor Shaft Length | | Gearhead Adapter Length | |
|---|---|---|---|---|
| | mm | in | mm | in |
| 60 | 16 – 35<br>35.1 – 41 | 0.630 – 1.378<br>1.382 – 1.614 | 16.5<br>22.5 | 0.65<br>0.886 |
| 90 | 20 – 40<br>40.1 – 48 | 0.787 – 1.575<br>1.579 – 1.890 | 20<br>28.5 | 0.787<br>1.122 |
| 115 | 22 – 50<br>50.1 – 61 | 0.866 – 1.969<br>1.972 – 2.402 | 24<br>35 | 0.945<br>1.378 |

* Know your motor and need our mounting kit part number?
See page 29 or use our Motor Mounting Search Tool on our website at:
www.parkermotion.com

## PX Generation II Inertia

All moment of inertia values are as reflected at the input of the gearhead

| Ratio | Units* | PX60 / PX23 | PX90 / PX34 | PX115 / PX42 |
|---|---|---|---|---|
| 3 | kg-cm² | 0.2500 | 0.9700 | 3.4000 |
| | in-lb-sec² | 0.000221 | 0.000858 | 0.003009 |
| 4 | kg-cm² | 0.1700 | 0.6700 | 2.2000 |
| | in-lb-sec² | 0.000150 | 0.000593 | 0.001947 |
| 5 | kg-cm² | 0.1500 | 0.5100 | 1.7000 |
| | in-lb-sec² | 0.000133 | 0.000451 | 0.001505 |
| 7 | kg-cm² | 0.1400 | 0.4100 | 1.3000 |
| | in-lb-sec² | 0.000124 | 0.000363 | 0.001151 |
| 10 | kg-cm² | 0.1400 | 0.3700 | 1.1000 |
| | in-lb-sec² | 0.000124 | 0.000327 | 0.000974 |
| 15 | kg-cm² | 0.1500 | 0.5200 | 0.1700 |
| | in-lb-sec² | 0.150000 | 0.000460 | 0.000150 |
| 20 | kg-cm² | 0.1500 | 0.5100 | 1.7000 |
| | in-lb-sec² | 0.000133 | 0.000451 | 0.001505 |
| 25 | kg-cm² | 0.1500 | 0.5100 | 1.7000 |
| | in-lb-sec² | 0.000133 | 0.000451 | 0.001505 |
| 30, 40, 50, 70, 100 | kg-cm² | 0.1300 | 0.3700 | 1.1000 |
| | in-lb-sec² | 0.000115 | 0.000327 | 0.000974 |

* Note: 1 kg-cm² = 0.000885 in-lb-sec²

# Generation II Stealth® Series

## RS Generation II Performance Specifications

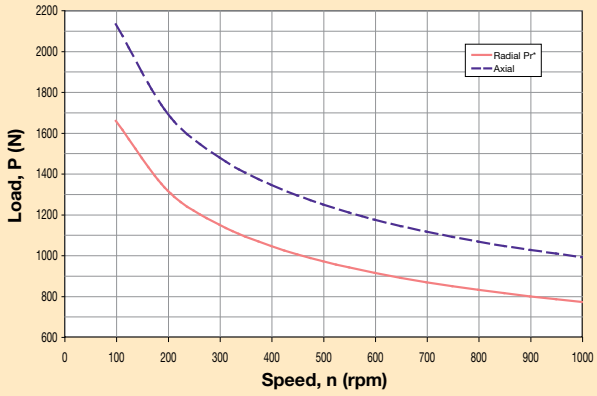
| Parameter | Units | Ratio | RS60 Gen II | RS90 Gen II | RS115 Gen II | RS142 Gen II |
|---|---|---|---|---|---|---|
| **Nominal Output Torque** [1] $T_{nom\ r}$ | Nm (in-lb) | 5 | 13 (115) | 55 (487) | 85 (752) | 225 (1992) |
| | | 10 | 24 (212) | 80 (708) | 160 (1415) | 365 (3232) |
| | | 15,20,25,50 | 35 (310) | 88 (779) | 220 (1947) | 430 (3807) |
| | | 30,40,100 | 30 (266) | 86 (752) | 195 (1726) | 310 (2745) |
| **Maximum Acceleration Output Torque** [2] $T_{acc\ r}$ | Nm (in-lb) | 5 | 19 (168) | 83 (743) | 127 (1124) | 337 (2984) |
| | | 10 | 36 (320) | 120 (743) | 240 (2124) | 547 (4843) |
| | | 15,20,25,50 | 45 (400) | 123 (867) | 255 (2257) | 645 (5711) |
| | | 30,40,100 | 37 (327) | 112 (797) | 240 (2124) | 465 (4717) |
| **Emergency Stop Output Torque** [3] $T_{em\ r}$ | Nm (in-lb) | 5 | 40 (355) | 150 (1327) | 270 (2390) | 625 (5534) |
| | | 10 | 72 (637) | 240 (2125) | 480 (4248) | 1000 (8854) |
| | | 15,20,25,50 | 80 (708) | 250 (2213) | 510 (4514) | 1100 (9739) |
| | | 30,40,100 | 60 (531) | 200 (1770) | 430 (3806) | 830 (7349) |
| **Nominal Input Speed** $N_{nom\ r}$ | RPM | 5 to 10 | 3200 | 2800 | 2400 | 2000 |
| | | 15,20,25,30,40 | 3700 | 3300 | 2900 | 2500 |
| | | 50,100 | 4200 | 3800 | 3400 | 3000 |
| **Maximum Input Speed** $N_{max\ r}$ [4] | RPM | 5 – 100 | 6000 | 5300 | 4500 | 3800 |
| **Maximum Radial Load** $Pr_{max}$ [5, 7] | N (lbs) | | 1650 (370) | 4800 (1080) | 7500 (1685) | 10,000 (2247) |
| **Maximum Axial Load** $Pa_{max}$ [6] | N (lbs) | | 2100 (475) | 3600 (810) | 6800 (1530) | 8800 (1976) |
| **Service Life** | h | | 20,000 | | | |
| **Standard Backlash** [8] | arc-min | 5 – 10 | <14 | <12 | <12 | <10 |
| | | 15 – 100 | <12 | <10 | <10 | <8 |
| **Low Backlash** [8] | arc-min | 5 – 10 | <10 | <8 | <8 | <6 |
| | | 15 – 100 | <8 | <6 | <6 | <4 |
| **Efficiency at Nominal Torque** | % | 5 – 100 | 94 | 94 | 94 | 94 |
| **Noise Level at 3000 RPM** [9] | db | 5 – 100 | <65 | <68 | <68 | <70 |
| **Torsional Stiffness** | Nm/arc-min (in-lb/arc-min) | 5 – 100 | 2.5 (22) | 10 (90) | 22 (195) | 42 (372) |
| **Maximum Allowable Case Temperature** | ° C | 5 – 100 | -20 to 90 | | | |
| **Lubrication** | | 5 – 100 | Per Maintenance Schedule | | | |
| **Mounting Position** | | 5 – 100 | Any | | | |
| **Degree of Protection** | | | IP65 | | | |
| **Maximum Weight** | kg (lbs) | 5 – 100 | 2.0 (4.4) | 6.0 (13.2) | 11.0 (24.2) | 24 (52) |

1) At nominal speed Nnom r.
2) Parker MotionSizer sizing software available for free download at parkermotion.com.
3) Maximum of 1000 stops.
4) For intermittent operation.
5) Max radial load applied to the center of the shaft at 100 rpm.
6) Max axial load at 100 rpm.
7) For combined radial and axial load consult factory.
8) Measured at 2% of rated torque.
9) Measure at 1m.

# RS Generation II Output Shaft Load Rating

**Formulas below graphs are used to calculate radial load (Prx) at any distance "X" from the gearhead mounting surface:**

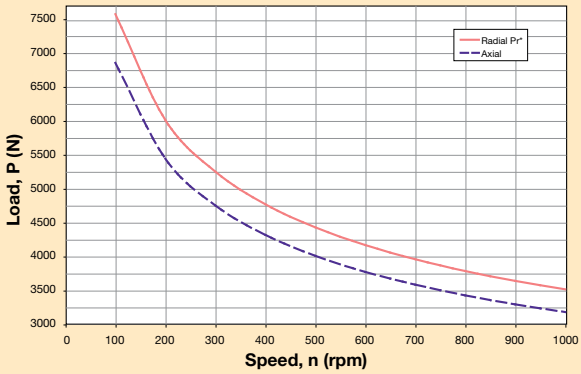
## RS60




**Prx = Pr * 75 mm / (49 + X)**

**Prx = Pr * 2.95 in / (1.93 in + X)**

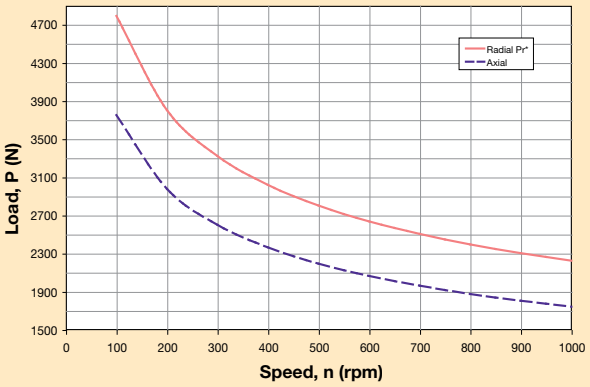
## RS115




**Prx = Pr * 124 mm / (81 + X)**

**Prx = Pr * 4.88 in / (3.19 in + X)**

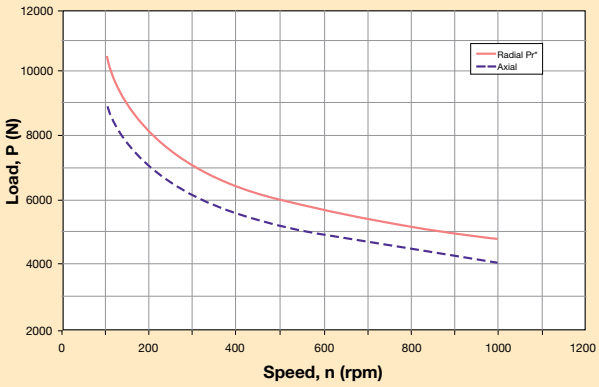
## RS90




**Prx = Pr * 96 mm / (62 + X)**

**Prx = Pr * 3.78 in / (2.44 in + X)**

## RS142




**Prx = Pr * 156 mm / (93 + X)**

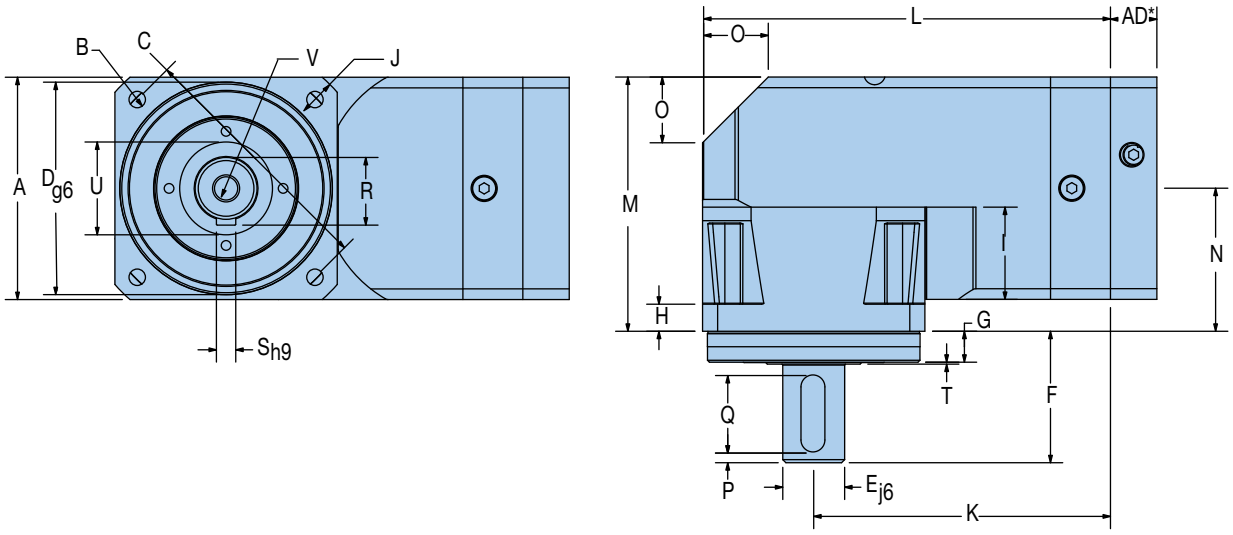
**Prx = Pr * 6.14 in / (3.66 in + X)**

* Radial load applied to center of the shaft.

# Generation II Stealth® Series

## RS Generation II Dimensions

Free 3D Solid Models and drawings available at parkermotion.com




### Metric Frame Sizes

| Frame Size | A Square Flange | | B Bolt Hole | | C Bolt Circle | | D Pilot Diameter | | E Output Shaft Diameter | | F Output Shaft Length | | G Pilot Thickness | | H Flange Thickness | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| **RS60** | 62 | 2.441 | 5.5 | 0.217 | 70 | 2.756 | 50 | 1.969 | 16 | 0.630 | 40 | 1.575 | 11 | 0.433 | 8 | 0.315 |
| **RS90** | 90 | 3.543 | 6.5 | 0.256 | 100 | 3.937 | 80 | 3.150 | 22 | 0.866 | 52 | 2.047 | 15 | 0.591 | 10 | 0.394 |
| **RS115** | 115 | 4.528 | 8.5 | 0.335 | 130 | 5.118 | 110 | 4.331 | 32 | 1.260 | 68 | 2.677 | 16 | 0.630 | 14 | 0.551 |
| **RS142** | 142 | 5.591 | 11.0 | 0.433 | 165 | 6.496 | 130 | 5.118 | 40 | 1.575 | 102 | 4.016 | 20 | 0.787 | 15 | 0.591 |

| Frame Size | I Recess Length | | J Housing Recess | | K Distance to Output Centerline | | L Housing Length | | M Housing Width | | N Distance to Input Centerline | | O Taper Distance | | P Distance from Shaft End | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| **RS60** | 23.5 | 0.925 | 5.0 | 0.197 | 66.0 | 2.598 | 124.7 | 4.909 | 78.0 | 3.071 | 47.0 | 1.850 | 15 | 0.591 | 2 | 0.079 |
| **RS90** | 33.0 | 1.299 | 6.5 | 0.256 | 132.0 | 5.197 | 177.0 | 6.969 | 103.0 | 4.055 | 58.0 | 2.283 | 27 | 1.063 | 3 | 0.118 |
| **RS115** | 42.0 | 1.653 | 7.5 | 0.295 | 153.5 | 6.043 | 211.0 | 8.307 | 132.0 | 5.177 | 74.0 | 2.913 | 34 | 1.339 | 5 | 0.197 |
| **RS142** | 56.5 | 2.224 | 10.0 | 0.394 | 198.5 | 7.815 | 269.5 | 10.610 | 158.2 | 6.228 | 87.2 | 3.433 | 42 | 1.654 | 5 | 0.197 |

| Frame Size | Q Keyway Length | | R Key Height | | S Keyway Width | | T Shoulder Height | | U Shoulder Diameter | | V Tap & Depth (end of shaft) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in | mm | in | mm | in | mm | in | mm | in | |
| **RS60** | 25 | 0.984 | 18.0 | 0.709 | 5 | 0.197 | 0.5 | 0.020 | 22 | 0.866 | M5x8 |
| **RS90** | 32 | 1.260 | 24.5 | 0.965 | 6 | 0.236 | 0.5 | 0.020 | 35 | 1.378 | M8x16 |
| **RS115** | 40 | 1.575 | 35.0 | 1.378 | 10 | 0.394 | 1 | 0.039 | 45 | 1.772 | M12x25 |
| **RS142** | 63 | 2.480 | 43.0 | 1.693 | 12 | 0.472 | 2.5 | 0.098 | 78 | 3.071 | M16x32 |

## RS Generation II Universal Mounting Kits*

Adapter Length "AD" Dimension

| Frame Size | Motor Shaft Length | | Gearhead Adapter Length | |
|---|---|---|---|---|
| | mm | in | mm | in |
| 60 | 16 – 35<br>35.1 – 41 | 0.630 – 1.378<br>1.382 – 1.614 | 16.5<br>22.5 | 0.65<br>0.886 |
| 90 | 20 – 40<br>40.1 – 48 | 0.787 – 1.575<br>1.579 – 1.890 | 20<br>28.5 | 0.787<br>1.122 |
| 115 | 22 – 50<br>50.1 – 61 | 0.866 – 1.969<br>1.972 – 2.402 | 24<br>35 | 0.945<br>1.378 |
| 142 | 26 – 62<br>62.1 – 82 | 1.023 – 2.441<br>2.445 – 3.228 | 30<br>50 | 1.181<br>1.969 |

* Know your motor and need our mounting kit part number? See page 29 or use our Motor Mounting Search Tool on our website at: www.parkermotion.com

## RS Generation II Inertia

All moment of inertia values are as reflected at the input of the gearhead

| Ratio | Units* | RS60 | RS90 | RS115 | RS142 |
|---|---|---|---|---|---|
| 5 | kg-cm² | 0.2200 | 0.8100 | 2.5000 | 9.4000 |
| | in-lb-sec² | 0.000195 | 0.000717 | 0.002213 | 0.008319 |
| 10 | kg-cm² | 0.1900 | 0.6100 | 1.9000 | 6.7000 |
| | in-lb-sec² | 0.000168 | 0.000540 | 0.001682 | 0.005929 |
| 15 | kg-cm² | 0.1800 | 0.6000 | 1.7000 | 6.6000 |
| | in-lb-sec² | 0.150000 | 0.000531 | 0.001505 | 0.005841 |
| 20 | kg-cm² | 0.1700 | 0.5100 | 1.4000 | 5.2000 |
| | in-lb-sec² | 0.000150 | 0.000451 | 0.001239 | 0.004602 |
| 25 | kg-cm² | 0.1600 | 0.4200 | 1.3000 | 4.5000 |
| | in-lb-sec² | 0.000142 | 0.000372 | 0.001151 | 0.003983 |
| 30 | kg-cm² | 0.1800 | 0.6000 | 1.7000 | 6.7000 |
| | in-lb-sec² | 0.000159 | 0.000531 | 0.001505 | 0.005929 |
| 40 | kg-cm² | 0.1700 | 0.5100 | 1.4000 | 5.2000 |
| | in-lb-sec² | 0.000150 | 0.000451 | 0.001239 | 0.004602 |
| 50 | kg-cm² | 0.1500 | 0.4000 | 1.1000 | 3.4000 |
| | in-lb-sec² | 0.000133 | 0.000354 | 0.000974 | 0.003009 |
| 100 | kg-cm² | 0.1500 | 0.4000 | 1.1000 | 3.4000 |
| | in-lb-sec² | 0.000133 | 0.000354 | 0.000974 | 0.003009 |

* Note: 1 kg-cm² = 0.000885 in-lb-sec²

# Generation II Stealth® Series

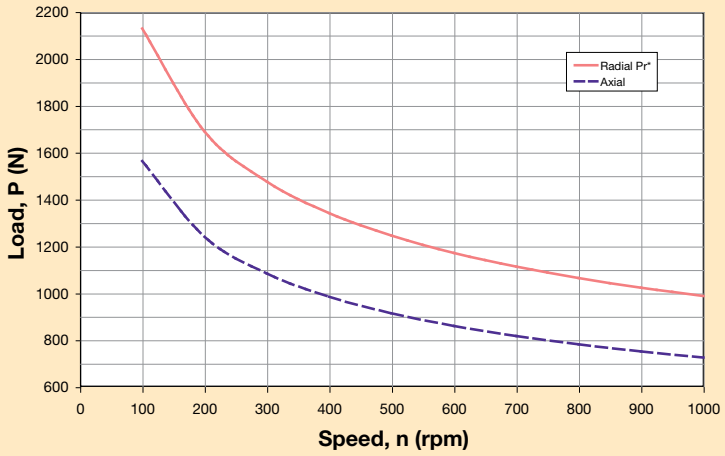
## RX Generation II Performance Specifications

| Parameter | Units | Ratio | RX60 Gen II | | RX90 Gen II | | RX115 Gen II | |
|---|---|---|---|---|---|---|---|---|
| **Nominal Output Torque** [1] $T_{nom\ r}$ | Nm (in-lb) | 5 | 10 | (89) | 44 | (390) | 68 | (602) |
| | | 10 | 19 | (168) | 64 | (566) | 128 | (566) |
| | | 15,20,25,50 | 24 | (212) | 66 | (585) | 136 | (584) |
| | | 30,40,100 | 20 | (177) | 60 | (530) | 128 | (531) |
| **Maximum Acceleration Output Torque** [2] $T_{acc\ r}$ | Nm (in-lb) | 5 | 15 | (133) | 66 | (584) | 102 | (903) |
| | | 10 | 28 | (248) | 96 | (850) | 128 | (1132) |
| | | 15,20,25,50 | 36 | (319) | 100 | (885) | 136 | (1203) |
| | | 30,40,100 | 30 | (266) | 90 | (797) | 128 | (1132) |
| **Emergency Stop Output Torque** [3] $T_{em\ r}$ | Nm (in-lb) | 5 | 32 | (283) | 120 | (1062) | 216 | (1912) |
| | | 10 | 58 | (513) | 192 | (1700) | 384 | (3398) |
| | | 15,20,25,50 | 64 | (566) | 200 | (1770) | 408 | (3611) |
| | | 30,40,100 | 48 | (425) | 160 | (1416) | 345 | (3053) |
| **Nominal Input Speed** $N_{nom\ r}$ | RPM | 5,10 | 3200 | | 2800 | | 2400 | |
| | | 15,20,25,30,40 | 3700 | | 3300 | | 2900 | |
| | | 50,100 | 4200 | | 3800 | | 3400 | |
| **Maximum Input Speed** $N_{max\ r}$ [4] | RPM | 5 – 100 | 6000 | | 5300 | | 4500 | |
| **Maximum Radial Load** $Pr_{max}$ [5, 7] | N (lbs) | | 1550 | (348) | 2800 | (1079) | 5500 | (1236) |
| **Maximum Axial Load** $Pa_{max}$ [6] | N (lbs) | | 2100 | (475) | 3600 | (810) | 6800 | (1530) |
| **Service Life** | h | | 20,000 | | | | | |
| **Standard Backlash** [8] | arc-min | 5 – 10 | <20 | | <18 | | <16 | |
| | | 15 – 100 | <20 | | <18 | | <16 | |
| **Low Backlash** [8] | arc-min | 5 – 10 | <18 | | <16 | | <14 | |
| | | 15 – 100 | <16 | | <14 | | <12 | |
| **Efficiency at Nominal Torque** | % | 5 – 100 | 94 | | 94 | | 94 | |
| **Noise Level at 3000 RPM** [9] | db | 5 – 100 | <65 | | <68 | | <68 | |
| **Torsional Stiffness** | Nm/arc-min (in-lb/arc-min) | 5 – 100 | 2.5 | (22) | 10 | (90) | 22 | (195) |
| **Maximum Allowable Case Temperature** | ° C | 5 – 100 | -20 to 90 | | | | | |
| **Lubrication** | | 5 – 100 | Per Maintenance Schedule | | | | | |
| **Mounting Position** | | 5 – 100 | Any | | | | | |
| **Degree of Protection** | | | IP65 | | | | | |
| **Maximum Weight** | kg (lbs) | 5 – 100 | 2.0 | (4.4) | 6.0 | (13.2) | 11.0 | (24.2) |

1) At nominal speed Nnom r.
2) Parker MotionSizer sizing software available for free download at parkermotion.com.
3) Maximum of 1000 stops.
4) For intermittent operation.
5) Max radial load applied to the center of the shaft at 100 rpm.
6) Max axial load at 100 rpm.
7) For combined radial and axial load consult factory.
8) Measured at 2% of rated torque.
9) Measure at 1m.

