SERVICE MANUAL

JCB 672 Mechanical Engine

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This manual contains original instructions, verified by the manufacturer (or their authorized representative).

Foreword

The Operator's Manual

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You and others can be killed or seriously injured if you operate or maintain the machine without first studying the Operator's Manual. You must understand and follow the instructions in the Operator's Manual. If you do not understand anything, ask your employer or JCB dealer to explain it.

Do not operate the machine without an Operator's Manual, or if there is anything on the machine you do not understand.

Treat the Operator's Manual as part of the machine. Keep it clean and in good condition. Replace the Operator's Manual immediately if it is lost, damaged or becomes unreadable.

Contents

00 - General

Introduction

Basic Description

The 6 cylinder mechanical engine has fuel ignited by compression ignition (C.I.). The engine operates on a four stroke cycle.

The engine is started by an electric starter motor. The starter motor turns the engine via a pinion and teeth on the engine flywheel, refer to (PIL 09-75).

When the engine runs the crankshaft drives the camshaft via gears. The camshaft opens and closes the inlet and exhaust valves and via push rods in time with the four stroke cycle. The engine has 24 valves, 2 inlet and 2 exhaust valves for each cylinder.

The crankshaft also drives a mechanical fuel injection pump via gears. The pump injects fuel via injectors, or atomisers into each cylinder in time with the four stroke cycle.

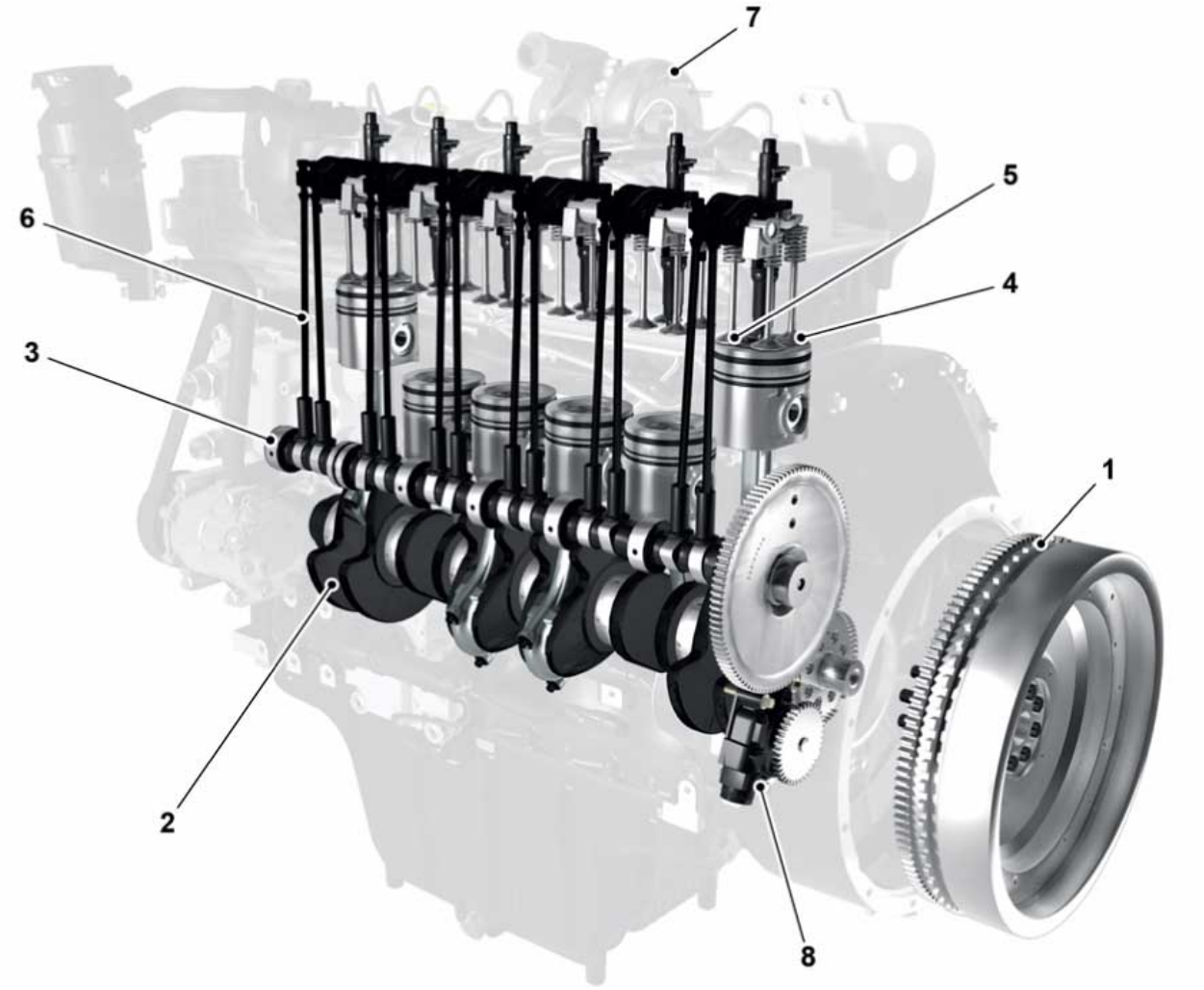
The pump injects fuel via injectors, or atomisers into each cylinder in time with the four stroke cycle. The pump is part of the mechanically actuated fuel injection system, refer to (PIL 18-00).

