
Perkins Peregrine and New Generation 1300 Series

Models WD to WJ

WORKSHOP MANUAL

Peregrine **6 cylinder diesel engines for
automotive applications**

1300 Series **6 cylinder diesel engines for
agricultural and industrial applications**

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1

General information

Introduction

The New Generation Peregrine and 1300 Series is an improved family of engines for automotive, industrial and agricultural applications from Perkins Engines Limited, a world leader in the design and manufacture of high performance diesel engines.

Perkins approved assembly and quality standards, together with the latest technology, have been applied to the manufacture of your engine to give you reliable and economic power.

Most of the general information which is included in the relevant User's Handbook (Chapters 1 to 6) has not been repeated in this workshop manual and the two publications should be used together.

To ensure that you use the relevant information for your specific engine type, refer to "Engine identification" on page 3.

Where the information applies only to certain engine types, this is indicated in the text.

When reference is made to the "left" or "right" side of the engine, this is as seen from the flywheel end of the engine.

Special tools have been made available and a list of these is given in Chapter 16, Special tools. Reference to the relevant special tools is also made at the beginning of each operation.

Data and dimensions are included in Chapter 2, Specifications.

Read and remember the "Safety precautions" on page 4. They are given for your protection and must be used at all times.

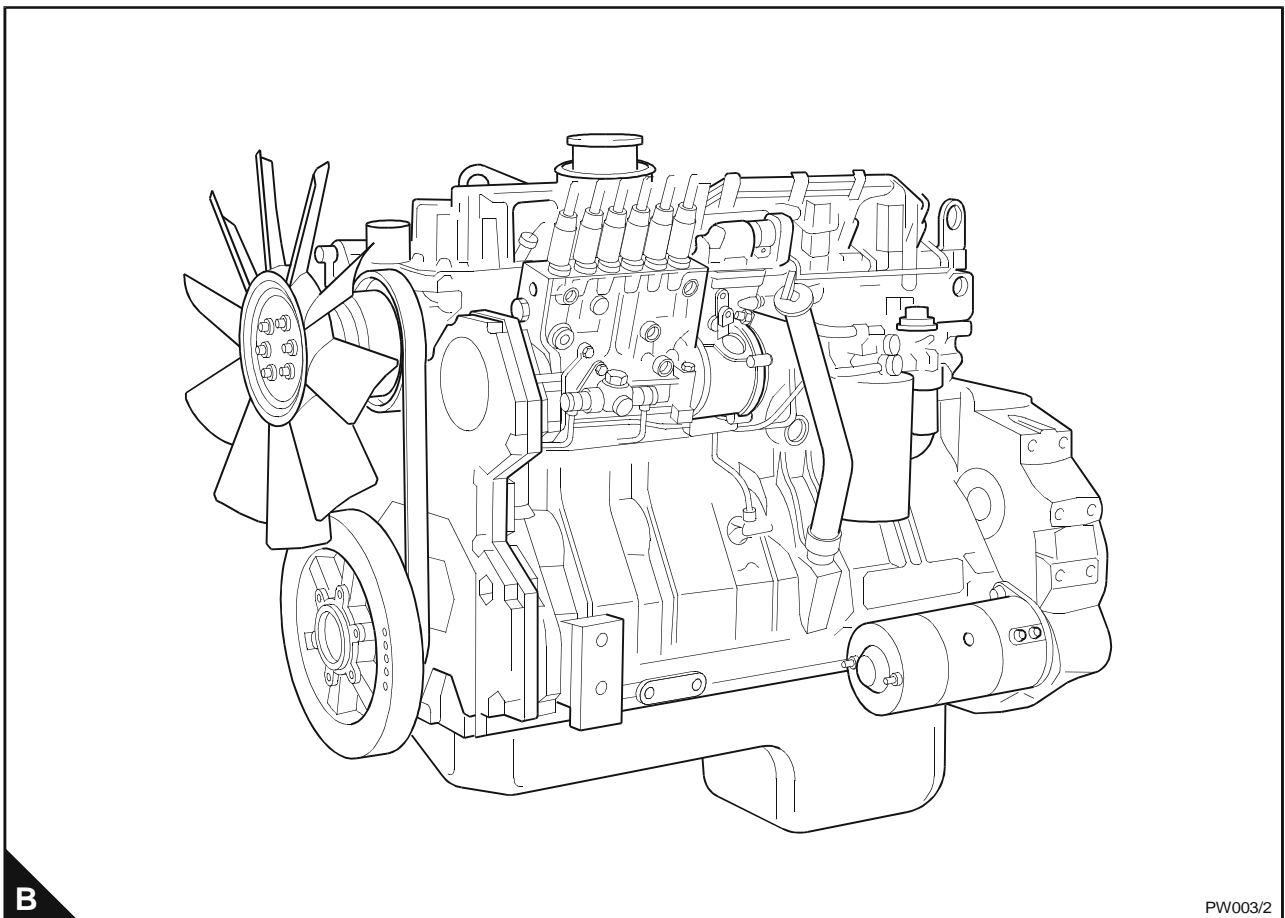
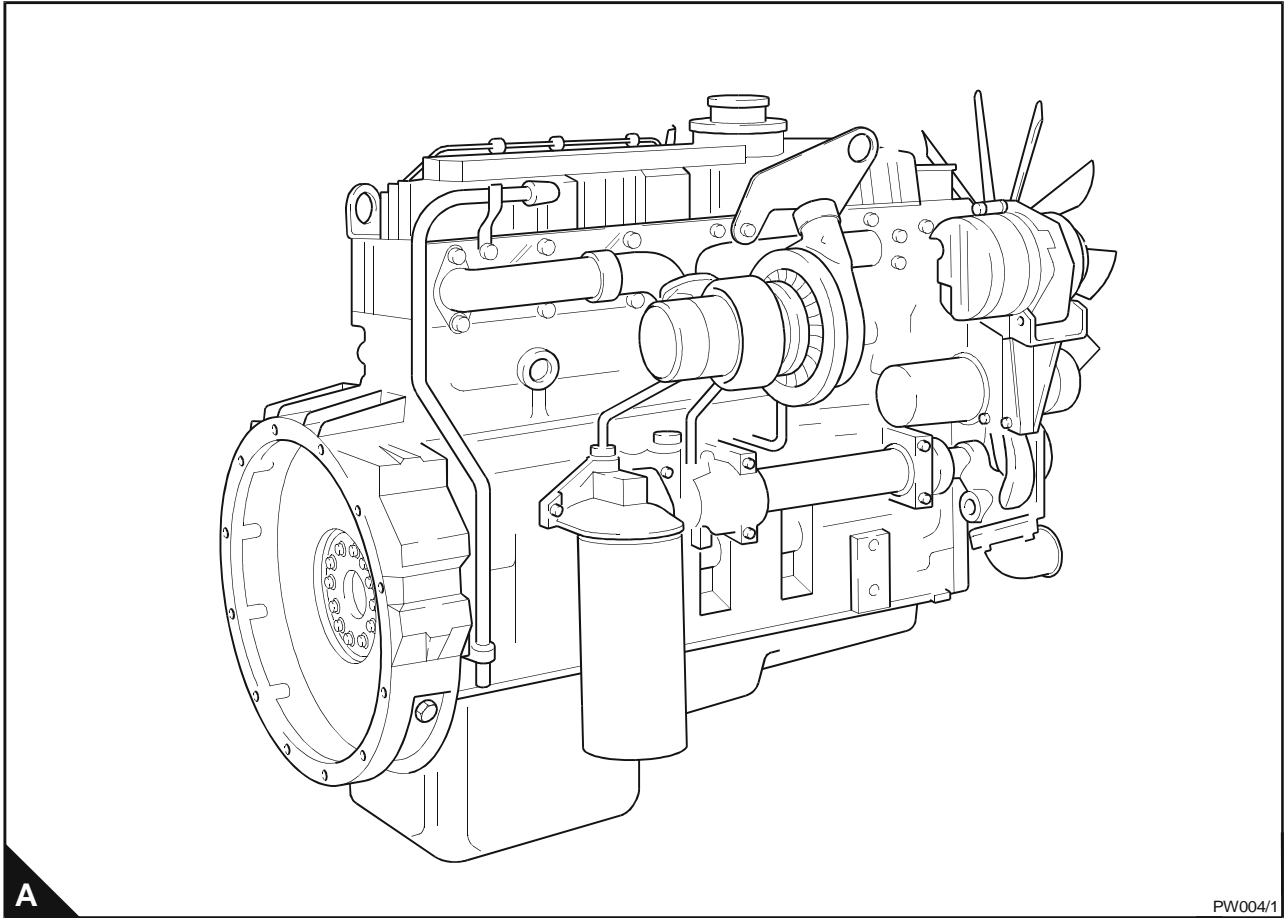
Danger is indicated in the text by two methods:

