

**PHT**

**Vertex Precision**

# PLANETARY GEARBOX

PROFESSIONAL TEAM  
HIGH-LEVEL INSPECTION  
TECHNICAL CONSULTATION  
VERTEX PRECISION



[www.vtx-precision.com](http://www.vtx-precision.com)

# INDEX

> About PHT Vertex Precision	1
> Quality Control Equipment	2
> What is Planetary Gearbox?	4
> Function of Planetary Gearbox	4
> Advantage of Planetary Gearbox	5
> How to select a proper Planetary Gearbox?	7
> Calculation of Reduction Ratio and Torque	8
> Application of Planetary Gearbox	8
> Select Gearbox based by Power Capacity of Servo Motor	9
> Model Code	10
> Planetary Gearboxes	
+ Introduction	11
+ DH series ..... All Purpose ..... $\leq 10 - 12$ arc min	13
+ DL series ..... All Purpose ..... $\leq 10 - 12$ arc min	15
+ DN series ..... High Load Capacity ..... $\leq 10 - 12$ arc min	17
+ DM series ..... Precision, Through Hole..... $\leq 5 - 8$ arc min	19
+ DML series ..... Precision, Thread Hole..... $\leq 5 - 8$ arc min	21
+ DS series ..... High Thermal Dissipation..... $\leq 5 - 8$ arc min	23
+ DA series ..... High Precision ..... $\leq 1 - 7$ arc min	25
+ DF series ..... Flange Rotating ..... $\leq 5 - 8$ arc min	27
> Right-Angle Planetary Gearboxes	
+ Introduction	29
+ RAM series Specification..... Precision ..... $\leq 8 - 11$ arc min	32
+ RAM – H Dimension ..... Hollow Shaft	33
+ RAM – S Dimension ..... Single Solid Shaft	34
+ RAM – 2S Dimension ..... Dual Solid Shafts	35
+ RAM – D Dimension ..... Collar Clamp	36
+ RAM – F Dimension ..... Flange Rotating	37
+ RAH series Specification..... All Purpose ..... $\leq 14 - 18$ arc min	38
+ RAH – H Dimension ..... Hollow Shaft	39
+ RAH – S Dimension ..... Single Solid Shaft	40
+ RAH – 2S Dimension ..... Dual Solid Shafts	41
+ RAH – D Dimension ..... Collar Clamp	42
+ RAH – F Dimension ..... Flange Rotating	43
> Planetary Gearbox Application Form	44

# About PHT Vertex Precision

As a major manufacturer of precise planetary gearboxes, **PHT Vertex Precision** offers the integral solution in the field of motion control application. Established in 1982 with the objective of producing the highest quality planetary gearboxes in the market, PHT Vertex Precision has achieved this goal with a new state of the art manufacturing facility. Utilizing the latest in machine tools and metrology equipment, PHT Vertex Precision is able to provide a high quality, competitiveness alternatives to that of the competition.

Through years' effort in the field of motion control application, for integrating the application of power transmission and linear motion, PHT Vertex Precision invested and established the factories of gear racks and rolled ball screws during the period of time from 2009 to 2012. The integral combination paved the way for PHT Vertex Precision of being a professional manufacturer who made a significant milestone during the developing history.



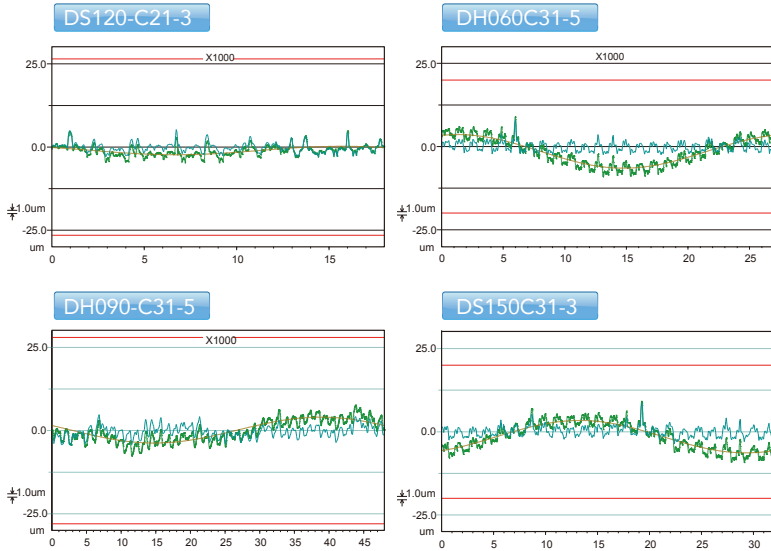
Now we have helped thousands of clients reach their full potential in the fields of Machines tools, Robotized Production Line, Conveyer System, Solar Energy, Industrial Print Machine, and so on. If you're looking for alternative and professional manufacturer with guaranteed products plus the advantages of competitiveness and compatibility for increasing products' added values, then, PHT Vertex Precision will be here for supporting you always.



# Quality Control Equipment

## + Gear Rolling Tester

Double flank gear rolling test



## + Concentricity Tester



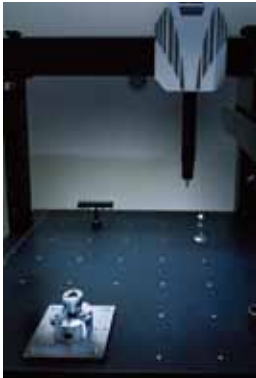
## + Optical Image Measuring Machine



## + Rockwell Hardness Testing Machine

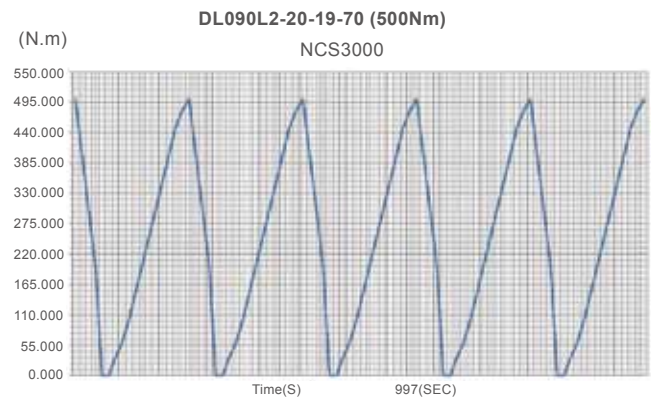
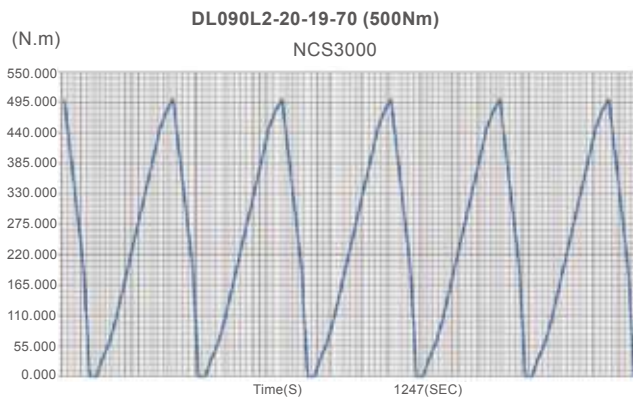


## + 3D Coordinate Measuring Machine



Statistical Data Analysis	
Total Numbers	50
Average Value	500.088
Minimum Value	499.430
Maximum Value	500.220
Range	1.260
Relative Error	0.00%
Repeatability Error	0.78%
Accuracy	100%
$\Sigma N$	0.281
$\Sigma$	0.284
Cp	56.89%
Cpk	56.89%

## + Torque Inspection Machine



## + Noise Inspection Machine



## + Inner Gear Inspection



# What is Planetary Gearbox?

A planetary gearbox is a mechanical device consisting of sun gear, the planet gears, the planet gears' carrier, and the ring gear. Sun gear is located at the center that transmits torque to planet gears orbiting around the sun gear. Planet and sun gears are located inside the ring gear.

Multi-staged planetary gearbox is available by connecting the individual stage in sequence. With the gear unit combination the individual stage is sized to the torque requirement.



- > Sun Gear
- > Planet Gears
- > Planet Gears' Carrier (output shaft)
- > Internal Ring

## Function of Planetary Gearbox

A planetary gearbox is a gear system utilized to increase the output torque and reduce load inertia while slowdown the speed.

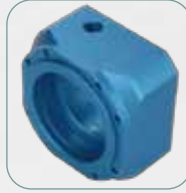
A gearbox provides speed and torque conversions from a rotating power source to another device using gear ratio. It can be used in various situations, such as precise machine tools, and anywhere else mechanical equipment.



# Advantage of Planetary Gearbox

## Motor Adapter

Flexible Adapter Machined for diverse Motor Mounting with precisely Concentricity.



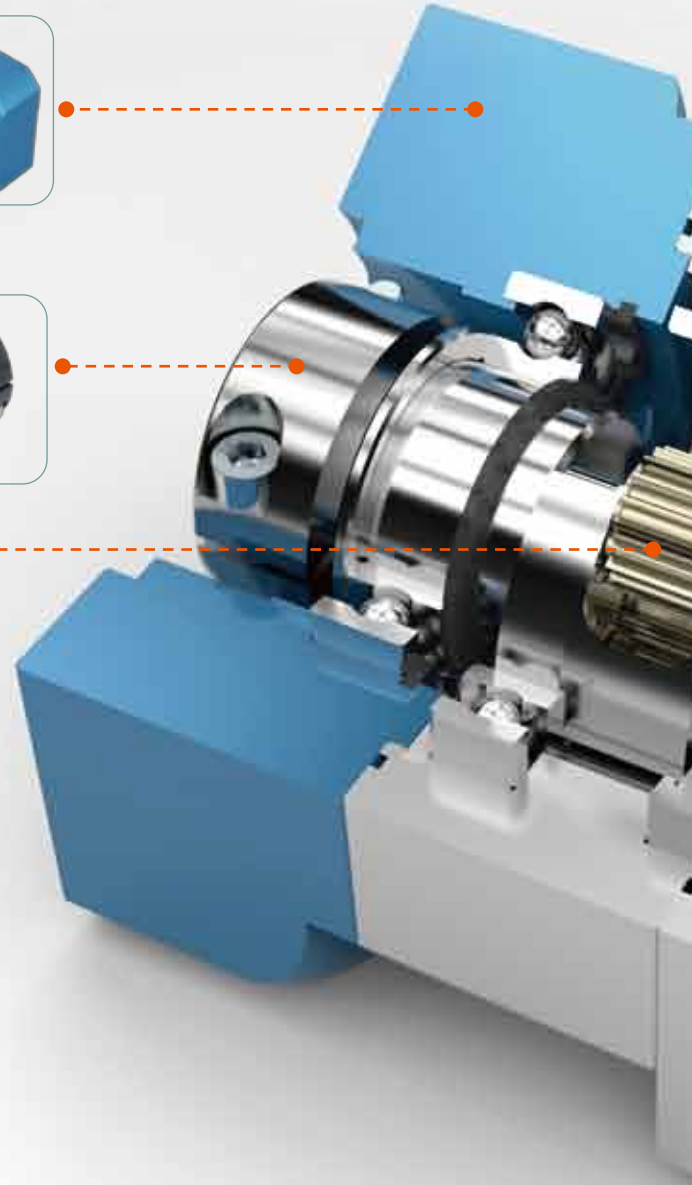
## Input Clamping Unit

Collar Clamping Design made Output Shaft of Motor connected with Gearboxes accurately under high Speed Environment.



## Planet Gears

Nitriding Heat Treatment Process for maintaining the Core Hardness and superior Wear Resistance.



## Compact Size

PHT Vertex Precision planetary gear unit share a common axis which results in a structure of compact size than traditional device.

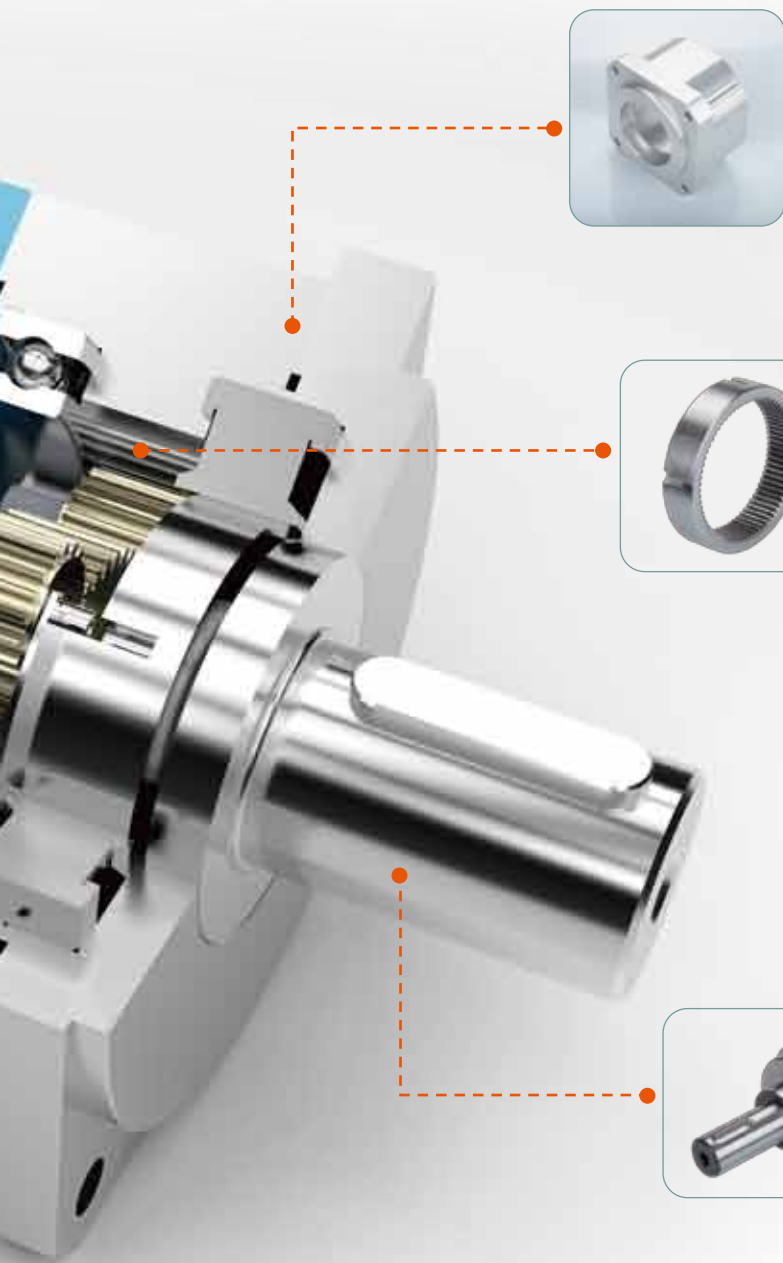
## High Efficiency

Planet gears are in full and constant-meshed, eliminating the possibility of gear tooth damaged from gear clash or partial engagement. The full and constant-meshed feature also permits automatic and quick gear ratio changes without power flow interruption.

A typical efficiency loss in a planetary gearbox arrangement is only 3% per stage; this type of efficiency ensures that a high proportion of the energy being input is transmitted through the gearbox, rather than being wasted on mechanical losses inside the gearbox. Efficiency better than harmonics, can be over 90% in some cases.

## High Radial Loads on Output Shaft

Planetary gears are strong and sturdy, which can handle larger torque loads, for the compact size, in comparison to



### **Gearbox Housing**

High Thermal Dissipation by the Characteristic of material Aluminum for achieving Excellent Efficiency in the Field of Machine Tools.



### **Internal Ring Gear**

Union-designed Internal Gear enhanced the Structure and Durability of Gearbox



### **Output Shaft with heat treatment**

Union-Designed fixed Support of Planetary Gears and Output Shaft enhanced the Torsional Rigidity and Radial Capacity.

other gear combinations in manual transmissions. This is because that the torque load as it passes through the planetary set is distributed over the several planet pinion gears, which in effect allow more tooth contact area to handle the power transmission.

### **Higher Torque Density**

Higher torque density, as well as greater load ability is obtained with more planet gears in the system.

### **Greater Stability**

Due to the even distribution of mass and increased rotational stiffness, the arrangement of planetary gearbox also creates greater stability.

### **Cost Effective Precision**

Competitive cost than other gearing options.



# How to select a proper Planetary Gearbox?

How to select a proper Planetary Gearbox for meeting specific application requirement, following factors need to be considered:

## Gear Ratio

Generally speaking, the reduction ratio can be simply explained by the formula: **Reduction Ratio = RPM-servo motor / RPM-gearbox output**

Gear ratio also can be defined as the correlation between the numbers of teeth of two different gears. Commonly, the number of teeth a gear has is proportional to its circumference. This means that the gear with a larger circumference will have more gear teeth, therefore, the relationship between the circumferences of the two gears can also give an accurate gear ratio.