# RX Generation II Output Shaft Load Rating

## RX60 / RX23

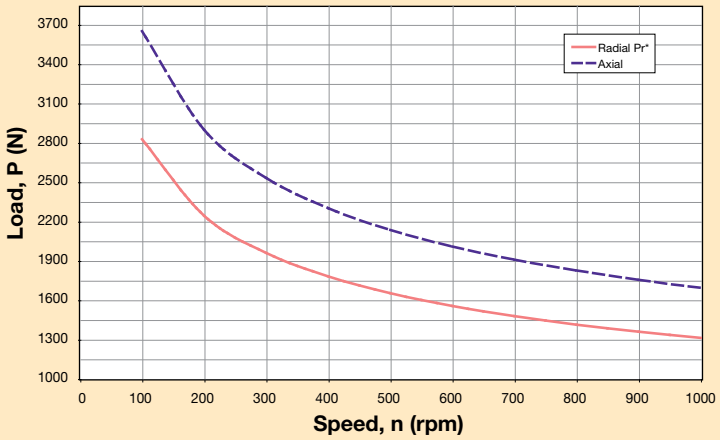



**Formulas to calculate radial load (Prx) at any distance "X" from the gearhead mounting surface:**

**Prx = Pr * 78 mm / (63 + X)**

**Prx = Pr * 3.07 in / (2.48 in + X)**

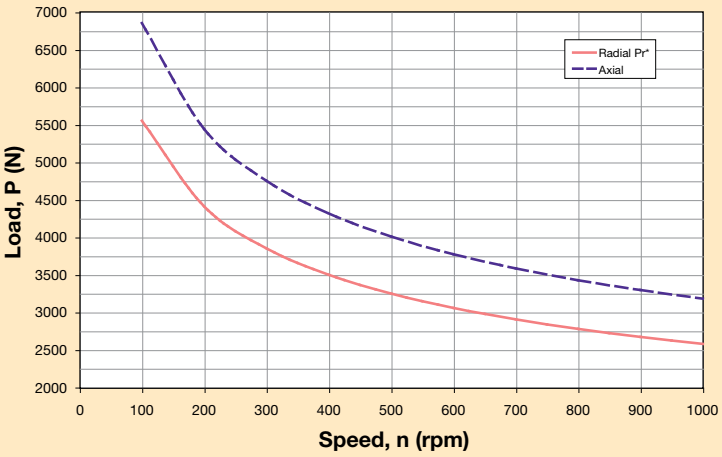
## RX90 / RX34




**Prx = Pr * 95 mm / (73 + X)**

**Prx = Pr * 3.74 in / (2.87 in + X)**

## RX115 / RX42




**Prx = Pr * 115 mm / (73 + X)**

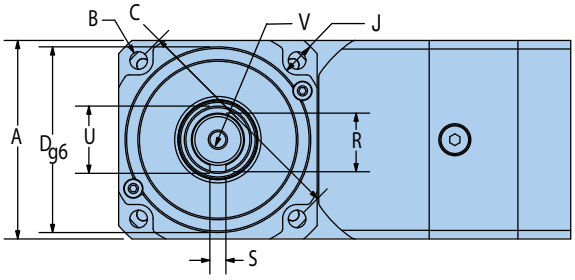
**Prx = Pr * 4.53 in / (3.43 in + X)**

* Radial load applied to center of the shaft.

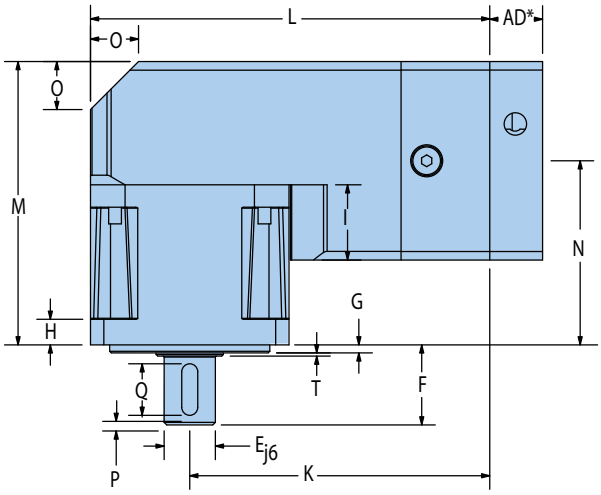
# Generation II Stealth® Series

## RX Generation II Dimensions

Free 3D Solid Models and drawings available at parkermotion.com




RX Gearheads also available with
Flange Mount Option – Contact Factory




### Metric Frame Sizes

| Frame Size | A Square Flange | | B Bolt Hole | | C Bolt Circle | | D Pilot Diameter | | E Output Shaft Diameter | | F Output Shaft Length | | G Pilot Thickness | | H Flange Thickness | | I Recess Length | | J Housing Recess | | K Distance to Output Centerline | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| **RX60** | 62 | 2.441 | 5.5 | 0.217 | 70 | 2.756 | 50 | 1.969 | 16 | 0.630 | 25 | 0.984 | 2.5 | 0.098 | 13 | 0.512 | 23.5 | 0.925 | 5 | 0.197 | 93.7 | 3.689 |
| **RX90** | 90 | 3.543 | 6.5 | 0.256 | 100 | 3.937 | 80 | 3.150 | 20 | 0.787 | 40 | 1.575 | 3 | 0.118 | 17 | 0.669 | 36.5 | 1.437 | 6.5 | 0.256 | 132 | 5.197 |
| **RX115** | 115 | 4.528 | 8.5 | 0.335 | 130 | 5.118 | 110 | 4.331 | 24 | 0.945 | 50 | 1.969 | 3.5 | 0.138 | 20 | 0.787 | 47.5 | 1.870 | 7.5 | 0.295 | 153.5 | 6.043 |

| Frame Size | L Housing Length | | M Housing Width | | N Distance to Input Centerline | | O Taper Distance | | P Distance from Shaft End | | Q Keyway Length | | R Key Height | | S Keyway Width | | T Shoulder Height | | U Shoulder Diameter | | V Tap & Depth (end of shaft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | |
| **RX60** | 124.5 | 4.902 | 88.5 | 3.484 | 57.5 | 2.264 | 14 | 0.551 | 3 | 0.118 | 16 | 0.630 | 18 | 0.709 | 5 | 0.197 | 0.5 | 0.020 | 21 | 0.827 | M5x8 |
| **RX90** | 177 | 6.969 | 114 | 4.469 | 68.5 | 2.697 | 25 | 0.984 | 5 | 0.197 | 28 | 1.102 | 24.5 | 0.965 | 6 | 0.236 | 0.5 | 0.020 | 29 | 1.142 | M8x16 |
| **RX115** | 211 | 8.307 | 138 | 5.445 | 81 | 3.189 | 32 | 1.260 | 7 | 0.276 | 32 | 1.260 | 27 | 1.063 | 8 | 0.315 | 1 | 0.039 | 36 | 1.417 | M8x16 |

### NEMA Frame Sizes

| Frame Size | B Bolt Hole | | C Bolt Circle | | D Pilot Diameter | | E Output Shaft Diameter | | F Output Shaft Length | | Q Keyway Length | | R Keyway Depth | | S Keyway Width | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm |
| **RX23** | 0.2 | 4.953 | 2.625 | 66.675 | 1.5 | 38.100 | 0.38 | 9.525 | 1 | 25.400 | — | — | — | — | — | — |
| **RX34** | 0.22 | 5.512 | 3.88 | 98.425 | 2.88 | 73.025 | 0.5 | 12.700 | 1.25 | 31.750 | 1.06 | 27.000 | 0.07 | 1.829 | 0.13 | 3.251 |
| **RX42** | 0.28 | 7.137 | 4.95 | 125.730 | 2.19 | 55.550 | 0.63 | 15.875 | 1.5 | 38.100 | 1.14 | 29.007 | 0.09 | 2.388 | 0.19 | 4.775 |

RX23 has a flat on output shaft, not a keyway
NOTE: NEMA Sizes have 20% lower torque/stiffness ratings due to smaller output shaft diameter.

## RX Generation II Universal Mounting Kits*

Adapter Length "AD" Dimension

| Frame Size | Motor Shaft Length | | Gearhead Adapter Length | |
|---|---|---|---|---|
| | mm | in | mm | in |
| 60 | 16 – 35<br>35.1 – 41 | 0.630 – 1.378<br>1.382 – 1.614 | 16.5<br>22.5 | 0.65<br>0.886 |
| 90 | 20 – 40<br>40.1 – 48 | 0.787 – 1.575<br>1.579 – 1.890 | 20<br>28.5 | 0.787<br>1.122 |
| 115 | 22 – 50<br>50.1 – 61 | 0.866 – 1.969<br>1.972 – 2.402 | 24<br>35 | 0.945<br>1.378 |

* Know your motor and need our mounting kit part number? See page 29 or use our Motor Mounting Search Tool on our website at: www.parkermotion.com

## RX Generation II Inertia

All moment of inertia values are as reflected at the input of the gearhead

| Ratio | Units* | RX60 / RX23 | RS90 / RX34 | RS115 / RX42 |
|---|---|---|---|---|
| 5 | kg-cm² | 0.2200 | 0.8100 | 2.5000 |
| | in-lb-sec² | 0.000195 | 0.000717 | 0.002213 |
| 10 | kg-cm² | 0.1900 | 0.6100 | 1.9000 |
| | in-lb-sec² | 0.000168 | 0.000540 | 0.001682 |
| 15 | kg-cm² | 0.1800 | 0.6000 | 1.7000 |
| | in-lb-sec² | 0.150000 | 0.000531 | 0.001505 |
| 20 | kg-cm² | 0.1700 | 0.5100 | 1.4000 |
| | in-lb-sec² | 0.000150 | 0.000451 | 0.001239 |
| 25 | kg-cm² | 0.1600 | 0.4200 | 1.3000 |
| | in-lb-sec² | 0.000142 | 0.000372 | 0.001151 |
| 30 | kg-cm² | 0.1800 | 0.6000 | 1.7000 |
| | in-lb-sec² | 0.000159 | 0.000531 | 0.001505 |
| 40 | kg-cm² | 0.1700 | 0.5100 | 1.4000 |
| | in-lb-sec² | 0.000150 | 0.000451 | 0.001239 |
| 50 | kg-cm² | 0.1500 | 0.4000 | 1.1000 |
| | in-lb-sec² | 0.000133 | 0.000354 | 0.000974 |
| 100 | kg-cm² | 0.1500 | 0.4000 | 1.1000 |
| | in-lb-sec² | 0.000133 | 0.000354 | 0.000974 |

* Note: 1 kg-cm² = 0.000885 in-lb-sec²

# Generation II Stealth® Series

## Generation II Stealth® How to Order

Choose gearhead series, frame size, ratio, backlash and specify motor, make and model for mounting kit from the charts below and on the following page.

**Sizing/Selection Design Assistance**

To properly size and select a gearhead for a specific application requires consideration of several interrelated parameters including: speed, continuous torque, repetitive peak torque or acceleration torque, emergency stop torque, duty cycle, ambient temperature and radial and axial shaft load.

The 9 step procedure on pages 72-73 provides a straightforward method of selecting the correct gearhead for your application.

### Gearhead Ordering Information

| | ① | ② | | ③ | | ④ | | ⑤ | ⑥ |
|---|---|---|---|---|---|---|---|---|---|
| **Order Example:** | PS | 60 | - | 003 | - | XXX | - | S | 2 |

| ① Series | ② Frame Size | ③ Ratio | ④ Special Options* | ⑤ Backlash | ⑥ GEN 2 Identifier |
|---|---|---|---|---|---|
| **PS** | 60, 90, 115, 142 | 003, 004, 005, 007, 010, 015, 020, 025, 030, 040, 050, 070, 100 | XXX = Factory issued | S = Standard<br>L = Low | 2 |
| **PX** | 60, 90, 115, 23, 34, 42 | 003, 004, 005, 007, 010, 015, 020, 025, 030, 040, 050, 070, 100 | XXX = Factory issued<br>T01 = Flange Mount | | |
| **RS** | 60, 90, 115, 142 | 005, 010, 015, 020, 025, 030, 040, 050, 100 | XXX = Factory issued | | |
| **RX** | 60, 90, 115, 23, 34, 42 | 005, 010, 015, 020, 025, 030, 040, 050, 100 | XXX = Factory issued (Contact factory for Flange Mount Option) | | |

* Standard special options include: F01 Food Grade, W01 Washdown, G01 GenI Spacer Plate, L02 No lubricant (standard is oil filled), V01 Vacuum, C01 CleanRoom Class 10,000. Leave blank if no special option required.

# Motor Mounting How to Order

Know your motor and need our mounting kit part number? Use the charts below or use our Motor Mounting Search Tool on our website at:

**www.parkermotion.com**

| | ⑦ | | ⑧ |
|---|---|---|---|
| **Order Example:** | **MU** | **60** - | **XXX** |

| | ⑦ | ⑧ |
|---|---|---|
| **Universal Mounting*** | **Frame Size ****| **Mounting Kit Suffix Number** |
| **MU** | 60, 90, 115 | See Motor Mounting Selection Tool on our website at: www.parkermotion.com |

* Common to PS, PX, RS and RX Series Gearheads
**PX/RX23 use MU60, PX/RX34 use MU90, PX/RX42 use MU115

### Universal Mounting Kit Adapter Length "AD" Dimension

| | Motor Shaft Length | | Gearhead Adapter Length | |
|---|---|---|---|---|
| **Frame Size** | **mm** | **in** | **mm** | **in** |
| **60** | 16 – 35<br>35.1 – 41 | 0.630 – 1.378<br>1.382 – 1.614 | 16.5<br>22.5 | 0.65<br>0.886 |
| **90** | 20 – 40<br>40.1 – 48 | 0.787 – 1.575<br>1.579 – 1.890 | 20<br>28.5 | 0.787<br>1.122 |
| **115** | 22 – 50<br>50.1 – 61 | 0.866 – 1.969<br>1.972 – 2.402 | 24<br>35 | 0.945<br>1.378 |
| **142** | 26 – 62<br>46 – 82 | 1.023 – 2.44<br>1.811 – 3.23 | 30<br>50 | 1.181<br>1.969 |

### Recommended Parker Motor and Mounting Kit

| | Recommended Servo Motor | | | Recommended Stepper Motor | | |
|---|---|---|---|---|---|---|
| **Frame Size** | **Motor** | **Mounting Kit** | **AD Dimension** | **Motor** | **Mounting Kit** | **AD Dimension** |
| **60 or 23** | BE23<br>SM23 | MU60-033 | 16.5 mm | LV23<br>HV23 | MU60-005 | 16.5 mm |
| **90 or 34** | MPP092<br>BE34 | MU90-092<br>MU90-005 | 20 mm | LV34<br>HV34 | MU90-005 | 20 mm |
| **115 or 42** | MPP100<br>MPP115 | MU-115-039<br>MU115-010 | 24 mm | | | |
| **142** | MPP115<br>MPP142 | MU142-010<br>Mu142-146 | 30 mm | | | |

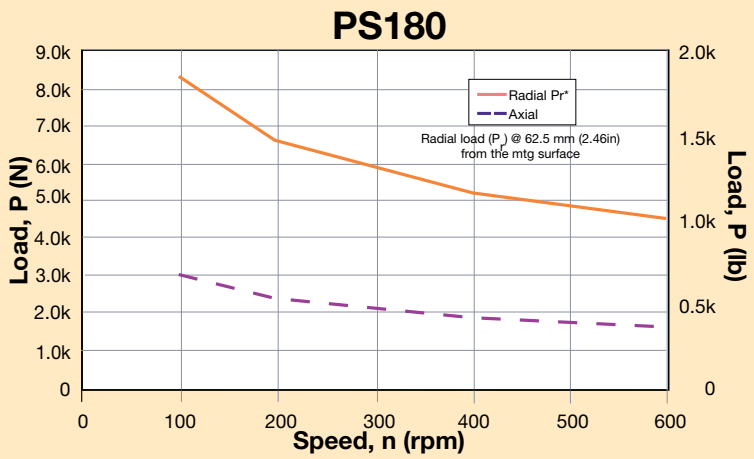
# Generation I Stealth® Series

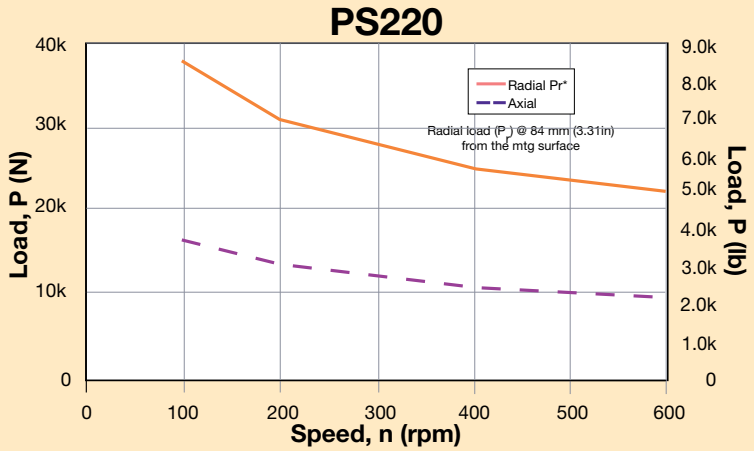
## PS Performance Specifications

| Parameter | Units | Ratio | PS180 | | PS220 | |
|---|---|---|---|---|---|---|
| **Nominal Output Torque $T_{nom\ r}$** | Nm (in-lb) | 3,4,5,7,10 | 735 | (6500) | 1413 | (12,500) |
| | | 15,20,25, 30,40,50 | 1017 | (9000) | 1808 | (16,000) |
| | | 70,100 | 893 | (7900) | 1582 | (14,000) |
| **Maximum Acceleration Output Torque [1] $T_{acc\ r}$** | Nm (in-lb) | 3,4,5,7,10 70,100 | 972 | (8600) | 1763 | (15,600) |
| | | 15,20,25, 30,40,50 | 1198 | (10,600) | 2011 | (17,800) |
| **Emergency Stop Output Torque [2] $T_{em\ r}$** | Nm (in-lb) | 3,4,5,7,10 70,100 | 2237 | (19,800) | 4068 | (36,000) |
| | | 15,20,25, 30,40,50 | 2757 | (24,400) | 4520 | (40,000) |
| **Nominal Input Speed $N_{nom\ r}$** | RPM | 3,4,5 | 1600 | | 1200 | |
| | | 7,10 | 2000 | | 1500 | |
| | | 15,20,25, 30,40,50 | 2400 | | 1800 | |
| | | 70,100 | 2800 | | 2100 | |
| **Maximum Input Speed $N_{max\ r}$** | RPM | 3 – 100 | 3000 | | 2300 | |
| **Standard Backlash [3]** | arc-min | 3 – 10 | 4 | | 4 | |
| | | 15 – 100 | 6 | | 6 | |
| **Low Backlash [3]** | arc-min | 3 – 10 | 3 | | 3 | |
| | | 15 – 100 | 5 | | 5 | |
| **Efficiency at Nominal Torque** | % | 3 – 10 | 97 | | 97 | |
| | | 15 – 100 | 94 | | 94 | |
| **Noise Level at:** **2000 RPM [4]** **3000 RPM [4]** | db | 3 – 100 | 66 — | | 68 — | |
| **Torsional Stiffness** | Nm/arc-min (in-lb/arc-min) | 3 – 100 | 110 | (973) | 210 | (1,858) |
| **Maximum Allowable Case Temperature** | ° C | 3 – 100 | -20 to 90 | | | |
| **Degree of Protection** | | | IP65 | | | |
| **Maximum Weight** | kg (lbs) | 3 – 10 | 26 | (57) | 49 | (108) |
| | | 15 – 100 | 35 | (77) | 71 | (157) |

1) Parker MotionSizer sizing software available for free download at parkermotion.com.
2) Maximum of 1,000 stops
3) Measured at 2% of rated torque
4) Measured at 1 meter

# PS Output Shaft Load Rating




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

**Prx = Pr * 138 mm / (76 + X)**

**Prx = Pr * 5.43 in / (2.99 in + X)**

**Prx = Pr * 190 mm / (106 + X)**

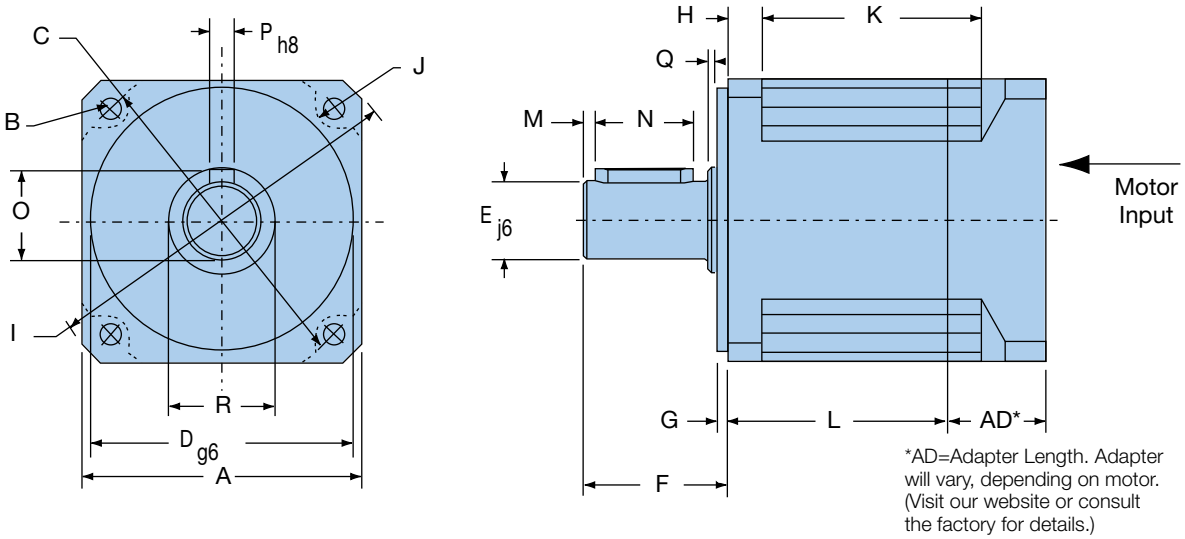
**Prx = Pr * 7.48 in / (4.17 in + X)**

* Radial load applied to center of the shaft.

# Generation I Stealth® Series

## PS Dimensions

Free 3D Solid Models and drawings available at parkermotion.com




*AD=Adapter Length. Adapter will vary, depending on motor. (Visit our website or consult the factory for details.)