Warning! *This indicates that there is a possible danger to the person.*

Caution: *This indicates that there is a possible danger to the engine.*

Note: Is used where the information is important, but there is not a danger.

Engine views



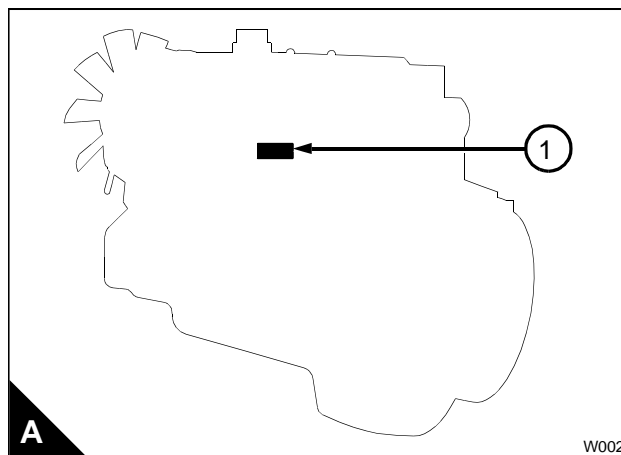
Engine identification

The New Generation Peregrine and 1300 Series of engines consists of a range of six cylinder in-line engines which are turbocharged / intercooled or turbocharged.

In this publication, the different engine types are indicated by their code letters, which are the first two letters of the engine number as indicated below:

Code letters	Capacity Ltrs (in ³)	Aspiration system
WD	6,7 (408)	Turbocharged
WE	6,7 (408)	Turbocharged/ intercooled
WF	7,6 (466)	Turbocharged
WG	7,6 (466)	Turbocharged/ intercooled
WH	8,6 (531)	Turbocharged
WJ	8,6 (531)	Turbocharged/ intercooled

The engine number is stamped on the left side of the cylinder block (A1), behind the fuel injection pump.



An example of an engine number is WJ1296N123456.

The components of the engine number are as follows:

WJ1296N123456

WJ = Type code letters

1296 = Build list number

N = Built in the USA

123456 = Engine serial number

If you need parts, service or information for your engine, you must give the complete engine number to your Perkins distributor.

Safety precautions

These safety precautions are important.

You must refer also to the local regulations in the country of use. Some items only refer to specific applications.

- Only use these engines in the type of application for which they have been designed.
- Do not change the specification of the engine.
- Do not smoke when you put fuel in the tank.
- Clean away fuel which has been spilt. Material which has been contaminated by fuel must be moved to a safe place.
- Do not put fuel in the tank while the engine runs (unless it is absolutely necessary).
- Do not clean, add lubricating oil, or adjust the engine while it runs (unless you have had the correct training; even then extreme care must be used to prevent injury).
- Do not make adjustments that you do not understand.
- Ensure that the engine does not run in a location where it can cause a concentration of toxic emissions.
- Other persons must be kept at a safe distance while the engine or auxiliary equipment is in operation.
- Do not permit loose clothing or long hair near moving parts.