## Output Torque

Output torque is important parameter when choosing a planetary gearbox. Gear reduction reduces the relatively high rotational speed of motor, delivering a lower rotational speed at the output end.

## Overload Torque

Peak overload torque is the short-term overloading of the permitted output torque.



## Speed (rpm)

Speed is proportional to the gear ratio of the system. If the input gear has more teeth than the output gear, the result will be increase in speed at the output shaft. On the other hand, having the reverse scenario with more gear teeth at the output compared to the input will result in a decrease of speed at the output shaft. In general, the output speed can be determined by dividing the input speed by the gear ratio. The higher the ratio the lower the output speed will be and vice versa.

## Backlash

Backlash is the angle in which the output shaft of a gearbox can rotate without the input shaft moving or the gap between the teeth of two adjacent gears. It is not necessary to consider backlash for applications which do not involve load reversals. If the motion cycle is exactly repeated the backlash of planetary gearbox has theoretically not influence on the repeatability. However, in precision applications with load reversals like Robotics, Automation, CNC Machines, etc., backlash is crucial for accuracy and positioning.



# Choosing an applicable Reduction Ratio

## Ideal Reduction Ratio

Reduction Ratio = RPM servo motor / RPM gearbox output

# Calculation of required Torque

The lifetime of a planetary gearbox depends on calculation of required torque, also needs to be considered the peak torque happened in accelerating or decelerating should be less than the maximum load torque of a planetary gearbox.

$$TP = ((GD_L^2 + GD_a^2 + GD_M^2) N / (375 \times t) \pm T_L) / R$$

<p><b>TP</b> Min. torque required at moment of starting, that gear reducer should bear against peak torque at moment.</p>	<p><b>T<sub>L</sub></b> The static torque of load reflected motor rotor.  <math>T_L = \frac{T_{load}}{(R \times EFF) \text{ EFF} = \text{efficiency}}</math></p>
<p><b>GD<sub>M</sub><sup>2</sup></b> Rotary inertia of motor rotor</p>	<p><b>t</b> The time required in accelerate/decelerate.</p>
<p><b>GD<sub>L</sub><sup>2</sup></b> The rotary inertia of load reflected motor rotor.</p>	<p><b>N</b> motor rotor speed RPM.</p>
<p><b>GD<sub>a</sub><sup>2</sup></b> Rotary inertia of gear reducer reflected to motor rotor.</p>	<p><b>+</b> Accelerating.</p>
<p><b>R</b> Total reduction ratio.  <math>R = \frac{\text{RPM}_{motor}}{\text{RPM}_{load}}</math></p>	<p><b>-</b> Decelerating.</p>

# Application of Planetary Gearbox

Planetary Gearbox is used on high precision motion control application that requires high torque, torsional stiffness and low backlash, specifics of which will vary by application.

higher, more efficient speed. The inertia reflects back to the motor is reduced for increased stability. Using a planetary gearbox allows machine builder using a smaller, less expensive motion control package.

Planetary Gearbox increases the torque by the stage of reduction ratio, making it possible to run the motor at a

The application of planetary gearbox covers the entire range of automation. It is frequently found in fields following:

- > Pick and Place Systems
- > Loading and unloading gantry Robots
- > Driving Rotary and Linear Actuators
- > Packaging Machines
- > Positioning Tables
- > Material Handling Systems
- > CNC Routers
- > Plasma Cutting Machines
- > Machine Tools
- > Industrial Conveyor
- > Industrial Printing Machines
- > Feeding Machines

# Select Gearbox based by Power Capacity

Power	Model Number	Reduction Ratio (stage 1)				
		1:3	1:4	1:5	1:7	1:10
100W	DM/DH 42	✗	●	●	●	●
	DA/DM/DS/DH/DL/DN/ DF 060	●	●	●	●	●
200W	DA/DM/DS/DH/DL/DN/ DF 060	●	●	●	●	●
400W	DM/DS 070	●	●	●	●	●
	DA/DM/DS/DH/DL/DN/ DF 090	●	●	●	●	●
500W	DA/DM/DS/DH/DL/DN/ DF 090	●	●	●	●	●
	DA/DM/DH/DL/DF 120	●	●	●	●	●
750W	DA/DM/DS/DH/DL/DN/DF 090	●	●	●	●	●
	DA/DM/DH/DL/DF 120	●	●	●	●	●
1.0kW	DA/DM/DH/DL/DF 120	●	●	●	●	●
	DM/DS/DH/DL/DF 150	●	●	●	●	●
1.5kW	DA/DM/DH/DL/DF 120	●	●	●	●	●
	DM/DS/DH/DL/DF 150	●	●	●	●	●
2.0kW	DM/DS/DH/DL/DF 150	●	●	●	●	●
	DM/DS 180	●	●	●	●	●
3.5kW	DM/DS/DH/DL/DF 150	●	●	●	●	●
	DM/DS 180	●	●	●	●	●
5.0kW	DM/DS/DH/DL/DF 150	●	●	●	●	●
	DM/DS 180	●	●	●	●	●
7.0kW	DM/DS/DH/DL/DF 150	●	●	●	●	●
	DM/DS 180	●	●	●	●	●
11.0kW	DM/DS 180	●	●	●	●	●
	DM/DS 220	●	●	●	●	●

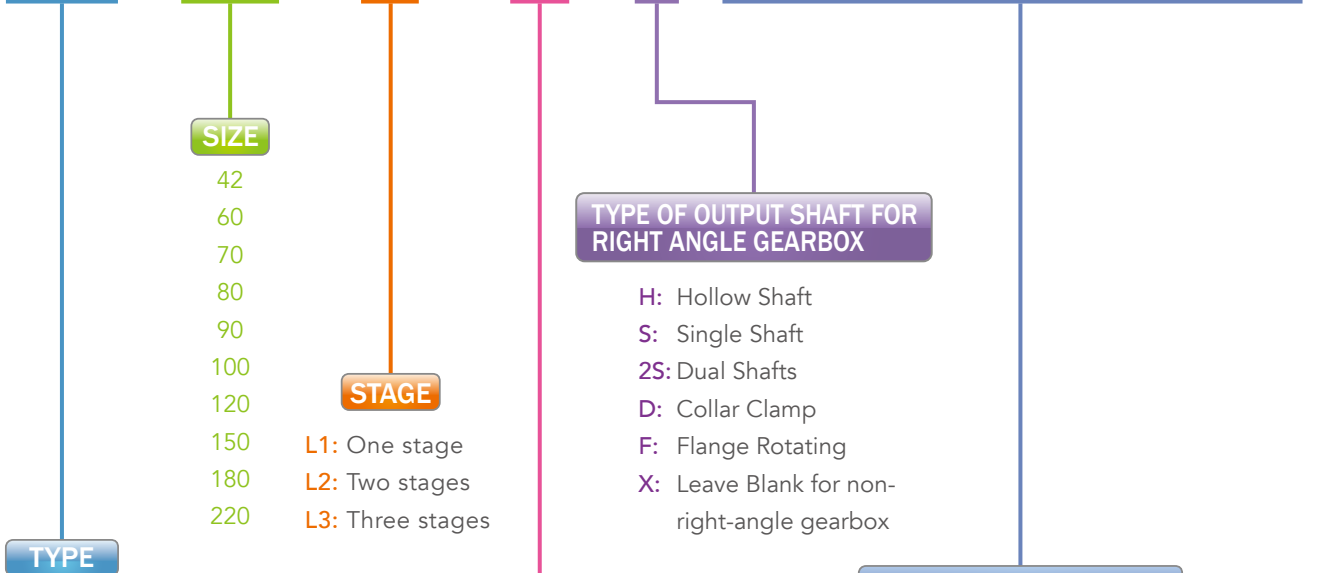
Power	Model Number	Reduction Ratio (stage 2)													
		1:9	1:12	1:15	1:16	1:20	1:21	1:25	1:28	1:30	1:35	1:40	1:50	1:70	1:100
100W	DM/DH 42	✗	✗	✗	●	●	✗	●	●	✗	●	●	●	●	●
	DA/DM/DS/DH/DL/DN/ DF 060	●	●	●	●	●	●	●	●	●	●	●	●	●	●
200W	DA/DM/DS/DH/DL/DN/ DF 060	●	●	●	●	●	●	●	●	●	●	●	●	●	●
400W	DA/DM/DS/DH/DL/DN/ DF 060	●	●	●	●	●	●	●	●	●	●	●	✗	✗	✗
	DM/DS 070	●	●	●	●	●	●	●	●	●	●	●	●	●	●
500W	DA/DM/DS/DH/DL/DN/ DF 090	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	DA/DM/DH/DL/DF 120	●	●	●	●	●	●	●	●	●	●	●	●	●	●
750W	DA/DM/DS/DH/DL/DN/DF 090	●	●	●	●	●	●	●	●	●	●	✗	✗	✗	✗
	DA/DM/DH/DL/DF 120	●	●	●	●	●	●	●	●	●	●	●	●	●	●
1.0kW	DA/DM/DH/DL/DF 120	●	●	●	●	●	●	●	●	●	●	●	●	✗	✗
	DM/DS/DH/DL/DF 150	●	●	●	●	●	●	●	●	●	●	●	●	●	●
1.5kW	DA/DM/DH/DL/DF 120	●	●	●	●	●	●	●	●	●	✗	✗	✗	✗	✗
	DM/DS/DH/DL/DF 150	●	●	●	●	●	●	●	●	●	●	●	●	●	✗
2.0kW	DM/DS/DH/DL/DF 150	●	●	●	●	●	●	●	●	●	●	●	●	✗	✗
	DM/DS 180	●	●	●	●	●	●	●	●	●	●	●	●	●	●
3.5kW	DM/DS/DH/DL/DF 150	●	●	●	●	●	●	●	●	●	✗	✗	✗	✗	✗
	DM/DS 180	●	●	●	●	●	●	●	●	●	●	●	●	●	✗
5.0kW	DM/DS/DH/DL/DF 150	●	●	●	●	●	✗	✗	✗	✗	✗	✗	✗	✗	✗
	DM/DS 180	●	●	●	●	●	●	●	●	●	●	●	●	✗	✗
7.0kW	DM/DS 180	●	●	●	●	●	●	●	●	●	✗	✗	✗	✗	✗
11.0kW	DM/DS 220	●	●	●	●	●	●	●	●	●	●	●	●	✗	✗



1. The starting ratio of DM / DH042 is 1:4.
2. The starting ratio of DN series is 1:4. Reduction ratio of 1:9 can be supplied based by one(1) stage for DN series only.
3. Two(2) stages by reduction ration 1:100 can not be applied to high-speedy converse and reverse environment unless three(3) stages gearboxes.
4. Size-upgraded gearboxes are suggested to be used under the applications which need bigger "Mass Movement of Inertia".
5. Three(3) stages gearboxes are not within the scope of this chart; if the choice of three stages gearboxes is needed, please contact with our staff.

# Model Code

RAM 090 Li 10 H D2-D3-D1-D4 (L1/L2)



**TYPE**

- DH: All Purpose, through hole output
- DL: All Purpose, thread hole output
- DN: High Load Capacity
- DM: Precision, Through Holedml
- DML: Precision, Thread Hole
- DS: High Thermal Dissipation
- DA: High Precision
- DF: Flange Rotating
- RA: Turning Module
- RAH: Right Angle, all-purpose
- RAM: Right Angle, precision

**SIZE**

- 42
- 60
- 70
- 80
- 90
- 100
- 120
- 150
- 180
- 220

**STAGE**

- L1: One stage
- L2: Two stages
- L3: Three stages

**REDUCTION RATIO**

- L1: 3 / 4 / 5 / 7 / 10
- L2: 9 / 12 / 15 / 16 / 20 / 25 / 28 / 30 / 40 / 49 / 50 / 70
- L3: 36 / 45 / 60 / 75 / 80 / 150 / 200 / 300 / 400 / 500 / 700 / 1000

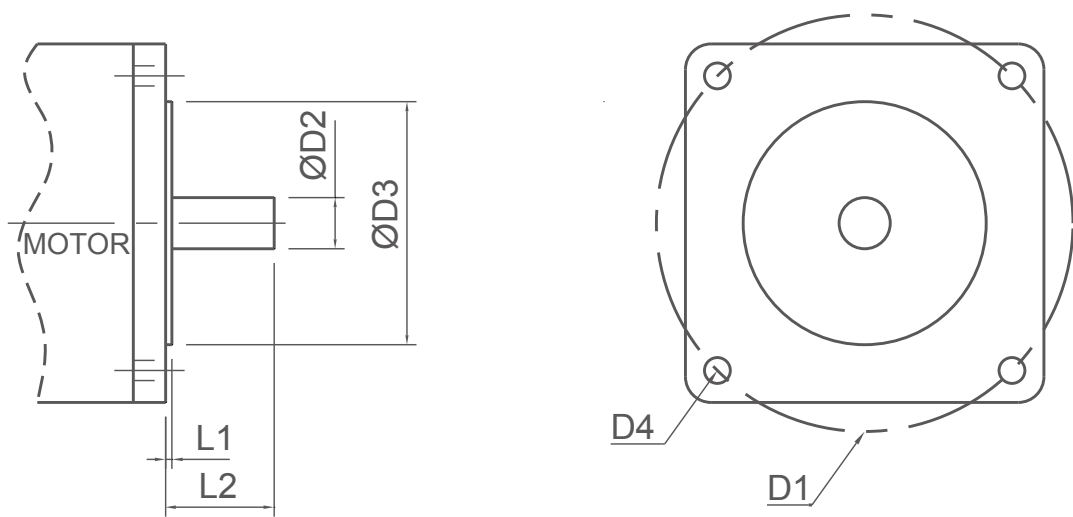
**TYPE OF OUTPUT SHAFT FOR RIGHT ANGLE GEARBOX**

- H: Hollow Shaft
- S: Single Shaft
- 2S: Dual Shafts
- D: Collar Clamp
- F: Flange Rotating
- X: Leave Blank for non-right-angle gearbox

**MOUNTING DIMENSION OF SERVO MOTOR**

- D2: Output Shaft Diameter of Servo Motor
- D3: Pilot / Spigot Diameter of Servo Motor
- D1: Bolt Cycle Diameter of Servo Motor
- L1: Pilot / Spigot Thickness of Servo Motor
- L2: Output Shaft Length of Servo Motor

## Motor Dimension



# Planetary Gearboxes

## Introduction

There're ten (10) different sizes available, from 1.7" to 8.66" (42 mm to 220 mm), within PHT Vertex Precision series Planetary Gearboxes. These can be used for any motors ranging from NEMA 23 to NEMA 42 or bigger than the ranges. The gears used in these planetary gearboxes offer you a reliable, economical choice for your motion control application.

There're eight (8) models can be chose for diverse fields of motion control applications. The choices let you select the appropriated backlash option for your application. Precision backlash is as low as 1 arc min maximum. We stock many ratios to match up to our wide range customers in worldwide market, and make a gearbox to fit any motor in as little as 7-10 working days or earlier. Ratios are available from 1:3 to 1:1000 with torque rating up to 10,488 in-lbs. (167,808 oz.-in)

### DHseries



The planetary gearbox has been developed specifically for all application, which is an ideal alternative to our precision series.

<b>Type:</b>	DH series
<b>Feature:</b>	All-Purpose, Through Hole
<b>Backlash:</b>	10 ~ 12 arc min
<b>Size:</b>	42, 60, 80, 90, 120, 150
<b>Noise:</b>	64 ~ 65 dB
<b>Life Time:</b>	20,000 hrs.

### DLseries



The planetary gearbox has been developed specifically for all application, which is an ideal alternative to our precision series.

<b>Type:</b>	DL series
<b>Feature:</b>	All-Purpose, Thread Hole
<b>Backlash:</b>	10 ~ 12 arc min
<b>Size:</b>	60, 90, 120, 150
<b>Noise:</b>	64 ~ 65 dB
<b>Life Time:</b>	20,000 hrs.

### DNseries



DN series offer premium performance in terms of radial and axial forces. It combines high performance with low cost and compact size, excellent reliability, simple installation and free maintenance.

<b>Type:</b>	DN series
<b>Feature:</b>	High Load Capacity
<b>Backlash:</b>	10 ~ 12 arc min
<b>Size:</b>	60, 80, 100
<b>Noise:</b>	64 ~ 65 dB
<b>Life Time:</b>	20,000 hrs.

### DMseries



Reduced backlash, easy motor assembly, smooth operation, and integrated product configurations as standard options are the outstanding features of DM series.

<b>Type:</b>	DM series
<b>Feature:</b>	Precision, Through Hole
<b>Backlash:</b>	5 ~ 8 arc min
<b>Size:</b>	42, 60, 70, 90, 120, 150, 180, 220
<b>Noise:</b>	64 ~ 65 dB
<b>Life Time:</b>	20,000 hrs.