Air is drawn into the engine, via the inlet manifold and exhaust gases exit via the exhaust manifold. The engine uses a turbocharger which pressurises the air at the inlet manifold, refer to (PIL 18-36).

A mechanical lubrication oil pump is driven by the crankshaft via gears. The pump pressurises and circulates oil for engine lubrication and cooling purposes.

A drive belt driven by the crankshaft, drives a coolant circulation pump, alternator, radiator cooling fan and other ancillaries such as an air conditioning compressor.

Figure 3.



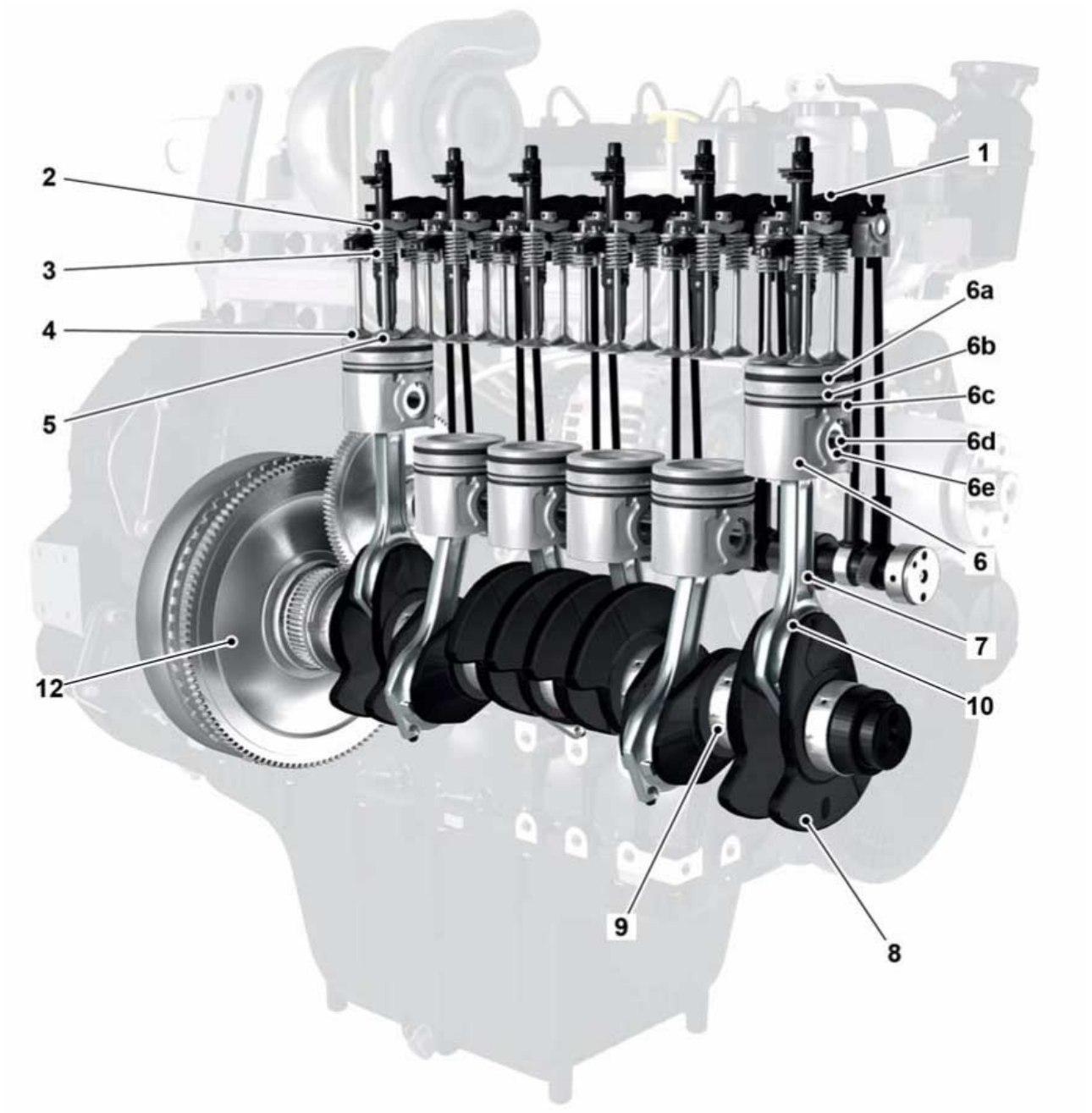
1 Flywheel
2 Crankshaft
3 Camshaft
4 Inlet valves (12 off)
5 Exhaust valves (12 off)
6 Push rods (12 off)
7 Turbocharger
8 Lubrication oil pump