### Metric Frame Sizes

| Frame Size | A Square Flange | | B Bolt Hole | | C Bolt Circle | | D Pilot Diameter | | E Output Shaft Diameter | | F Output Shaft Length | | G Pilot Thickness | | H Flange Thickness | | I Housing Diameter | | J Housing Recess | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| **PS180** | 182 | 7.165 | 13 | 0.512 | 215 | 8.465 | 160 | 6.299 | 55 | 2.165 | 105 | 4.134 | 20 | 0.787 | 16 | 0.630 | 240 | 9.449 | 16 | 0.630 |
| **PS220** | 220 | 8.661 | 17 | 0.669 | 250 | 9.843 | 180 | 7.087 | 75 | 2.953 | 138 | 5.433 | 30 | 1.181 | 22 | 0.866 | 290 | 11.417 | 16 | 0.630 |

| Frame Size | K1 Recess Length (for ratios 3-10) | | K2 Recess Length (for ratios 15-100) | | L1 Length (for ratios 3-10) | | L2 Length (for ratios 15-100) | | M Distance from Shaft End | | N Keyway Length | | O Key Height | | P Keyway Width | | Q Shoulder Height | | R Shoulder Diameter | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| **PS180** | 88 | 3.465 | 158 | 6.220 | 83.5 | 3.287 | 153.5 | 6.043 | 6 | 0.236 | 70 | 2.756 | 59 | 2.323 | 16 | 0.630 | 3 | 0.118 | 70 | 2.756 |
| **PS220** | 116 | 4.567 | 218 | 8.583 | 108 | 4.252 | 210.5 | 8.287 | 6 | 0.236 | 90 | 3.543 | 79.5 | 3.130 | 20 | 0.787 | 3 | 0.118 | 95 | 3.740 |

## PS Inertia

All moment of inertia values are as reflected at the input of the gearhead

| | Ratio | Units | Frame Size | |
|---|---|---|---|---|
| | | | PS180 | PS220 |
| Small Motor Shaft Diameter Range | 3 to 100 | mm | 15.9-35 | 24-48 |
| | | in | 0.626-1.378 | 0.945-1.89 |
| | 3 | gm-cm-sec$^2$ | 28.6 | — |
| | | oz-in-sec$^2$ | 0.397 | — |
| | 4, 5 | gm-cm-sec$^2$ | 17.6 | 62.6 |
| | | oz-in-sec$^2$ | 0.244 | 0.869 |
| | 7, 10 | gm-cm-sec$^2$ | 9.24 | 34.3 |
| | | oz-in-sec$^2$ | 0.128 | 0.476 |
| | 15 | gm-cm-sec$^2$ | 15.8 | 51.0 |
| | | oz-in-sec$^2$ | 0.219 | 0.708 |
| | 20, 25 | gm-cm-sec$^2$ | 16.7 | 53.3 |
| | | oz-in-sec$^2$ | 0.232 | 0.741 |
| | 30, 40, 50, 70, 100 | gm-cm-sec$^2$ | 7.450 | 27.1 |
| | | oz-in-sec$^2$ | 0.104 | 0.377 |

| | Ratio | Units | Frame Size | |
|---|---|---|---|---|
| | | | PS180 | PS220 |
| Large Motor Shaft Diameter Range | 3 to 100 | mm | 35-42 | 48-55 |
| | | in | 1.38-1.65 | 1.89-2.17 |
| | 3 | gm-cm-sec$^2$ | 37.8 | 111 |
| | | oz-in-sec$^2$ | 0.526 | 1.54 |
| | 4, 5 | gm-cm-sec$^2$ | 25.6 | 72.4 |
| | | oz-in-sec$^2$ | 0.356 | 1.01 |
| | 7, 10 | gm-cm-sec$^2$ | 15.8 | 44.1 |
| | | oz-in-sec$^2$ | 0.219 | 0.613 |
| | 15 | gm-cm-sec$^2$ | 23.8 | 60.8 |
| | | oz-in-sec$^2$ | 0.331 | 0.845 |
| | 20, 25 | gm-cm-sec$^2$ | 24.7 | 62.9 |
| | | oz-in-sec$^2$ | 0.344 | 0.874 |
| | 30, 40, 50, 70, 100 | gm-cm-sec$^2$ | 14.0 | 37.0 |
| | | oz-in-sec$^2$ | 0.195 | 0.513 |

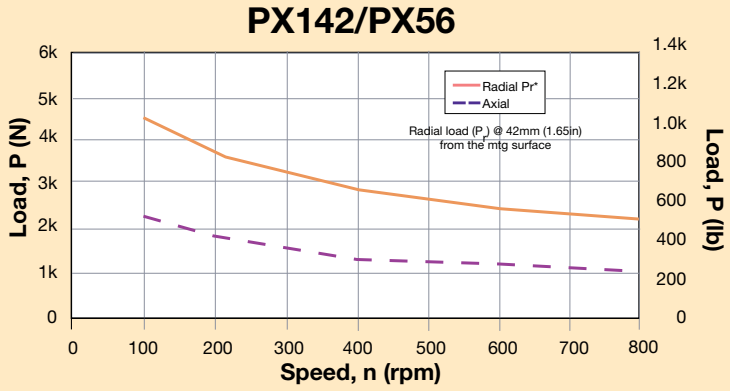
# Generation I Stealth® Series

## PX Performance Specifications

| Parameter | Units | Ratio | PX142 / PX56 |
|---|---|---|---|
| **Nominal Output Torque $T_{nom\ r}$** | Nm (in-lb) | 3, 4, 5 | 226 (1,994) |
| | | 7, 10, 15 | 231 (2,038) |
| | | 20, 25, 30, 50 | 278 (2,453) |
| | | 70,100 | 261 (2,303) |
| **Maximum Acceleration Output Torque [1] $T_{acc\ r}$** | Nm (in-lb) | 3, 4, 5, 7, 10, 15, 70, 100 | 282 (2,488) |
| | | 20, 25, 30, 50 | 347 (3,062) |
| **Emergency Stop Output Torque [2] $T_{em\ r}$** | Nm (in-lb) | 3, 4, 5, 7, 10, 15, 70, 100 | 656 (5,789) |
| | | 20, 25, 30, 50 | 900 (7,055) |
| **Nominal Input Speed $N_{nom\ r}$** | RPM | 3,4,5 | 2000 |
| | | 7, 10, 15 | 2500 |
| | | 20, 25, 30, 50 | 3000 |
| | | 70,100 | 3500 |
| **Maximum Input Speed $N_{max\ r}$** | RPM | 3 – 100 | 3800 |
| **Standard Backlash [3]** | arc-min | 3 – 10 | 8 |
| | | 15 – 100 | 10 |
| **Low Backlash [3]** | arc-min | 3 – 10 | 6 |
| | | 15 – 100 | 8 |
| **Efficiency at Nominal Torque** | % | 3 – 10 | 96 |
| | | 15 – 100 | 93 |
| **Noise Level at 3000 RPM [4]** | db | 3 – 100 | 66 |
| **Torsional Stiffness** | Nm/arc-min (in-lb/arc-min) | 3 – 100 | 39 (345) |
| **Maximum Allowable Case Temperature** | ° C | 3 – 100 | -20 to 90 |
| **Degree of Protection** | | | IP65 |
| **Maximum Weight** | kg (lbs) | 3 – 10 | 14 (30) |
| | | 15 – 100 | 20 (43) |

1) Parker MotionSizer sizing software available for free download at parkermotion.com.
2) Maximum of 1,000 stops
3) Measured at 2% of rated torque
4) Measured at 1 meter

## PX Output Shaft Load Rating




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

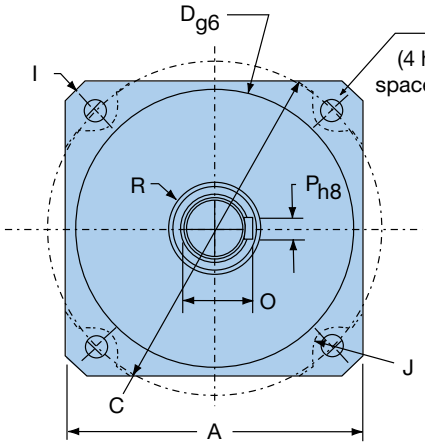
**Prx = Pr * 121 mm / (65 + X)**

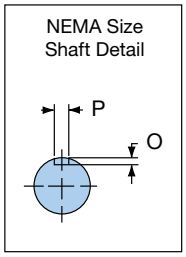
**Prx = Pr * 4.76 in / (2.56 in + X)**

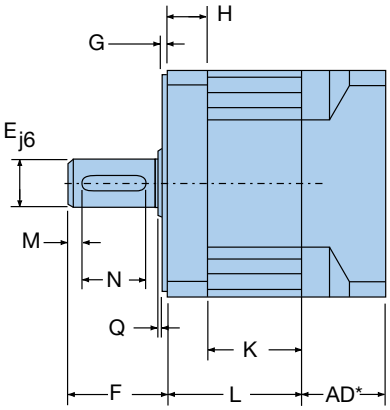
* Radial load applied to center of the shaft.

# PX Dimensions

Free 3D Solid Models and drawings available at parkermotion.com




*AD=Adapter Length. Adapter will vary, depending on motor. (Visit our website or consult the factory for details.)

## Metric Frame Size

| Frame Size | A Square Flange | | B Bolt Hole | | C Bolt Circle | | D Pilot Diameter | | E Output Shaft Diameter | | F Output Shaft Length | | G Pilot Thickness | | H Flange Thickness | | I Housing Diameter | | J Housing Recess | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| PX142 | 142 | 5.591 | 11.0 | 0.433 | 165 | 6.496 | 130 | 5.118 | 40 | 1.575 | 80 | 3.150 | 3.5 | 0.138 | 25 | 0.984 | 194 | 7.637 | 10.0 | 0.394 |

| Frame Size | K1 Recess Length (for ratios 3-10) | | K2 Recess Length (for ratios 15-100) | | L1 Length (for ratios 3-10) | | L2 Length (for ratios 15-100) | | M Distance from Shaft End | | N Keyway Length | | O Key Height | | P Keyway Width | | Q Shoulder Height | | R Shoulder Diameter | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| PX142 | 61.5 | 2.421 | 123.0 | 4.843 | 86.5 | 3.406 | 148.0 | 5.827 | 8 | 0.315 | 63 | 2.480 | 43.0 | 1.693 | 12 | 0.472 | 1.5 | 0.059 | 46 | 1.811 |

## NEMA Frame Size

| Frame Size | B Bolt Hole | | C Bolt Circle | | D Pilot Diameter | | E Output Shaft Diameter | | F Output Shaft Length | | N Keyway Flat Length | | O Keyway Flat Depth | | P Keyway Flat Width | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm |
| PX56 | 0.398 | 10.109 | 7.000 | 177.8 | 4.500 | 114.30 | 1.000 | 25.40 | 2.000 | 50.80 | 1.625 | 41.275 | 0.142 | 3.607 | 0.250 | 6.35 |

NOTE: NEMA size has 20% lower torque/stiffness ratings due to smaller output shaft diameter.

## PX Inertia

All moment of inertia values are as reflected at the input of the gearhead

| Frame Size | Units | Ratio | | | | | |
|---|---|---|---|---|---|---|---|
| | | 3 | 4, 5 | 7, 10 | 15 | 20, 25 | 30, 50, 70, 100 |
| PX142 | gm-cm-sec$^2$ | 8.826 | 4.514 | 3.326 | 4.849 | 5.179 | 2.840 |
| PX56 | oz-in-sec$^2$ | 0.124 | 0.063 | 0.047 | 0.068 | 0.073 | 0.040 |

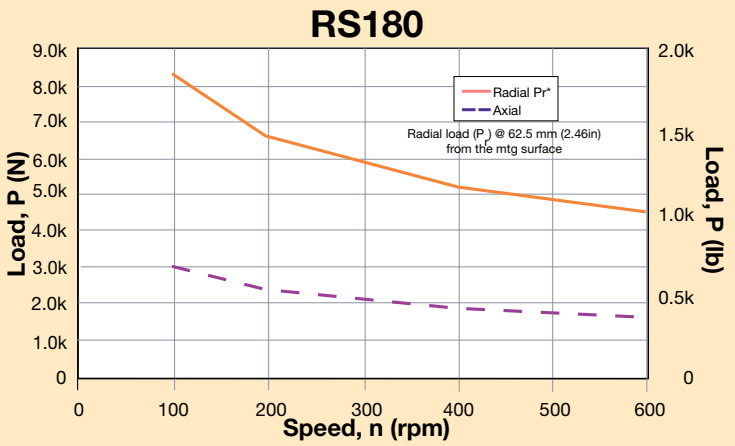
# Generation I Stealth® Series

## RS Performance Specifications

| Parameter | Units | Ratio | RS180 | | RS220 | |
|---|---|---|---|---|---|---|
| **Nominal Output Torque $T_{nom\ r}$** | Nm (in-lb) | 5 | 316 | (2800) | 678 | (16,000) |
| | | 10 | 621 | (5500) | 1299 | (11,500) |
| | | 15,20,25 | 938 | (8300) | 1808 | (16,000) |
| | | 30,40,50,100 | 836 | (7400) | 1469 | (13,000) |
| **Maximum Acceleration Output Torque [1] $T_{acc\ r}$** | Nm (in-lb) | 5 | 373 | (3300) | 902 | (7,100) |
| | | 10 | 734 | (6500) | 1582 | (14,000) |
| | | 15,20,25, 30,40,50,100 | 1096 | (9700) | 2000 | (17,700) |
| **Emergency Stop Output Torque [2] $T_{em\ r}$** | Nm (in-lb) | 5 | 870 | (7700) | 1853 | (16,400) |
| | | 10 | 1695 | (15,000) | 3684 | (32,600) |
| | | 15,20,25, 30,40,50,100 | 2520 | (22,300) | 4588 | (40,600) |
| **Nominal Input Speed $N_{nom\ r}$** | RPM | 5,10 | 1600 | | 1200 | |
| | | 5,20, 25,30,40 | 2000 | | 1500 | |
| | | 50,100 | 2400 | | 1800 | |
| **Maximum Input Speed $N_{max\ r}$** | RPM | 5 – 100 | 3000 | | 2300 | |
| **Standard Backlash [3]** | arc-min | 5 – 10 | 10 | | 10 | |
| | | 15 – 100 | 8 | | 8 | |
| **Low Backlash [3]** | arc-min | 5 – 10 | 6 | | 6 | |
| | | 15 – 100 | 4 | | 4 | |
| **Efficiency at Nominal Torque** | % | 5 – 100 | 94 | | 94 | |
| **Noise Level at:**<br>**1500 RPM [4]**<br>**2000 RPM [4]**<br>**3000 RPM [4]** | db | 5 – 100 | —<br>72<br>— | | —<br>—<br>72 | |
| **Torsional Stiffness** | Nm/arc-min (in-lb/arc-min) | 5 – 100 | 90 | (800) | 170 | (1,500) |
| **Maximum Allowable Case Temperature** | ° C | 5 – 100 | -20 to 90 | | | |
| **Degree of Protection** | | | IP65 | | | |
| **Maximum Weight** | kg (lbs) | 5 – 100 | 43 | (94) | 80 | (177) |

1) Parker MotionSizer sizing software available for free download at parkermotion.com.
2) Maximum of 1,000 stops
3) Measured at 2% of rated torque
4) Measured at 1 meter.

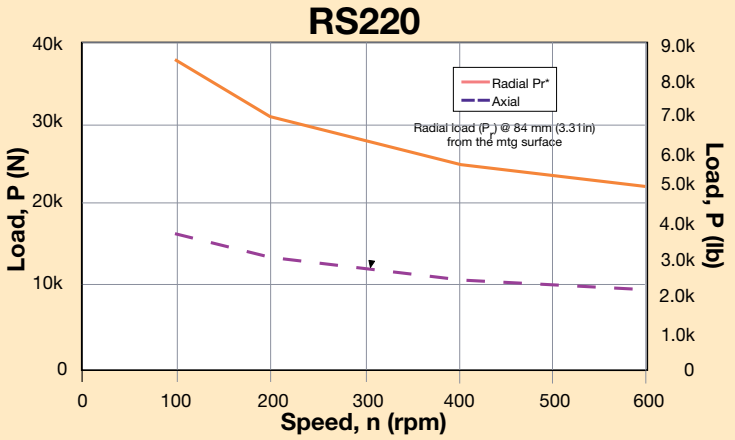
# RS Output Shaft Load Rating




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

**Prx = Pr * 138 mm / (76 + X)**

**Prx = Pr * 5.43 in / (2.99 in + X)**




**Prx = Pr * 190 mm / (106 + X)**

**Prx = Pr * 7.48 in / (4.17 in + X)**

* Radial load applied to center of the shaft.

### RS Inertia

All moment of inertia values are as reflected at the input of the gearhead

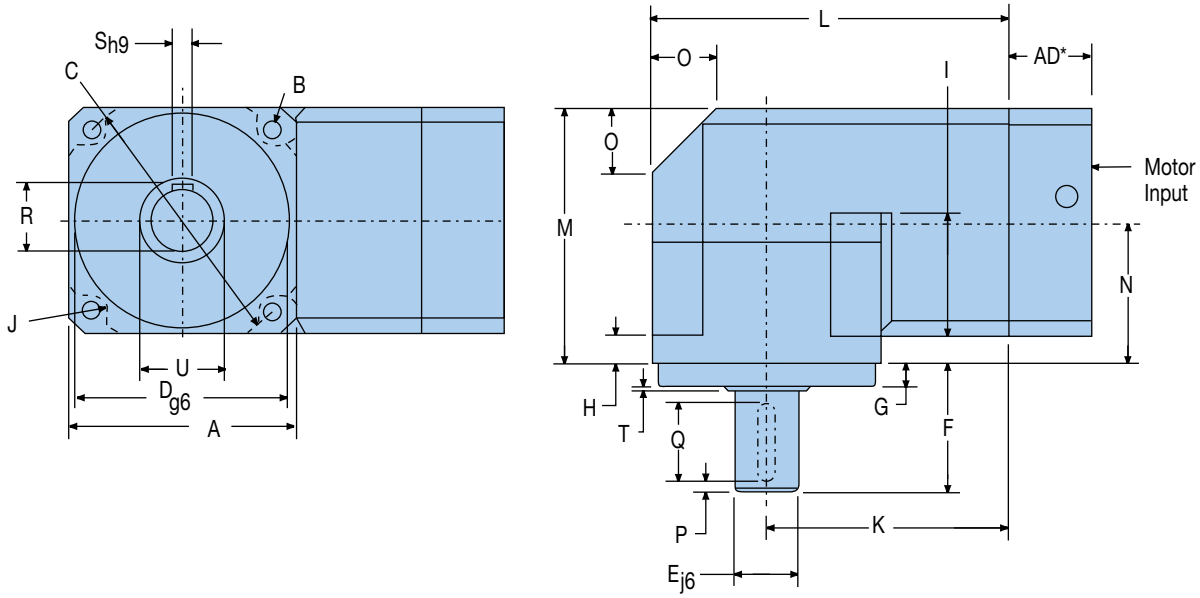
| Ratio | Units | Frame Size | |
|---|---|---|---|
| | | RS180 | RS220 |
| 5 | gm-cm-sec$^2$ | 26.5 | 82.2 |
| | oz-in-sec$^2$ | 0.368 | 1.14 |
| 10 | gm-cm-sec$^2$ | 16.7 | 50.4 |
| | oz-in-sec$^2$ | 0.232 | 0.700 |
| 15, 30 | gm-cm-sec$^2$ | 15.2 | 47.4 |
| | oz-in-sec$^2$ | 0.211 | 0.658 |
| 20, 25, 40 | gm-cm-sec$^2$ | 10.7 | 34.3 |
| | oz-in-sec$^2$ | 0.149 | 0.476 |
| 50, 100 | gm-cm-sec$^2$ | 6.70 | 21.2 |
| | oz-in-sec$^2$ | 0.093 | 0.294 |

# Generation I Stealth® Series

## RS Dimensions

Free 3D Solid Models and drawings available at parkermotion.com

*AD=Adapter Length. Adapter will vary, depending on motor.
(Visit our website or consult the factory for details.)




### Metric Frame Sizes

| Frame Size | A Square Flange | | B Bolt Hole | | C Bolt Circle | | D Pilot Diameter | | E Output Shaft Diameter | | F Output Shaft Length | | G Pilot Thickness | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| RS180 | 182 | 7.165 | 13 | 0.512 | 215 | 8.465 | 160 | 6.299 | 55 | 2.165 | 105 | 4.134 | 20 | 0.787 |
| RS220 | 220 | 8.661 | 17 | 0.669 | 250 | 9.843 | 180 | 7.087 | 75 | 2.953 | 138 | 5.433 | 30 | 1.181 |

| Frame Size | H Flange Thickness | | I Recess Length | | J Housing Recess | | K Distance to Output Centerline | | L Housing Length | | M Housing Width | | N Distance to Input Centerline | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| RS180 | 16 | 0.630 | 97.5 | 3.839 | 16 | 0.630 | 172 | 6.772 | 263 | 10.354 | 197 | 7.756 | 106 | 4.173 |
| RS220 | 22 | 0.866 | 101 | 3.976 | 16 | 0.630 | 230 | 9.055 | 340 | 13.386 | 245 | 9.646 | 135 | 5.315 |

| Frame Size | O Taper Distance | | P Distance from Shaft End | | Q Keyway Length | | R Key Height | | S Keyway Width | | T Shoulder Height | | U Shoulder Diameter | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| RS180 | 55 | 2.165 | 6 | 0.236 | 70 | 2.756 | 59 | 2.323 | 16 | 0.630 | 3 | 0.118 | 70 | 2.756 |
| RS220 | 60 | 2.362 | 6 | 0.236 | 90 | 3.543 | 79.5 | 3.130 | 20 | 0.787 | 3 | 0.118 | 95 | 3.740 |

# Generation I Stealth® Series

## Stealth® How to Order

Choose gearhead series, frame size, ratio, backlash and orientation from the chart below.

### Gearhead Ordering Information

| | ① | ② | | ③ | | | ④ | ⑤ |
|---|---|---|---|---|---|---|---|---|
| **Order Example:** | PS | 180 | - | 003 | - | XXX | - | S | H |

| ① Series | ② Frame Size | ③ Ratio | ④ Backlash | ⑤ Orientation |
|---|---|---|---|---|
| **PS** | 180 (Metric)<br>220 (Metric) | 003, 004, 005, 007, 010, 015,<br>020, 025, 030, 040, 050, 070, 100 | S = Standard<br>L = Low | See illustrations below<br>H = Horizontal orientation<br>U = Output shaft pointing up<br>D = Output shaft pointing down |
| **PX** | 142 (Metric)<br>56 (NEMA) | 003, 004, 005, 007, 010, 015,<br>020, 025, 030, 050, 070, 100 | Blank = Standard<br>LB = Low | — |
| **RS** | 180 (Metric)<br>220 (Metric) | 005, 010, 015, 020, 025,<br>030, 040, 050,100 | S = Standard<br>L = Low | See illustrations below<br>H = Horizontal orientation<br>U = Output shaft pointing up<br>D = Output shaft pointing down<br>E = Motor input facing up<br>F = Motor input facing down |

### Recommended Parker Motor and Mounting Kit

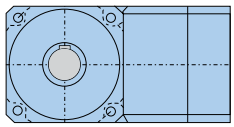
| Frame Size | Recommended Servo Motor | | |
|---|---|---|---|
| | Motor | Mounting Kit | AD Dimension |
| **PS180** | MPP142<br>MPP180 | MT180-131<br>MT180-096 | 67.5 mm<br>109 mm |
| **PS220** | MPP180<br>MPP230 | MT220-021<br>MT220-022 | 104 mm<br>138 mm |
| **PX142** | MPP115<br>MPP142 | MX142-107<br>MX142-008 | 70 mm<br>75 mm |
| **RS180** | MPP142<br>MPP190 | MZ180-025<br>MZ180-032 | 80 mm<br>120 mm |
| **RS220** | MPP190<br>MPP230 | MZ220-009<br>Consult Factory | 108 mm<br>— |

**Sizing/Selection Design Assistance**

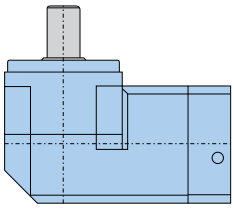
To properly size and select a gearhead for a specific application requires consideration of several interrelated parameters including: speed, continuous torque, repetitive peak torque or acceleration torque, emergency stop torque, duty cycle, ambient temperature and radial and axial shaft load.

The 9 step procedure on pages 72-73 provides a straightforward method of selecting the correct gearhead for your application.

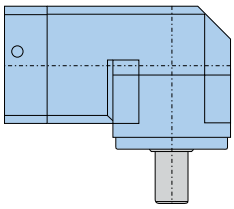
**Right Angle Gearhead Orientation**



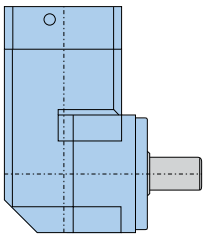
H
Horizontal Orientation



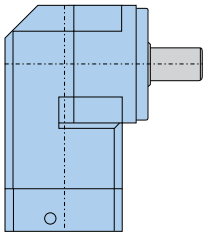
U
Output Shaft Up



D
Output Shaft Down



E
Motor InpuT
Facing Up



F
Motor Input
Facing Down

# PV Series Gearheads

## PV Series: Value Alternative Precision Planetary Gearheads

### PV = Power + Versatility

The PV Series planetary gearhead combines power and versatility in an economical package. It comes in a wide range of options, including dimensional output face crossovers to the Parker PX, Alpha LP, Neugart PLE, Stober PE and standard NEMA gearheads.

The PV Series is available in metric or NEMA frame sizes: 40, 60, 90 and 115 mm, and NEMA sizes 17, 23, 34 and 42. Ratios are available from 3:1 to 100:1.