**DML**<sub>series</sub>



Reduced backlash, easy motor assembly, smooth operation, and integrated product configurations as standard options are the outstanding features of DML series.

<b>Type:</b>	DML series
<b>Feature:</b>	Precision, Thread Hole
<b>Backlash:</b>	5 ~ 8 arc min
<b>Size:</b>	42, 60, 90, 120, 150, 180, 220
<b>Noise:</b>	64 ~ 65 dB
<b>Life Time:</b>	20,000 hrs.

**DS**<sub>series</sub>



The DS series are designed for precision servo application with the characteristics of high thermal dissipation.

<b>Type:</b>	DS series
<b>Feature:</b>	High Thermal Dissipation
<b>Backlash:</b>	5 ~ 8 arc min
<b>Size:</b>	60, 70, 90, 120, 150, 180, 220
<b>Noise:</b>	64 ~ 65 dB
<b>Life Time:</b>	20,000 hrs.

**DA**<sub>series</sub>



The DA series provide you with a wide torque spectrum which is dedicated to high performance application where a combination of speed, precision and high-level duty cycle is required.

<b>Type:</b>	DA series
<b>Feature:</b>	High Precision
<b>Backlash:</b>	1 ~ 7 arc min
<b>Size:</b>	60, 90, 120
<b>Noise:</b>	64 ~ 65 dB
<b>Life Time:</b>	20,000 hrs.

**DF**<sub>series</sub>



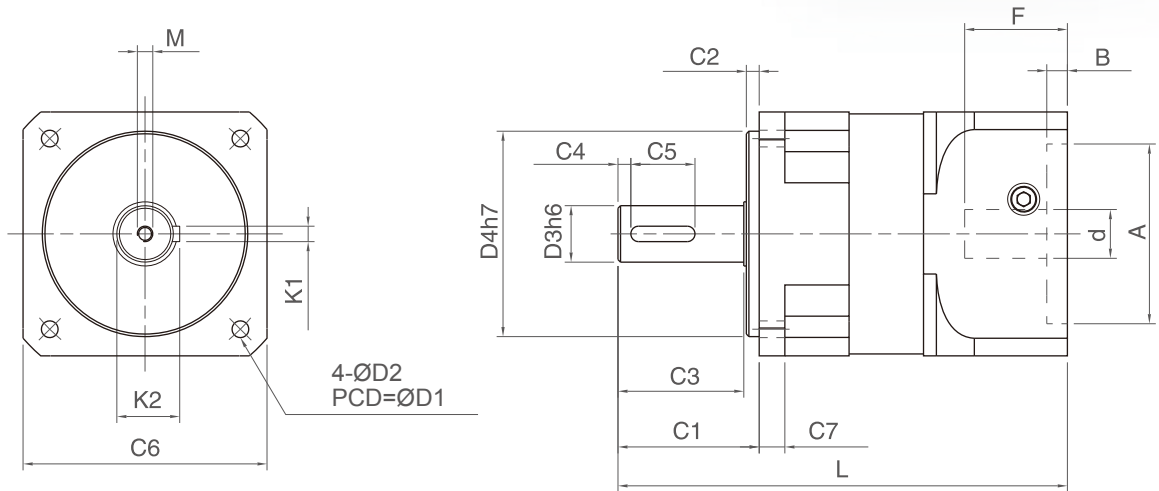
The rotating output flange allows machine elements such as pinion gears, pulleys, rotary index tables and transmission shafting to be easily connected directly to the output. These are ideal for motion control applications that require gearboxes to redirect the power flow.

<b>Type:</b>	DF series
<b>Feature:</b>	Flange Rotating
<b>Backlash:</b>	5 ~ 8 arc min
<b>Size:</b>	60, 90, 120, 150
<b>Noise:</b>	64 ~ 65 dB
<b>Life Time:</b>	20,000 hrs.

**ALL-PURPOSE, THROUGH HOLE**

# DHseries

PHT VERTEX PRECISION COMPONENTS CORP.



Unit: mm

Info.	DH042	DH060	DH080	DH090	DH120	DH150	
D1	50.0	70.0	90.0	105.0	130.0	165.0	
D2	4.20	5.20	6.50	6.50	8.50	10.5	
D3	12.0	16 (12~16)	20	20 (18~22)	32 (24~35)	42 (38~45)	
D4	35.0	50.0	70.0	80.0	110.0	130.0	
C1	24.0	35.0	56.0	55.0	58.0	74.0	
C2	4.00	7.00	6.00	5.00	5.00	4.00	
C3	20.0	27.0	49.0	49.0	52.0	67.0	
C4	3.00	3.00	5.00	5.00	5.00	5.00	
C5	12.0	20.0	25.0	25.0	40.0	45.0	
C6	42.0	62.0	79.0	95.0	115.0	145.0	
C7	8.00	9.6	16.0	10.0	19.0	23.5	
L	L1	95.0	118.0	169.0	172.5	170.3	262.0
	L2	109.0	137.0	194.5	198.5	198.6	314.0
M	M4 x P0.7 x 8	M4 x P0.7 x 15	M6 x P1.0 x 20	M6 x P1.0 x 20	M8 x P1.25 x 27	M12 x P1.75 x 32	
K1	4.00	5.00	6.00	6.00	10.0	12.0	
K2	13.50	18.0	22.5	22.5	35.1	45.0	
d	≦ 8.0	≦ 14.0	≦ 24.0	≦ 24.0	≦ 28.0	≦ 42.0	
A	20~30	30~50	50~80	50~80	55~110	95~130	
B	4.00	6.00	6.00	8.00	5.00	10.0	
F	≦ 25.0	≦ 32.0	≦ 35.0	≦ 40.0	≦ 47.5	≦ 66.5	

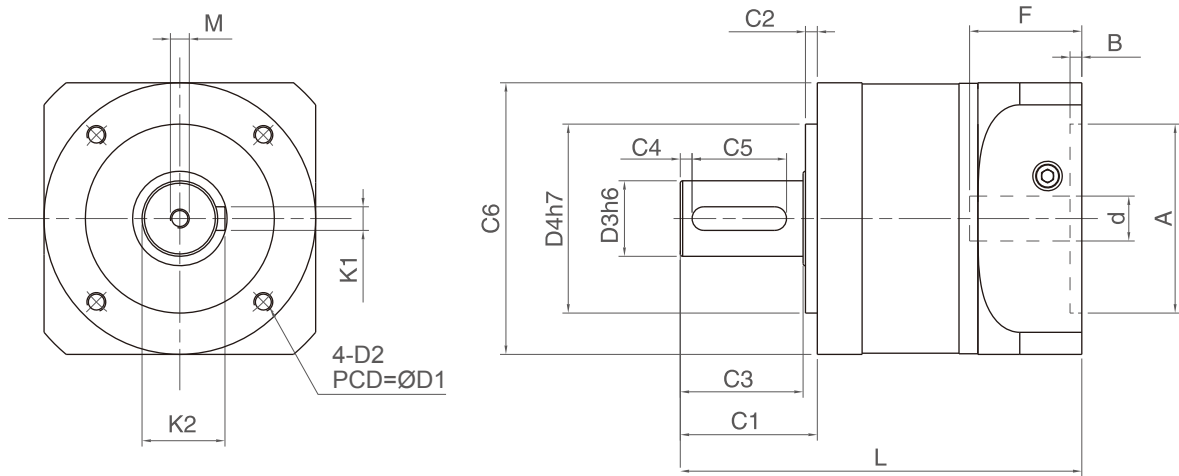
Information	Stage	Ratio	DH042	DH060	DH080	DH090	DH120	DH150		
<b>Defined Output Torque (Nm)</b>	1	3	-	40	115	140	260	476		
		4	35	60	135	168	306	560		
		5	34	55	126	155	292	536		
		7	30	50	132	166	285	520		
		10	18	40	115	140	260	476		
	2	9	-	40	115	140	260	476		
		12	-	40	115	140	260	476		
		15	-	40	115	140	260	476		
		16	35	60	135	168	306	560		
		20	34	55	126	155	292	536		
		21	-	40	115	140	260	476		
		25	34	55	126	155	292	536		
		28	30	50	132	166	285	520		
		30	-	40	115	140	260	476		
		35	30	50	132	166	285	520		
		40	18	40	115	140	260	476		
		50	18	40	115	140	260	476		
		70	18	40	115	140	260	476		
	3	100	34	55	126	155	292	536		
	<b>Peak Output Torque (Nm)</b>	1, 2, 3	3~100	<b>3 times of Defined Output Torque</b>						
<b>Backlash (arc min)</b>	1	3~10	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10		
	2	9~70	≤ 12	≤ 12	≤ 12	≤ 12	≤ 12	≤ 12		
<b>Defined Input Speed (RPM)</b>	1	3, 4, 5	3300	3300	3000	2600	2300	2200		
		7, 10	4000	4000	3300	2900	2700	2700		
	2	9~40	4400	4400	3500	3200	3000	3000		
		50	4800	4800	4000	3600	3300	3200		
		70	5500	5500	4700	4200	3900	3500		
<b>Weight (kg)</b>	1	3~10	0.40	1.30	2.30	3.50	6.00	16.0		
	2	9~70	0.50	1.60	3.30	4.50	7.20	20.0		
<b>Torsional Rigidity (Nm/arc min)</b>	1, 2	3~70	5.00	7.00	8.00	11.00	27.00	48.0		
<b>Allowable Radial Force (N)</b>			365	840	1600	6000	7500	14000		
<b>Allowable Axial Force (N)</b>			305	605	1400	5000	6450	12000		
<b>Noise (dB)</b>			65	65	64	64	64	64		
<b>Life Time (hrs)</b>			20000							
<b>Temperature (°C)</b>			-15°C~+90°C							
<b>Protection Rank</b>			IP64							
<b>Lubricant</b>			Synthetic Lubricant, ISO VG220							
<b>Mass Moments of Inertia (kg X cm<sup>2</sup>)</b>			1	3	-	0.31	0.35	0.40	5.90	10.50
				4	0.30	0.30	0.33	0.60	5.09	9.10
	5	0.29		0.29	0.33	0.59	4.93	8.85		
	7	0.28		0.28	0.31	0.58	4.83	8.85		
	10	0.27		0.27	0.31	0.57	4.81	8.46		
	2	9	-	0.29	0.30	0.56	4.91	9.02		
		12	-	0.30	0.30	0.58	5.10	9.01		
		16	0.30	0.30	0.30	0.60	5.09	9.01		
		20	0.30	0.30	0.30	0.60	5.07	9.02		
		25	0.29	0.29	0.30	0.59	4.91	8.83		
		28	0.30	0.30	0.30	0.59	5.07	9.01		
		35	0.30	0.30	0.30	0.58	4.91	8.82		
		40	0.27	0.27	0.30	0.56	4.80	8.45		
		50	0.27	0.27	0.30	0.56	4.80	8.45		
		70	0.27	0.27	0.30	0.56	4.80	8.45		
	3	100	0.27	0.27	0.30	0.56	4.80	8.45		



**ALL-PURPOSE, THREAD HOLE**

# DLseries

PHT VERTEX PRECISION COMPONENTS CORP.



Unit: mm

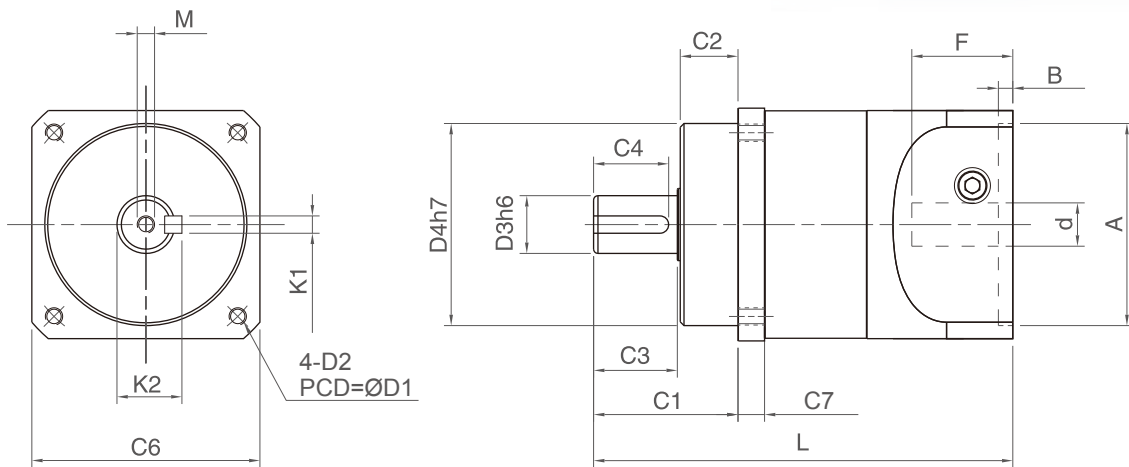
Info.	DL060	DL090	DL120	DL150
D1	50.0	70.0	100.0	145.0
D2	M5	M6	M8	M12
D3	16 (12~16)	20 (18~22)	32 (24~32)	42 (38~42)
D4	40.0	60.0	80.0	130.0
C1	31.0	55.0	58.0	74.0
C2	3.00	5.00	5.00	4.00
C3	27.0	49.0	52.0	67.0
C4	3.00	5.00	5.00	5.00
C5	20.0	25.0	40.0	45.0
C6	60.0	93.0	115.0	160.0
L	L1	118.0	172.5	262.0
	L2	137.0	198.5	314.0
M	M4 x P0.7 x 15	M6 x P1.0 x 20	M8 x P1.25 x 27	M12 x P1.75 x 32
K1	5.00	6.00	10.0	12.0
K2	18.0	22.5	35.1	45.0
d	≦ 14.0	≦ 24.0	≦ 28.0	≦ 42.0
A	30~50	50~80	55~110	95~130
B	6.00	8.00	5.00	10.0
F	≦ 32.0	≦ 40.0	≦ 47.5	≦ 66.5

Information	Stage	Ratio	DL060	DL090	DL120	DL150	
<b>Defined Output Torque (Nm)</b>	1	3	40	140	260	476	
		4	51	168	306	560	
		5	47	155	292	536	
		7	44	166	285	520	
		10	40	140	260	476	
	2	9	40	140	260	476	
		12	40	140	260	476	
		15	40	140	260	476	
		16	51	168	306	560	
		20	47	155	292	536	
		21	40	140	260	476	
		25	47	155	292	536	
		28	44	166	285	520	
		30	40	140	260	476	
		35	44	166	285	520	
		40	40	140	260	476	
		50	40	140	260	476	
		70	40	140	260	476	
	3	100	47	155	292	536	
	<b>Peak Output Torque (Nm)</b>	1, 2, 3	3~100	<b>3 times of Defined Output Torque</b>			
<b>Backlash (arc min)</b>	1	3~10	≤ 10	≤ 10	≤ 10	≤ 10	
	2	9~70	≤ 12	≤ 12	≤ 12	≤ 12	
<b>Defined Input Speed (RPM)</b>	1	3, 4, 5	3300	2600	2300	2200	
		7, 10	4000	2900	2700	2700	
	2	9~40	4400	3200	3000	3000	
		50	4800	3600	3300	3200	
		70	5500	4200	3900	3500	
<b>Weight (kg)</b>	1	3~10	1.10	3.50	6.00	16.0	
	2	9~70	1.60	4.50	7.20	20.0	
<b>Torsional Rigidity (Nm/arc min)</b>	1, 2	3~70	7.00	11.00	27.00	48.0	
<b>Allowable Radial Force (N)</b>			750	5400	7500	14000	
<b>Allowable Axial Force (N)</b>			545	4500	6450	12000	
<b>Noise (dB)</b>			65	64	64	64	
<b>Life Time (hrs)</b>			20000				
<b>Temperature (°C)</b>			-15°C~+90°C				
<b>Protection Rank</b>			IP64				
<b>Lubricant</b>			Synthetic Lubricant, ISO VG220				
<b>Mass Moments of Inertia (kg X cm<sup>2</sup>)</b>			1	3	0.31	0.40	5.90
	4	0.30		0.60	5.09	9.10	
	5	0.29		0.59	4.93	8.85	
	7	0.28		0.58	4.83	8.85	
	10	0.27		0.57	4.81	8.46	
	2	9	0.29	0.56	4.91	9.02	
		12	0.30	0.58	5.10	9.01	
		16	0.30	0.60	5.09	9.01	
		20	0.30	0.60	5.07	9.02	
		25	0.29	0.59	4.91	8.83	
		28	0.30	0.59	5.07	9.01	
		35	0.30	0.58	4.91	8.82	
		40	0.27	0.56	4.80	8.45	
		50	0.27	0.56	4.80	8.45	
		70	0.27	0.56	4.80	8.45	
		3	100	0.27	0.56	4.80	8.45

**HIGH LOAD CAPACITY, THROUGH HOLE**

# DNseries

PHT VERTEX PRECISION COMPONENTS CORP.