Internal

The following identifies the main internal components of a typical engine assembly. Some variants may differ in detail.

As viewed on the right hand side. Refer to Figure 4.

Figure 4.

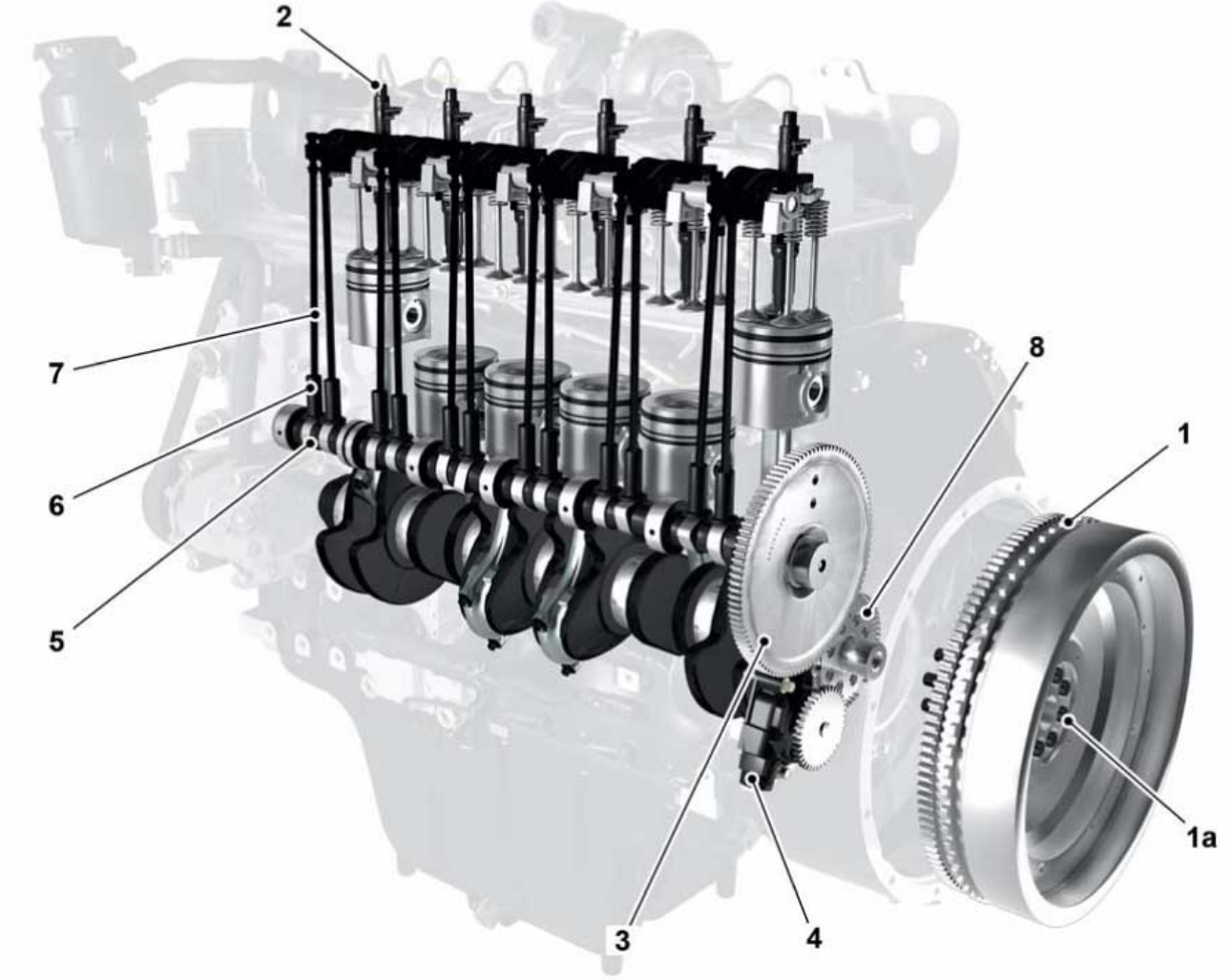


1 Rocker assembly
2 Valve bridge piece (12 off)
3 Valve bridge piece (12 off)
4 Inlet valve (12 off)
5 Exhaust valve (12 off)
6 Piston assembly (6 off)
7 Connecting rod assembly (6 off)
8 Crankshaft
9 Main bearing - crankshaft (7 off)
10 Big end bearing - crankshaft/connecting rod (6 off)
11 Front crankshaft oil seal (not shown)
12 Flywheel

6a Piston ring - top compression (6 off)
6b Piston ring - 2nd compression (6 off)
6c Piston ring - oil control (6 off)
6d Gudgeon pin (6 off)
6d Gudgeon pin circlip (12 off)

As viewed on the rear left side. Refer to Figure 5.

Figure 5.



1 Flywheel
1a Flywheel - crankshaft fixing bolts (8 off)
2 Fuel injector (atomiser) (6 off)
3 Camshaft drive gear
4 Lubrication oil pump
5 Camshaft
6 Tappet (12 off)
7 Push rod (12 off)
8 Flywheel hub

Health and Safety

Hot Components

Touching hot surfaces can burn skin. The engine and machine components will be hot after the unit has been running. Allow the engine and components to cool before servicing the unit.

Turning the Engine

Do not try to turn the engine by pulling the fan or fan belt. This could cause injury or premature component failure.

Notice: *The engine and other components could be damaged by high pressure washing systems. Special precautions must be taken if the machine is to be washed using a high pressure system.Make sure that the alternator, starter motor and any other electrical components are shielded and not directly cleaned by the high pressure cleaning system. Do not aim the water jet directly at bearings, oil seals or the engine air induction system.*