Warning! *Keep away from moving parts during engine operation.*

- Some moving parts cannot be seen clearly while the engine runs.
- Do not operate the engine if a safety guard has been removed.
- Do not remove the filler cap of the cooling system while the engine is hot and while the coolant is under pressure, because dangerous hot coolant can be discharged.
- Do not allow sparks or fire near the batteries (especially when the batteries are on charge) because the gases from the electrolyte are highly flammable. The battery fluid is dangerous to the skin and especially to the eyes.
- Disconnect the battery terminals before a repair is made to the electrical system.
- Only one person must control the engine.
- Ensure that the engine is operated only from the control panel or from the operators position.
- If your skin comes into contact with high-pressure fuel, obtain medical assistance immediately.
- Diesel fuel and lubricating oil (especially used lubricating oil) can damage the skin of certain persons. Protect your hands with gloves or a special solution to protect the skin.
- Do not wear clothing which is contaminated by lubricating oil. Do not put material which is contaminated with oil into the pockets of clothing.
- Discard used lubricating oil in a safe place to prevent contamination.
- Ensure that the control lever of the transmission drive is in the "out-of-drive" position before the engine is started.
- Use extreme care if emergency repairs must be made in adverse conditions.
- The combustible material of some components of the engine (for example certain seals) can become extremely dangerous if it is burned. Never allow this burnt material to come into contact with the skin or with the eyes.
- Read and use the instructions relevant to "Engine lift equipment" on page 6.

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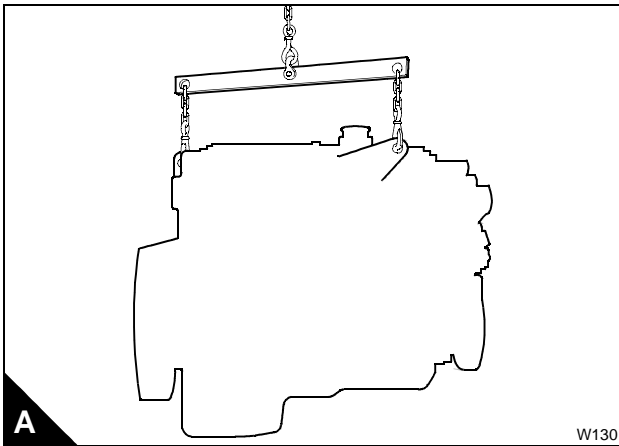
- Always use a safety cage to protect the operator when a component is to be pressure tested in a bath of water. Fit safety wires to secure the plugs which seal the hose connections of a component which is to be pressure tested.
- Do not allow compressed air to contact your skin. If compressed air enters your skin, obtain medical help immediately.
- Turbochargers operate at high speed and at high temperatures. Keep fingers, tools and other objects away from the inlet and outlet ports of the turbocharger and avoid contact with hot surfaces.
- Fit only genuine Perkins parts.
- The latest engines have a cover fitted to give some protection from the alternator fan and the drive belt. Ensure that this cover is fitted before the engine is started.

Asbestos joints

The New Generation Peregrine and 1300 Series of engines are asbestos free.

Engine lift equipment

- The maximum weight of the engine without coolant, lubricant or a gearbox fitted will vary for different applications, it is recommended that lift equipment of the minimum capacity of 770 Kg (1700 lbs) is used:
- Always use engine lift equipment of the approved type and of the correct capacity, to lift the engine. It is recommended that lift equipment of the type shown in (A) is used, to provide a vertical lift directly above the engine lift brackets (A1). Never use a single lift bracket to raise an engine.
- Check the engine lift brackets for damage and security before the engine is lifted.
- Use lift equipment or obtain assistance to lift heavy engine components such as the cylinder block, cylinder head, flywheel housing, crankshaft and flywheel.
- To avoid possible damage to the engine rocker cover by contact from the lift equipment; use the correct lift equipment (A) to raise the engine.