Unit: mm

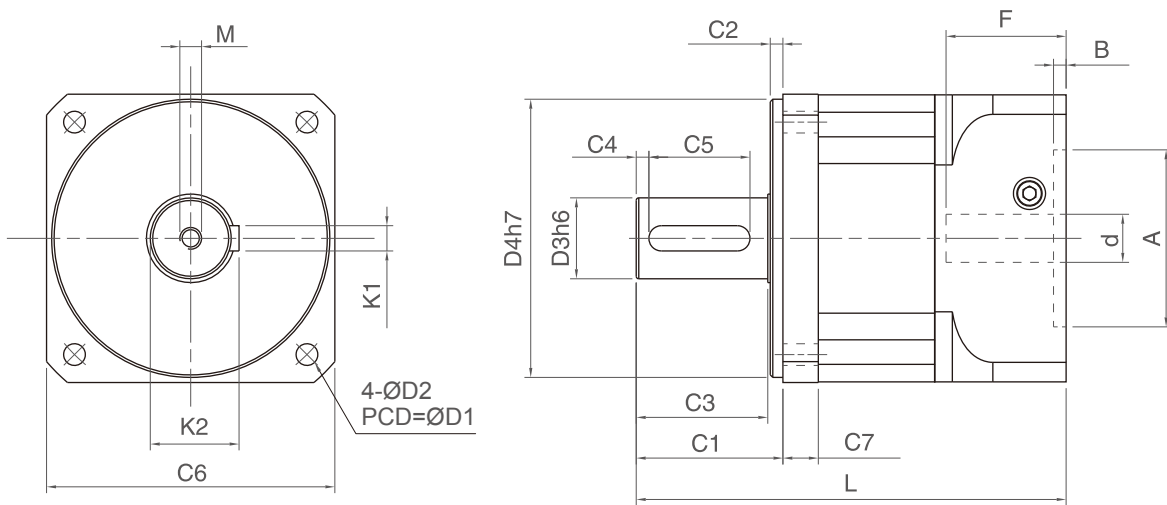
Info.	DN060	DN080	DN100
D1	70.0	90.0	115.0
D2	M5	M6	M8
D3	16 (12~16)	19 (18~22)	24 (22~30)
D4	50.0	70.0	90.0
C1	32.0	50.0	55.0
C2	11.0	20.0	14.0
C3	20.0	29.0	40.0
C4	18.0	25.0	35.0
C6	62.0	79.0	98.0
C7	13.5	9.0	15.4
L	L1	116.0	145.0
	L2	136.0	176.0
M	M4 x P0.7 x 15	M6 x P1.0 x 15	M8 x P1.0 x 20
K1	5.0	6.0	8.0
K2	18.0	21.5	27
d	≦ 14.0	≦ 24.0	≦ 28.0
A	30~50	50~80	50~80
B	6.0	6.0	8.0
F	≦ 32.0	≦ 35.0	≦ 47

Information	Stage	Ratio	DN060	DN080	DN100
<b>Defined Output Torque (Nm)</b>	1	4	60	135	306
		5	55	126	292
		7	50	132	285
		9	50	132	285
		10	40	115	260
	2	16	60	135	306
		20	55	126	292
		25	55	126	292
		28	50	132	285
		35	50	132	285
		36	50	132	285
		40	40	115	260
		45	50	132	285
		49	50	132	285
		50	40	115	260
		63	50	132	285
		70	40	115	260
		81	50	132	285
		90	40	115	260
	3	100	55	126	292
<b>Peak Output Torque (Nm)</b>	1, 2, 3	4~100	<b>3 times of Defined Output Torque</b>		
<b>Backlash (arc min)</b>	1	4~10	≤ 10	≤ 10	≤ 10
	2	16~90	≤ 12	≤ 12	≤ 12
<b>Defined Input Speed (RPM)</b>	1	4, 5	3300	3000	2300
		7~10	4000	3300	2700
	2	16~40	4400	3500	3000
		45~63	4800	4000	3300
		70~90	5500	4700	3900
<b>Weight (kg)</b>	1	4~10	1.30	2.30	6.00
	2	16~90	1.60	3.30	7.20
<b>Torsional Rigidity (Nm/arc min)</b>	1, 2	4~90	7.00	8.00	27.00
<b>Allowable Radial Force (N)</b>			2800	7200	8000
<b>Allowable Axial Force (N)</b>			2200	5000	5600
<b>Noise (dB)</b>			65	64	64
<b>Life Time (hrs)</b>			20000		
<b>Temperature (°C)</b>			-15°C~+90°C		
<b>Protection Rank</b>			IP64		
<b>Lubricant</b>			Synthetic Lubricant, ISO VG220		
<b>Mass Moments of Inertia (kg X cm<sup>2</sup>)</b>	1	4	0.30	0.33	5.09
		5	0.29	0.33	4.93
		7	0.28	0.31	4.83
		9	0.28	0.31	4.83
		10	0.28	0.31	4.83
	2	16	0.30	0.30	5.09
		20	0.30	0.30	5.07
		25	0.29	0.30	4.91
		28	0.30	0.30	5.07
		35	0.30	0.30	4.91
		40	0.27	0.30	4.80
		50	0.27	0.30	4.80
		70	0.27	0.30	4.80
	3	100	0.27	0.30	4.80

**PRECISION, THROUGH HOLE**

# DMseries

PHT VERTEX PRECISION COMPONENTS CORP.



Unit: mm

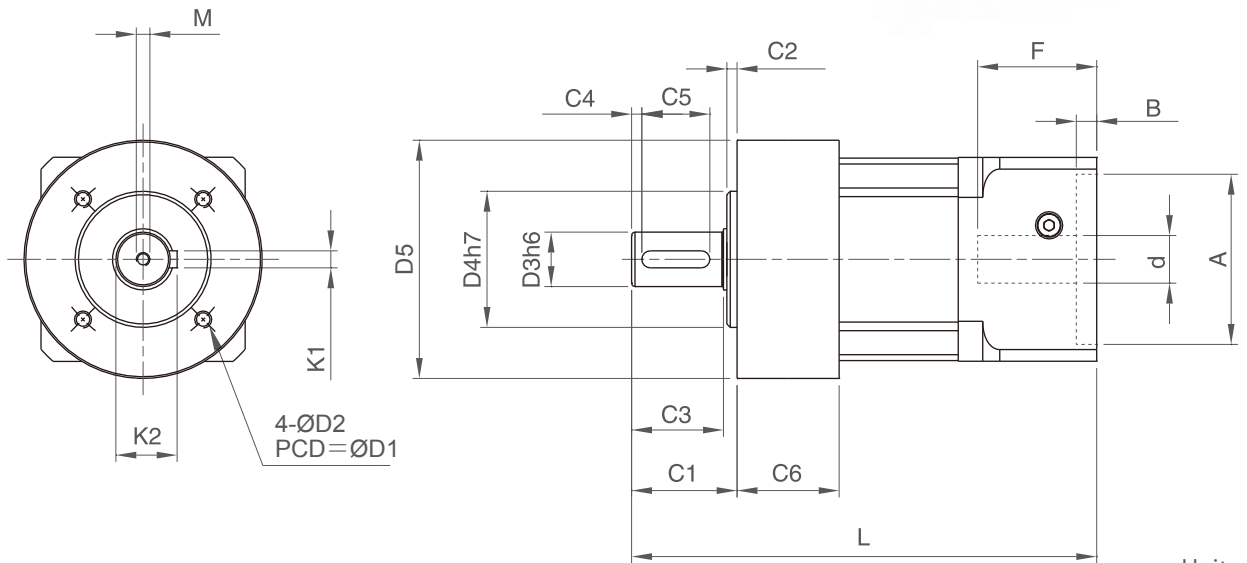
Info.	DM042	DM060	DM070	DM090	DM120	DM150	DM180	DM220	
D1	50.0	70.0	75.0	105.0	130.0	165.0	215.0	250.0	
D2	4.20	5.50	5.50	6.80	8.60	10.5	13.0	17.0	
D3	12.0	16 (12~16)	16 (12~16)	20 (16~22)	32 (24~35)	42 (38~45)	55 (50~60)	75 (50~75)	
D4	35.0	50.0	60.0	80.0	110.0	130.0	160.0	180.0	
C1	25.0	35.0	33.0	56.0	58.0	74.0	107.0	124.0	
C2	4.00	7.00	5.00	6.00	5.00	4.00	10.0	15.0	
C3	20.0	27.0	27.0	49.0	52.0	67.0	96.0	106.0	
C4	3.00	3.00	3.00	5.00	5.00	5.00	6.00	7.00	
C5	12.0	20.0	20.0	25.0	40.0	45.0	70.0	90.0	
C6	42.0	60.0	68.0	94.0	114.0	142.0	180.0	220.0	
C7	8.00	15.0	17.0	17.0	18.7	18.0	20.0	30.0	
L	L1	96.9	125.7	125.7	167.0	170.3	262.0	334.0	356.0
	L2	111.4	147.7	147.7	195.3	198.6	313.8	416.0	462.5
M	M4xP0.7x15	M4xP0.7x15	M4xP0.7x15	M6xP1.0x20	M8xP1.25x27	M12xP1.75x 32	M12xP1.75x40	M14xP2.0x40	
K1	4.00	5.00	5.00	6.00	10.0	12.0	14.0	20.0	
K2	13.5	18.0	18.0	22.5	35.1	45.0	58.5	79.5	
d	≦ 8.0	≦ 14.0	≦ 14.0	≦ 24.0	≦ 28.0	≦ 42.0	≦ 55.0	≦ 69.7	
A	22~30	30~50	30~60	50~80	55~110	95~130	95~155	180~250	
B	5.00	6.00	6.00	6.00	5.00	10.0	11.0	12.0	
F	≦ 25.0	≦ 35.0	≦ 35.0	≦ 47.5	≦ 47.5	≦ 66.5	≦ 82.5	≦ 88.5	

Information	Stage	Ratio	DM042	DM060	DM070	DM090	DM120	DM150	DM180	DM220		
<b>Defined Output Torque (Nm)</b>	1	3	-	44	48	168	260	476	987	1560		
		4	35	54	60	188	306	560	1280	2200		
		5	34	48	56	180	292	536	1248	2360		
		7	30	46	52	176	285	520	1185	1880		
		10	22	44	48	168	260	476	987	1560		
	2	9	-	44	48	168	260	476	987	1560		
		12	-	44	48	168	260	476	987	1560		
		15	-	44	48	168	260	476	987	1560		
		16	35	54	60	188	306	560	1280	2200		
		20	34	48	56	180	292	536	1248	2360		
		21	-	44	48	168	260	476	987	1560		
		25	34	48	56	180	292	536	1248	2360		
		28	30	46	52	176	285	520	1185	1880		
		30	-	44	48	168	260	476	987	1560		
		35	30	46	52	176	285	520	1185	1880		
		40	22	44	48	168	260	476	987	1560		
		50	22	44	48	168	260	476	987	1560		
	70	22	44	48	168	260	476	987	1560			
	3	100	34	48	56	180	292	536	1248	2360		
<b>Peak Output Torque (Nm)</b>	1, 2, 3	3~100	<b>3 times of Defined Output Torque</b>									
<b>Backlash (arc min)</b>	1	3~10	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5		
	2	9~70	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8		
<b>Defined Input Speed (RPM)</b>	1	3, 4, 5	3300	3300	3300	2600	2300	2200	1500	1500		
		7, 10	4000	4000	4000	2900	2700	2700	2400	2000		
	2	9~40	4400	4400	4400	3200	3000	3000	2800	2400		
		50	4800	4800	4800	3600	3300	3200	3000	2500		
		70	5500	5500	5500	4200	3900	3500	3200	2000		
<b>Weight (kg)</b>	1	3~10	0.40	1.28	1.40	4.10	6.30	18.0	38.0	70.0		
	2	9~70	0.50	1.60	1.80	5.20	7.80	25.0	50.0	78.0		
<b>Torsional Rigidity (Nm/arc min)</b>	1, 2	3~70	3.0	6.50	7.00	14.00	27.00	48.0	115	218		
<b>Allowable Radial Force (N)</b>			700	1400	1400	6200	7500	14000	22000	28800		
<b>Allowable Axial Force (N)</b>			350	800	800	5200	6450	12000	20000	26000		
<b>Noise (dB)</b>			65	65	65	64	64	64	64	64		
<b>Life Time (hrs)</b>			20000									
<b>Temperature (°C)</b>			-15°C~+90°C									
<b>Protection Rank</b>			IP64									
<b>Lubricant</b>			Synthetic Lubricant, ISO VG220									
<b>Mass Moments of Inertia (kg X cm<sup>2</sup>)</b>			1	3	-	0.042	0.042	0.78	2.38	19.80	48.70	66.50
				4	0.04	0.030	0.030	0.60	2.00	17.00	45.00	63.20
	5	0.04		0.029	0.029	0.59	2.00	17.00	46.50	65.00		
	7	0.04		0.028	0.028	0.73	2.00	16.80	46.50	65.80		
	10	0.04		0.035	0.035	0.75	2.30	19.00	48.00	66.80		
	2	9	-	0.042	0.042	0.78	2.38	19.80	19.80	24.50		
		12	-	0.030	0.030	0.73	2.10	17.00	19.00	24.00		
		16	0.03	0.030	0.030	0.60	2.10	17.00	17.00	22.00		
		20	0.03	0.030	0.030	0.60	2.10	16.8	17.00	22.00		
		25	0.03	0.029	0.029	0.75	2.10	17.00	17.00	21.50		
		28	0.03	0.030	0.030	0.75	2.10	19.00	17.00	21.50		
		35	0.03	0.030	0.030	0.73	2.38	19.00	19.00	21.00		
		40	0.03	0.035	0.035	0.78	2.38	19.00	19.00	21.00		
		50	0.03	0.035	0.035	0.78	2.38	19.00	19.00	21.00		
		70	0.03	0.035	0.035	0.78	2.38	19.00	19.00	21.00		
	3	100	0.03	0.035	0.035	0.78	2.38	19.80	19.80	20.60		

**PRECISION, THREAD HOLE**

# DMLseries

PHT VERTEX PRECISION COMPONENTS CORP.



Unit: mm

Info.	DML042	DML060	DML090	DML120	DML150	DML180	DML220	
D1	34.0	50.0	70.0	100.0	145.0	184.0	210.0	
D2	M4	M5	M6	M8	M12	M12	M16	
D3	12.0	16 (12~16)	20 (16~22)	32 (24~35)	42 (38~45)	55 (50~60)	75 (50~75)	
D4	26.0	40.0	60.0	80.0	130.0	160.0	180.0	
D5	46.0	70.0	101.0	128.0	160.0	205.0	260.0	
C1	23.0	31.0	55.0	58.0	74.0	107.0	124.0	
C2	2.00	3.00	5.00	5.00	4.00	10.0	15.0	
C3	20.0	27.0	49.0	52.0	67.0	96.0	106.0	
C4	3.00	3.00	5.00	5.00	5.00	6.00	7.00	
C5	12.0	20.0	25.0	40.0	45.0	70.0	90.0	
C6	24.2	30.0	35.0	32.0	38.0	40.0	55.0	
L	L1	106.9	136.7	184.0	118.3	282.0	354.0	381.0
	L2	121.4	158.7	212.3	216.6	333.8	436.0	487.5
M	M4xP0.7x15	M4xP0.7x15	M6xP1.0x20	M8xP1.25x27	M12xP1.75x 32	M12xP1.75x40	M14xP2.0x40	
K1	4.00	5.00	6.00	10.0	12.0	14.0	20.0	
K2	13.5	18.0	22.5	35.1	45.0	58.5	79.5	
d	≦ 8.0	≦ 14.0	≦ 24.0	≦ 28.0	≦ 42.0	≦ 55.0	≦ 69.7	
A	22~30	30~50	50~80	55~110	95~130	95~155	180~250	
B	5.00	6.00	6.00	5.00	10.0	11.0	12.0	
F	≦ 25.0	≦ 35.0	≦ 47.5	≦ 47.5	≦ 66.5	≦ 82.5	≦ 88.5	