WARNING! *To bleed the injectors you must turn the engine. When the engine is turning, there are parts rotating in the engine compartment.Before starting this job make sure that you have no loose clothing (cuffs, ties etc) which could get caught in rotating parts.When the engine is turning, keep clear of rotating parts.*

Notice: *Clean the engine before you start engine maintenance. Obey the correct procedures. Contamination of the fuel system will cause damage and possible failure of the engine.*

Notice: *Do not exceed the correct level of engine oil in the sump. If there is too much engine oil, the excess must be drained to the correct level. An excess of engine oil could cause the engine speed to increase rapidly without control.*

WARNING! *The engine has exposed rotating parts. Switch off the engine before working in the engine compartment. Do not use the machine with the engine cover open.*

WARNING! *Hot oil and engine components can burn you. Make sure the engine is cool before doing this job.Used engine crankcase lubricants contain harmful contaminants. In laboratory tests it was shown that used engine oils can cause skin cancer.*

Notice: *A drive belt that is loose can cause damage to itself and/or other engine parts.*

WARNING! *Do not open the high pressure fuel system with the engine running. Engine operation causes high fuel pressure. High pressure fuel spray can cause serious injury or death.*

CAUTION! *It is illegal to pollute drains, sewers or the ground. Clean up all spilt fluids and/or lubricants.Used fluids and/or lubricants, filters and contaminated materials must be disposed of in accordance with local regulations. Use authorised waste disposal sites.*

Technical Data

Table 5. Basic Engine Data (Dieselmax 672 Mechanical Engine)