POWERPART recommended consumable products

Perkins have made available the products recommended below in order to assist in the correct operation, service and maintenance of your engine and your machine. The instructions for the use of each product are given on the outside of each container. These products are available from your Perkins distributor.

POWERPART Antifreeze

Protects the cooling system against frost, cavitation and corrosion. Part number 1 litre 21825166 or 5 litres 21825167.

POWERPART Easy Flush

Cleans the cooling system. Part number 2182501

POWERPART Jointing compound

Universal jointing compound which seals joints. Currently Hylomar. Part number 1861155 or 1861117.

POWERPART Silicone rubber sealant

Silicone rubber sealant which prevents leakage through gaps. Currently Hylosil Part number 1861108.

POWERPART Lay-Up 1

A diesel fuel additive for protection against corrosion. Part number 1772204.

POWERPART Lay-Up 2

Protects the inside of the engine and of other closed systems. Part number 1762811.

POWERPART Lay-Up 3

Protects outside metal parts. Part number 1734115.

POWERPART Chisel

Allows easy removal of old gaskets and joints. Currently Loctite chisel. Part number 21825163.

POWERPART Repel

Dries damp equipment and gives protection against corrosion. Passes through dirt and corrosion to lubricate and to assist removal of components. Currently Loctite repel. Part number 21825164.

POWERPART Threadlock

To retain small fasteners where easy removal is necessary. Currently Loctite 222e. Part number 21820222.

POWERPART Nutlock

To retain and seal threaded fasteners and cup plugs where easy removal is necessary. Currently Loctite 242e. Part number 21820242

POWERPART Studlock

To permanently retain large fasteners and studs. Currently Loctite 270. Part number 21820270.

POWERPART Liquid gasket

To seal flat faces of components where no joint is used. Especially suitable for aluminium components. Currently Loctite 518. Part number 21820518

POWERPART Threadlock (hydraulic/pneumatic)

To retain and seal pipe connections with fine threads. Especially suitable for hydraulic and pneumatic systems. Currently Loctite 542. Part number 21820542

Continued

POWERPART Threadlock (pipe)

To retain and seal pipe connections with coarse threads. Pressure systems can be used immediately. Currently Loctite 575. Part number 21820575.

POWERPART Retainer (oil tolerant)

To retain components which have a transition fit. Currently Loctite 603. Part number 21820603.

POWERPART Retainer (high strength)

To retain components which have an interference fit. Currently Loctite 638. Part number 21820638.

2

Specifications

Basic engine data

Number of cylinders.	6
Cylinder arrangement	In-line
Cycle	Four stroke
Firing order	1, 5, 3, 6, 2, 4
Direction of rotation	Clockwise from the front
Induction system:	
WD, WF and WJ engines	Turbocharged
WE, WF and WG engines	Turbocharged / intercooled
Bore:	
WD, WE, WF and WG engines	109,2 mm (4.301 in)
WH and WJ engines	116,5 mm (4.590 in)
Stroke:	
WD and WE engines	119,0 mm (4.685 in)
WF, WG, WH and WJ engines	135,9 mm (5.350 in)
Compression ratios.. ...	16.5:1
Cubic capacity:	
WD and WE engines	6,68 litres (408.9 in ³)
WF and WG engines	7,64 litres (466 in ³)
WH and WJ engines	8,70 litres (531 in ³)

Data and dimensions

Note: This information is given as a guide for personnel engaged on engine overhauls. The dimensions which are shown are those which are mainly used in the factory. The information applies to all engines, unless an engine type code is shown.