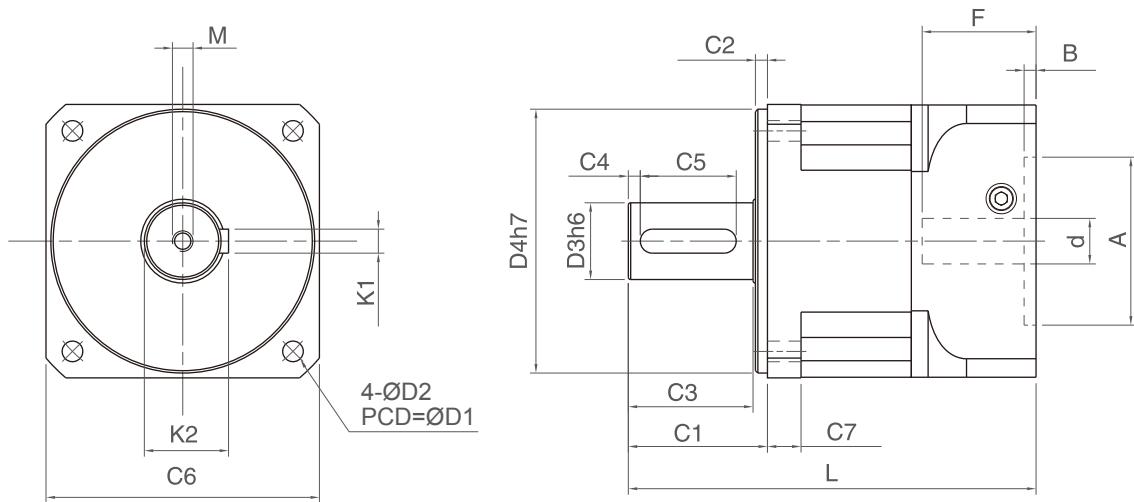
Information	Stage	Ratio	DML042	DML060	DML090	DML120	DML150	DML180	DML220	
<b>Defined Output Torque (Nm)</b>	1	3	-	44	168	260	476	987	1560	
		4	35	54	188	306	560	1280	2200	
		5	34	48	180	292	536	1248	2360	
		7	30	46	176	285	520	1185	1880	
		10	22	44	168	260	476	987	1560	
	2	9	-	44	168	260	476	987	1560	
		12	-	44	168	260	476	987	1560	
		15	-	44	168	260	476	987	1560	
		16	35	54	188	306	560	1280	2200	
		20	34	48	180	292	536	1248	2360	
		21	-	44	168	260	476	987	1560	
		25	34	48	180	292	536	1248	2360	
		28	30	46	176	285	520	1185	1880	
		30	-	44	168	260	476	987	1560	
		35	30	46	176	285	520	1185	1880	
		40	22	44	168	260	476	987	1560	
		50	22	44	168	260	476	987	1560	
		70	22	44	168	260	476	987	1560	
	3	100	34	48	180	292	536	1248	2360	
	<b>Peak Output Torque (Nm)</b>	1, 2, 3	3~100	<b>3 times of Defined Output Torque</b>						
<b>Backlash (arc min)</b>	1	3~10	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	
	2	9~70	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8	
<b>Defined Input Speed (RPM)</b>	1	3, 4, 5	3300	3300	2600	2300	2200	1500	1500	
		7, 10	4000	4000	2900	2700	2700	2400	2000	
	2	12~40	4400	4400	3200	3000	3000	2800	2400	
		50	4800	4800	3600	3300	3200	3000	2500	
		70	5500	5500	4200	3900	3500	3200	2000	
<b>Weight (kg)</b>	1	3~10	0.40	1.28	4.10	6.30	18.0	38.0	70.0	
	2	9~70	0.50	1.60	5.20	7.80	25.0	50.0	78.0	
<b>Torsional Rigidity (Nm/arc min)</b>	1, 2	3~70	3.0	6.50	14.00	27.00	48.0	115	218	
<b>Allowable Radial Force (N)</b>			630	1260	5580	6750	12600	19800	25920	
<b>Allowable Axial Force (N)</b>			315	720	4680	5805	10800	18000	23400	
<b>Noise (dB)</b>			65	65	64	64	64	64	64	
<b>Life Time (hrs)</b>			20000							
<b>Temperature (°C)</b>			-15°C~+90°C							
<b>Protection Rank</b>			IP64							
<b>Lubricant</b>			Synthetic Lubricant, ISO VG220							
<b>Mass Moments of Inertia (kg X cm<sup>2</sup>)</b>	1	3	-	0.042	0.78	2.38	19.80	48.70	66.50	
		4	0.04	0.030	0.60	2.00	17.00	45.00	63.20	
		5	0.04	0.029	0.59	2.00	17.00	46.50	65.00	
		7	0.04	0.028	0.73	2.00	16.80	46.50	65.80	
		10	0.04	0.035	0.75	2.30	19.00	48.00	66.80	
	2	9	-	0.042	0.78	2.38	19.80	19.80	24.50	
		12	-	0.030	0.73	2.10	17.00	19.00	24.00	
		16	0.03	0.030	0.60	2.10	17.00	17.00	22.00	
		20	0.03	0.030	0.60	2.10	16.8	17.00	22.00	
		25	0.03	0.029	0.75	2.10	17.00	17.00	21.50	
		28	0.03	0.030	0.75	2.10	19.00	17.00	21.50	
		35	0.03	0.030	0.73	2.38	19.00	19.00	21.00	
		40	0.03	0.035	0.78	2.38	19.00	19.00	21.00	
		50	0.03	0.035	0.78	2.38	19.00	19.00	21.00	
		70	0.03	0.035	0.78	2.38	19.00	19.00	21.00	
		3	100	0.03	0.035	0.78	2.38	19.80	19.80	20.60



**HIGH THERMAL DISSIPATION**

# DS series

PHT VERTEX PRECISION COMPONENTS CORP.



Unit: mm

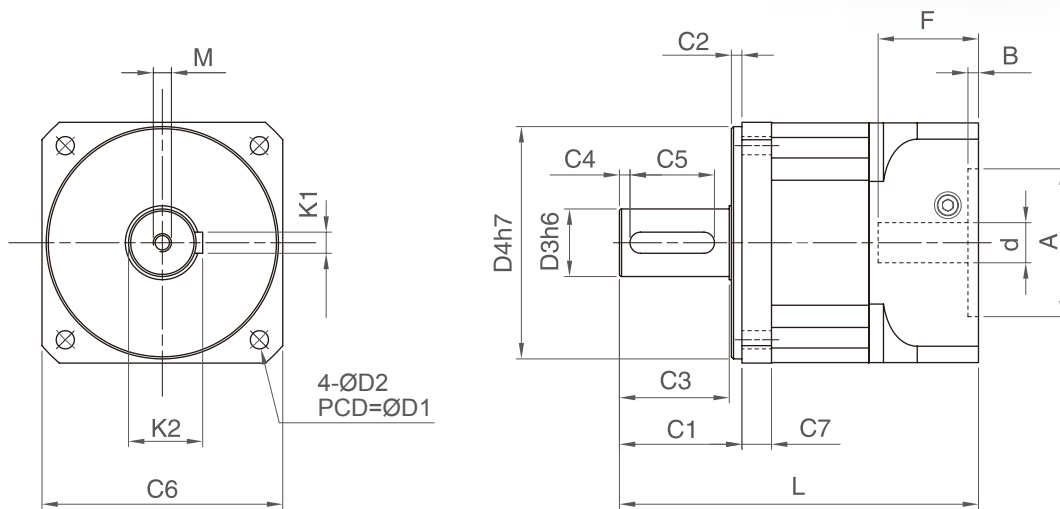
Info.	DS060	DS070	DS090	DS120	DS150	DS180	DS220	
D1	70.0	75.0	105.0	130.0	165.0	215.0	250.0	
D2	5.50	5.50	6.80	8.60	10.5	13.0	17.0	
D3	16 (12~16)	16 (12~16)	20 (16~22)	32 (24~35)	42 (38~45)	55 (50~60)	75 (50~75)	
D4	50.0	60.0	80.0	110.0	130.0	160.0	180.0	
C1	35.0	33.0	56.0	58.0	74.0	107.0	124.0	
C2	7.00	5.00	6.00	5.00	4.00	10.0	15.0	
C3	27.0	27.0	49.0	52.0	67.0	96.0	106.0	
C4	3.00	3.00	5.00	5.00	5.00	6.00	7.00	
C5	20.0	20.0	25.0	40.0	45.0	70.0	90.0	
C6	60.0	68.0	94.0	114.0	142.0	180.0	220.0	
C7	11.0	10.0	17.0	14.0	18.0	25.0	30.0	
L	L1	125.7	125.7	167.0	170.3	262.0	334.0	356.0
	L2	147.7	147.7	195.3	198.6	313.8	416.0	462.5
	M	M4 x P0.7 x 15	M4 x P0.7 x 15	M6 x P1.0 x 20	M8xP1.25x27	M12xP1.75x32	M12xP2.0x40	M14xP2.0x40
K1	5.00	5.00	6.00	10.0	12.0	14.0	20.0	
K2	18.0	18.0	22.5	35.1	45.0	58.5	79.5	
d	≦ 14.0	≦ 14.0	≦ 24.0	≦ 28.0	≦ 42.0	≦ 55.0	≦ 69.7	
A	30~50	30~60	50~80	55~110	95~130	95~155	180~250	
B	6.00	6.00	6.00	5.00	10.0	11.0	12.0	
F	≦ 35.0	≦ 35.0	≦ 47.5	≦ 47.5	≦ 66.5	≦ 82.5	≦ 88.5	

Information	Stage	Ratio	DS060	DS070	DS090	DS120	DS150	DS180	DS220
<b>Defined Output Torque (Nm)</b>	1	3	44	48	168	260	476	987	1560
		4	54	60	188	306	560	1280	2200
		5	48	56	180	292	536	1248	2360
		7	46	52	176	285	520	1185	1880
		10	44	48	168	260	476	987	1560
	2	9	44	48	168	260	476	987	1560
		12	44	48	168	260	476	987	1560
		15	44	48	168	260	476	987	1560
		16	54	60	188	306	560	1280	2200
		20	48	56	180	292	536	1248	2360
		21	44	48	168	260	476	987	1560
		25	48	56	180	292	536	1248	2360
		28	46	52	176	285	520	1185	1880
		30	44	48	168	260	476	987	1560
		35	46	52	176	285	520	1185	1880
		40	44	48	168	260	476	987	1560
		50	44	48	168	260	476	987	1560
	70	44	48	168	260	476	987	1560	
	3	100	48	56	180	292	536	1248	2360
<b>Peak Output Torque (Nm)</b>	1, 2, 3	3~100	<b>3 times of Defined Output Torque</b>						
<b>Backlash (arc min)</b>	1	3~10	≦ 5	≦ 5	≦ 5	≦ 5	≦ 5	≦ 5	≦ 5
	2	9~70	≦ 8	≦ 8	≦ 8	≦ 8	≦ 8	≦ 8	≦ 8
<b>Defined Input Speed (RPM)</b>	1	3, 4, 5	3300	3300	2600	2300	2200	1500	1500
		7, 10	4000	4000	2900	2700	2700	2400	2000
	2	9~40	4400	4400	3200	3000	3000	2800	2400
		50	4800	4800	3600	3300	3200	3000	2500
		70	5500	5500	4200	3900	3500	3200	2000
<b>Weight (kg)</b>	1	3~10	1.10	1.30	3.20	4.60	13.0	32.0	49.0
	2	9~70	1.40	1.60	4.20	5.80	17.0	41.0	61.0
<b>Torsional Rigidity (Nm/arc min)</b>	1, 2	3~70	6.50	7.00	14.00	27.00	48.0	115	218
<b>Allowable Radial Force (N)</b>			1400	1400	6200	7500	14000	22000	28800
<b>Allowable Axial Force (N)</b>			800	800	5200	6450	12000	20000	26000
<b>Noise (dB)</b>			65	65	64	64	64	64	64
<b>Life Time (hrs)</b>			20000						
<b>Temperature (°C)</b>			-15°C~+90°C						
<b>Protection Rank</b>			IP64						
<b>Lubricant</b>			Synthetic Lubricant, ISO VG220						
<b>Mass Moments of Inertia (kg X cm<sup>2</sup>)</b>			1	3	0.042	0.042	0.78	2.38	19.80
	4	0.030		0.030	0.60	2.00	17.00	45.00	63.20
	5	0.029		0.029	0.59	2.00	17.00	46.50	65.00
	7	0.028		0.028	0.73	2.00	16.80	45.50	65.80
	10	0.035		0.035	0.75	2.30	19.00	48.00	66.80
	2	9	0.042	0.042	0.78	2.38	19.80	19.80	24.50
		12	0.030	0.030	0.73	2.10	17.00	19.00	24.00
		16	0.030	0.030	0.60	2.10	17.00	17.00	22.00
		20	0.030	0.030	0.60	2.10	16.80	17.00	22.00
		25	0.029	0.029	0.75	2.10	17.00	17.00	21.50
		28	0.030	0.030	0.75	2.10	19.00	17.00	21.50
		35	0.030	0.030	0.73	2.38	19.00	19.00	21.00
		40	0.035	0.035	0.78	2.38	19.00	19.00	21.00
		50	0.035	0.035	0.78	2.38	19.00	19.00	21.00
		70	0.035	0.035	0.78	2.38	19.00	19.00	21.00
	3	100	0.035	0.035	0.78	2.38	19.80	19.80	20.60

**HIGH PRECISION, THROUGH HOLE**

# DAseries

PHT VERTEX PRECISION COMPONENTS CORP.



Unit: mm

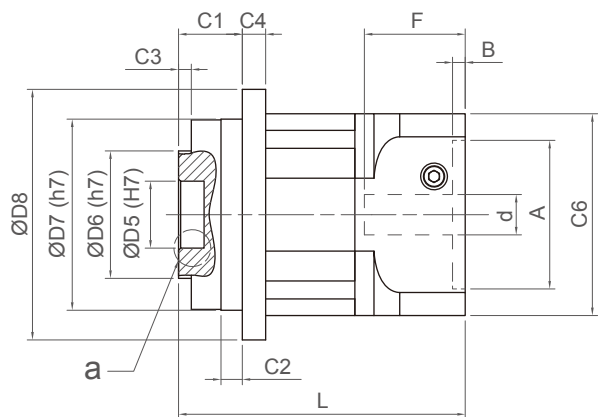
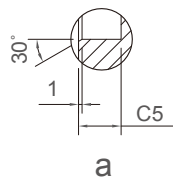
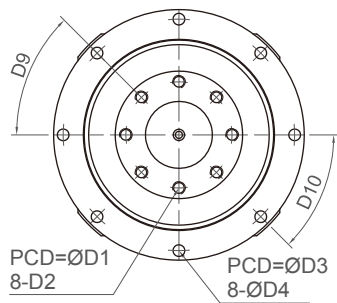
Info.	DA060	DA090	DA120
D1	70.0	105.0	130.0
D2	5.50	6.8	8.6
D3	16 (12~16)	20 (18~22)	32 (24~35)
D4	50.0	80.0	110.0
C1	35.0	56.0	58.0
C2	7.0	6.0	5.0
C3	27.0	49.0	52.0
C4	3.0	5.0	5.0
C5	20.0	25.0	40.0
C6	60.0	94.0	114.0
C7	15.0	17.0	18.7
L	L1	125.7	170.3
	L2	147.7	198.6
M	M4 x P0.7 x 15	M6 x P1.0 x 20	M8 x P1.25 x 27
K1	5.0	6.0	10.0
K2	18.0	22.5	35.1
d	≦ 14.0	≦ 24.0	≦ 28.0
A	30~50	50~80	50~110
B	6.0	8.0	5.0
F	≦ 35.0	≦ 47.5	≦ 47.5

Information	Stage	Ratio	DA060	DA090	DA120
<b>Defined Output Torque (Nm)</b>	1	3	37	115	208
		4	47	160	268
		5	47	150	260
		7	45	150	260
		10	37	115	208
	2	9	37	115	208
		12	37	115	208
		15	37	115	208
		16	47	160	268
		20	47	150	260
		21	37	115	208
		25	47	150	260
		28	45	150	260
		30	37	115	208
		35	45	150	260
		40	37	115	208
		50	37	115	208
		70	37	115	208
	3	100	47	150	260
<b>Peak Output Torque (Nm)</b>	1, 2, 3	3~100	<b>3 times of Defined Output Torque</b>		
<b>Backlash (arc min)</b>	1	3~10	P2≤5, P1≤3, P0≤1	P2≤5, P1≤3, P0≤1	P2≤5, P1≤3, P0≤1
	2	9~70	P2≤7, P1≤5, P0≤3	P2≤7, P1≤5, P0≤3	P2≤7, P1≤5, P0≤3
<b>Defined Input Speed (RPM)</b>	1	3, 4, 5	3300	3300	3200
		7, 10	3600	3600	3500
	2	9~40	4000	3900	3800
		50	4400	4300	4200
		70	4800	4600	4500
<b>Weight (kg)</b>	1	3~10	1.30	3.50	6.00
	2	9~70	1.60	4.50	7.20
<b>Torsional Rigidity (Nm/arc min)</b>	1, 2	3~70	7.00	14.00	25.00
<b>Allowable Radial Force (N)</b>			1500	3500	6000
<b>Allowable Axial Force (N)</b>			750	2800	4800
<b>Noise (dB)</b>			65	64	64
<b>Life Time (hrs)</b>			20000		
<b>Temperature (°C)</b>			-15°C~+90°C		
<b>Protection Rank</b>			IP64		
<b>Lubricant</b>			Synthetic Lubricant, ISO VG220		
<b>Mass Moments of Inertia (kg X cm<sup>2</sup>)</b>			1	3	0.26
	4	0.22		1.00	4.30
	5	0.20		0.95	3.90
	7	0.19		0.90	3.50
	10	0.18		0.80	3.40
	2	9	0.20	0.89	3.50
		12	0.19	0.80	3.20
		16	0.18	0.80	3.20
		20	0.17	0.80	3.20
		25	0.17	0.75	3.10
		28	0.17	0.75	3.10
		35	0.17	0.75	3.10
		40	0.17	0.75	3.10
		50	0.17	0.70	3.00
		70	0.17	0.70	3.00
		3	100	0.17	0.70

**FLANGE ROTATING**

# DF series

PHT VERTEX PRECISION COMPONENTS CORP.