Engine	**EC - 6 Cylinder Mechanical, Turbocharged with Intercooler**
Emission compliance	Non-emission
Rated speed	1800 rpm
Weight (Dry):	680 kg (1500 lb)(1)
Number of cylinders	6
Nominal bore size	106 mm (4.173 in)
Stroke	135 mm (5.314 in)
Cylinder arrangement	In line
Combustion Cycle	4-stroke
Firing order	1-5-3-6-2-4
Displacement	7.148 litres
Compression ratio	18:1
Engine Compression	see note(2)
Direction of rotation (viewed from front {crankshaft pulley} end)	Clockwise
Valves	4 per cylinder
Valve clearances measured at the tappet end of the rockers (measured cold):	see note(2)
- Inlet	0.28–0.34mm
- Exhaust	0.43–0.5mm
Lubricating oil pressure(3)	1.6 - 6.5 bar (23 - 91lb in2)
Combustion system	Direct injection, mechanical fuel injection
High pressure fuel pump	Mechanical inline

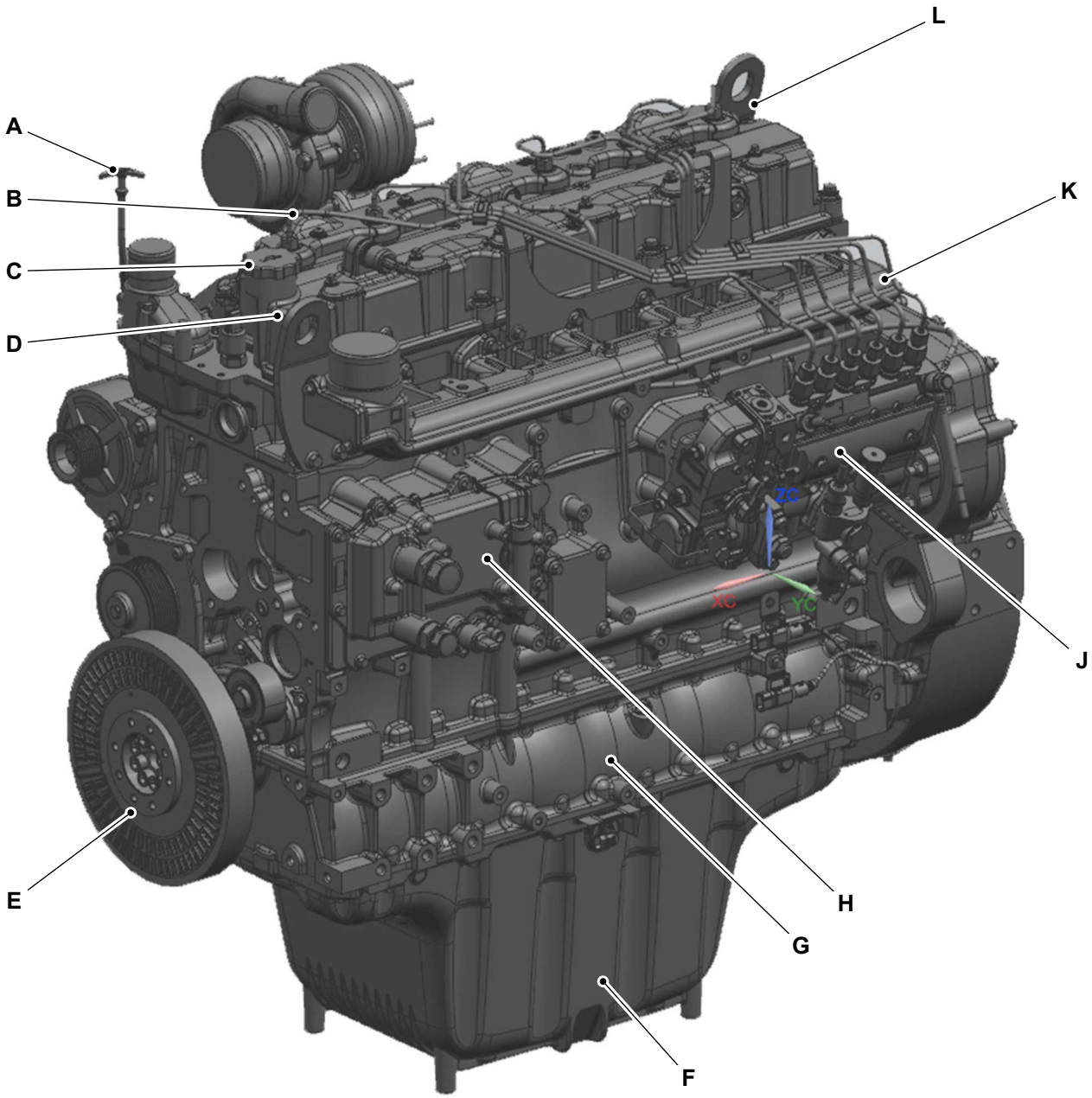
(1) Dry weight. No cooling fan drive.
(2) Compression variance between each cylinder should be no greater than 3.5 bar (50 lb in2).
(3) Dependent on engine temperature and speed.