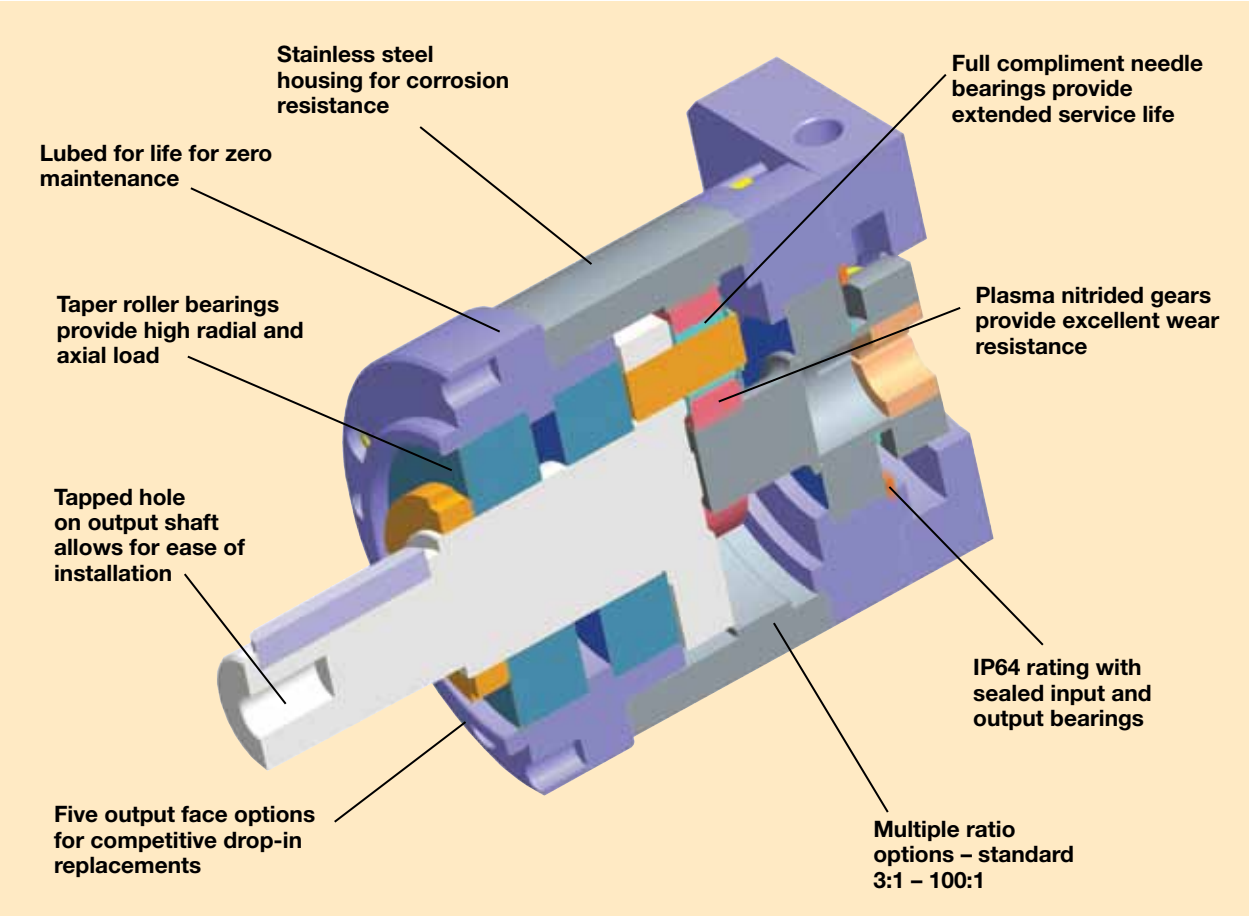
Whether you're an OEM or an end user searching for competitive alternatives, the PV offers a superior solution. Parker's PV Series gearheads are made in the USA.

- **Higher radial load capacity: Taper roller output bearings**
- **Competitive Alternatives: Five Drop-In Output Face Options**
- **Universal mounting kits: Quicker deliveries and easier mounting**
- **Higher gear wear resistance: Plasma Nitriting heat treating**

**PV Series Precision Gearheads**

| Product Series | Gear Geometry | Configuration | Frame Size (mm) | Nominal Continuous Torque (Nm) | Radial Load (N) | Backlash arc-min | IP Rating |
|---|---|---|---|---|---|---|---|
| PV40/17 | Planetary | In-Line | 40 (NEMA 17) | 3.5 – 6.7 | 190 – 590 | <15 | IP64 |
| PV60/23 | Planetary | In-Line | 60 (NEMA 23) | 10.2 – 22.5 | 665 – 2535 | <12 | IP64 |
| PV90/34 | Planetary | In-Line | 90 (NEMA 34) | 33 – 71 | 1040 – 4270 | <10 | IP64 |
| PV115/42 | Planetary | In-Line | 115 (NEMA 42) | 67 – 144 | 1235 – 10,550 | <8 | IP64 |

# PV Series Gearhead Features and Benefits



# PV Series Gearheads

## Performance Specifications

| Parameter | Units | Ratio | PV40/PV17 | | PV60/PV23 | | PV90/PV34 | | PV115/PV42 | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Nominal Output Torque $T_{nom\ r}$** | Nm (in-lb) | 3 | – | – | 12.0 | (106.200) | 35 | (309.75) | 74 | (654.90) |
| | | 4 | 5.9 | (52.215) | 18.9 | (167.265) | 56 | (495.60) | 111 | (982.30) |
| | | 5 | 6.2 | (54.870) | 19.6 | (173.460) | 58 | (513.30) | 115 | (1017.70) |
| | | 7 | 5.5 | (48.675) | 16.7 | (147.795) | 52 | (460.20) | 104 | (920.40) |
| | | 10 | 3.5 | (30.975) | 10.6 | (93.810) | 33 | (292.05) | 67 | (592.95) |
| | | 12 | – | – | 18.2 | (161.070) | 54 | (477.90) | 112 | (991.20) |
| | | 15 | – | – | 19.4 | (171.690) | 58 | (513.30) | 120 | (1062.00) |
| | | 16 | 6.5 | (57.525) | – | – | – | – | – | – |
| | | 20 | 6.5 | (57.525) | 21.5 | (190.275) | 67 | (592.95) | 136 | (1203.60) |
| | | 25 | 6.7 | (59.295) | 20.0 | (177.000) | 63 | (557.55) | 126 | (1115.10) |
| | | 30 | – | – | 22.5 | (199.275) | 71 | (628.35) | 144 | (1274.40) |
| | | 35 | 6.7 | (59.295) | – | – | – | – | – | – |
| | | 40 | 6.5 | (57.525) | 21.5 | (190.275) | 67 | (592.95) | 136 | (1203.60) |
| | | 50 | 6.7 | (59.295) | 20.0 | (177.000) | 63 | (557.55) | 126 | (1115.10) |
| | | 70 | 5.5 | (48.675) | 16.7 | (147.795) | 52 | (460.20) | 104 | (920.40) |
| | | 100 | 3.5 | (30.975) | 10.6 | (93.810) | 33 | (292.05) | 67 | (592.95) |
| **Maximum Acceleration Output Torque [1] $T_{acc\ r}$** | Nm (in-lb) | 3 | – | – | 24.0 | (212.400) | 70 | (619.50) | 148 | (1309.80) |
| | | 4,5, 12,15 | 11.8 | (104.430) | 36.4 | (322.140) | 108 | (955.80) | 222 | (1964.70) |
| | | 7,70 | 11.0 | (97.350) | 33.4 | (295.590) | 104 | (920.40) | 208 | (1840.80) |
| | | 10,100 | 7.0 | (61.950) | 21.2 | (187.620) | 66 | (584.10) | 134 | (1185.90) |
| | | 16,20, 25,30, 35,40,50 | 13.0 | (115.050) | 40.0 | (354.000) | 126 | (1115.10) | 252 | (2230.20) |
| **Emergency Stop Output Torque [2] $T_{em\ r}$** | Nm (in-lb) | 3,4,5, 12,15,16, 20,25,30, 35,40,50 | 16.0 | (141.600) | 55.0 | (486.750) | 170 | (1504.50) | 350 | (3097.50) |
| | | 7, 70 | 13.7 | (121.245) | 44.0 | (389.400) | 137 | (1212.45) | 290 | (2466.50) |
| | | 10, 100 | 9.2 | (81.420) | 39.0 | (345.150) | 122 | (1079.70) | 255 | (2256.75) |
| **Nominal Input Speed $N_{nom\ r}$** | RPM | 3 – 100 | 4500 | | 4000 | | 3500 | | 3000 | |
| **Maximum Input Speed $N_{max\ r}$** | RPM | 3 – 100 | 8000 | | 6000 | | 6000 | | 5000 | |
| **Service Life** | h | 3 – 100 | 20,000 | | | | | | | |
| **Standard Backlash [3]** | arc-min | 3 – 10 | <15 | | <12 | | <10 | | <8 | |
| | | 15 – 100 | <18 | | <16 | | <14 | | <12 | |
| **Efficiency at Nominal Torque** | % | 3 – 10 | 96 | | | | | | | |
| | | 15 – 100 | 94 | | | | | | | |
| **Noise Level at 3000 RPM [4]** | db | 3 – 100 | <60 | | <65 | | <65 | | <70 | |
| **Maximum Allowable Case Temperature** | ° C | 3 – 100 | -20 to 100 | | | | | | | |
| **Lubrication** | | 3 – 100 | Lifetime lubrication | | | | | | | |
| **Mounting Position** | | 3 – 100 | Any | | | | | | | |
| **Direction of Rotation** | | 3 – 100 | Same as Input | | | | | | | |
| **Degree of Protection** | | 3 – 100 | IP64 | | | | | | | |
| **Maximum Weight** | kg (lbs) | 3 – 10 | 0.6 | (1.2) | 1.2 | (2.5) | 3.2 | (7.0) | 6.8 | (13.5) |
| | | 15 – 100 | 0.9 | (2.0) | 1.6 | (3.5) | 4.3 | (9.5) | 9.7 | (19.3) |

1) Parker MotionSizer sizing software available for free download at parkermotion.com. tacc + tdec = 0.2 (tacc + tcont + tdec) Tcont = 0.25 Tacc
2) Maximum of 1000 stops.
3) Measured at 2% of rated torque.
4) Measure at 1m.

## Inertia

All moment of inertia values are as reflected at the input of the gearhead

| Ratio | Units* | PV40/PV17 | PV60/PV23 | PV90/PV34 | PV115/PV42 |
|---|---|---|---|---|---|
| 3 | kg-cm² | – | 0.1400 | 0.7400 | 1.9700 |
| | in-lb-sec² | – | 0.000124 | 0.000655 | 0.001743 |
| 4 | kg-cm² | 0.0200 | 0.1000 | 0.5000 | 1.3400 |
| | in-lb-sec² | 0.000018 | 0.000089 | 0.000443 | 0.001186 |
| 5 | kg-cm² | 0.0180 | 0.0840 | 0.3900 | 1.1300 |
| | in-lb-sec² | 0.000016 | 0.000074 | 0.000345 | 0.001000 |
| 7 | kg-cm² | 0.0160 | 0.0750 | 0.3400 | 0.9300 |
| | in-lb-sec² | 0.000014 | 0.000066 | 0.000301 | 0.000823 |
| 10 | kg-cm² | 0.0160 | 0.0700 | 0.3000 | 0.8500 |
| | in-lb-sec² | 0.000014 | 0.000062 | 0.000266 | 0.000752 |
| 12 | kg-cm² | – | 0.0970 | 0.4900 | 1.2300 |
| | in-lb-sec² | – | 0.000086 | 0.000434 | 0.001089 |
| 15 | kg-cm² | – | 0.0830 | 0.3900 | 1.0400 |
| | in-lb-sec² | – | 0.000073 | 0.000345 | 0.000920 |
| 16 | kg-cm² | 0.0190 | – | – | – |
| | in-lb-sec² | 0.000017 | – | – | – |
| 20 | kg-cm² | 0.0170 | 0.0830 | 0.3900 | 1.0400 |
| | in-lb-sec² | 0.000015 | 0.000073 | 0.000345 | 0.000920 |
| 25 | kg-cm² | 0.0170 | 0.0830 | 0.3900 | 1.0400 |
| | in-lb-sec² | 0.000015 | 0.000073 | 0.000345 | 0.000920 |
| 30 | kg-cm² | – | 0.0700 | 0.3000 | 0.8400 |
| | in-lb-sec² | – | 0.000062 | 0.000266 | 0.000743 |
| 35 | kg-cm² | 0.0160 | – | – | – |
| | in-lb-sec² | 0.000014 | – | – | – |
| 40, 50, 70, 100 | kg-cm² | 0.0160 | 0.0700 | 0.3000 | 0.8400 |
| | in-lb-sec² | 0.000014 | 0.000062 | 0.000266 | 0.000743 |

* Note: 1 kg-cm² = 0.000885 in-lb-sec²

## Maximum Output Shaft Load Rating

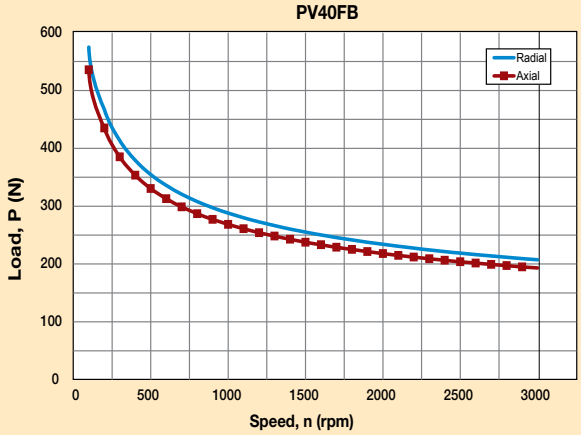
See load rating charts on pages 44-45

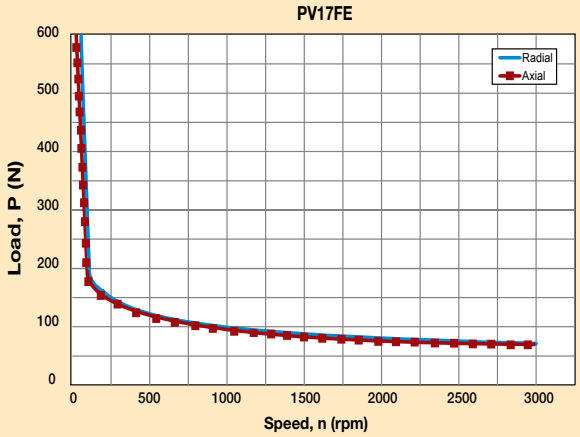
| | Output Face Option* | PV40/PV17 | PV60/PV23 | PV90/PV34 | PV115/PV42 |
|---|---|---|---|---|---|
| Maximum Radial Load Pr, N ** (3-100 ratios) | FE | 200 | 665 | 1040 | 1235 |
| | TN | 440 | 665 | 1040 | 2100 |
| | FB, FN, TA | 590 | 2535 | 4270 | 8550 |
| Maximum Axial Load Pr, N ** (3-100 ratios) | FE | 190 | 765 | 1140 | 1300 |
| | TN | 430 | 765 | 1140 | 2380 |
| | FB, FN, TA | 530 | 2350 | 4670 | 10550 |

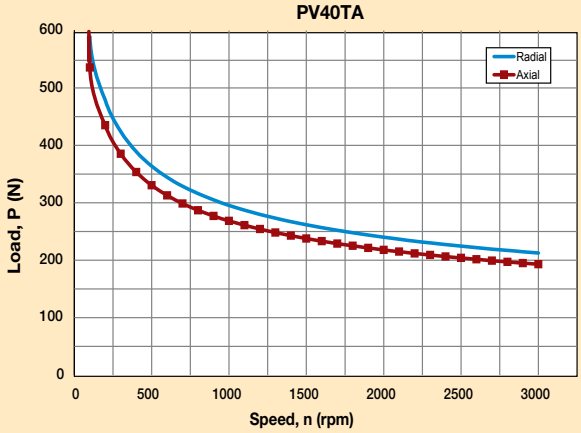
* See How to Order page 48, items 3 & 4 for front face/output face code definitions.
** @100 rpm, radial load applied at center of shaft

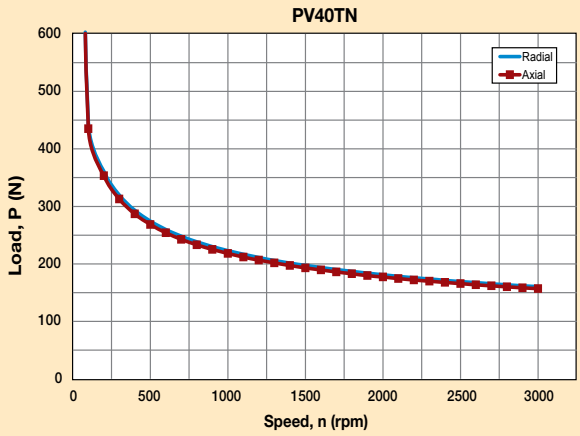
# PV Series Gearheads

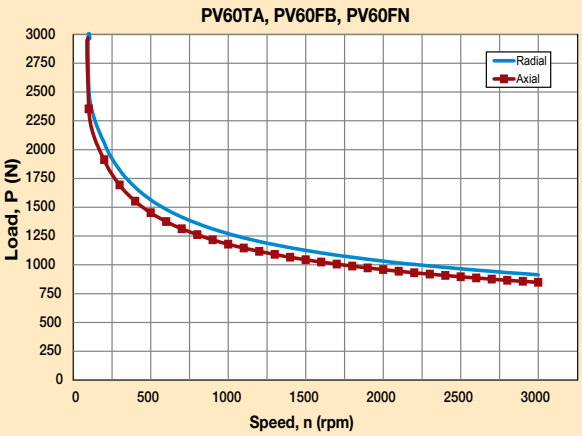
## Output Shaft Load Ratings – PV40/PV17 & PV60/PV23

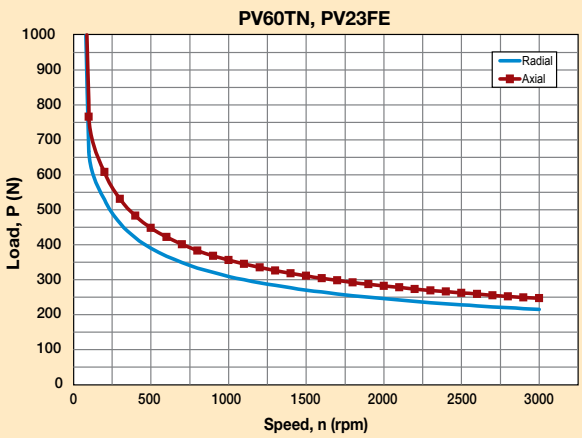


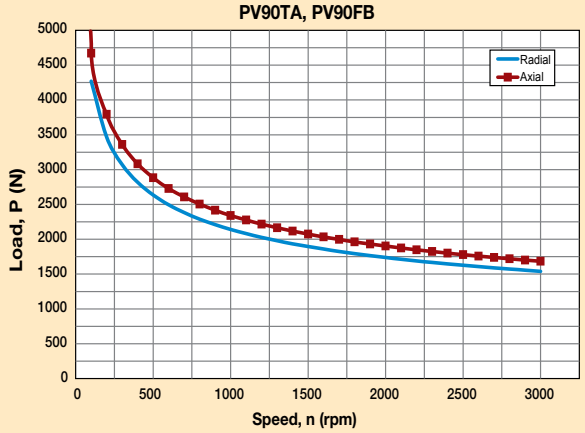



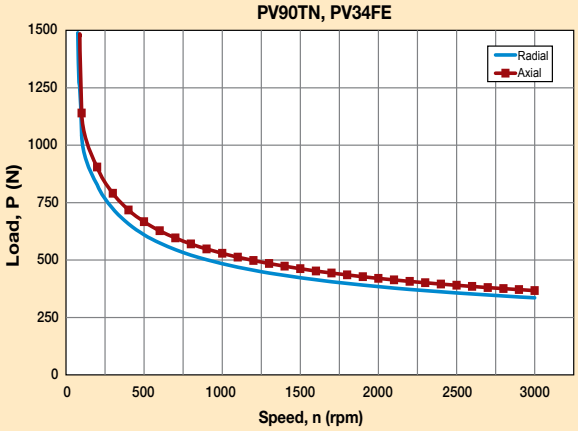



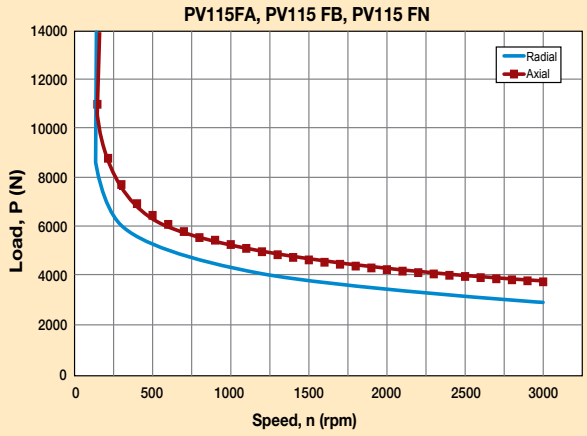



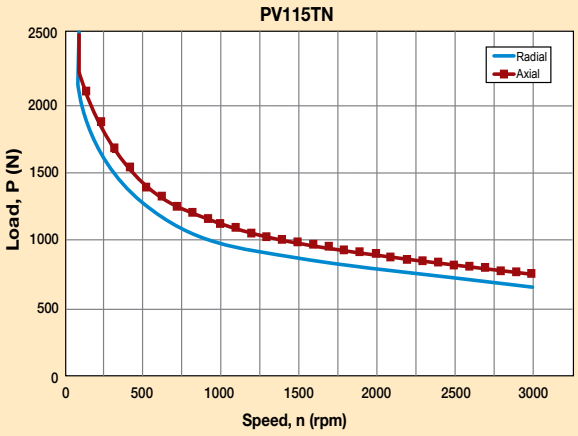

See How to Order page 48, items 3 & 4 for front face/output face code definitions.
1) Maximum axial load, Fa.
2) Maximum radial load applied to the center of the shaft, Fr.
3) Radial load curves can be used to combine (radial + axial) load if Fa/Fr < 0.22.
4) If Fa/Fr > 0.22 consult factory.

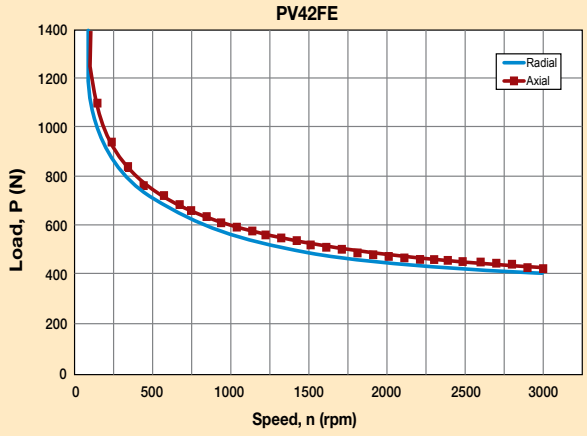
# Output Shaft Load Ratings – PV90/PV34 & PV115/PV42



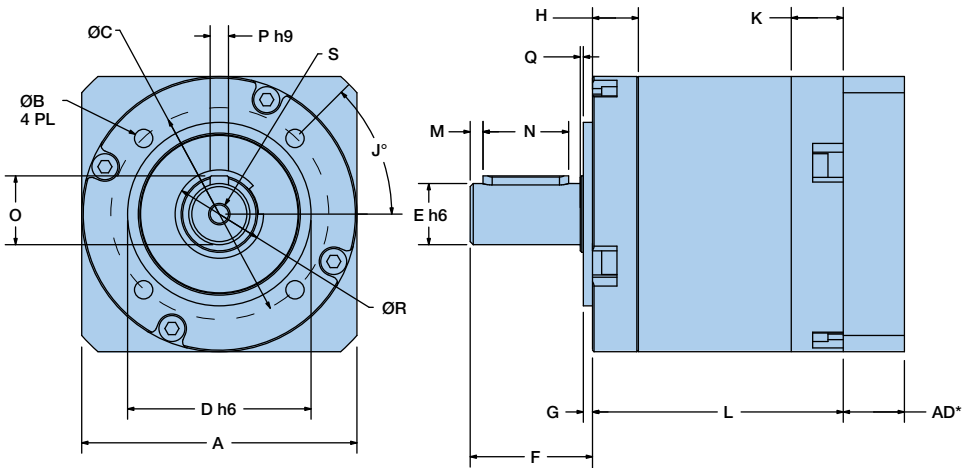




See How to Order page 48, items 3 & 4 for front face/output face code definitions.
1) Maximum axial load, Fa.
2) Maximum radial load applied to the center of the shaft, Fr.
3) Radial load curves can be used to combine (radial + axial) load if Fa/Fr < 0.22.
4) If Fa/Fr > 0.22 consult factory.

# PV Series Gearheads

## Dimensions – Tapped Face (TA & TN)

Free 3D Solid Models and drawings available at parkermotion.com




*AD = Adapter length. See how to order page for mounting kit adapter lengths.