Cylinder head

Angle of valve seat:

Exhaust	45° (90° included angle)
Inlet	30° (120° included angle)
Diameter of parent bore for valve guide.	50,70/50,72 mm (1.996/1.997 in)
Leak test pressure	200 kPa (29 lbf/in ²) 2,04 kgf/cm ²
Head thickness	106,43/106,93 mm (4.190/4.180 in)
Minimum permissible thickness after head face has been machined	106,17 mm (4.180 in)
Maximum permissible distortion of cylinder head	0,01 mm (0.004 in) in any 228,6 mm (9 in)
.....	0,15 mm (0.006 in) overall

Inlet and exhaust valves

Inlet valves

Diameter of valve stem	7,920/7,938 mm (0.3118/0.3125 in)
Maximum clearance in valve guide	0,15 mm (0.006 in)
Angle of valve face.	30°
Depth of valve head below the face of cylinder head	0,35 mm (0.014 in)
Seal arrangement	Rubber seal assembly fitted to valve guide

Exhaust valves

Diameter of valve stem	7,920/7,938 mm (0.3118/0.3125 in)
Maximum clearance in valve guide	0,15 mm (0.006 in)
Diameter of valve head	37,26/37,52 mm (1.467/1.477 in)
Angle of valve face.	45°
Depth of valve head below the face of cylinder head	0,35 mm (0.014 in)

Valve guides and valve springs

Valve guides

Inside diameter	7,976/8,019 mm (0.3140/0.3157 in)
Outside diameter	14,341/14,361 mm (0.5646/0.5654 in)
Interference fit of valve guide in cylinder head... ..	0,053/0,038 mm (0.0021/0.0015 in)

Overall length:

Inlet	60,73 mm (2.391 in)
Exhaust	60,73 mm (2.391 in)
Protrusion from bottom of recess... ..	22,05/22,56 mm (0.868/0.888 in)

Inlet valve springs

Free length.	58,22 mm (2.292 in)
Valve closed length	50,29 mm (1.980 in) under a load of, 556/391 N (80/88 lbf) 36,3/39,9 kgf
Valve open length	37,59 mm (1.480 in) under a load of, 952/996 N (214/224 lbf) 97/102 kgf

Exhaust valve springs

Free length.	62,18 mm (2.448 in)
Valve closed length	50,29 mm (1.980 in) under a load of, 538/574 N (80/88 lbf) 36,3/39,9 kgf
Valve open length	38,86 mm (1.530 in) under a load of, 1063/1117 N (239/251 lbf) 108,4/113,9 kgf

Tappets, rocker shaft, rocker levers and bushes**Tappets**

Diameter of tappet...	28,435/28,448 mm (1.1195/1.1200 in)
Length of tappet...	74,24/75,01 mm (2.923/2.953 in)
Clearance of tappet in cylinder block...	0,064/0,102 mm (0.0025/0.0040 in)
Clearance of roller to tappet wall	0,666 mm (0.026 in)

Rocker shaft

Outside diameter	21,567/21,593 mm (0.8491/0.8501 in)
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Rocker shaft springs

Quantity	5
Free length	103,1 mm (4.06 in)
Length under load of 31 N (7 lbf) 3,18 kgf	56,6 mm (2.07 in)
Diameter	25,9 mm (1.02 in)

Rocker levers and bushes

Internal diameter of bush	21,69 mm (0.854 in)
Clearance between rocker lever bush and rocker shaft	0,048/0,124 mm (0.0019/0.0049 in)
Push rod length	268,980/269,743 mm (10.5898/10.6198 in)

Piston and connecting rod assemblies

Pistons

Type:

WD, WE, WF and WG engines.. One piece, all aluminium. "Toroidal" combustion bowl

WH and WJ engines Two piece, high-pressure. Steel crown. "Toroidal" combustion bowl

Diameter of the bore for the gudgeon pin 48,856/46,380 mm (1.9255/1.9235 in)

Cooling jets per piston 2

Piston rings

Oil control ring to groove clearance 0,102/0,0508 mm (0.0040/0.0020 in)

Top ring groove width, measured over (0.1150 in) gauge pins:

WD, WE, WF and WG 109,519/108,697 mm (4.3118/4.2794 in)