Component Identification

6 Cylinder Mechanical Engine

The following identifies the main components of a typical engine assembly visible from the exterior. Some variants may differ in detail.

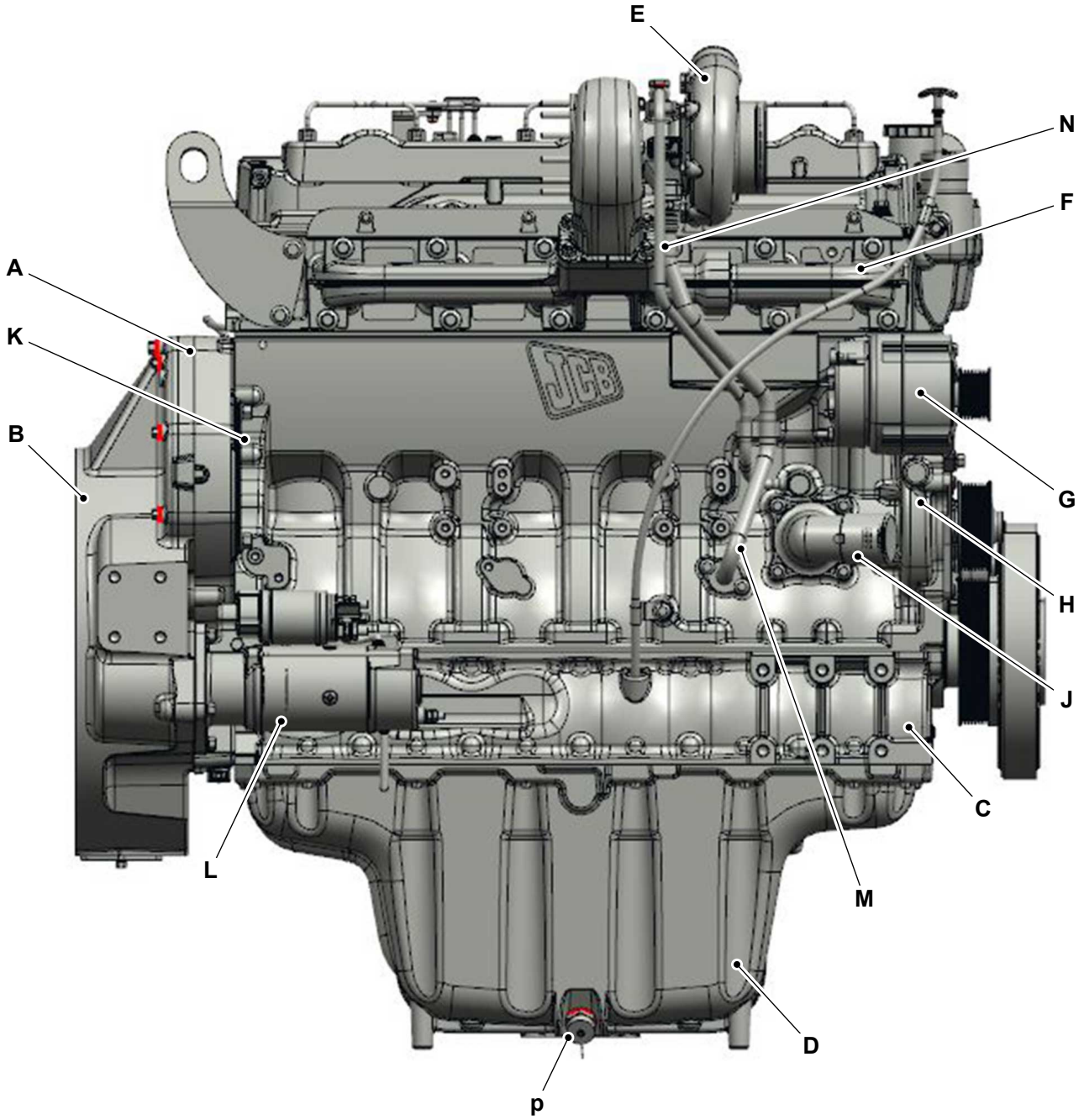
Figure 6. Left hand Side



A Lubrication oil dipstick
B Fuel injectors and high pressure fuel pipes
C Lubrication oil filler cap
D Rocker cover
E Torsional vibration damper
F Lubrication oil sump
G Bedplate housing
H Oil cooler housing with ports for remote oil filter