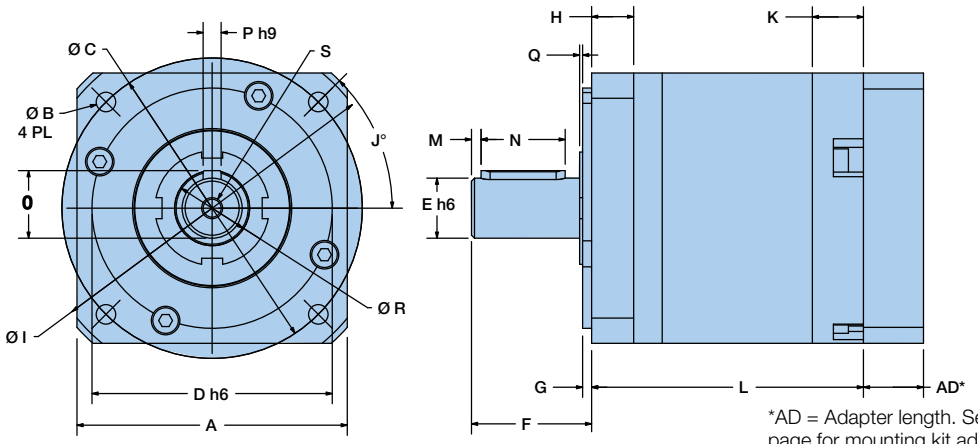
### Metric Frame Sizes

| Frame Size | A | | B | C | | D | | E | | F | | G | | H | | J | K | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Body Diameter | | Tap x Depth | Bolt Circle | | Pilot Diameter | | Output Shaft Diameter | | Output Shaft Length | | Pilot Thickness | | Flange Thickness | | Lead Angle | Rear Thickness | |
| | mm | in | | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | ° | mm | in |
| **PV40TN** | 43 | 1.693 | M4x7 | 34 | 1.339 | 26 | 1.024 | 10 | 0.394 | 26 | 1.024 | 1.5 | 0.059 | 10 | 0.394 | 45 | 11 | 0.433 |
| **PV40TA** | 50 | 1.969 | M4X10 | 44 | 1.732 | 35 | 1.378 | 12 | 0.472 | 25 | 0.984 | 3 | 0.118 | 10 | 0.394 | 90 | 11 | 0.433 |
| **PV60TN** | 62 | 2.441 | M5x10 | 52 | 2.047 | 40 | 1.575 | 14 | 0.551 | 35 | 1.378 | 2.5 | 0.098 | 12 | 0.472 | 45 | 16 | 0.630 |
| **PV60TA** | 70 | 2.756 | M5x10 | 62 | 2.362 | 52 | 2.047 | 16 | 0.630 | 36 | 1.417 | 5 | 0.197 | 16 | 0.630 | 90 | 16 | 0.630 |
| **PV90TN** | 90 | 3.543 | M6x11 | 70 | 2.756 | 60 | 2.362 | 20 | 0.787 | 40 | 1.575 | 3 | 0.118 | 15 | 0.591 | 45 | 17 | 0.670 |
| **PV90TA** | 90 | 3.543 | M6x12 | 80 | 3.150 | 68 | 2.677 | 22 | 0.866 | 46 | 1.811 | 5 | 0.197 | 18.5 | 0.728 | 90 | 17 | 0.670 |
| **PV115TN** | 115 | 4.528 | M10x16 | 100 | 3.937 | 80 | 3.150 | 25 | 0.984 | 55 | 2.165 | 4 | 0.157 | 20 | 0.787 | 45 | 23 | 0.906 |
| **PV115TA** | 120 | 4.724 | M8x20 | 108 | 4.252 | 90 | 3.543 | 32 | 1.260 | 70 | 2.756 | 6 | 0.236 | 28 | 1.102 | 90 | 23 | 0.906 |

| Frame Size | L1 | | L2 | | M | | N | | O | | P | | Q | | R | | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Length (3 – 10 Ratios) | | Length (12 – 100 Ratios) | | Distance from Shaft End | | Keyway Length | | Key Height | | Keyway Width | | Shoulder Height | | Shoulder Diameter | | Tap & Depth (end of shaft) |
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | |
| **PV40TN** | 48.5 | 1.909 | 63 | 2.480 | 3.1 | 0.122 | 16 | 0.630 | 10.2 | 0.402 | 3 | 0.118 | 0.6 | 0.024 | 11.633 | 0.458 | M3X6 |
| **PV40TA** | 48.5 | 1.909 | 63 | 2.480 | 1.3 | 0.051 | 16 | 0.630 | 13.5 | 0.531 | 4 | 0.157 | 3.5 | 0.138 | 17.831 | 0.702 | M4x8 |
| **PV60TN** | 63 | 2.480 | 83 | 3.268 | 2.71 | 0.107 | 25 | 0.984 | 16 | | 5 | 0.197 | 2.5 | 0.098 | 19.939 | 0.785 | M5x12 |
| **PV60TA** | 67 | 2.638 | 87 | 3.425 | 2.21 | 0.087 | 25 | 0.984 | 18 | 0.709 | 5 | 0.197 | 3 | 0.118 | 28 | 1.102 | M5x12 |
| **PV90TN** | 82 | 3.228 | 105.5 | 4.154 | 4.197 | 0.165 | 28 | 1.102 | 22.5 | 0.886 | 6 | 0.236 | 1 | 0.039 | 25 | 0.984 | M6x12 |
| **PV90TA** | 85.5 | 3.366 | 109 | 4.291 | 3.197 | 0.126 | 28 | 1.102 | 24.5 | 0.965 | 6 | 0.236 | 5 | 0.197 | 38 | 1.496 | M8x13 |
| **PV115TN** | 102 | 4.016 | 136 | 5.354 | 5.2 | 0.205 | 40 | 1.575 | 28 | 1.102 | 8 | 0.315 | 1 | 0.039 | 35 | 1.378 | M10x20 |
| **PV115TA** | 110 | 4.331 | 144 | 5.669 | 4 | 0.157 | 50 | 1.969 | 35 | 1.378 | 10 | 0.394 | 1.8 | 0.071 | 40 | 1.575 | M12x22 |

# Dimensions – Flange Face (FB, FE & FN)

Free 3D Solid Models and drawings available at parkermotion.com




*AD = Adapter length. See how to order page for mounting kit adapter lengths.

## Metric & NEMA Frame Sizes

| | Frame Size | A Body Diameter mm | A Body Diameter in | B Bolt Hole mm | B Bolt Hole in | C Bolt Circle mm | C Bolt Circle in | D Pilot Diameter mm | D Pilot Diameter in | E Output Shaft Diameter mm | E Output Shaft Diameter in | F Output Shaft Length mm | F Output Shaft Length in | G Pilot Thickness mm | G Pilot Thickness in | H Flange Thickness mm | H Flange Thickness in | I Housing Diameter mm | I Housing Diameter in | J Lead Angle ° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Metric | PV40FB | 43 | 1.693 | 3.4 | 0.134 | 50 | 1.969 | 35 | 1.378 | 13 | 0.512 | 26 | 1.024 | 3 | 0.118 | 10 | 0.394 | 56 | 2.205 | 45 |
| | PV60FB | 62 | 2.441 | 5.5 | 0.217 | 70 | 2.756 | 50 | 1.969 | 16 | 0.630 | 25 | 0.984 | 2.5 | 0.098 | 10.3 | 0.406 | 80 | 3.150 | 45 |
| | PV60FN | 62 | 2.441 | 5.5 | 0.217 | 70 | 2.756 | 50 | 1.969 | 14 | 0.551 | 25 | 0.984 | 2.5 | 0.098 | 10.3 | 0.406 | 80 | 3.150 | 45 |
| | PV90FB | 90 | 3.543 | 6.5 | 0.256 | 100 | 3.937 | 80 | 3.150 | 20 | 0.787 | 40 | 1.575 | 3 | 0.118 | 14 | 0.551 | 116 | 4.567 | 45 |
| | PV90FN | 90 | 3.543 | 6.5 | 0.256 | 100 | 3.937 | 80 | 3.150 | 20 | 0.787 | 40 | 1.575 | 3 | 0.118 | 14 | 0.551 | 116 | 4.567 | 45 |
| | PV115FB | 115 | 4.528 | 8.5 | 0.335 | 130 | 5.118 | 110 | 4.331 | 24 | 0.945 | 50 | 1.969 | 3.5 | 0.138 | 18 | 0.709 | 152 | 5.984 | 45 |
| | PV115FN | 115 | 4.528 | 8.5 | 0.335 | 130 | 5.118 | 110 | 4.331 | 25 | 0.984 | 55 | 2.165 | 3.5 | 0.138 | 18 | 0.709 | 152 | 5.984 | 45 |

| | | A in | A mm | B in | B mm | C in | C mm | D in | D mm | E in | E mm | F in | F mm | G in | G mm | H in | H mm | I in | I mm | J ° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NEMA | PV17FE | 1.693 | 43 | 0.138 | 3.5 | 1.724 | 43.8 | 0.866 | 22 | 0.250 | 6.35 | 0.984 | 25 | 0.059 | 1.5 | 0.236 | 6 | 2.165 | 55 | 45 |
| | PV23FE | 2.441 | 62 | 0.195 | 4.95 | 2.625 | 66.675 | 1.500 | 38.1 | 0.375 | 9.525 | 1.000 | 25.4 | 0.098 | 2.5 | 0.374 | 9.5 | 3.150 | 80 | 45 |
| | PV34FE | 3.543 | 90 | 0.217 | 5.52 | 3.875 | 98.43 | 2.875 | 73.025 | 0.500 | 12.7 | 1.250 | 31.75 | 0.118 | 3 | 0.591 | 15 | 4.567 | 116 | 45 |
| | PV42FE | 4.528 | 115 | 0.281 | 7.14 | 4.949 | 125.7 | 2.187 | 55.55 | 0.625 | 15.875 | 1.500 | 38.1 | 0.094 | 2.4 | 0.787 | 20 | 5.984 | 152 | 45 |

| | Frame Size | K Rear Thickness mm | K Rear Thickness in | L1 Length (3 – 10 Ratios) mm | L1 Length (3 – 10 Ratios) in | L2 Length (12 – 100 Ratios) mm | L2 Length (12 – 100 Ratios) in | M Distance from Shaft End mm | M Distance from Shaft End in | N Keyway Length mm | N Keyway Length in | O Key Height mm | O Key Height in | P Keyway Width mm | P Keyway Width in | Q Shoulder Height mm | Q Shoulder Height in | R Shoulder Diameter mm | R Shoulder Diameter in | S Tap & Depth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Metric | PV40FB | 11 | 0.433 | 48.5 | 1.909 | 63 | 2.480 | 2.1 | 0.083 | 16 | 0.630 | 15 | 0.591 | 5 | 0.197 | 2 | 0.079 | 17.831 | 0.702 | M4x8 |
| | PV60FB | 16 | 0.630 | 71.5 | 2.815 | 91.5 | 3.602 | 3.2 | 0.126 | 16 | 0.630 | 18 | 0.709 | 5 | 0.197 | 1 | 0.039 | 28 | 1.102 | M5x12 |
| | PV60FN | 16 | 0.630 | 71.5 | 2.815 | 91.5 | 3.602 | 3.2 | 0.126 | 16 | 0.630 | 16 | 0.630 | 5 | 0.197 | 1 | 0.039 | 28 | 1.102 | M5x12 |
| | PV90FB | 17 | 0.670 | 90.5 | 3.563 | 119 | 4.685 | 3.197 | 0.126 | 28 | 1.102 | 22.5 | 0.886 | 6 | 0.236 | 1 | 0.039 | 38 | 1.496 | M6x12 |
| | PV115FB | 23 | 0.906 | 114.5 | 4.508 | 148.5 | 5.846 | 4.2 | 0.165 | 40 | 1.575 | 27 | 1.063 | 8 | 0.315 | 1.5 | 0.059 | 40 | 1.575 | M10x22 |
| | PV115FN | 23 | 0.906 | 114.5 | 4.508 | 148.5 | 5.846 | 4.2 | 0.165 | 40 | 1.575 | 27 | 1.063 | 8 | 0.315 | 1.5 | 0.059 | 40 | 1.575 | M10x22 |

| | | K in | K mm | L1 in | L1 mm | L2 in | L2 mm | M in | M mm | N in | N mm | O in | O mm | P in | P mm | Q in | Q mm | R in | R mm | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NEMA | PV17FE | 0.433 | 11 | 1.909 | 48.5 | 2.480 | 63 | – | – | – | – | – | – | – | – | 0.091 | 2.3 | 0.458 | 11.633 | – |
| | PV23FE | 0.630 | 16 | 2.382 | 60.5 | 3.169 | 80.5 | – | – | 0.748 | 19 | 0.372 | 9.444 | Flat | | 0.039 | 1 | 0.785 | 19.939 | M5x12 |
| | PV34FE | 0.670 | 17 | 3.228 | 82 | 4.154 | 105.5 | – | – | 1.063 | 27 | 0.561 | 14.247 | 0.125 | 3.175 | 0.039 | 1 | 0.984 | 25 | M6x12 |
| | PV42FE | 0.906 | 23 | 4.016 | 102 | 5.354 | 136 | 0.016 | 0.4 | 1.120 | 28.45 | 0.705 | 17.91 | 0.188 | 4.775 | – | – | – | – | M6x20 |

# PV Series Gearheads

## How to Order

Use the tables below to configure your PV gearhead and motor mounting kit part number.

| | ① | ② | ③ | ④ | ⑤ |
|---|---|---|---|---|---|
| **Order Example:** | PV | 40 | T | N | - 004 |

**Sizing/Selection Design Assistance**

To properly size and select a gearhead for a specific application requires consideration of several interrelated parameters including: speed, continuous torque, repetitive peak torque or acceleration torque, emergency stop torque, duty cycle, ambient temperature and radial and axial shaft load.

The 9 step procedure on pages 72-73 provides a straightforward method of selecting the correct gearhead for your application.

| ① Series | ② Frame Size | | ③ Front Face | | ④ Output Face Compatible | | ⑤ Ratio | |
|---|---|---|---|---|---|---|---|---|
| **PV**<br>**Power Versatility Series** | 40 | 40 mm | T | Tapped (round) | A<br>N | Alpha/Stober<br>Neugart | 004<br>005 | 4:1<br>5:1 |
| | | | F | Flanged (square) | B | Parker Bayside (PX) | 007 | 7:1 |
| | 17 | NEMA 17 | F | Flanged (square) | E | NEMA (English) | 010<br>016<br>020<br>025<br>035<br>040<br>050<br>070<br>100 | 10:1<br>16:1<br>20:1<br>25:1<br>35:1<br>40:1<br>50:1<br>70:1<br>100:1 |
| | 60 | 60 mm | T | Tapped (round) | A<br>N | Alpha/Stober<br>Neugart | 003<br>004 | 3:1<br>4:1 |
| | | | F | Flanged (square) | B<br>N | Parker Bayside (PX)<br>Neugart | 005<br>007 | 5:1<br>7:1 |
| | 23 | NEMA 23 | F | Flanged (square) | E | NEMA (English) | 010 | 10:1 |
| | 90 | 90 mm | T | Tapped (round) | A<br>N | Alpha/Stober<br>Neugart | 012<br>015 | 12:1<br>15:1 |
| | | | F | Flanged (square) | B | Parker Bayside (PX) | 020<br>025 | 20:1<br>25:1 |
| | 34 | NEMA 34 | F | Flanged (square) | E | NEMA (English) | 030 | 30:1 |
| | 115 | 115 mm | T | Tapped (round) | A<br>N | Alpha/Stober<br>Neugart | 040<br>050 | 40:1<br>50:1 |
| | | | F | Flanged (square) | B | Parker Bayside (PX) | 070 | 70:1 |
| | 42 | NEMA 42 | F | Flanged (square) | E | NEMA (English) | 100 | 100:1 |

# Mounting Kit Ordering Information

Know your motor and need our mounting kit part number? Use the charts below or use our Motor Mounting Search Tool on our website at:

**www.parkermotion.com**

| | ⑥ | ⑦ | ⑧ |
|---|---|---|---|
| **Order Example:** | MV | 60 | XXX |

| ⑥ Series | ⑦ Frame Size | | ⑧ Factory Assigned | |
|---|---|---|---|---|
| **MV** | 40 | 40 or 17 | XXX | See Motor Mounting Search Tool on parkermotion.com or consult factory for part number |
| **(Mounting kit for PV)** | 60 | 60 or 23 | | |
| | 90 | 90 or 34 | | |
| | 115 | 115 or 42 | | |

**Mounting Kit Adapter Length***

| Frame Size | Motor Shaft Length | | "AD" | |
|---|---|---|---|---|
| | mm | (in) | mm | (in) |
| **40/17** | 12 – 20 | (0.472 – 0.787) | 13.7 | (0.539) |
| | 20.1 – 25.4 | (0.791 – 1.000) | 19.0 | (0.748) |
| **60/23** | 16 – 25.4 | (0.630 – 1.000) | 16.5 | (0.650) |
| | 25.4 – 31.8 | (1.004 – 1.252) | 22.5 | (0.886) |
| **90/34** | 20 – 31.8 | (0.787 – 1.252) | 20.0 | (0.787) |
| | 31.9 – 40 | (1.256 – 1.575 | 28.5 | (1.122) |
| **115/42** | 22 – 40 | (0.866 – 1.575) | 24.0 | (0.945) |
| | 40.1 – 51 | (1.579 – 2.008) | 35.0 | (1.378) |

* Adapter length may vary depending on motor make and model.

**Recommended Parker Motor and Mounting Kit***

| Frame Size | Recommended Servo Motor | | | Recommended Stepper Motor | | |
|---|---|---|---|---|---|---|
| | Motor | Mounting Kit | AD Dimension | Motor | Mounting Kit | AD Dimension |
| **40 or 17** | BE16<br>SM16 | MV40-005 | 19 mm | LV17<br>HV17 | MV40-003 | 19 mm |
| **60 or 23** | BE23<br>SM23 | MV60-001<br>MV60-005 | 22.5 mm<br>16.5 mm | LV23<br>HV23 | MV60-002 | 16.5 mm |
| **90 or 34** | BE34<br>MPP092 | MV90-005<br>MV90-002 | 20 mm<br>28.5 mm | LV34<br>HV34 | MV90-005 | 20 mm |
| **115 or 42** | MPP100<br>MPP115 | MV115-039<br>MV115-010 | 24 mm<br>35 mm | | | |

*Parker MotionSizer sizing software available for free download at: www.parkermotion.com

# Stealth® MultiDrive Gearheads

## Stealth® MultiDrive Series:

## The Flexible Right Angle Gearhead Solution

Stealth® MultiDrive (MD) offers three different output options for true flexibility. MultiDrive models include low-ratio, dual-shaft and hollow-shaft options in a compact, right angle package. MultiDrive gearheads features Stealth helical gearing for high torque, high accuracy and quiet operation. With five frame sizes and multiple ratios to choose from, you are sure to find a Stealth MultiDrive to fit your servo motor application.

- **Space Saving: Compact, right-angle design saves space in many applications**
- **Low Backlash: Standard as low as 8 arc-minutes and 4 arc-minutes optional**
- **Smooth, Quiet Operation and Long Life: Hardened, precision spiral bevel gears ensure quiet operation**
- **Quick, Error-Free Mounting to any servo or stepper motor using Parker's ServoMount® design**
- **Sealed Unit: Seals and O-rings provide IP65 protection to prevent leaks and to protect against harsh environments**

**MultiDrive RT, RD and RB Series Precision Gearheads**

| Product Series | Configuration | Ratios | Gear Geometry | Performance | Frame Size (mm) | Continuous Torque Nm (in-lb) | Radial Load N (lbs) | Backlash arc-min |
|---|---|---|---|---|---|---|---|---|
| **RT** | Right Angle Hollow Shaft | 3, 9, 15, 21 and 30:1 | Helical | High Precision | 90 – 220 | 23 – 565 (204 – 5178) | 2800 – 7500 (692 – 1685) | <14 to <6 |
| **RD** | Right Angle Double Shaft | 1, 2, 3, 9, 15, 21 and 30:1 | Helical | High Precision | 90 – 220 | 30 – 150 (266 – 1328 | 2800 – 7500 (692 – 1685) | <14 to <6 |
| **RB** | Right Angle Low Ratio | 1, 2 and 3:1 | Helical | High Precision | 90 – 220 | 35 – 190 (266 – 1682) | 2800 – 7500 (692 – 1685) | <14 to <6 |

# Performance Specifications

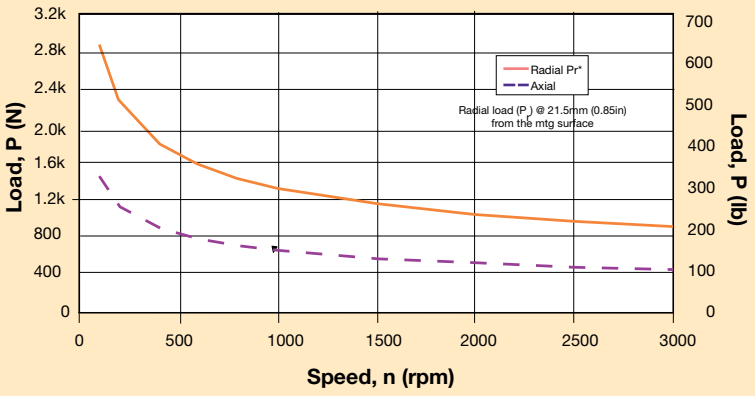
| | Units | Frame Size (RT, RD, RB) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Ratio | R_90 | R_115 | R_142 | R_180 | R_220 |
| **Nominal Output Torque $T_{nom\ r}$** | Nm (in-lb) | 1 | 23 (200) | 45 (400) | 113 (1000) | 192 (1700) | 508 (4500) |
| | | 2,3,9,15, 21,30 | 34 (300) | 90 (800) | 136 (1200) | 260 (2300) | 565 (5000) |
| **Max. Acceleration Output Torque $T_{acc\ r}$** | Nm (in-lb) | 1 | 28 (250) | 56 (500) | 141 (1250) | 240 (2125) | 636 (5625) |
| | | 2,3,9,15, 21,30 | 42 (375) | 113 (1000) | 169 (1500) | 324 (2875) | 636 (5625) |
| **Emergency (1) Stop Output Torque $T_{em\ r}$** | Nm (in-lb) | 1 | 45 (400) | 90 (800) | 226 (2000) | 384 (3400) | 1017 (9000) |
| | | 2,3,9, 15,21,30 | 68 (600) | 181 (1600) | 271 (2400) | 520 (4600) | 1130 (10,000) |
| **Nominal Input Speed, $N_{nom\ r}$** | RPM | 1,2,3 | 3000 | 2600 | 2200 | 1800 | 1400 |
| | | 9,15,21,30 | 3800 | 3400 | 3000 | 2400 | 1800 |
| **Max. Input Speed, $N_{max\ r}$** | RPM | 1,2,3 | 4000 | 3500 | 2900 | 2500 | 1600 |
| | | 9,15,21,30 | 5300 | 4500 | 3800 | 3000 | 2300 |
| **Standard Backlash** | arc-min | 1,2,3 | 10 | 9 | 9 | 8 | 8 |
| | | 9,15,21,30 | 12 | 11 | 11 | 10 | 10 |
| **Low Backlash** | arc-min | 1,2,3 | 6 | 5 | 5 | 4 | 4 |
| | | 9,15,21,30 | 8 | 7 | 7 | 6 | 6 |
| **Efficiency at Nominal Torque** | % | 1,2,3 | 95 | 95 | 95 | 95 | 95 |
| | | 9,15,21,30 | 92 | 92 | 92 | 92 | 92 |
| **Noise Level (2) at:** | dB | All | | | | | |
| **2,500 RPM** | | | 70 | 70 | 70 | — | — |
| **1,500 RPM** | | | — | — | — | 72 | 72 |
| **Torsional Stiffness** | Nm/arc-min (in-lb/arc-min) | All | 3 (28) | 6 (56) | 16 (140) | 43 (380) | 90 (800) |
| **Maximum Weight** | kg (lb) | All | 7 (16) | 13 (28) | 25 (56) | 54 (120) | 114 (250) |
| **Maximum Allowable Case Temperature** | °C | All | | | 100 | | |