Unit: mm

Info.	DF060	DF090	DF120	DF150
D1	31.5	50.0	63.0	80.0
D2	8 x M5 x P0.8	8 x M6 x P1.0	12 x M6 x P1.0	12 x M8 x P1.25
D3	79.0	109.0	135.0	168.0
D4	8 x 4.5	8 x 5.5	8 x 5.5	12 x 6.6
D5	20.0	31.5	40.0	50.0
D6	40.0	60.0	80.0	95.0
D7	64.0	90.0	110.0	140.0
D8	86.0	118.0	145.0	179.0
D9	45°	45°	45°	30°
D10	45°	45°	30°	30°
C1	20.5	30.0	29.0	38.0
C2	16.5	10.0	10.0	15.0
C3	4.0	6.0	6.0	6.0
C4	15.5	11.0	17.4	25.0
C5	8.0	12.0	12.0	12.0
C6	60.0	94.0	114.0	142.0
d	≤ 14.0	≤ 24.0	≤ 28.0	≤ 42.0
A	30~50	50~80	55~100	95~130
B	6.0	6.0	5.0	10.0
F	≤ 35.0	≤ 47.5	≤ 47.5	≤ 66.5
L	L1	111.7	135.0	233.0
	L2	134.0	163.3	284.8

Information	Stage	Ratio	DF060	DF090	DF120	DF150	
<b>Defined Output Torque (Nm)</b>	1	3	44	168	260	476	
		4	54	188	306	560	
		5	46	176	285	520	
		7	48	180	292	536	
		10	44	168	260	476	
	2	9	44	168	260	476	
		12	44	168	260	476	
		15	44	168	260	476	
		16	54	188	306	560	
		20	46	176	285	520	
		21	44	168	260	476	
		25	46	176	285	520	
		28	48	180	292	536	
		30	44	168	260	476	
		35	48	180	292	536	
		40	44	168	260	476	
		50	44	168	260	476	
		70	44	168	260	476	
	3	100	46	176	285	520	
<b>Peak Output Torque (Nm)</b>	1, 2, 3	3~100	<b>3 times of Defined Output Torque</b>				
<b>Backlash (arc min)</b>	1	3~10	≤ 5	≤ 5	≤ 5	≤ 5	
	2	9~70	≤ 8	≤ 8	≤ 8	≤ 8	
<b>Defined Input Speed (RPM)</b>	1	3, 4, 5	3300	2600	2300	2200	
		7, 10	4000	2900	2700	2700	
	2	9~40	4400	3200	3000	3000	
		50	4800	3600	3300	3200	
		70	5500	4200	3900	3500	
<b>Weight (kg)</b>	1	3~10	2.30	4.70	7.40	22.0	
	2	9~70	2.80	5.80	8.90	29.0	
<b>Torsional Rigidity (Nm/arc min)</b>	1, 2	3~70	6.50	14.00	27.00	48.0	
<b>Max. Bending Moment (Nm)</b>			50	98	125	200	
<b>Allowable Axial Force (N)</b>			2300	5400	6700	9000	
<b>Noise (dB)</b>			65	65	64	64	
<b>Life Time (hrs)</b>			20000				
<b>Temperature (°C)</b>			-15°C~+90°C				
<b>Protection Rank</b>			IP64				
<b>Lubricant</b>			Synthetic Lubricant, ISO VG220				
<b>Mass Moments of Inertia (kg X cm<sup>2</sup>)</b>			1	3	0.04	0.78	2.38
	4	0.03		0.60	2.00	17.00	
	5	0.03		0.59	2.00	17.00	
	7	0.03		0.73	2.00	16.80	
	10	0.04		0.75	2.30	19.00	
	2	9	0.04	0.78	2.38	19.80	
		12	0.03	0.73	2.10	17.00	
		16	0.03	0.60	2.10	17.00	
		20	0.03	0.60	2.10	16.80	
		25	0.03	0.75	2.10	17.00	
		28	0.03	0.75	2.10	19.00	
		35	0.03	0.73	2.38	19.00	
		40	0.04	0.78	2.38	19.00	
		50	0.04	0.78	2.38	19.00	
		70	0.04	0.78	2.38	19.00	
		3	100	0.04	0.78	2.38	19.80

# Right-Angle Planetary Gearboxes

## Introduction

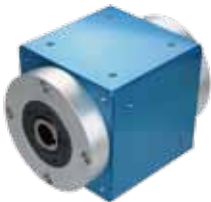




PHT Vertex Precision produces a complete range of right-angle planetary gearboxes, which offer a wide range of standard ratios and shaft options, for applications requiring high precision and space-saving installation.

## Advantage of PHT Vertex Right-Angle Planetary Gearbox

- > High Thermal Dissipation
- > Low Backlash for Outstanding Repeatability
- > Flexible and customized Design for Motor Mounting
- > No Extra Lubrication by Unique Design on Seal
- > High Output Torque and Low Noise
- > Diverse combination with in-line planetary gearboxes

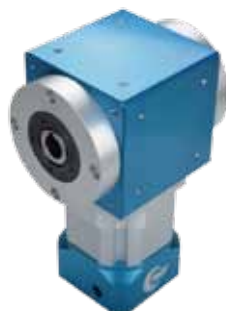
## Modularity of Turning Unit

The modularity of turning unit supplies the convenience for customer to combine existed PHT Vertex in-line planetary gearbox, also reduces the burden of stock.

RA-H	RA-S	RA-2S	RA-D	RA-F
				
Dual Hollow Shafts	Single Solid Shaft	Dual Solid Shafts	Collar Clamp Shafts	Flange Rotating

## Right-Angle Planetary Gearbox - Precision

### RAM-H<sub>series</sub>



<b>Type:</b>	RAM-H series
<b>Feature:</b>	Precision, Dual Hollow Shafts
<b>Backlash:</b>	8 ~ 11 arc min
<b>Size:</b>	60, 90, 120, 150
<b>Noise:</b>	65 dB
<b>Life Time:</b>	20,000 hrs.

**RAM-S**series



**Type:** RAM-S series  
**Feature:** Precision, Single Solid Shaft  
**Backlash:** 8 ~ 11 arc min  
**Size:** 60, 90, 120, 150  
**Noise:** 65 dB  
**Life Time:** 20,000 hrs.

**RAM-2S**series



**Type:** RAM-2S series  
**Feature:** Precision, Dual Solid Shafts  
**Backlash:** 8 ~ 11 arc min  
**Size:** 60, 90, 120, 150  
**Noise:** 65 dB  
**Life Time:** 20,000 hrs.

**RAM-D**series



**Type:** RAM-D series  
**Feature:** Precision, Collar Clamp  
**Backlash:** 8 ~ 11 arc min  
**Size:** 60, 90, 120, 150  
**Noise:** 65 dB  
**Life Time:** 20,000 hrs.

**RAM-F**series

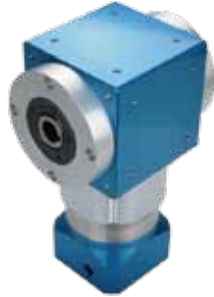


**Type:** RAM-F series  
**Feature:** Precision, Flange Rotating  
**Backlash:** 8 ~ 11 arc min  
**Size:** 60, 90, 120, 150  
**Noise:** 65 dB  
**Life Time:** 20,000 hrs.



## Right-Angle Planetary Gearbox - All-Purpose

### RAH-H<sub>series</sub>



**Type:** RAH-H series  
**Feature:** All-Purpose, Dual Hollow Shafts  
**Backlash:** 14~18 arc min  
**Size:** 60, 90, 120, 150  
**Noise:** 65 dB  
**Life Time:** 20,000 hrs.

### RAH-S<sub>series</sub>



**Type:** RAH-S series  
**Feature:** All-Purpose, Single Solid Shaft  
**Backlash:** 14~18 arc min  
**Size:** 60, 90, 120, 150  
**Noise:** 65 dB  
**Life Time:** 20,000 hrs.

### RAH-2S<sub>series</sub>



**Type:** RAH-2S series  
**Feature:** All-Purpose, Dual Solid Shafts  
**Backlash:** 14~18 arc min  
**Size:** 60, 90, 120, 150  
**Noise:** 65 dB  
**Life Time:** 20,000 hrs.

### RAH-D<sub>series</sub>



**Type:** RAH-D series  
**Feature:** All-Purpose, Collar Clamp  
**Backlash:** 14~18 arc min  
**Size:** 60, 90, 120, 150  
**Noise:** 65 dB  
**Life Time:** 20,000 hrs.

### RAH-F<sub>series</sub>



**Type:** RAH-F series  
**Feature:** All-Purpose, Flange Rotating  
**Backlash:** 14~18 arc min  
**Size:** 60, 90, 120, 150  
**Noise:** 65 dB  
**Life Time:** 20,000 hrs.

**8 ~ 11 ARC MIN**

# RAMseries Specification

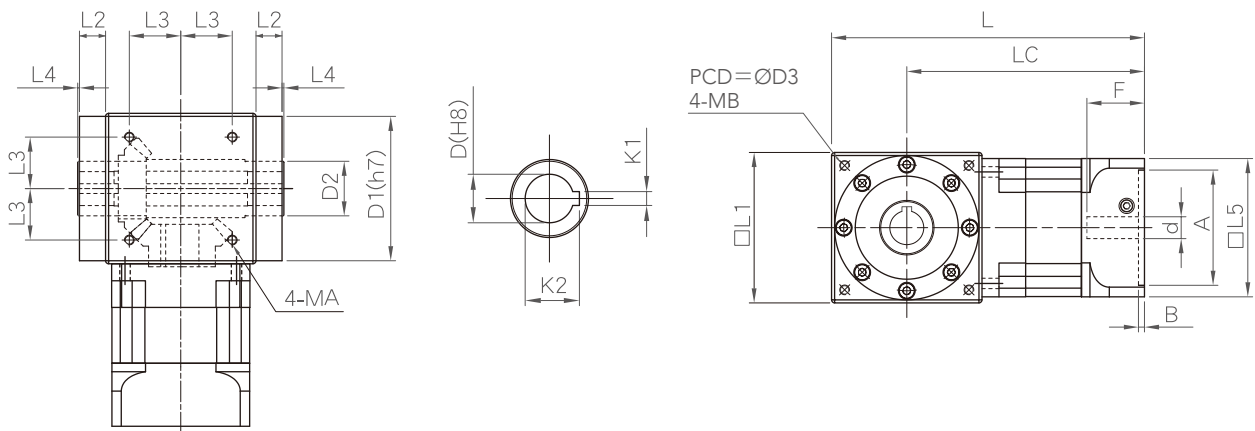
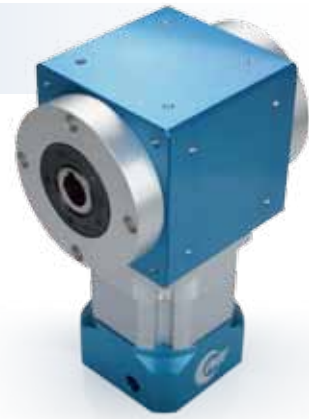
PHT VERTEX PRECISION COMPONENTS CORP.

Information	Stage	Ratio	RAM060	RAM090	RAM120	RAM150
<b>Defined Output Torque (Nm)</b>	1	3	44	168	260	476
		4	54	188	306	560
		5	48	180	292	536
		7	46	176	285	520
		10	44	168	260	476
	2	9	44	168	260	476
		12	44	168	260	476
		15	44	168	260	476
		16	54	188	306	560
		20	48	180	292	536
		21	44	168	260	476
		25	48	180	292	536
		28	46	176	285	520
		30	44	168	260	476
		35	46	176	285	520
		40	44	168	260	476
		49	46	176	285	520
50	44	168	260	476		
70	44	168	260	476		
<b>Peak Output Torque (Nm)</b>	1, 2	3~70	<b>3 times of Defined Output Torque</b>			
<b>Backlash (arc min)</b>	1	3~10	≤ 8	≤ 8	≤ 8	≤ 8
	2	9~70	≤ 11	≤ 11	≤ 11	≤ 11
<b>Defined Input Speed (RPM)</b>	1	3, 4, 5	3300	2600	2300	2200
		7, 10	4000	2900	2700	2700
	2	9~40	4400	3200	3000	3000
		49, 50 70	4800 5500	3600 4200	3300 3900	3200 3500
<b>Efficiency (%)</b>	1	3~10	≥ 91	≥ 91	≥ 91	≥ 91
	2	9~70	≥ 88	≥ 88	≥ 88	≥ 88
<b>Noise (dB)</b>	1, 2	3~70	65	65	65	65
<b>Life Time (hrs)</b>			20000			
<b>Temperature (°C)</b>			-15°C~+90°C			
<b>Protection Rank</b>			IP64			
<b>Lubricant</b>			Synthetic Lubricant, ISO VG220			

**DUAL HOLLOW SHAFTS**

# RAM-Hseries

PHT VERTEX PRECISION COMPONENTS CORP.



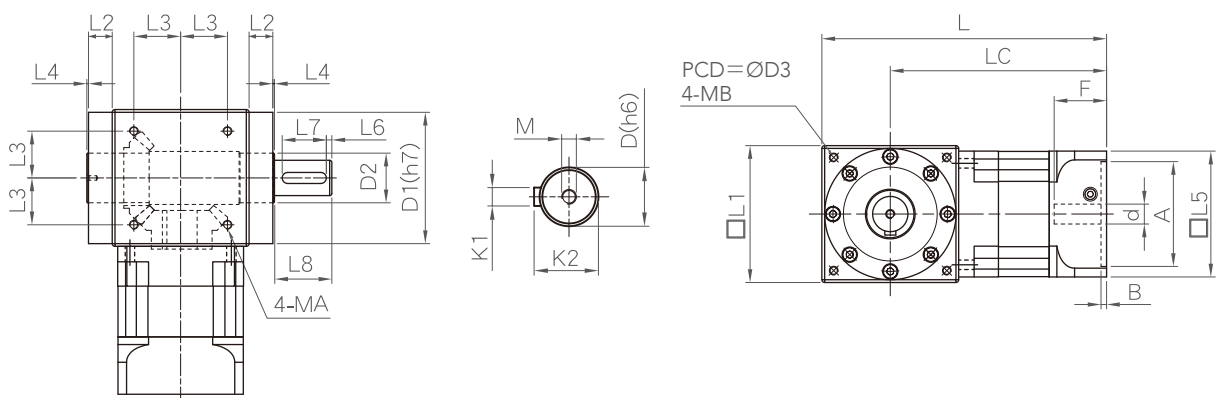
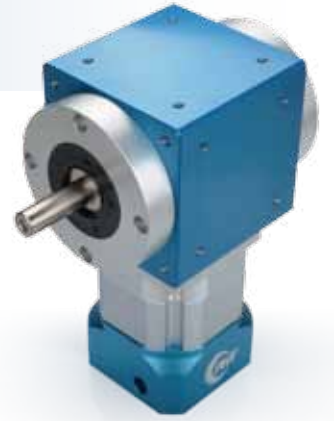
Unit: mm

Info.	RAM060 H	RAM090 H	RAM120 H	RAM150 H
L 1	83.0	114.0	124.0	154.0
L 2	17.0	21.5	21.5	21.0
L 3	28.284	33.587	38.890	45.962
MA	M5 x P0.8 x 10	M6 x P1.0 x 12	M8 x P1.25 x 14	M10 x P1.5 x 22
L 4	1.5	1.5	1.5	1.5
L 5	60.0	94.0	114.0	142.0
LC	Stage 1	146.0	187.0	282.0
	Stage 2	168.0	215.3	333.8
L	Stage 1	187.5	244.0	359.0
	Stage 2	209.5	272.3	410.8
D	16.0	20.0	28.0	40.0
D1	79.0	109.0	119.0	149.0
D2	25.0	30.0	45.0	55.0
D3	100.0	130.0	145.0	190.0
MB	M5 x P0.8 x 10	M6 x P1.0 x 12	M8 x P1.25 x 14	M10 x P1.5 x 22
K1	5.0	6.0	8.0	12.0
K2	18.3	22.8	31.3	43.3
d	≦ 14.0	≦ 24.0	≦ 28.0	≦ 42.0
A	30~50	50~80	55~110	95~130
B	6.0	6.0	5.0	10.0
F	≦ 35.0	≦ 47.5	≦ 47.5	≦ 66.5

**SINGLE SOLID SHAFT**

# RAM-Sseries

PHT VERTEX PRECISION COMPONENTS CORP.