WH and WJ engines 114,338/113,477 mm (4.5015/4.4676 in)

Second ring width, measured over (0.1150 in) gauge pins:

WD, WE, WF and WG engines.. . . . 109,519/108,697 mm (4.3118/4.2794 in)

WH and WJ engines 116,967/116,108 mm (4.6050/4.5712 in)

Ring gap with new cylinder liner:

Top ring.. . . . 0,66/0,356 mm (0.026/0.014 in)

Second ring 1,91/1,65 mm (0.075/0.065 in)

Oil control ring for WD, WE, WF and WG engines 0,56/0,31 mm (0.022/0.012 in)

Oil control ring for WH and WJ engines. 0,66/0,356 mm (0.026/0.014 in)

Connecting rods

Type... .. 'H' section, wedge shape small end

Length between centres. 219,050/219,100 mm (8.624/8.626 in)

Small end:

Diameter of parent bore. 48,900/48,856 mm (1.9255/1.9235 in)

Diameter of bush (fitted) 46,380/46,373 mm (1.8260/1.8257 in)

Big end:

Side clearance to crankshaft.. . . . 0,300/0,419 mm (0.0120/0.0165 in)

Diameter of parent bore. 85,131/85,000 mm (3.3516/3.3516 in)

Diameter of bearing (fitted) 80,100/80,000 mm (3.1544/3.1524 in)

Gudgeon pins:

Type... .. Fully floating

Outside diameter 46,358/46,352 mm (1.8251/1.8249 in)

Clearance fit in piston boss 0,0028/0,015 mm (0.0011/0.0006 in)

Crankshaft assembly**Crankshaft**

Number of main bearings	7
Thrust bearing position	Rear main (number 7)
Crankshaft end-float	0,152/0,305 mm (0.006/0.012 in)
Maximum permissible end-float	0,51 mm (0.020 in)
Crankshaft flange diameter	140,97 mm (5.550 in)
Crankshaft gear backlash	0,076/0,406 mm (0.003/0.016 in)

Run-out of the mounting face for:

Rear oil seal (Maximum)	0,0762 mm (0.003 in)
Damper assembly (Maximum)	0,0127 mm (0.0005 in)
Flywheel (Maximum)	0,0508 mm (0.002 in)

Main bearing journals

Width (Except thrust bearing journal)	32,664 +/- 0,015 mm (1.286 +/- 0.0006 in)
Width of thrust bearing journal	34,404 +/- 0,254 mm (1.355 +/- 0.0100 in)
Ovality (Maximum)	0,0508 mm (0.002 in)
Thrust face, out of alignment (Maximum)	0,0508 mm (0.002 in)
Taper (Maximum)	0,0071 mm (0.0028 in)
Fillet radius	5,72/1,27 mm (0.225/0.050 in)
Clearance, bearing to crankshaft	0,127/0,046 mm (0.0050/0.0018 in)

Diameter of main journals:

New	89,789 +/- 0,015 mm (3.535 +/- 0.0006 in)
0.010 in undersize	89,535 +/- 0,015 mm (3.525 +/- 0.0006 in)
0.020 in undersize	89,281 +/- 0,015 mm (3.515 +/- 0.0006 in)
0.030 in undersize	89,027 +/- 0,015 mm (3.505 +/- 0.0006 in)

Crank pins

Width	35,179 mm (1.385 in)
Ovality (Maximum)	0,00635 mm (0.00025 in)
Taper (Maximum)	0,00686 mm (0.00027 in)
Fillet radius	5,72/1,27 mm (0.225/0.050 in)

Diameter of crank pins:

New	80,010 +/- 0,015 mm (3.1500 +/- 0.0006 in)
0.010 in undersize	79,756 +/- 0,015 mm (3.1400 +/- 0.0006 in)
0.020 in undersize	79,502 +/- 0,015 mm (3.1300 +/- 0.0006 in)
0.030 in undersize	79,248 +/- 0,015 mm (3.1200 +/- 0.0006 in)



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