(1) Maximum of 1,000 stops
(2) Measured at 1 meter

# Stealth® MultiDrive Gearheads

## MultiDrive RT/RD/RB Output Shaft Load Rating

### RT90/RD90/RB90

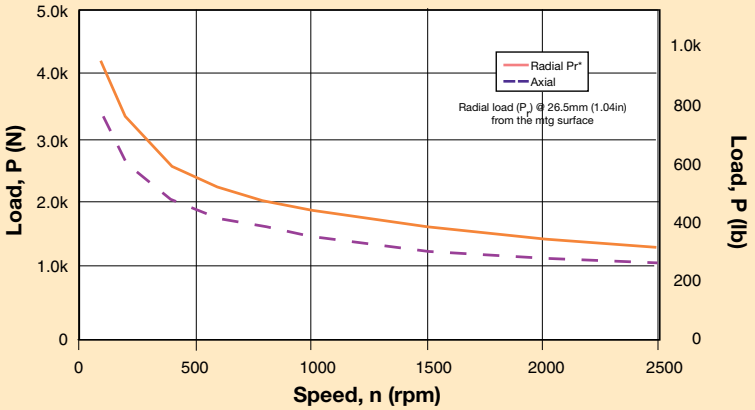



**Formulas to calculate radial load (Prx) at any distance "X" from the gearhead mounting surface:**

**Prx = Pr * 121 mm / (100 mm + X)**

**Prx = Pr * 4.76 in / (3.94 in + X)**

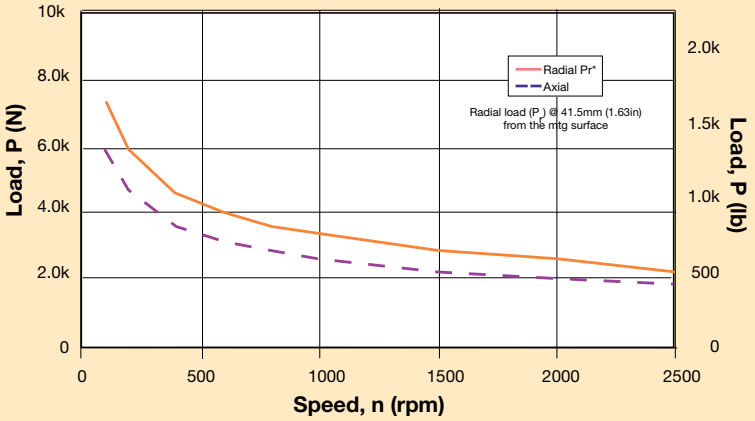
### RT115/RD115/RB115




**Prx = Pr * 151 mm / (125 + X)**

**Prx = Pr * 5.94 in / (4.92 in + X)**

### RT142/RD142/RB142

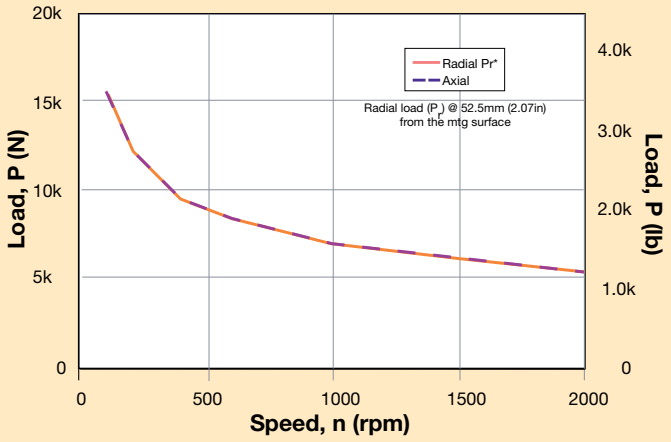



**Prx = Pr * 201 mm / (160 + X)**

**Prx = Pr * 7.91 in / (6.30 in + X)**

# MultiDrive RT/RD/RB Output Shaft Load Rating

## RT180/RD180/RB180

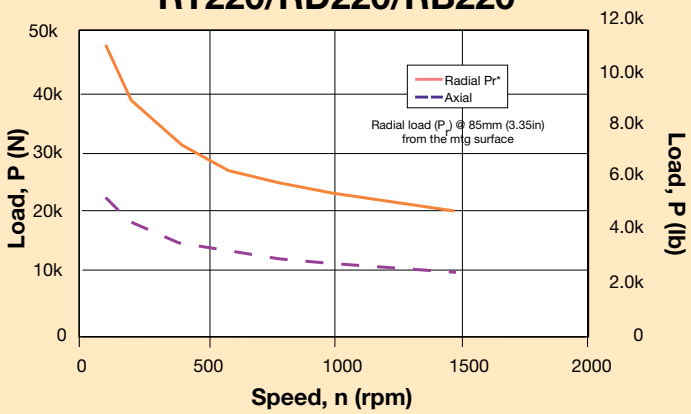



**Formulas to calculate radial load (Prx) at any distance "X" from the gearhead mounting surface:**

**Prx = Pr * 260 mm / (208 mm + X)**

**Prx = Pr * 10.24 in / (8.19 in + X)**

## RT220/RD220/RB220




**Prx = Pr * 352 mm / (267 + X)**

**Prx = Pr * 13.86 in / (10.5 in + X)**

### Inertia

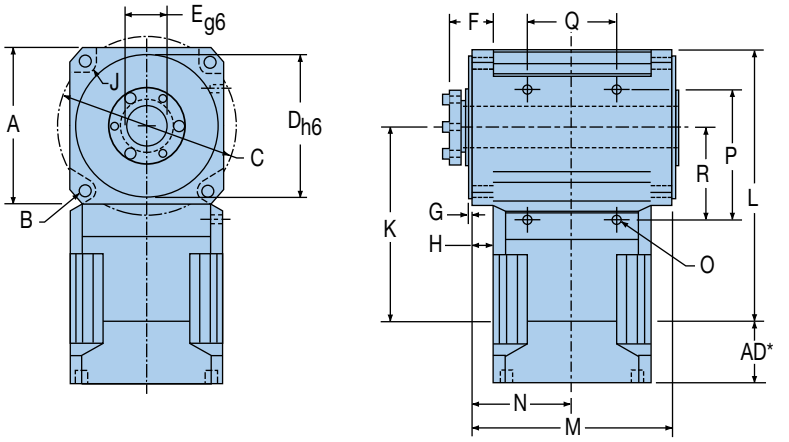
All moment of inertia values are as reflected at the input of the gearhead

| | | Frame Size (RT, RD, RB) | | | | |
|---|---|---|---|---|---|---|
| **Ratio** | **Units** | **R_90** | **R_115** | **R_142** | **R_180** | **R_220** |
| **1** | gm-cm-sec$^2$ | 3.28 | 11.0 | 38.7 | 101 | 444 |
| | oz-in-sec$^2$ | 0.046 | 0.153 | 0.538 | 1.41 | 6.17 |
| **2** | gm-cm-sec$^2$ | 4.17 | 11.3 | 32.8 | 95.4 | 274 |
| | oz-in-sec$^2$ | 0.058 | 0.157 | 0.455 | 1.32 | 3.81 |
| **3** | gm-cm-sec$^2$ | 2.68 | 7.75 | 22.3 | 65.6 | 191 |
| | oz-in-sec$^2$ | 0.037 | 0.108 | 0.311 | 0.911 | 2.65 |
| **9** | gm-cm-sec$^2$ | 1.07 | 3.28 | 10.4 | 35.8 | 119 |
| | oz-in-sec$^2$ | 0.015 | 0.046 | 0.145 | 0.497 | 1.66 |
| **15, 21, 30** | gm-cm-sec$^2$ | 0.566 | 2.09 | 5.36 | 17.9 | 62.6 |
| | oz-in-sec$^2$ | 0.008 | 0.029 | 0.075 | 0.248 | 0.869 |

# Stealth® MultiDrive Gearheads

## Dimensions – RT Hollow Shaft

Free 3D Solid Models and drawings available at parkermotion.com




*AD=Adapter Length. Adapter will vary, depending on motor. (Visit our website or consult the factory for details.)

| Frame Size | A Square Flange | | B Bolt Hole | | C Bolt Circle | | D Pilot Diameter | | E – Bore Diameter * | | F Taper Bushing Extension | | G Pilot Thickness | | H Flange Thickness | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| **RT90** | 90 | 3.543 | 6.5 | 0.256 | 100 | 3.937 | 80 | 3.150 | 22 | 0.866 | 26.5 | 1.043 | 3 | 0.118 | 12 | 0.472 |
| **RT115** | 115 | 4.528 | 8.5 | 0.335 | 130 | 5.118 | 110 | 4.331 | 30 | 1.181 | 31 | 1.220 | 3.5 | 0.138 | 14 | 0.551 |
| **RT142** | 142 | 5.591 | 11 | 0.433 | 165 | 6.496 | 130 | 5.118 | 38 | 1.496 | 43 | 1.693 | 3.5 | 0.138 | 20 | 0.787 |
| **RT180** | 182 | 7.165 | 13 | 0.512 | 215 | 8.465 | 160 | 6.299 | 48 | 1.890 | 54.2 | 2.134 | 10 | 0.394 | 25 | 0.984 |
| **RT220** | 220 | 8.661 | 17 | 0.669 | 250 | 9.843 | 180 | 7.087 | 60 | 2.362 | 74.1 | 2.917 | 15 | 0.591 | 35 | 1.378 |

| Frame Size | J Housing Recess | | K1 Distance to Output Centerline (For ratio = 3:1) | | K2 Distance to Output Centerline (For ratio > 3:1) | | L1 Housing Length (For ratio = 3:1) | | L2 Housing Length (For ratio > 3:1) | | M Housing Width | | N Distance to Input Centerline | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| **RT90** | 6.6 | 0.260 | 95 | 3.740 | 117 | 4.606 | 140 | 5.512 | 162 | 6.378 | 114 | 4.488 | 57 | 2.244 |
| **RT115** | 7.9 | 0.311 | 116 | 4.567 | 144.2 | 5.677 | 173.5 | 6.831 | 201.7 | 7.941 | 143 | 5.630 | 71.5 | 2.815 |
| **RT142** | 10.5 | 0.413 | 134 | 5.276 | 179 | 7.047 | 205 | 8.071 | 250 | 9.843 | 182 | 7.165 | 91 | 3.583 |
| **RT180** | 10 | 0.394 | 169 | 6.654 | 209.1 | 8.228 | 260 | 10.236 | 300.1 | 11.815 | 232 | 9.134 | 116 | 4.567 |
| **RT220** | 16 | 0.630 | 206 | 8.110 | 266 | 10.472 | 316 | 12.441 | 376 | 14.803 | 290 | 11.417 | 145 | 5.709 |

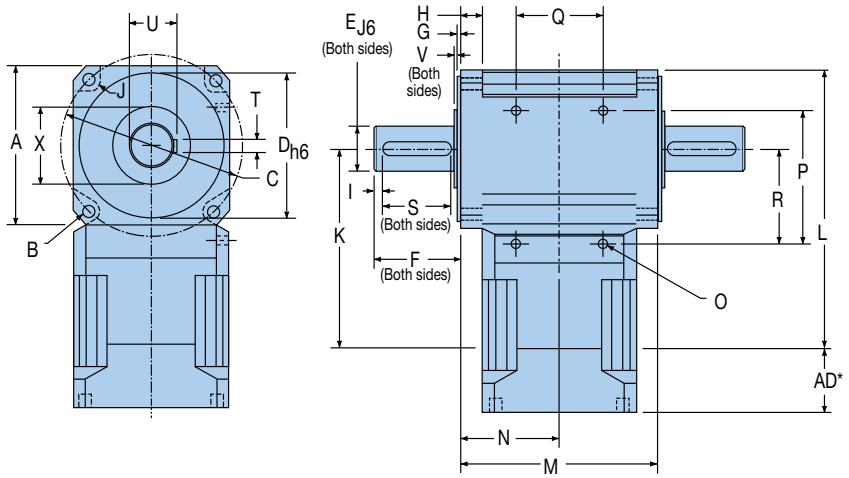
Both output flanges have identical dimensions.
*Maximum bushing bore diameter. Actual through bore of output shaft is larger. For additional bore diameter, contact Parker's Application Engineers for information.

### Foot Mounting Holes Location

| Frame Size | O Thread Size x Depth | P | | Q | | R | |
|---|---|---|---|---|---|---|---|
| | | mm | in | mm | in | mm | in |
| **RT90** | M4x6 | 80 | 3.150 | 60 | 2.362 | 60 | 2.362 |
| **RT115** | M6x9 | 100 | 3.937 | 70 | 2.756 | 75 | 2.953 |
| **RT142** | M8x12 | 120 | 4.724 | 80 | 3.150 | 85 | 3.346 |
| **RT180** | M10x15 | 160 | 6.299 | 100 | 3.937 | 110 | 4.331 |
| **RT220** | M12x20 | 195 | 7.677 | 130 | 5.118 | 136 | 5.354 |

# Dimensions – RD Dual Shaft

Free 3D Solid Models and drawings available at parkermotion.com




*AD=Adapter Length. Adapter will vary, depending on motor. (Visit our website or consult the factory for details.)

| Frame Size | A Square Flange | | B Bolt Hole | | C Bolt Circle | | D Pilot Diameter | | E Output Shaft Diameter | | F Output Shaft Length | | G Pilot Thickness | | H Flange Thickness | | I Distance from Shaft End | | J Housing Recess | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| **RT90** | 90 | 3.543 | 6.5 | 0.256 | 100 | 3.937 | 80 | 3.150 | 20 | 0.787 | 40 | 1.575 | 3 | 0.118 | 12 | 0.472 | 5 | 0.197 | 6.6 | 0.260 |
| **RT115** | 115 | 4.528 | 8.5 | 0.335 | 130 | 5.118 | 110 | 4.331 | 24 | 0.945 | 50 | 1.969 | 3.5 | 0.138 | 14 | 0.551 | 7 | 0.276 | 7.9 | 0.311 |
| **RT142** | 142 | 5.591 | 11 | 0.433 | 165 | 6.496 | 130 | 5.118 | 40 | 1.575 | 80 | 3.150 | 3.5 | 0.138 | 20 | 0.787 | 8 | 0.315 | 10.5 | 0.413 |
| **RT180** | 182 | 7.165 | 13 | 0.512 | 215 | 8.465 | 160 | 6.299 | 50 | 1.969 | 95 | 3.740 | 10 | 0.394 | 25 | 0.984 | 6 | 0.236 | 10 | 0.394 |
| **RT220** | 220 | 8.661 | 17 | 0.669 | 250 | 9.843 | 180 | 7.087 | 75 | 2.953 | 155 | 6.102 | 15 | 0.591 | 35 | 1.378 | 8 | 0.315 | 16 | 0.630 |

| Frame Size | K1 Distance to Output Centerline (For ratio = 3:1) | | K2 Distance to Output Centerline (For ratio > 3:1) | | L1 Housing Length (For ratio = 3:1) | | L2 Housing Length (For ratio > 3:1) | | M Housing Width | | N Distance to Input Centerline | | S Keyway Length | | T Keyway Thickness | | U Keyway Height | | V Shoulder Height | | X Shoulder Diameter | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| **RT90** | 95 | 3.740 | 117 | 4.606 | 140 | 5.512 | 162 | 6.378 | 114 | 4.488 | 57 | 2.244 | 28 | 1.102 | 6 | 0.236 | 22.5 | 0.886 | 2.5 | 0.098 | 45 | 1.575 |
| **RT115** | 116 | 4.567 | 144.2 | 5.677 | 173.5 | 6.831 | 201.7 | 7.941 | 143 | 5.630 | 71.5 | 2.815 | 32 | 1.260 | 8 | 0.315 | 27 | 1.063 | 2.5 | 0.098 | 50 | 1.969 |
| **RT142** | 134 | 5.276 | 179 | 7.047 | 205 | 8.071 | 250 | 9.843 | 182 | 7.165 | 91 | 3.583 | 63 | 2.480 | 12 | 0.472 | 43 | 1.693 | 2.5 | 0.098 | 50 | 1.969 |
| **RT180** | 169 | 6.654 | 209.1 | 8.228 | 260 | 10.236 | 300.1 | 11.815 | 232 | 9.134 | 116 | 4.567 | 70 | 2.756 | 14 | 0.551 | 53.5 | 2.106 | 2.5 | 0.098 | 55 | 2.165 |
| **RT220** | 206 | 8.110 | 266 | 10.472 | 316 | 12.441 | 376 | 14.803 | 290 | 11.417 | 145 | 5.709 | 100 | 3.937 | 20 | 0.787 | 79.5 | 3.130 | 2.5 | 0.098 | 100 | 3.937 |

Both output flanges have identical dimensions.

## Foot Mounting Holes Location

| Frame Size | O Thread Size x Depth | P | | Q | | R | |
|---|---|---|---|---|---|---|---|
| | | mm | in | mm | in | mm | in |
| **RT90** | M4x6 | 80 | 3.150 | 60 | 2.362 | 60 | 2.362 |
| **RT115** | M6x9 | 100 | 3.937 | 70 | 2.756 | 75 | 2.953 |
| **RT142** | M8x12 | 120 | 4.724 | 80 | 3.150 | 85 | 3.346 |
| **RT180** | M10x15 | 160 | 6.299 | 100 | 3.937 | 110 | 4.331 |
| **RT220** | M12x20 | 195 | 7.677 | 130 | 5.118 | 136 | 5.354 |

## Encoder Mounting Option

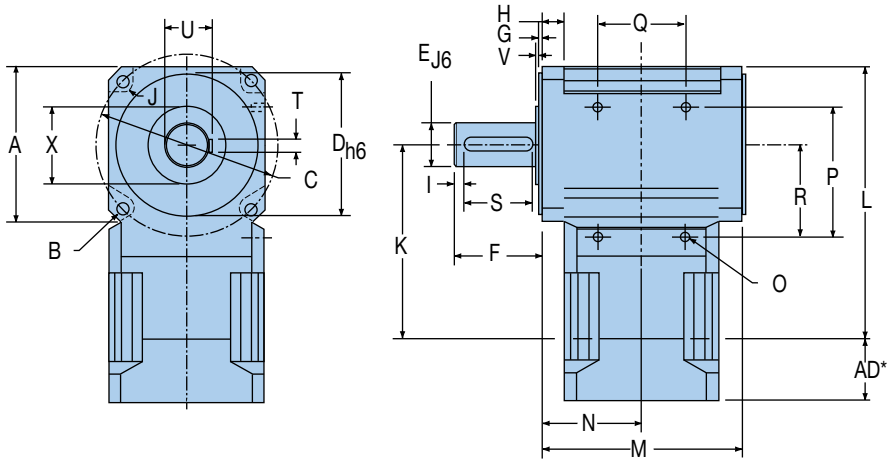
| | Dimensions For All Frame Sizes – mm (in) |
|---|---|
| **Shaft Diameter** | 9.525 (0.375) |
| **Shaft Length** | 19.050 (0.750) |
| **Bolt Circle** | 74.981 (2.952) |
| **Tapped Holes** | M4x6 (Min. Depth) |
| **Encoder (Not Supplied)** | DRC C25, BEI E25, RENCO C2520 |

An additional flange is required on the gearhead for encoder mounting. it will increase the thickness of one output flange by 10mm.

# Stealth® MultiDrive Gearheads

## Dimensions – RB Low Ratio

Free 3D Solid Models and drawings available at parkermotion.com




*AD=Adapter Length. Adapter will vary, depending on motor. (Visit our website or consult the factory for details.)

| Frame Size | A Square Flange | | C Bolt Circle | | E Output Shaft Diameter | | F Output Shaft Length | | G Pilot Thickness | | H Flange Thickness | | I Distance from Shaft End | | J Housing Recess | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| **RT90** | 90 | 3.543 | 100 | 3.937 | 20 | 0.787 | 40 | 1.575 | 3 | 0.118 | 12 | 0.472 | 5 | 0.197 | 6.6 | 0.260 |
| **RT115** | 115 | 4.528 | 130 | 5.118 | 24 | 0.945 | 50 | 1.969 | 3.5 | 0.138 | 14 | 0.551 | 7 | 0.276 | 7.9 | 0.311 |
| **RT142** | 142 | 5.591 | 165 | 6.496 | 40 | 1.575 | 80 | 3.150 | 3.5 | 0.138 | 20 | 0.787 | 8 | 0.315 | 10.5 | 0.413 |
| **RT180** | 182 | 7.165 | 215 | 8.465 | 50 | 1.969 | 95 | 3.740 | 10 | 0.394 | 25 | 0.984 | 6 | 0.236 | 10 | 0.394 |
| **RT220** | 220 | 8.661 | 250 | 9.843 | 75 | 2.953 | 155 | 6.102 | 15 | 0.591 | 35 | 1.378 | 8 | 0.315 | 16 | 0.630 |

| Frame Size | K Distance to Output Centerline | | L Housing Length | | M Housing Width | | N Distance to Input Centerline | | S Keyway Length | | T Keyway Thickness | | U Keyway Height | | V Shoulder Height | | X Shoulder Diameter | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| **RT90** | 95 | 3.740 | 140 | 5.512 | 114 | 4.488 | 57 | 2.244 | 28 | 1.102 | 6 | 0.236 | 22.5 | 0.886 | 2.5 | 0.098 | 45 | 1.575 |
| **RT115** | 116 | 4.567 | 173.5 | 6.831 | 143 | 5.630 | 71.5 | 2.815 | 32 | 1.260 | 8 | 0.315 | 27 | 1.063 | 2.5 | 0.098 | 50 | 1.969 |
| **RT142** | 134 | 5.276 | 205 | 8.071 | 182 | 7.165 | 91 | 3.583 | 63 | 2.480 | 12 | 0.472 | 43 | 1.693 | 2.5 | 0.098 | 50 | 1.969 |
| **RT180** | 169 | 6.654 | 260 | 10.236 | 232 | 9.134 | 116 | 4.567 | 70 | 2.756 | 14 | 0.551 | 53.5 | 2.106 | 2.5 | 0.098 | 55 | 2.165 |
| **RT220** | 206 | 8.110 | 316 | 12.441 | 290 | 11.417 | 145 | 5.709 | 100 | 3.937 | 20 | 0.787 | 79.5 | 3.130 | 2.5 | 0.098 | 100 | 3.937 |

Both output flanges have identical dimensions.

### Foot Mounting Holes Location

| Frame Size | O Thread Size x Depth | P | | Q | | R | |
|---|---|---|---|---|---|---|---|
| | | mm | in | mm | in | mm | in |
| **RT90** | M4x6 | 80 | 3.150 | 60 | 2.362 | 60 | 2.362 |
| **RT115** | M6x9 | 100 | 3.937 | 70 | 2.756 | 75 | 2.953 |
| **RT142** | M8x12 | 120 | 4.724 | 80 | 3.150 | 85 | 3.346 |
| **RT180** | M10x15 | 160 | 6.299 | 100 | 3.937 | 110 | 4.331 |
| **RT220** | M12x20 | 195 | 7.677 | 130 | 5.118 | 136 | 5.354 |

# Stealth® MultiDrive How to Order

Choose gearhead series, frame size, ratio, backlash and orientation from the chart below.

**Gearhead Ordering Information**

| | ① | ② | ③ | ④ | | ⑤ | ⑥ |
|---|---|---|---|---|---|---|---|
| **Order Example:** | RD | 142 | E | 003 | - | XXX | LB |

| ① Series | | ② Frame Size (mm) | ③ Encoder | ④ Ratio | ⑤ Special | ⑥ Backlash |
|---|---|---|---|---|---|---|
| **RB** | **Low Ratio** | 090<br>115<br>142<br>180<br>220 | — | 001, 002, 003 | Factory Assigned (Only if needed) | Blank = Standard<br>LB = Low |
| **RD** | **Dual Shaft** | 090<br>115<br>142<br>180<br>220 | E | 001, 002, 003, 009, 015, 021, 030 | | |
| **RT** | **Hollow Shaft** | 090<br>115<br>142<br>180<br>220 | — | 003, 009, 015, 021, 030 | | |

**Mounting Kit Ordering Information**

For 1:1, 2:1 and 3:1 ratios, mounting kit is: MD (frame size)-ratio-xxx. For example MD90-001

For 9:1 or higher, , mounting kit is: MT (frame size)-ratio-xxx. For example MD90-021

Parker MotionSizer sizing software available for free download at: www.parkermotion.com

**Recommended Parker Motor and Mounting Kit**

| Frame Size | Ratio | Recommended Servo Motor | | | Recommended Stepper Motor | | |
|---|---|---|---|---|---|---|---|
| | | Motor | Mounting Kit | AD Dimension | Motor | Mounting Kit | AD Dimension |
| **90** | 1:1, 2:1, 3:1 | BE34<br>MPP092 | MD90-209<br>MD90-016 | 24.5 mm | LV34<br>HV34 | MD90-209 | 24.5 mm |
| | 9:1 or Higher | BE34<br>MPP092 | MT90-005<br>MT90-051 | 35.3 mm<br>44 mm | LV34<br>HV34 | MT90-005 | 35.3 mm |
| **115** | 1:1, 2:1, 3:1 | MPP092<br>MPP115 | MD115-017<br>MD115-010 | 26.5 mm<br>34.4-mm | | | |
| | 9:1 or Higher | MPP092<br>MPP115 | MT115-045<br>MT115-010 | 43.2 mm<br>51 mm | | | |
| **142** | 1:1, 2:1, 3:1 | MPP115<br>MPP142 | MD142-010<br>MD142-013 | 40.8 mm<br>36 mm | | | |
| | 9:1 or Higher | MPP115<br>MPP142 | MT142-010<br>MT142-146 | 58 mm<br>75 mm | | | |
| **180** | 1:1, 2:1, 3:1 | MPP142<br>MPP190 | MD180-123<br>MD180-125 | 36.4 mm<br>48 mm | | | |
| | 9:1 or Higher | MPP142<br>MPP190 | MT180-131<br>MT180-096 | 67.5 mm<br>109 mm | | | |
| **220** | 1:1, 2:1, 3:1 | MPP190<br>MPP220 | MD220-<br>MD-220 | Consult Factory | | | |
| | 9:1 or Higher | MPP190<br>MPP220 | MT220-021<br>MT220-022 | 104 mm<br>138 mm | | | |

**Sizing/Selection Design Assistance**

To properly size and select a gearhead for a specific application requires consideration of several interrelated parameters including: speed, continuous torque, repetitive peak torque or acceleration torque, emergency stop torque, duty cycle, ambient temperature and radial and axial shaft load.