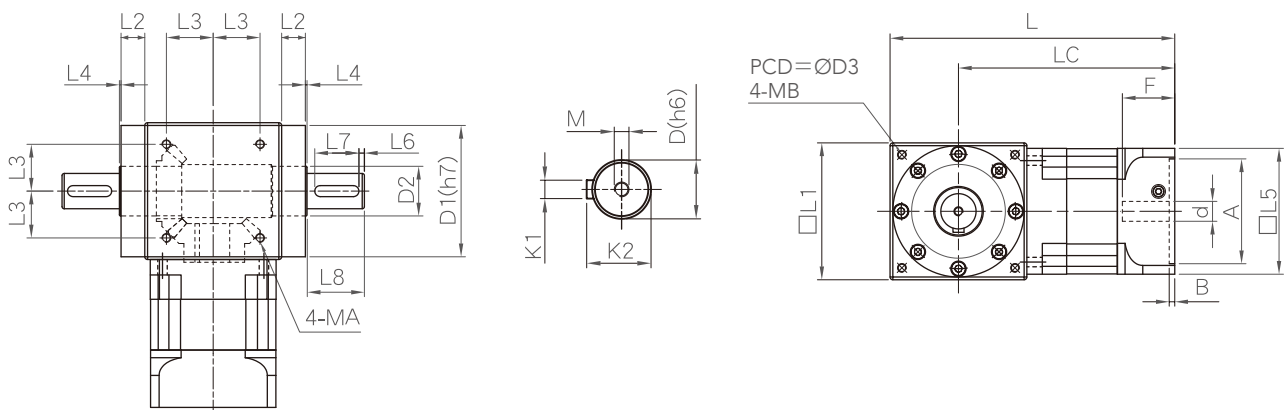
Unit: mm

Info.	RAM060 S	RAM090 S	RAM120 S	RAM150 S
L 1	83.0	114.0	124.0	154.0
L 2	17.0	21.5	21.5	21.0
L 3	28.284	33.587	38.890	45.962
MA	M5 x P0.8 x 10	M6 x P1.0 x 12	M8 x P1.25 x 14	M10 x P1.5 x 22
L 4	1.5	1.5	1.5	1.5
L 5	60.0	94.0	114.0	142.0
L 6	3.0	5.0	5.0	5.0
L 7	20.0	25.0	40.0	45.0
L 8	27.0	49.0	52.0	67.0
LC	Stage 1	146.0	187.0	282.0
	Stage 2	168.0	215.3	333.8
L	Stage 1	187.5	244.0	359.0
	Stage 2	209.5	272.3	410.8
D	16.0	20.0	32.0	42.0
D1	79.0	109.0	119.0	149.0
D2	25.0	30.0	45.0	55.0
D3	100.0	130.0	145.0	190.0
MB	M5 x P0.8 x 10	M6 x P1.0 x 12	M8 x P1.25 x 14	M10 x P1.5 x 22
M	M4 x P0.7 x 15	M6 x P1.0 x 20	M8 x P1.25 x 27	M12 x P1.75 x 32
K1	5.0	6.0	10.0	12.0
K2	18.0	22.5	35.0	45.0
d	≤ 14.0	≤ 24.0	≤ 28.0	≤ 42.0
A	30~50	50~80	55~110	95~130
B	6.0	6.0	5.0	10.0
F	≤ 35.0	≤ 47.5	≤ 47.5	≤ 66.5

**DUAL SOLID SHAFTS**

# RAM-2S series

PHT VERTEX PRECISION COMPONENTS CORP.



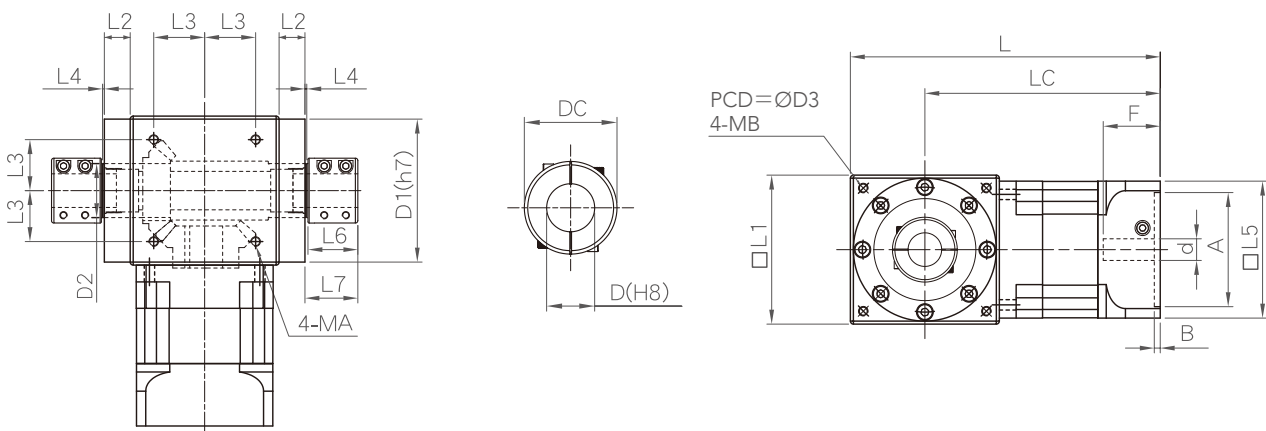
Unit: mm

Info.	RAM060 2S	RAM090 2S	RAM120 2S	RAM150 2S
L 1	83.0	114.0	124.0	154.0
L 2	17.0	21.5	21.5	21.0
L 3	28.284	33.587	38.890	45.962
MA	M5 x P0.8 x 10	M6 x P1.0 x 12	M8 x P1.25 x 14	M10 x P1.5 x 22
L 4	1.5	1.5	1.5	1.5
L 5	60.0	94.0	114.0	142.0
L 6	3.0	5.0	5.0	5.0
L 7	20.0	25.0	40.0	45.0
L 8	27.0	49.0	52.0	67.0
LC	Stage 1	146.0	187.0	282.0
	Stage 2	168.0	215.3	333.8
L	Stage 1	187.5	244.0	359.0
	Stage 2	209.5	272.3	410.8
D	16.0	20.0	32.0	42.0
D1	79.0	109.0	119.0	149.0
D2	25.0	30.0	45.0	55.0
D3	100.0	130.0	145.0	190.0
MB	M5 x P0.8 x 10	M6 x P1.0 x 12	M8 x P1.25 x 14	M10 x P1.5 x 22
M	M4 x P0.7 x 15	M6 x P1.0 x 20	M8 x P1.25 x 27	M12 x P1.75 x 32
K1	5.0	6.0	10.0	12.0
K2	18.0	22.5	35.0	45.0
d	≤ 14.0	≤ 24.0	≤ 28.0	≤ 42.0
A	30~50	50~80	55~110	95~130
B	6.0	6.0	5.0	10.0
F	≤ 35.0	≤ 47.5	≤ 47.5	≤ 66.5

**COLLAR CLAMP**

# RAM-D series

PHT VERTEX PRECISION COMPONENTS CORP.



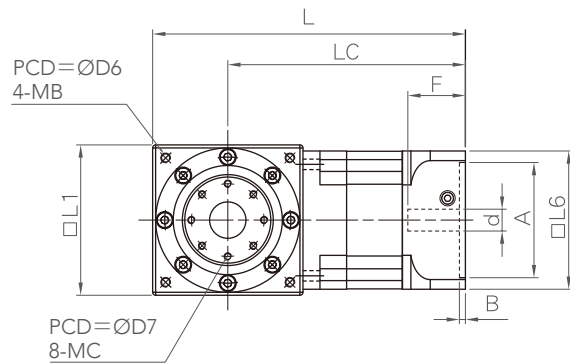
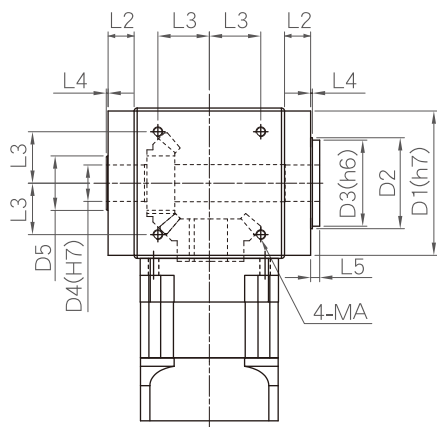
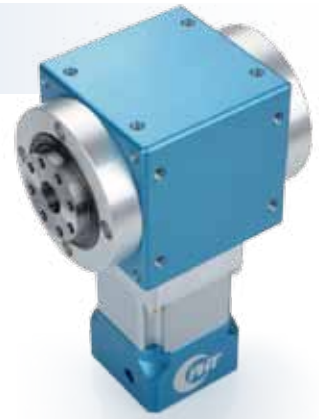
Unit: mm

Info.	RAM060 D	RAM090 D	RAM120 D	RAM150 D
L 1	83.0	114.0	124.0	154.0
L 2	17.0	21.5	21.5	21.0
L 3	28.284	33.587	38.890	45.962
MA	M5 x P0.8 x 10	M6 x P1.0 x 12	M8 x P1.25 x 14	M10 x P1.5 x 22
L 4	1.5	1.5	1.5	1.5
L 5	60.0	94.0	114.0	142.0
L 6	33.5	33.5	42.5	42.5
L 7	35.0	35.0	44.0	44.0
LC	Stage 1	146.0	187.0	282.0
	Stage 2	168.0	215.3	333.8
L	Stage 1	187.5	244.0	359.0
	Stage 2	209.5	272.3	410.8
DC	30.0	36.0	54.0	66.0
D	16.0	20.0	28.0	40.0
D1	79.0	109.0	119.0	149.0
D2	25.0	30.0	45.0	55.0
D3	100.0	130.0	145.0	190.0
MB	M5 x P0.8 x 10	M6 x P1.0 x 12	M8 x P1.25 x 14	M10 x P1.5 x 22
d	≦ 14.0	≦ 24.0	≦ 28.0	≦ 42.0
A	30~50	50~80	55~110	95~130
B	6.0	6.0	5.0	10.0
F	≦ 35.0	≦ 47.5	≦ 47.5	≦ 66.5

**FLANGE ROTATING**

# RAM-F series

PHT VERTEX PRECISION COMPONENTS CORP.



Unit: mm

Info.	RAM060 F	RAM090 F	RAM120 F	RAM150 F
L 1	83.0	114.0	124.0	154.0
L 2	17.0	21.5	21.5	21.0
L 3	28.284	33.587	38.890	45.962
MA	M5 x P0.8 x 10	M6 x P1.0 x 12	M8 x P1.25 x 14	M10 x P1.5 x 22
L 4	1.5	1.5	1.5	1.5
L 5	7.5	7.5	7.5	7.5
L 6	60.0	95.0	114.0	142.0
LC	Stage 1	146.0	187.0	196.0
	Stage 2	168.0	215.3	224.3
L	Stage 1	187.5	244.0	258.0
	Stage 2	209.5	272.3	286.3
D1	79.0	109.0	119.0	139.0
D2	45.0	60.0	75.0	80.0
D3	44.0	59.0	71.0	79.0
D4	15.0	20.0	30.0	35.0
D5	25.0	30.0	45.0	55.0
D6	100.0	130.0	145.0	190.0
MB	M5 x P0.8 x 10	M6 x P1.0 x 12	M8 x P1.25 x 14	M10 x P1.5 x 22
D7	35.0	50.0	60.0	68.0
MC	8-M5 x P0.8 x 12	8-M5 x P0.8 x 15	8-M6 x P1.0 x 15	12-M6 x P1.0 x 15
d	≤ 14.0	≤ 24.0	≤ 28.0	≤ 42.0
A	30~50	50~80	55~110	95~130
B	6.0	6.0	5.0	10.0
F	≤ 35.0	≤ 47.5	≤ 47.5	≤ 66.5

**14 ~ 18 ARC MIN**

# RAHseries Specification

PHT VERTEX PRECISION COMPONENTS CORP.

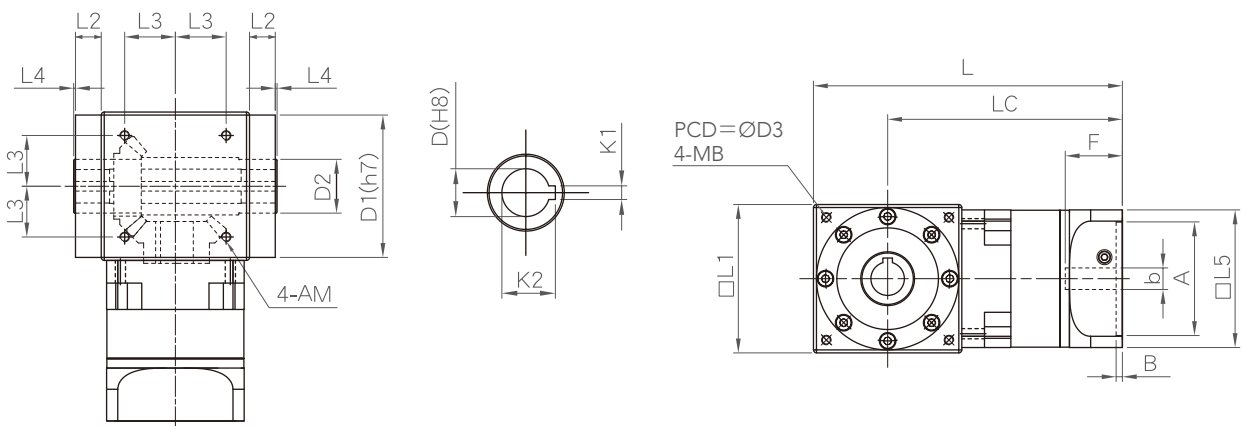
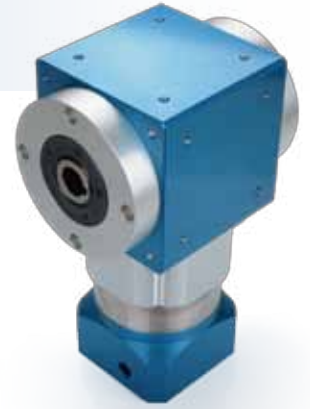
Information	Stage	Ratio	RAH060	RAH090	RAH120	RAH150
<b>Defined Output Torque (Nm)</b>	1	3	40	140	260	476
		4	60	168	306	560
		5	55	155	292	536
		7	50	166	285	520
		10	40	140	260	476
	2	9	40	140	260	476
		12	40	140	260	476
		15	40	140	260	476
		16	60	168	306	560
		20	55	155	292	536
		21	40	140	260	476
		25	55	155	292	536
		28	50	166	285	520
		30	40	140	260	476
		35	50	166	285	520
		40	40	140	260	476
		49	50	166	285	520
		50	40	140	260	476
70	40	140	260	476		
<b>Peak Output Torque (Nm)</b>	1, 2	3~70	<b>3 times of Defined Output Torque</b>			
<b>Backlash (arc min)</b>	1	3~10	≦ 14	≦ 14	≦ 14	≦ 14
	2	9~70	≦ 18	≦ 18	≦ 18	≦ 18
<b>Defined Input Speed (RPM)</b>	1	3, 4, 5	3300	2600	2300	2200
		7, 10	4000	2900	2700	2700
	2	9~40	4400	3200	3000	3000
		49, 50 70	4800 5500	3600 4200	3300 3900	3200 3500
<b>Efficiency (%)</b>	1	3~10	≧ 91	≧ 91	≧ 91	≧ 91
	2	9~70	≧ 88	≧ 88	≧ 88	≧ 88
<b>Noise (dB)</b>	1, 2	3~70	65	65	65	65
<b>Life Time (hrs)</b>			20000			
<b>Temperature (°C)</b>			-15°C~+90°C			
<b>Protection Rank</b>			IP64			
<b>Lubricant</b>			Synthetic Lubricant, ISO VG220			



**DUAL HOLLOW SHAFTS**

# RAH-Hseries

PHT VERTEX PRECISION COMPONENTS CORP.