The 9 step procedure on pages 72-73 provides a straightforward method of selecting the correct gearhead for your application.

# NEMA Spur Gearheads

## NE Series NEMA Spur Gearheads

Parker's NEMA gearheads feature a high-efficiency spur- gear design, in a light, compact package. Designed to mount directly to the face of NEMA face stepper and servo motors, NEMA gearheads are ideal for applications requiring low weight and low starting torque.

- **Ratios from 3:1 to 100:1**
- **Lightweight, aluminum housing and spur gearing**
- **Compact, short overall length and direct mounting to NEMA 23, 34 and 42 frame size motors**
- **Low friction, low running torque, ideal for stepper motors**


| Product Series | Gear Geometry | Configuration | Frame Size | Continuous Torque (Nm) | Ratios | Backlash arc-min | IP Rating |
|---|---|---|---|---|---|---|---|
| **NE** | Spur | In-Line | NEMA 23, 34, 42 | 50 – 350 | 3, 5, 8, 10, 15, 20, 30, 50, 100 | 10 – 30 | IP54 |

### Direct Mount to NEMA Frame Motors

Gearheads attach directly to motors with NEMA mounting dimensions (see tables on following pages.) Parker's clamp-on-pinion and mounting hardware are included with gearheads, so your motor can be up and running in a matter of minutes.

### Adapter Mount to Non-NEMA Frame Motors

For motors with non-NEMA dimensions, Parker supplies a mounting kit including a clamp-on-pinion, adapter plate and all necessary hardware. When ordering, simply provide the part number or outline drawing of your motor, and the gearhead will be shipped ready to mount.

# Performance Specifications

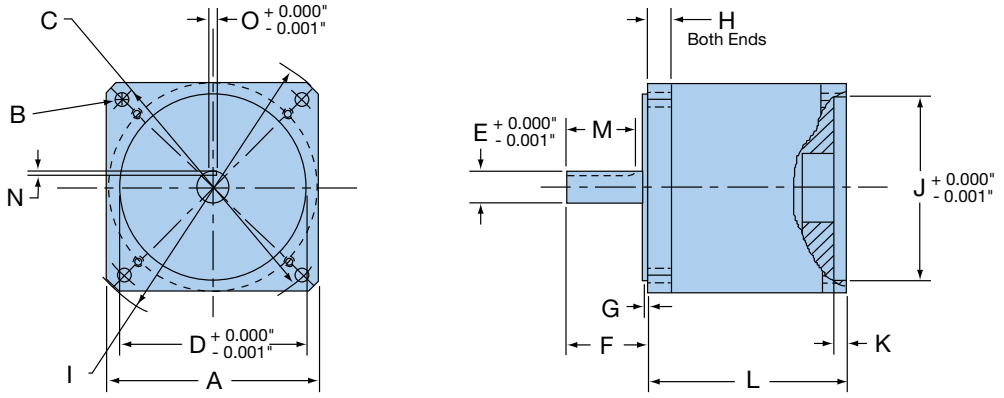
| | | Frame Size | | | |
|---|---|---|---|---|---|
| | **Units** | **Ratio** | **NE23** | **NE34** | **NE42** |
| **Nominal Output Torque $T_{nom\ r}$** | Nm (in-lb) | 3 | 2 (16) | 7 (64) | 14 (123) |
| | | 5 | 3 (27) | 12 (107) | 23 (205) |
| | | 8-10 | 5 (40) | 16 (142) | 28 (250) |
| | | 15 | 5 (46) | 19 (170) | 34 (300) |
| | | 20 – 100 | 6 (50) | 20 (180) | 40 (350) |
| **Max. Acceleration Output Torque $T_{acc\ r}$** | Nm (in-lb) | 3 | 3 (24) | 11 (95) | 21 (185) |
| | | 5 | 5 (40) | 18 (160) | 35 (307) |
| | | 8 – 10 | 7 (60) | 24 (210) | 42 (375) |
| | | 15 | 8 (70) | 29 (255) | 51 (450) |
| | | 20 – 100 | 9 (75) | 31 (270) | 59 (525) |
| **Nominal Input Speed $N_{nom\ r}$** | RPM | All | 4000 | 4000 | 4000 |
| **Max. Input Speed $N_{maxr}$** | RPM | All | 5500 | 5000 | 4500 |
| **Standard Backlash [1)]** | arc-min | 3, 5, 8, 10 | 30 | 25 | 25 |
| | | 15 – 100 | 20 | 20 | 20 |
| **Low Backlash [1)]** | arc-min | 3, 5, 8, 10 | 15 | 15 | 15 |
| | | 15 – 100 | 10 | 10 | 10 |
| **Efficiency at Nominal Torque** | % | All | 98% | 98% | 98% |
| **Moment of Inertia** | gm-cm-sec$^2$ (oz-in-sec$^2$) | All | 0.0051 (0.00007) | 0.0408 (0.0005) | 0.306 (0.004) |
| **Maximum Weight** | kg (lb) | All | 0.5 (1.0) | 1.4 (3.0) | 3.0 (6.0) |
| **Radial Load [2)]** | N (lb) | All | 90 (20) | 350 (80) | 890 (200) |
| **Axial Load** | N (lb) | All | 45 (10) | 135 (30) | 265 (60) |

1) Measured at 2% of rated torque
2) Radial loads are measured at 12.7mm (0.5in) from the gearhead mounting surface. These ratings are based on gearhead making more than one revolution on output shaft.

# NEMA Spur Gearheads

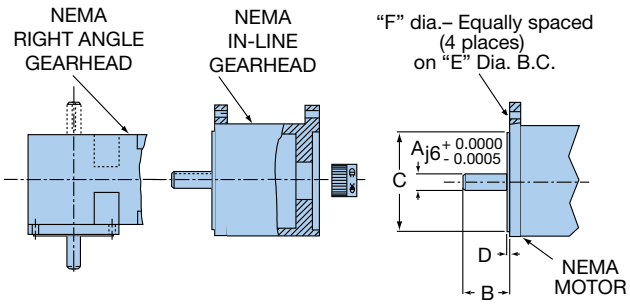
## Dimensions – NE NEMA Spur Gearhead

Free 3D Solid Models and drawings available at parkermotion.com




| Frame Size | A Square Flange mm | A Square Flange in | B Bolt Hole mm | B Bolt Hole in | C Bolt Circle mm | C Bolt Circle in | D Pilot Diameter mm | D Pilot Diameter in | E Output Shaft Diameter mm | E Output Shaft Diameter in | F Output Shaft Length mm | F Output Shaft Length in | G Pilot Thickness mm | G Pilot Thickness in | H Flange Thickness mm | H Flange Thickness in |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **NE 23** | 58 | 2.27 | 5.0 | 0.195 | 66.7 | 2.625 | 38.1 | 1.500 | 9.5 | 0.375 | 25.4 | 1.00 | 1.6 | 0.062 | 5 | 0.19 |
| **NE 34** | 83 | 3.25 | 5.5 | 0.218 | 98.4 | 3.875 | 73.0 | 2.875 | 12.7 | 0.500 | 31.8 | 1.25 | 1.7 | 0.067 | 10 | 0.38 |
| **NE 42** | 107 | 4.20 | 7.1 | 0.281 | 125.7 | 4.950 | 55.5 | 2.187 | 15.9 | 0.625 | 38.1 | 1.50 | 2.4 | 0.093 | 13 | 0.50 |

| Frame Size | I Housing Diameter mm | I Housing Diameter in | J Input Pilot Diameter mm | J Input Pilot Diameter in | K Input Pilot Depth mm | K Input Pilot Depth in | L Housing Length mm | L Housing Length in | M Keyway Length (Flat) mm | M Keyway Length (Flat) in | N Keyway Depth (Flat) mm | N Keyway Depth (Flat) in | O Keyway Width mm | O Keyway Width in |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **NE 23** | 3.00 | 76 | 1.501 | 38.13 | 0.125 | 3.2 | 2.30 | 58 | 0.75 | 19 | 0.015 | 0.4 | — | — |
| **NE 34** | 4.38 | 111 | 2.876 | 73.05 | 0.200 | 5.1 | 3.00 | 76 | 1.06 | 27 | 0.072 | 1.8 | 0.124 | 3.15 |
| **NE 42** | 5.63 | 143 | 2.188 | 55.58 | 0.187 | 4.7 | 3.75 | 95 | 1.13 | 29 | 0.108 | 2.7 | 0.187 | 4.75 |




### NEMA Motor Mounting Dimensions

| Dimension | | NE23 mm | NE23 in | NE34 mm | NE34 in | NE42 mm | NE42 in |
|---|---|---|---|---|---|---|---|
| **A** | Motor Shaft Diameter | 6.4 | 0.250 | 9.5/12.7 | 0.375/0.500 | 15.9 | 0.625 |
| **B** | Motor Shaft Length | 20.6 | 0.810 | 31.8 | 1.250 | 35.1 | 1.380 |
| **C** | Pilot Diameter | 38.1 | 1.500 | 73.0 | 2.875 | 55.5 | 2.186 |
| **D** | Pilot Length | 1.6 | 0.063 | 1.6 | 0.063 | 2.4 | 0.093 |
| **E** | Mounting Bolt Circle | 66.7 | 2.625 | 98.4 | 3.875 | 125.7 | 4.950 |
| **F** | Bolt Hole Size | 5.0 | 0.195 | 5.5 | 0.218 | 7.1 | 0.281 |

# NE Series NEMA Gearheads How to Order

Choose gearhead series, frame size, ratio, backlash and orientation from the chart below.

### Gearhead Ordering Information

| | ① | ② | | ③ | | | | ④ |
|---|---|---|---|---|---|---|---|---|
| **Order Example:** | NE | 34 | - | 010 | - | XXX | - | LB |

| ① | ② | ③ | ④ |
|---|---|---|---|
| **Series** | **Frame Size** | **Ratio** | **Backlash** |
| **NE** | 23<br>34<br>42 | 003, 005, 008, 015, 020, 030, 050, 100 | Blank = Standard<br>LB = Low |

### Recommended Parker Motor and Mounting Kit

| Frame Size | Recommended Servo Motor | | | Recommended Stepper Motor | | |
|---|---|---|---|---|---|---|
| | **Motor** | **Mounting Kit** | **AD Dimension** | **Motor** | **Mounting Kit** | **AD Dimension** |
| **23** | BE23 | MM23-136 | 0.78 in | LV23<br>HV23 | MM23-000 | No adapter<br>(pinion gear only) |
| **34** | BE34 | MM34-016 | No adapter<br>(pinion gear only) | LV34<br>HV34 | MM34-171 | 0.65 in |

Parker MotionSizer sizing software available for free download at: www.parkermotion.com

**Sizing/Selection Design Assistance**

To properly size and select a gearhead for a specific application requires consideration of several interrelated parameters including: speed, continuous torque, repetitive peak torque or acceleration torque, emergency stop torque, duty cycle, ambient temperature and radial and axial shaft load.

The 9 step procedure on pages 72-73 provides a straightforward method of selecting the correct gearhead for your application.

# Servo Wheel™ Integral Gearmotors

## Compact Wheel Drives for Electric Vehicles

**Combining servo motor, gearing and wheel design makes system integration easy**

The Servo Wheel™ combines a brushless DC motor with planetary gears in a lightweight, aluminum housing to provide a compact solution for vehicle control. The Power Wheel's unique design makes system integration easy. You no longer have to purchase the motor, gearhead, wheel, electronics and bracket from different sources. Parker does all of the work for you. From component sourcing to actual assembly, Parker engineers designed the Power Wheel with your application in mind. All you have to do is bolt it up and go!

### Single-Piece Construction Motor Shaft

The first stage's planetary section sun gear is integrated into the single-piece construction motor shaft, to provide higher reliability in a compact package.

### Planetary Gears

The planetary input stage provides a first pass reduction that is capable of carrying high torques with high input speeds in a small package.

### Integrated Output Stage

The second stage planetary's unique design uses two planets for higher efficiency. Built entirely into the wheel, it utilizes an otherwise wasted area to provide a compact, space-saving package. Two large diameter bearings support the weight, protecting the gears from shock loading and dramatically increasing the radial load carrying capacity of the wheels.

**Features:**

**Brushless DC motor amplifiers designed for common motion profiles in battery powered vehicles**

- **12, 24, 36 and 48 volt operation**
- **Current and temperature feedback control for safe, reliable operation**
- **Multiple input architectures for easy communication with higher-level controllers and navigation systems**

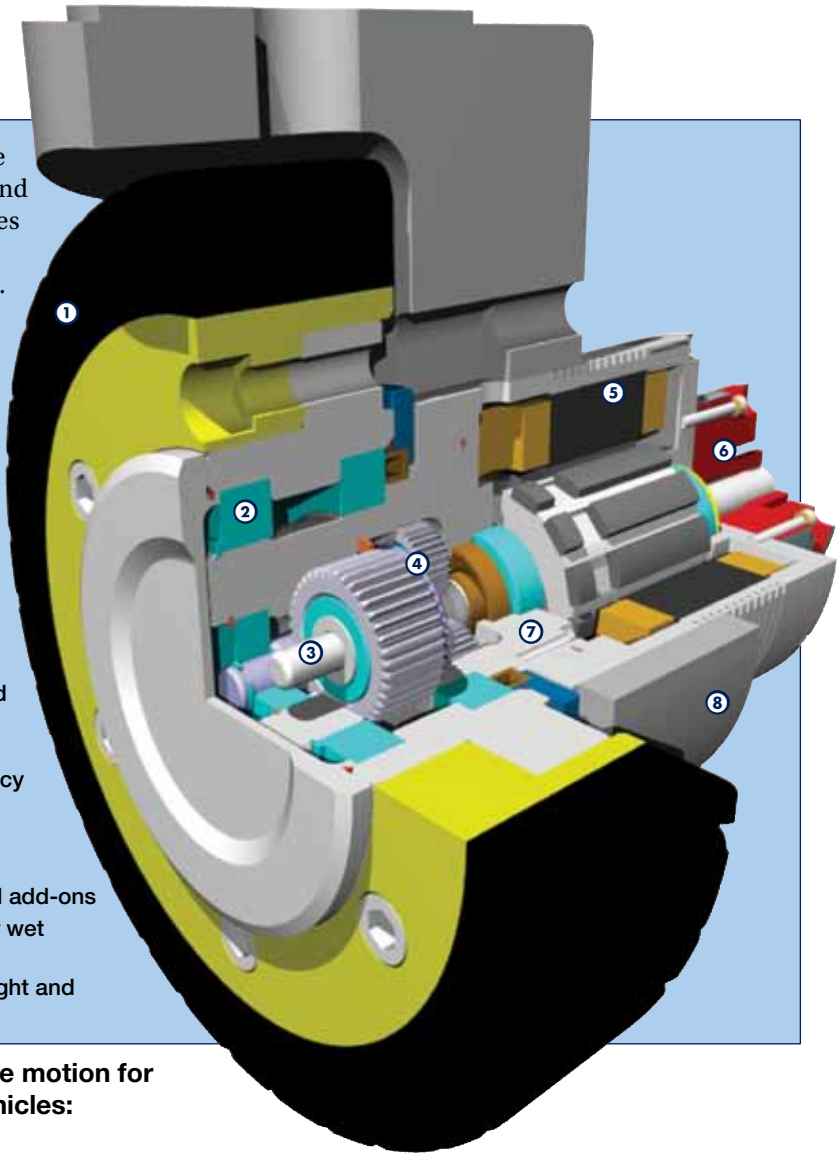
**Permanent magnet brushless motors**

- **High efficiency for longer run times between battery charges**
- **Greater power to size ratio for a compact package**
- **Integral hall sensors for motor TRAP commutation**
- **Long life and maintenance free-operation**
- **High input speeds in excess of 10,000 RPM**
- **No internal sparking – safe in explosive environments**
- **Low EMI, eliminating the need for heavy shielding**

# Planetary gears provide high torque-carrying capability in a small package

The gears are built into the hub of the wheel, making the package compact and lightweight. This design also increases the radial load-carrying and shock loading capacity of the entire system.

Polyurethane tires are ideal for applications in hospitals, schools, and airports – any place requiring non-marking materials. This material is also ideal for high load carrying applications like material handling.




### Design Features

1. Polyurethane antistatic tires
2. High load capacity ball bearings to accommodate heavy vehicle loads
3. Single piece stainless steel gears and shaft for high quality and reliability
4. Dual stage planetary gear design delivers high torque and high efficiency in a compact package
5. Brushless motor provides efficient, maintenance-free power
6. Encoder/brake extension for optional add-ons
7. Sealed unit for operation in hostile or wet environments
8. Aluminum alloy housing reduces weight and provides optimum heat dissipation

**Servo Wheel™ Drive System provide motion for small, battery-powered, electric vehicles:**

- **Automated cleaning equipment**
- **Health care equipment**
- **Robotic & material handling equipment**
- **AGV's**

# Servo Wheel™ Integral Gearmotors

## Performance Specifications*

| | | High Speed Motor Performance Models | | | | High Torque Motor Performance Models | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Wheel Diameter (inches)** | **Ratio** | **Max Speed (mph)** | **Wheel RPM @ Max Speed** | **Continuous Torque (in -lb)** | **Peak Torque** | **Max Speed (mph)** | **Wheel RPM @ Max Speed** | **Continuous Torque (in -lb)** | **Peak Torque** |
| **6** | 20:1 | 3.5 | 196 | 150 | 450 | 3.0 | 168 | 340 | 1020 |
| | 24:1 | 2.7 | 151 | 180 | 540 | 2.5 | 140 | 408 | 1224 |
| | 30:1 | 2.3 | 128 | 225 | 675 | 2.0 | 112 | 510 | 1530 |
| | 36:1 | 2.0 | 112 | 270 | 810 | 1.5 | 84 | 612 | 1836 |
| **8** | 20:1 | 4.5 | 189 | 150 | 450 | 3.8 | 159 | 340 | 1020 |
| | 24:1 | 3.6 | 151 | 180 | 540 | 3.0 | 126 | 408 | 1224 |
| | 30:1 | 3.0 | 126 | 225 | 675 | 2.5 | 105 | 510 | 1530 |
| | 36:1 | 2.5 | 105 | 270 | 810 | 2.0 | 84 | 612 | 1836 |

* All models have a maximum load capacity of 1000 lbs. Performance based on 24 volt operation. Other performance requirements may be met with a different power supply or choice of different motor winding. Please contact Parker Application Engineering to inquire about these options.

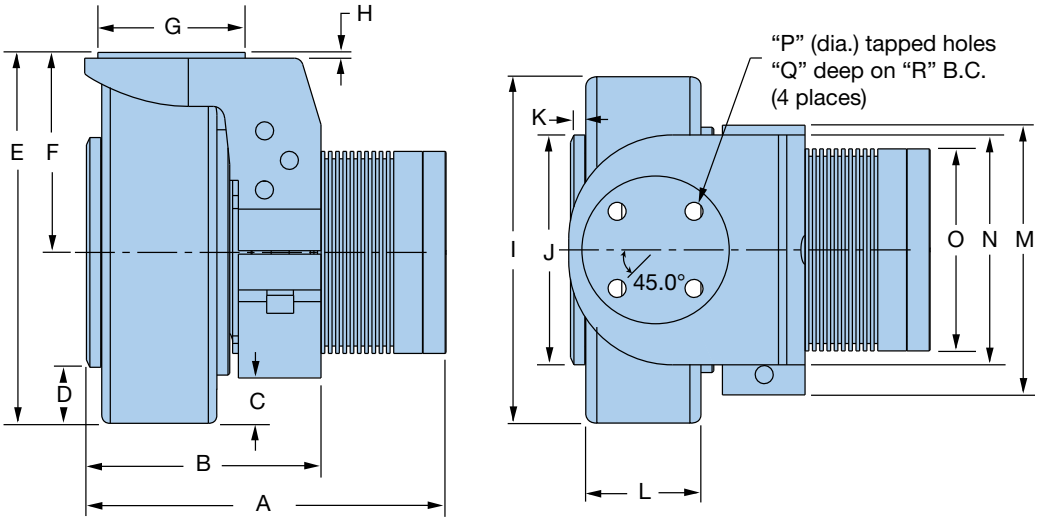
## Motor Constants**

| | Units | High Speed Motor Performance Models | High Torque Motor Performance Models |
|---|---|---|---|
| **Stall Current Continuous** | Arms<br>Amps DC | 22.2<br>27.1 | 41.5<br>50.8 |
| **Peak Current** | Arms<br>Amps DC | 70.0<br>85.7 | 131.1<br>160.6 |
| **Voltage Constant** | V/rad/s<br>Vrms/krpm | 0.0377<br>2.79 | 0.0515<br>3.81 |
| **Torque Constant** | Nm/Arms<br>oz-in/Amp DC | 0.046<br>5.33 | 0.06<br>7.29 |
| **Resistance** | ohm | 0.070 | 0.033 |
| **Inductance** | mH | 0.1 | 0.1 |
| **DC bus Voltage** | VDC | 24 | 24 |
| **Winding Thermal Resistance**<br>**Ambient**<br>**Case** | °C/W | <br>1.68<br>0.56 | <br>1.02<br>0.32 |
| **Temperature**<br>**Ambient**<br>**Max Winding** | °C | <br>25<br>155 | <br>25<br>155 |
| **Thermal Time Constant**<br>**Motor**<br>**Winding** | minutes | <br>22<br>1.7 | <br>28<br>2.8 |
| **Rotor Shaft**<br>**Viscous Damping**<br>**Dynamic Friction** | Nm/krpm<br>Nm | <br>0.0021<br>0.0060 | <br>0.0068<br>0.0193 |
| **Number of rotor magnet poles** | | 8 | 12 |

** Motors used as standard are Parker K064100-3D motor for High Speed Models and K089100-1D winding for High Torque Models.

# Dimensions

Free 3D Solid Models and drawings available at parkermotion.com




| Wheel Diameter (in) | Motor Performance | A* Without Brake | | B | | C | | D | | E | | F | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| 6 | High Speed | 158.75 | 6.25 | 104.1 | 4.1 | 20.3 | 0.8 | 25.4 | 1.0 | 165.1 | 6.5 | 87.9 | 3.46 |
| | High Torque | 175.26 | 6.90 | 104.1 | 4.1 | 20.3 | 0.8 | 25.4 | 1.0 | 165.1 | 6.5 | 87.9 | 3.46 |
| 8 | High Speed | 158.75 | 6.25 | 104.1 | 4.1 | 45.7 | 1.8 | 50.8 | 2.0 | 218.4 | 8.6 | 116.8 | 4.60 |
| | High Torque | 175.26 | 6.90 | 104.1 | 4.1 | 45.7 | 1.8 | 50.8 | 2.0 | 218.4 | 8.6 | 116.8 | 4.60 |

| Wheel Diameter (in) | Motor Performance | G | | H | | I | | J | | K | | L | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| 6 | High Speed | 65.0 | 2.559 | 2.54 | 0.1 | 152.4 | 6.0 | 101.1 | 3.98 | 6.86 | 0.27 | 50.8 | 2.0 |
| | High Torque | 65.0 | 2.559 | 2.54 | 0.1 | 152.4 | 6.0 | 101.1 | 3.98 | 6.86 | 0.27 | 50.8 | 2.0 |
| 8 | High Speed | 65.0 | 2.559 | 2.54 | 0.1 | 203.2 | 8.0 | 101.1 | 3.98 | 6.86 | 0.27 | 50.8 | 2.0 |
| | High Torque | 65.0 | 2.559 | 2.54 | 0.1 | 203.2 | 8.0 | 101.1 | 3.98 | 6.86 | 0.27 | 50.8 | 2.0 |

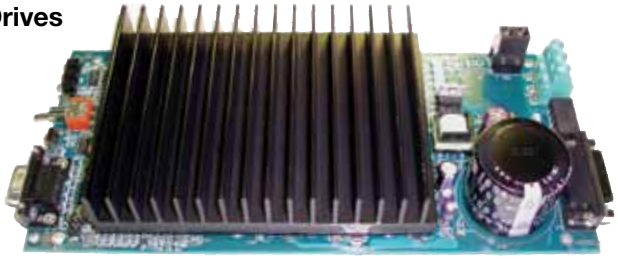
| Wheel Diameter (in) | Motor Performance | M | | N | | O | | P | | Q | | R | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mm | in | mm | in | mm | in | mm | in | mm | in | mm | in |
| 6 | High Speed | 118.6 | 4.67 | 101.1 | 3.98 | 88.9 | 3.5 | 7.94 | 5.16 | 25.4 | 1.0 | 47.98 | 1.889 |
| | High Torque | 118.6 | 4.67 | 101.1 | 3.98 | 88.9 | 3.5 | 7.94 | 5.16 | 25.4 | 1.0 | 47.98 | 1.889 |
| 8 | High Speed | 118.6 | 4.67 | 101.1 | 3.98 | 88.9 | 3.5 | 7.94 | 5.16 | 25.4 | 1.0 | 47.98 | 1.889 |
| | High Torque | 118.6 | 4.67 | 101.1 | 3.98 | 88.9 | 3.5 | 7.94 | 5.16 | 25.4 | 1.0 | 47.98 | 1.889 |

* Consult factory for increased length with encoder and on brake option.

# Servo Wheel™ Integral Gearmotors

## Digital Servo Amplifier Accessory

**Provides High Current Control for Servo Wheel™ Drives**



This digital servo amplifier provides DSP-based digital closed-loop, four-quadrant PWM control of force or torque of permanent magnet, linear or rotary, brush or brushless DC motors. Our PWM current control algorithm, current sensing method, and advanced switching scheme yields performance comparable to a linear servo amplifier.

This digital drive will reduce expensive motor drive stocking requirements because it will control brush-type, brushless-trapezoidal and brushless-sinusoidal motors.

Setup is easy. The operating configuration – motor type, motor parameters, operating voltage, peak and continuous current limits and system parameters for velocity or position control are all input by the user to a PC-based setup program that automatically downloads the information, with the computed algorithm, into the flash memory of the drive via an RS-232 port. The drive can be reconfigured at any time by running the setup-program.

**Features**

- **High-performance DSP-based servo controls motor force or torque. Control of velocity or position using the motor's Hall of encoder signals is an option**
- **Controls brush-type, brushless-trapezoidal and brushless-sinusoidal motors**
- **User inputs motor parameters, voltage, peak and continuous current limit into Windows-based setup software. Setup software automatically downloads the algorithm for a 2kHz current loop bandwidth via RS-232 communications**
- **Proprietary PWM software controlled switching scheme yields ultra-low ripple at low current levels, zero crossover distortion, and minimizes EMI in noise sensitive applications**
- **Differential amplifiers accept a single ±10V analog current command for trapezoidal brushless and brush type motors**
- **Optional inputs allow digital commands through the RS-232 or serial peripheral interface**
- **3 output current ranges and scale factors available**
- **Optically isolated digital inputs for Enable/ Reset, Brake, and ±Travel Limits**
- **Motor current monitor output, and optically isolated digital outputs provide controller fault indication**
- **Configurator program provides drive status and fault history via RS-232 link**
- **Fault protection makes this drive virtually indestructible**
- **Operates from one low-cost 24 – 48 VDC unregulated power supply or battery**

# Specifications

| Part Number | 11564041 | 11564045 |
|---|---|---|
| Input Power Bus | 24 to 48 VDC | 24 to 48 VDC |
| Continuous Output Power (Max.) | 450 watts[1] | 1350 watts[1] |
| Continuous Output Current | 10 amps[1] | 15 amps[1] |
| Peak Output Current | 20 amps[1] (1 sec typ.) | 40 amps[1] |
| Scale Factor ( A / V ) | 2 | 6 |
| Voltage @ Continuous Output Current | Input Bus Voltage – 3 Volts Typ. | Input Bus Voltage – 3 Volts Typ.l |
| Max Heat Sink Temperature | Disables if >70°C | Disables if >70°C |
| Current Loop Bandwidth | 2 kHz Typ. | 2 kHz Typ. |
| Switching Frequency | 40 kHz | 40 kHz |
| Minimum Maintenance | 100 UH | 100 UH |
| Weight | 25 oz | 25 oz |

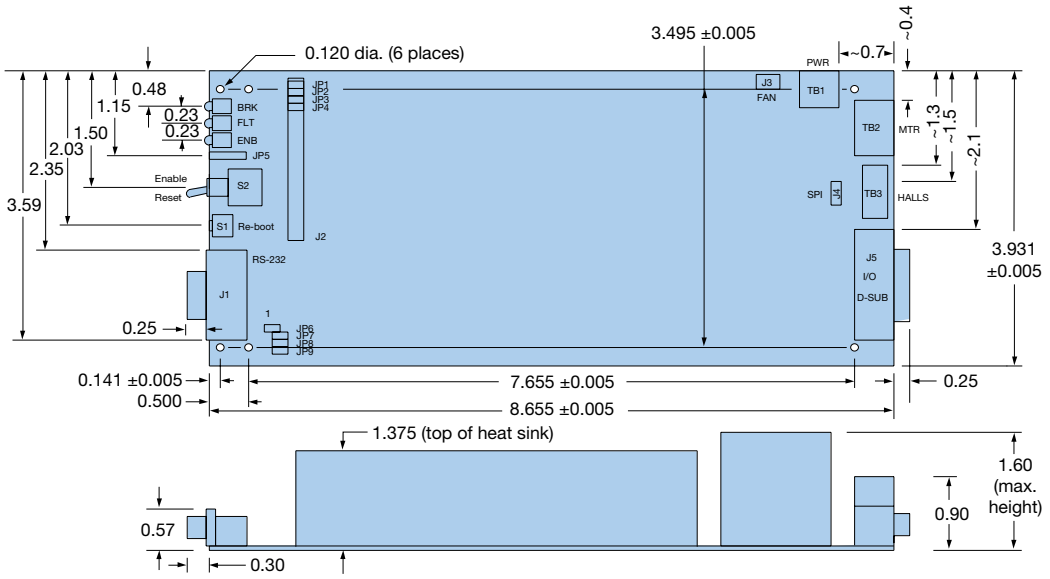
1 Depends on ambient operating temperature and heat sink. For the >10 amperes continuous output, we recommend forced convection cooling with a minimum airflow of 100 CFM. Consult factory for assistance.

# Operating Control Signals and Indicators

| | |
|---|---|
| Input Analog Control Signal | ±10 Volts |
| Digital Input Commands | Rs-232, SPI |
| Peak Current limit | Software adjustable |
| Continuous Current Limit | Software adjustable |
| Drive Enable/Reset | 5V logic, optically isolated |
| (+) Travel Limit | 5V logic, optically isolated |
| (-) Travel Limit | 5V logic, optically isolated |
| Brake | 5V logic, optically isolated |
| Fault and/or Brake Status | 5V logic, optically isolated |
| Drive Enabled indicator | Green LED |
| Brake Indicator | Red LED |
| Fault Indicator | Red LED |
| Digital Hall Effect Sensors | 3 channels,+5 Volts,Gnd |

# Mounting Dimensions

**(inches)**



# Servo Wheel™ Integral Gearmotors

## DX Series Servo Wheel How to Order

Choose wheel size, ratio, motor performance, supply voltage, tire material, and brake option from the chart below.

**Servo Wheel Ordering Information**

| | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ |
|---|---|---|---|---|---|---|---|
| **Order Example:** | DX | A | 1 | 1 | K | S | 3 |

| ① Series | ② Wheel Size (Diameter) | ③ Ratio | ④ Motor Performance | ⑤ Supply Voltage | ⑥ Tire Material | ⑦ Brake/Encoder |
|---|---|---|---|---|---|---|
| **DX** | A = 6”<br>B = 8” | 1 = 20:1<br>2 = 24:1<br>3 = 30:1<br>4 = 36:1 | 1 = High speed<br>2 = High torque | K = 24 VDC<br>X = Other | S = Polyurethane black x tread<br>R = Polyurethane black<br>(Other tire compositions available upon request) | 0 = None<br>1 = Encoder<br>2 = Brake<br>3 = Encoder & Brake (50 in-lb) |

# Related Products from Parker

## K Series Frameless Kit Motors

Frameless kit motors are the ideal solution for machine designs that require high performance in small spaces. Kit motors are directly integrated with the drive train, resulting in a smaller, more reliable motor package.

Direct drive motion construction also gives equipment designers the advantages of lower costs, increased reliability and improved performance.

**When to Use**

- **A significant cost savings**
- **Reduced mechanical complexity**
- **Greater design flexibility**
- **High performance in a compact package**
- **Improved dynamic response and settling**
- **Minimum motor size per application space**
- **Low cogging for smooth operation**
- **Low inertia for high acceleration**

**Features**

- **High peak torque up to 93.37 Nm (826.4 in-lb)**
- **High speeds up to 50,000 RPM**
- **Superior performance – high stiffness and better response**
- **High reliability – no mechanical couplings**
- **Compact design – minimizes product size**
- **Low cogging - special orientation of the laminations and odd slot count**
- **Very low torque ripple at low speeds for smooth and precise rotary motion**

## MPP/MPJ Series Rotary Servo Motors

The MaxPlusPlus (MPP) family of brushless servo motors is redefining performance, flexibility, and reliability. The industry's highest-performing servo motor uses eight-pole segmented lamination technology, which produces more torque in a shorter package. Use MaxPlusPlus motors for higher torque applications, customization options, or when high performance is required.

When higher inertia is desired to improve system performance, the MPJ is the perfect choice. It includes all the same features and benefits of the MPP, but increases the rotor inertia by 3 to 8 times over the standard MPP.

- **MPP – 92 to 270 mm frame sizes**
  **MPJ – 92 to 142 mm frame sizes**
- **1.5 to 158 Nm (13 to 1398 in-lb) continuous stall torque**
- **4.3 to 402 Nm (38.1 to 3558 in-lb) peak torque**
- **Very high torque-to-inertia ratio**
- **Right-angle rotatable connectors**
- **Seven different feedback devices including encoder, serial encoder, resolver, Heidenhain and Stegmann single and multi-turn absolute encoders**
- **IP64 standard, IP65 optional**
- **Special shaft, front flange, and feedback devices available**
- **CE and UL**

# Related Products from Parker

## RD Series Direct Drive Servo Rotary Positioners

Parker direct drive rotary stages feature a robust construction and high performance in a compact package, providing smooth, near frictionless motion with zero backlash.

Featuring an integral brushless DC servo motor, these rotary stages offer several distinct advantages over traditional worm gear-driven stages. The elimination of the worm gearing offers the ability to reduce wear with zero backlash while exhibiting near frictionless motion.

The RD's high positioning accuracy, solely based on the stage's encoder, provides repeatability within 2 encoder counts, with resolutions down to 1.4 arc-seconds. The RD Direct Drive features speeds up to 700 RPM with significant torque capability.

- **Robust bearing design for high load capacity**
- **Integrated brushless motor features high copper slot fill and rare earth magnets for maximum torque efficiency**
- **In-line rotary encoder for direct position feedback. Also includes once per rev index mark**
- **Aluminum or stainless steel precision ground top plate for accurate mounting**
- **Motor rotor and top plate shaft as one-piece construction for high stiffness**
- **Sub "D" connectors for "plug & play" operation and simple connectivity**

## Compax3 Servo Drives & Drive/Controllers

With its high performance and modular design, the Compax3 family of industrial servo drives and drive/controllers offers a new level of servo performance and flexibility.

Enhanced by the IEC 61131-3 programming environment, the modular structure of the Compax3 family allows options such as intelligent motion controllers, fieldbus interfaces and industry standard motor feedback.

Available in single- or multi-axis configurations, with numerous expansion options, all models are rated for 120 – 480 VAC input, continuous current output from 2.5 A (rms) to 155 A (rms), and are CE (EMC &LVD) and UL compliant.

**Compax3 Drive**

- **5V/24V step/direction and ±10V analog command**
- **Resolver, encoder or high-resolution SinCos® Hiperface™ and Endat 2.1**
- **Torque, velocity or position control modes**
- **Encoder tracking capability**

**Compax3 Drive/Controller**

- **Available as:**
  **– servo positioning**
  **– programmable positioning with function modules according to PLCopen**
  **– advanced programmable positioning with electronic camming, gearing, etc.**
- **Certified safety technology integrated into drive (EN954-1 Category 3)**
- **Fieldbus options: DeviceNet, Profibus, CANopen, ETHERNET Powerlink and RS232**
- **Supports all five IEC 61131-3 programming languages and continuous flow chart**
- **Resolver, encoder or high-resolution Sin/Cos®, Hiperface™, Endat 2.1 and SSI feedback devices**

# Aries Servo Drives & Drive/Controllers

The Aries Series are compact, easy-to-use servo motor drives and drive/controllers. Aries is a cost-effective and flexible digital servo solution where users are required to pay for only the performance they need. All models are CE (EMC & LVD), UL compliant.

### Aries Drive

The Aries Drive is standard as a torque-only amplifier, but is software selectable to run in velocity mode. An optional step-and-direction version is also available.

- **120/240 VAC input**
- **100 to 3000 W power levels**
- **Plug in and spin – no set up required; auto-configures when used with Parker's "smart encoder" motor**
- **Drive Talk – ACR9000 controller can access all drive parameters**
- **Supported feedback devices include Smart encoder, quadrature encoder, Heidenhain EnDat absolute encoder and resolver**

### Aries Drive/Controller

The Aries Controller combines the versatile and cost-effective Aries digital servo drive platform with the advanced control capabilities of the ACR servo controller into a single-axis drive/controller.

- **Ethernet TCP/IP communications**
- **400 to 1300 W power levels**
- **1 1/2 axis encoder input for camming, following, and gearing**
- **Up to 16 multi-tasking programs**
- **Set-up and auto-tuning via ACR-View SDK**
- **Supports EtherNet/IP**

# HPLA/HLE Series Industrial Belt-Driven Positioners

The HLE/HPLA linear modules are ideal as single-axis products or as components for high-speed multi-axis gantries. With thousands of units in operation worldwide, the HPLA/HLE Series are proven performers offering long life and with trouble-free operation.

With flexible design options for bearing selection, profile size, stroke length, and motor/gearbox combination, the HPLA/HLE design has your application covered.

- **Rugged construction for heavy duty applications**
- **Thrust force capacity to 5455 N**
- **Standard travel up to 9 meters**
- **Velocity up to 5 meters/sec.**
- **Positional repeatability of ±0.2 mm**
- **Timing belt and pulley drive mechanism for fast, accurate positioning**
- **Increased system stiffness due to larger belt width**
- **Low-maintenance sealed bearings**
- **Hollow-shaft input option for higher axial forces**
- **Steel-wheel or square-rail designs for normal load capacities up to 15 kN**
- **Quiet operation**
- **Corrosion-resistant option for harsh environments**
- **IP30 seal design**

# Gearhead Sizing/Selection

## Stealth® Gearhead 9 Step Sizing/Selection Procedure

To properly select an appropriate gearhead for a specific application requires consideration of several interrelated parameters including:

- **Speed**
- **Continuous torque**
- **Repetitive peak torque or acceleration torque**
- **Emergency stop torque**
- **Duty cycle**
- **Ambient temperature**
- **Radial and axial shaft load**

The following 9 step procedure provides a quick, straightforward method for selecting a gearhead that will provide an L-10 life of 10,000 hours.

### 1) Load Parameters

Evaluate the following requirements of the load:

Load inertia
Acceleration time ($t_{acc}$)
Continuous run time ($t_{cont}$)
Deceleration time ($t_{dec}$)
Dwell time ($t_{dwel}$)
Maximum continuous speed ($N_{cont}$)

From these, calculate:

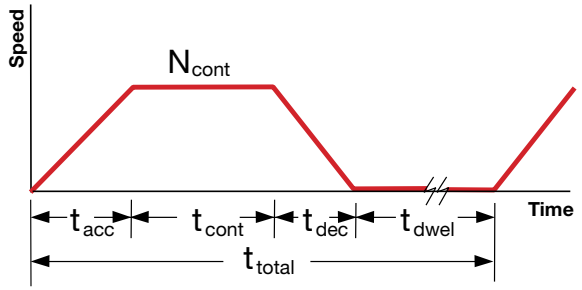
Acceleration torque ($T_{acc}$)
Continuous torque ($T_{cont}$)
Deceleration torque ($T_{dec}$)
Dwell torque ($T_{dwel}$)*

*Although not used in the following torque calculations, torque requirements during dwell (zero speed) must be considered when selecting gearhead size.

### 2) Duty Cycle

Determine if the application duty cycle is **intermittent** or continuous by calculating the duty cycle as follows:

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

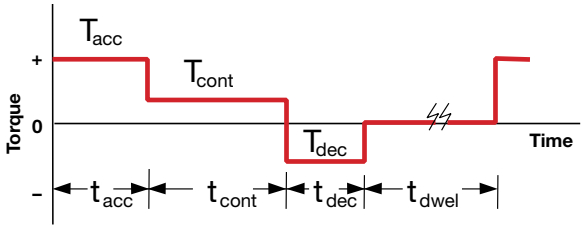



If the duty cycle is <60% and ($t_{acc}+t_{cont}+t_{dec}$) is less than 20 minutes, the motion is considered **intermittent**.

If the duty cycle is ≥60% and ($t_{acc}+t_{cont}+t_{dec}$) is greater than 20 minutes, the motion is considered **continuous**.

### 3) Calculate the Root Mean Cube Output Torque

$$T_{mean} = \sqrt[3]{\frac{\left[\frac{(T_{acc}^3)(N_{cont})(t_{acc})}{2} + (T_{cont}^3)(N_{cont})(t_{cont}) + \frac{(T_{dec}^3)(t_{dec})}{2}\right]}{\left[\frac{(N_{cont})(t_{acc})}{2} + (N_{cont})(t_{cont}) + \frac{(N_{cont})(t_{dec})}{2}\right]}}$$




### 4) Select Gearhead Type and Size

Choose the gearhead type (PS, PX, etc) and frame size to match the motor frame size.

### 5) Check Selected Gearhead Size Ratings

Check the specifications of the gearhead selected and confirm that it meets the following criteria:

$$\text{Rated nominal torque } (T_{nom\ r}) \geq T_{mean}$$

$$\text{Rated accel torque } (T_{acc\ r}) \geq T_{acc} \text{ or } T_{dec}$$

### 6) Determine Maximum Allowable Gearhead Ratio

Using the selected gearhead's listed specification for maximum rated speed ($N_{maxr}$), determine the maximum allowable ratio:

$$\text{Maximum ratio} = N_{maxr} / N_{cont}$$

### 7) Calculate the Mean and Maximum Input Speed

Choose a ratio for the selected gearhead (must be less than the maximum determined in Step 6). With this ratio, calculate the mean input speed ($N_{mean\ i}$) and the maximum input speed ($N_{max\ i}$):

$$N_{mean\ i} = \left(\frac{\frac{(N_{cont})(t_{acc})}{2} + (N_{cont})(t_{cont}) + \frac{N_{cont})(t_{dec})}{2}}{t_{acc} + t_{cont} + t_{dec}}\right)(\text{ratio})$$

$$N_{max\ i} = (N_{cont})\ (\text{ratio})$$

Note: Reflected inertia requirement may determine the actual ratio, as long as it does not exceed the maximum ratio value calculated in Step 6.

### 8) Determine Thermal (KT) and Shock (KS) Factor

Use the selected gearhead's specifications and the K Factor charts below to compensate for thermal and shock torque effects to comply with the following:

**For continuous duty**: $T_{nom\ r} > (T_{mean})(K_T)(K_S)$

**For intermittent duty**: $T_{nom\ r} > (T_{mean})(K_S)$

#### $K_T$ Thermal Factor

This factor derates the transmitted torque to prevent case temperature from exceeding 100°C. The KT values shown in the table below are for 25°C ambient temperature, medium-size indoor space, with the gearheads mounted to a metal base with a surface area more than 3 times larger than the gearhead surface area.

#### $K_S$ Shock Factor

This factor is used to derate the transmitted torque when the application is not well defined, has random duty cycles or experiences varying peak torques subjecting the gear teeth to torques above the estimated torques. $K_S$ factor values are shown below for three general application categories. $K_S$ values are independent of gearhead size. If your application does not fit into one of these categories, contact Parker to discuss your requirements.

### 9) Confirm Selection

Using the selected gearhead's listed specifications and the calculations from the previous steps, check that the following criteria are met:

- $T_{accr}$ must be greater than the larger of $T_{acc}$ or $T_{dec}$
- Check the emergency stop torque rating
- $N_{nomr}$ must be greater than $N_{mean\ i}$
- $N_{maxr}$ must be greater than $N_{max\ i}$
- Verify radial and axial shaft load

If any of the above comparisons are not met, then:

- Choose a larger gearhead
- Reevaluate the ratio
- Reevaluate the torque
- Reevaluate the speed
- Reevaluate the duty cycle
- Reevaluate shaft load

### $K_S$ Shock Factor

| Load Type | Application | KS |
|---|---|---|
| **Known Load Data** | All Industries | 1.00 |
| **Unknown Load Data – Light** | Textiles, liquid mixers, can filling, food, conveyors, plastics, fans | 1.25 |
| **Unknown Load Data – Moderate** | Paper mills, rubber industry, sugar industry, metal mills, lumber, robotics | 1.50 |

### $K_T$ Thermal Factor

| Frame Size | Ratio | KT Factor @ Designated Output Speed (RPM) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 100 | 200 | 400 | 600 | 800 | 1000 | 1500 | 2000 | 2500 | 3000 |
| **PV40** | | 1 | 1 | 1 | 1 | 1 | 1 | — | — | — | — |
| **PS, PX, PV, RS60** | | 1 | 1 | 1 | 1 | 1 | 1 | — | — | — | — |
| **PS, PX, PV, RS90** | | 1 | 1 | 1 | 1 | 1 | 1.2 | — | — | — | — |
| **PS, PX, RS115** | | 1 | 1 | 1 | 1 | 1.2 | 1.5 | — | — | — | — |
| **PS, RS142** | | 1 | 1 | 1 | 1.3 | 1.7 | — | — | — | — | — |
| **PS, RS180** | 1 stage (1) | 1 | 1 | 1.5 | 2.3 | — | — | — | — | — | — |
| | 2 stage (2) | 1.1 | 1.5 | — | — | — | — | — | — | — | — |
| **PS, RS220** | 1 stage (1) | 1 | 1.2 | 2.1 | 3.2 | — | — | — | — | — | — |
| | 2 stage (2) | 1.3 | 2.5 | — | — | — | — | — | — | — | — |
| **PS ,RS300** | 1 stage (1) | 1 | 1.5 | 3.1 | — | — | — | — | — | — | — |
| | 2 stage (2) | 1.9 | — | — | — | — | — | — | — | — | — |
| **RT, RD, RB90** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1.25 | 1.5 |
| | 2-30 | 1 | 1 | 1 | 1 | 1 | 1 | 1.1 | — | — | — |
| **RT, RD, RB115** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1.3 | 1.7 | — |
| | 2-30 | 1 | 1 | 1 | 1 | 1 | 1.3 | 2 | — | — | — |
| **RT, RD, RB142** | 1 | 1 | 1 | 1 | 1 | 1 | 1.3 | 2 | 2.7 | 3.4 | — |
| | 2-30 | 1 | 1 | 1 | 1 | 1.3 | 1.6 | — | — | — | — |
| **RT, RD, RB180** | 1 | 1 | 1 | 1 | 1 | 1.3 | 1.7 | 2.5 | 3.4 | — | — |
| | 2-30 | 1 | 1 | 1 | 1.4 | 1.8 | 2.3 | — | — | — | — |
| **RT, RD, RB220** | 1 | 1 | 1 | 1.2 | 1.8 | 2.4 | 3.0 | 4.5 | — | — | — |
| | 2-30 | 1 | 1 | 1.3 | 2.0 | 2.6 | — | — | — | — | — |

(1) Data given for PS 3:1 to 10:1 and all RS ratios
(2) Data given for PS ratios above 10:1

# Offer of Sale

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2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

4. Warranty: Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of 12 months from date of shipment from Parker. THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED. NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGNS OR SPECIFICATIONS.

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6. Changes, Reschedules and Cancellations: Buyers may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification of cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially converted or adapted for such manufacture and not withstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

8. Buyer's Property: Any designs, tools, patterns, materials, drawings confidential information or equipment furnished by Buyer, or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. Indemnity For Infringement of Intellectual Property Rights: Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets (hereinafter 'Intellectual Property Rights'). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it non infringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Right. If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

11. Force Majeure: Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter 'Events of Force Majeure'). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder of this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

## ⚠ WARNING

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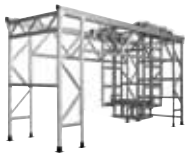

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