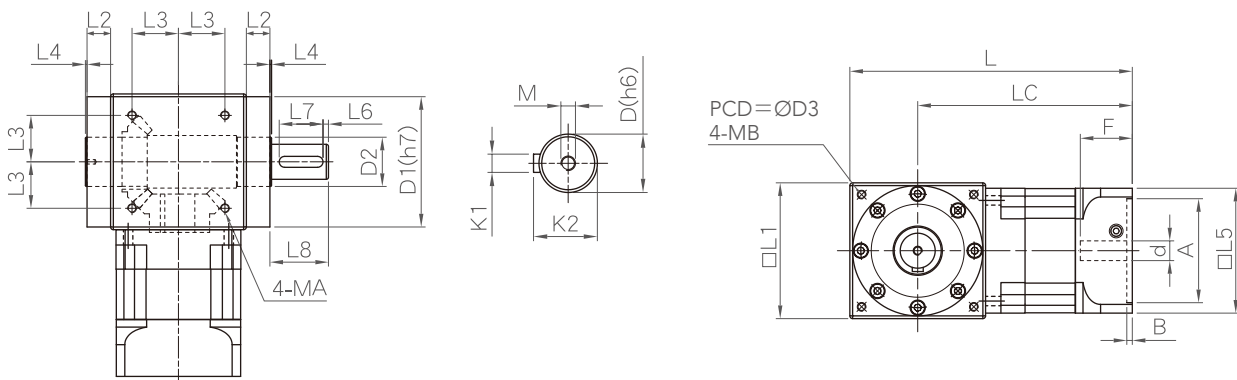
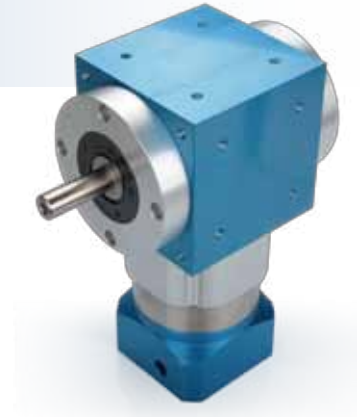
Unit: mm

Info.	RAH060 H	RAH090 H	RAH120 H	RAH150 H
L 1	83.0	114.0	124.0	154.0
L 2	17.0	21.5	21.5	21.0
L 3	28.284	33.587	38.890	45.962
MA	M5 x P0.8 x 10	M6 x P1.0 x 12	M8 x P1.25 x 14	M10 x P1.5 x 22
L 4	1.5	1.5	1.5	1.5
L 5	60.0	95.0	114.0	142.0
LC	Stage 1	135.7	184.8	196.3
	Stage 2	153.2	210.8	224.6
L	Stage 1	177.2	241.8	258.3
	Stage 2	194.7	267.8	286.6
D	16.0	20.0	28.0	40.0
D1	79.0	109.0	119.0	149.0
D2	25.0	30.0	45.0	55.0
D3	100.0	130.0	145.0	190.0
MB	M5 x P0.8 x 10	M6 x P1.0 x 12	M8 x P1.25 x 14	M10 x P1.5 x 22
K1	5.0	6.0	8.0	12.0
K2	18.3	22.8	31.3	43.3
d	≦ 14.0	≦ 24.0	≦ 28.0	≦ 42.0
A	30~50	50~80	55~110	95~130
B	6.0	8.0	5.0	10.0
F	≦ 32.0	≦ 40.0	≦ 47.5	≦ 66.5

SINGLE SOLID SHAFT

# RAH-S series

PHT VERTEX PRECISION COMPONENTS CORP.



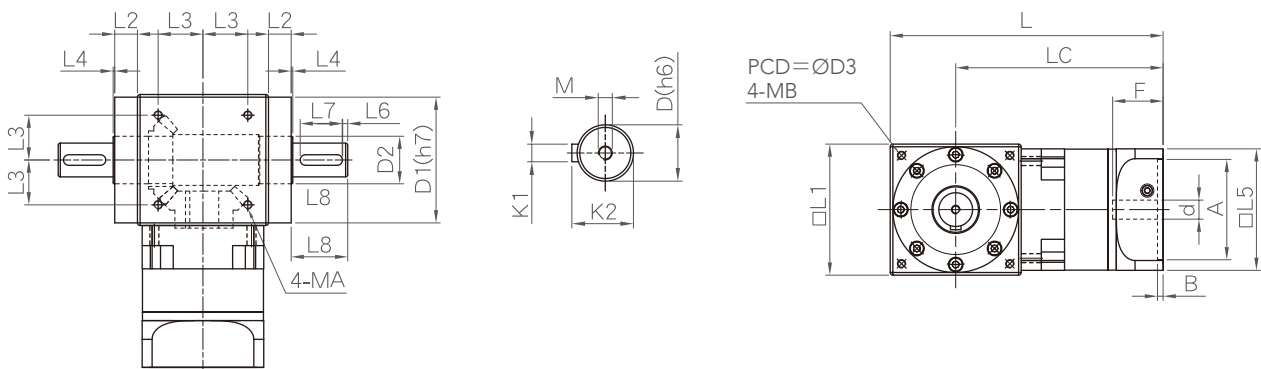
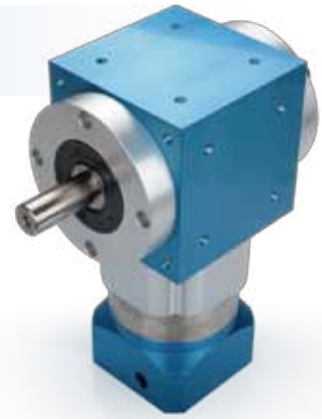
Unit: mm

Info.	RAH060 S	RAH090 S	RAH120 S	RAH150 S
L 1	83.0	114.0	124.0	154.0
L 2	17.0	21.5	21.5	21.0
L 3	28.284	33.587	38.890	45.962
MA	M5 x P0.8 x 10	M6 x P1.0 x 12	M8 x P1.25 x 14	M10 x P1.5 x 22
L 4	1.5	1.5	1.5	1.5
L 5	60.0	95.0	114.0	142.0
L 6	3.0	5.0	5.0	5.0
L 7	20.0	25.0	40.0	45.0
L 8	27.0	49.0	52.0	67.0
LC	Stage 1	135.7	184.8	282.5
	Stage 2	153.2	210.8	334.5
L	Stage 1	177.2	241.8	359.5
	Stage 2	194.7	267.8	411.5
D	16.0	20.0	32.0	42.0
D1	79.0	109.0	119.0	149.0
D2	25.0	30.0	45.0	55.0
D3	100.0	130.0	145.0	190.0
MB	M5 x P0.8 x 10	M6 x P1.0 x 12	M8 x P1.25 x 14	M10 x P1.5 x 22
M	M4 x P0.7 x 15	M6 x P1.0 x 20	M8 x P1.25 x 27	M12 x P1.75 x 32
K1	5.0	6.0	10.0	12.0
K2	18.0	22.5	35.0	45.0
d	≤ 14.0	≤ 24.0	≤ 28.0	≤ 42.0
A	30~50	50~80	55~110	95~130
B	6.0	8.0	5.0	10.0
F	≤ 32.0	≤ 40.0	≤ 47.5	≤ 66.5

**DUAL SOLID SHAFTS**

# RAH-2S series

PHT VERTEX PRECISION COMPONENTS CORP.



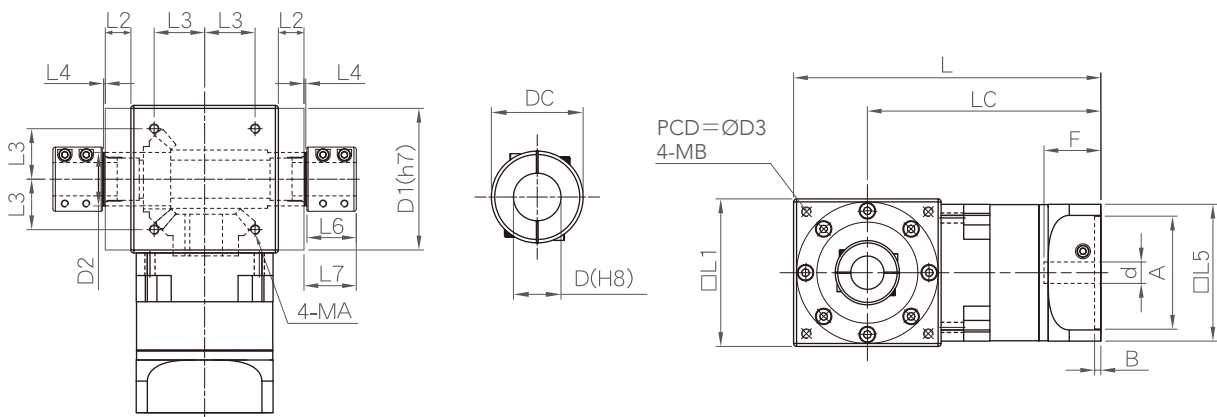
Unit: mm

Info.	RAH060 2S	RAH090 2S	RAH120 2S	RAH150 2S	
L 1	83.0	114.0	124.0	154.0	
L 2	17.0	21.5	21.5	21.0	
L 3	28.284	33.587	38.890	45.962	
MA	M5 x P0.8 x 10	M6 x P1.0 x 12	M8 x P1.25 x 14	M10 x P1.5 x 22	
L 4	1.5	1.5	1.5	1.5	
L 5	60.0	95.0	114.0	142.0	
L 6	3.0	5.0	5.0	5.0	
L 7	20.0	25.0	40.0	45.0	
L 8	27.0	49.0	52.0	67.0	
LC	Stage 1	135.7	184.8	282.5	
	Stage 2	153.2	210.8	224.6	334.5
L	Stage 1	177.2	241.8	258.3	359.5
	Stage 2	194.7	267.8	286.6	411.5
D	16.0	20.0	32.0	42.0	
D1	79.0	109.0	119.0	149.0	
D2	25.0	30.0	45.0	55.0	
D3	100.0	130.0	145.0	190.0	
MB	M5 x P0.8 x 10	M6 x P1.0 x 12	M8 x P1.25 x 14	M10 x P1.5 x 22	
M	M4 x P0.7 x 15	M6 x P1.0 x 20	M8 x P1.25 x 27	M12 x P1.75 x 32	
K1	5.0	6.0	10.0	12.0	
K2	18.0	22.5	35.0	45.0	
d	≤ 14.0	≤ 24.0	≤ 28.0	≤ 42.0	
A	30~50	50~80	55~110	95~130	
B	6.0	8.0	5.0	10.0	
F	≤ 32.0	≤ 40.0	≤ 47.5	≤ 66.5	

COLLAR CLAMP

# RAH-D series

PHT VERTEX PRECISION COMPONENTS CORP.



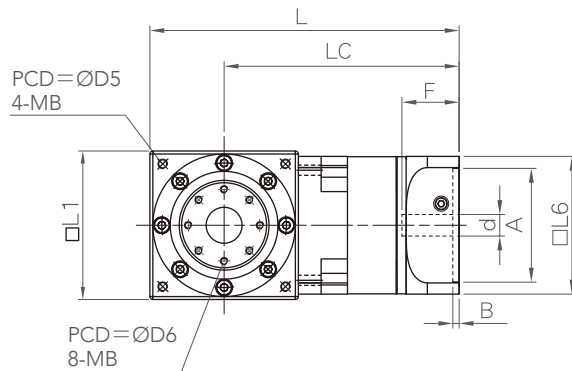
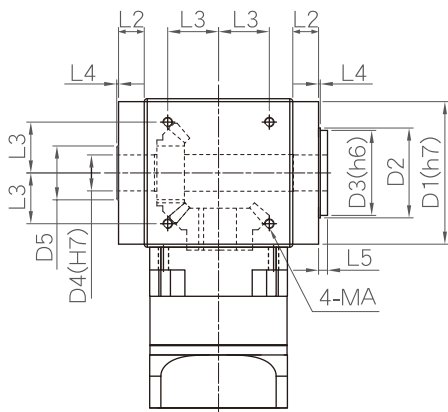
Unit: mm

Info.	RAH060 D	RAH090 D	RAH120 D	RAH150 D	
L 1	83.0	114.0	124.0	154.0	
L 2	17.0	21.5	21.5	21.0	
L 3	28.284	33.587	38.890	45.962	
MA	M5 x P0.8 x 10	M6 x P1.0 x 12	M8 x P1.25 x 14	M10 x P1.5 x 22	
L 4	1.5	1.5	1.5	1.5	
L 5	60.0	95.0	114.0	142.0	
L 6	33.5	33.5	42.5	42.5	
L 7	35.0	35.0	44.0	44.0	
LC	Stage 1	135.7	184.8	196.3	282.5
	Stage 2	153.2	210.8	224.6	334.5
L	Stage 1	177.2	241.8	258.3	359.5
	Stage 2	194.7	267.8	286.6	411.5
DC	30.0	36.0	54.0	66.0	
D	16.0	20.0	28.0	40.0	
D1	79.0	109.0	119.0	149.0	
D2	25.0	30.0	45.0	55.0	
D3	100.0	130.0	145.0	190.0	
MB	M5 x P0.8 x 10	M6 x P1.0 x 12	M8 x P1.25 x 14	M10 x P1.5 x 22	
d	≦ 14.0	≦ 24.0	≦ 28.0	≦ 42.0	
A	30~50	50~80	55~110	95~130	
B	6.0	8.0	5.0	10.0	
F	≦ 32.0	≦ 40.0	≦ 47.5	≦ 66.5	

**FLANGE ROTATING**

# RAH-F series

PHT VERTEX PRECISION COMPONENTS CORP.



Unit: mm

Info.	RAH060 F	RAH090 F	RAH120 F	RAH150 F	
L 1	83.0	114.0	124.0	154.0	
L 2	17.0	21.5	21.5	21.0	
L 3	28.284	33.587	38.890	45.962	
MA	M5 x P0.8 x 10	M6 x P1.0 x 12	M8 x P1.2 x 14	M10 x P1.5 x 22	
L 4	1.5	1.5	1.5	1.5	
L 5	7.5	7.5	7.5	7.5	
L 6	60.0	95.0	114.0	142.0	
LC	Stage 1	135.7	184.8	196.3	
	Stage 2	153.2	210.8	224.6	334.5
L	Stage 1	177.2	241.8	258.3	359.5
	Stage 2	194.7	267.8	286.6	411.5
D1	79.0	109.0	119.0	149.0	
D2	45.0	60.0	75.0	80.0	
D3	44.0	59.0	71.0	79.0	
D4	15.0	20.0	30.0	35.0	
D5	25.0	30.0	45.0	55.0	
D6	100.0	130.0	145.0	190.0	
MB	M5 x P0.8 x 10	M6 x P1.0 x 12	M8 x P1.25 x 14	M10 x P1.5 x 22	
D7	35.0	50.0	60.0	68.0	
MC	8-M5 x P0.8 x 12	8-M5 x P0.8 x 15	8-M6 x P1.0 x 15	12-M6 x P1.0 x 15	
d	≤ 14.0	≤ 24.0	≤ 28.0	≤ 42.0	
A	30~50	50~80	55~110	95~130	
B	6.0	8.0	5.0	10.0	
F	≤ 32.0	≤ 40.0	≤ 47.5	≤ 66.5	

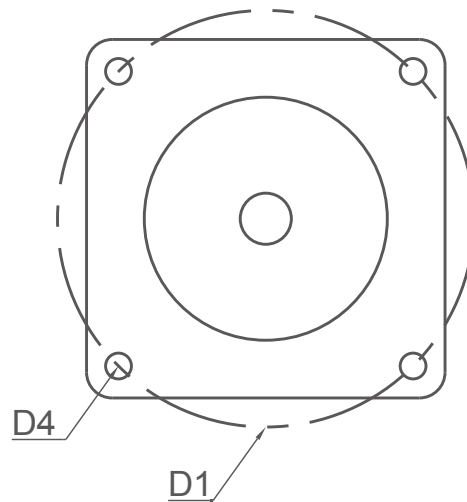
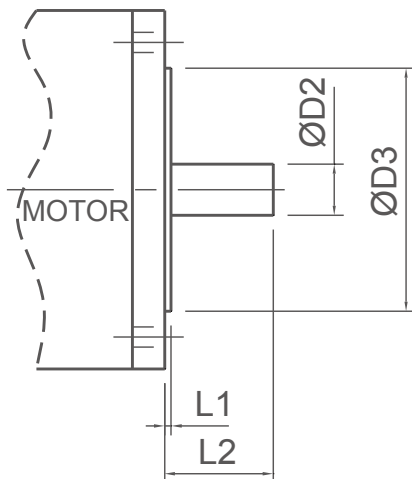
# Planetary Gearbox Application Form

Company:	Website:
Contact:	E-mail:
Address:	Phone:
City:	Fax:
Zip:	State:

## Motor Specifications:

Unit:  mm  in

Bolt Circle Diameter (D1):	Pilot Thickness (L1):
Hole Diameter (D4):	Pilot Diameter (D3):
Shaft Diameter (D2):	Shaft Length (L2):



## Planetary Gearbox Specifications:

Ratio:	Current Quantity:
Backlash:	Annual Requirement:

Please provide any additional information below:



**PHT | VERTEX PRECISION COMPONENTS CORPORATION**

1F, No. 127, Songjian Street, Banqiao District, New Taipei City 22047, Taiwan  
 TEL: +886 2 2250 9940 FAX: +886 2 8252 1842 E-mail: vtx@vtx-precision.com