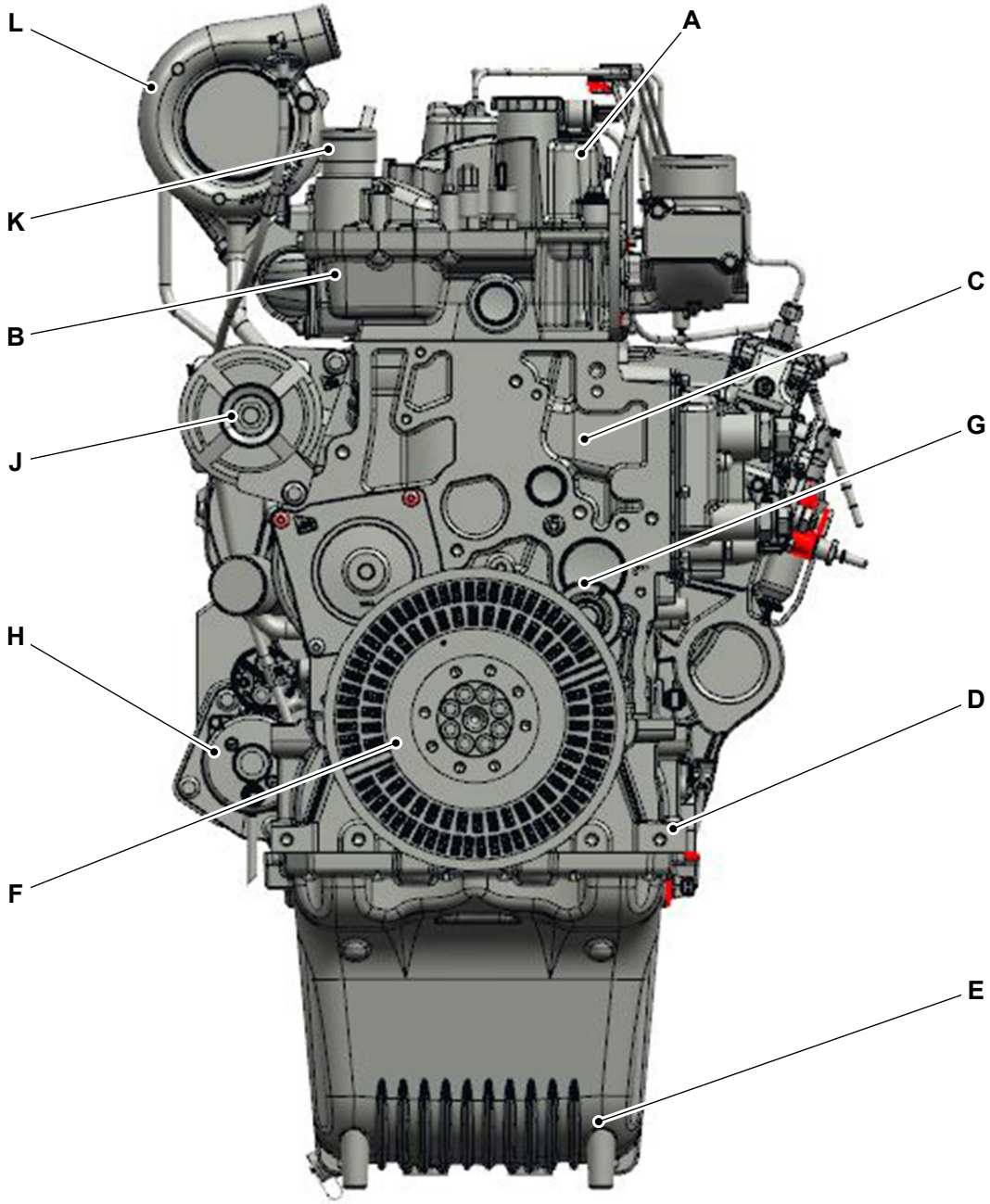
J Fuel injection pump
K High pressure fuel pipes
L Lifting eye head

Figure 7. Right hand side



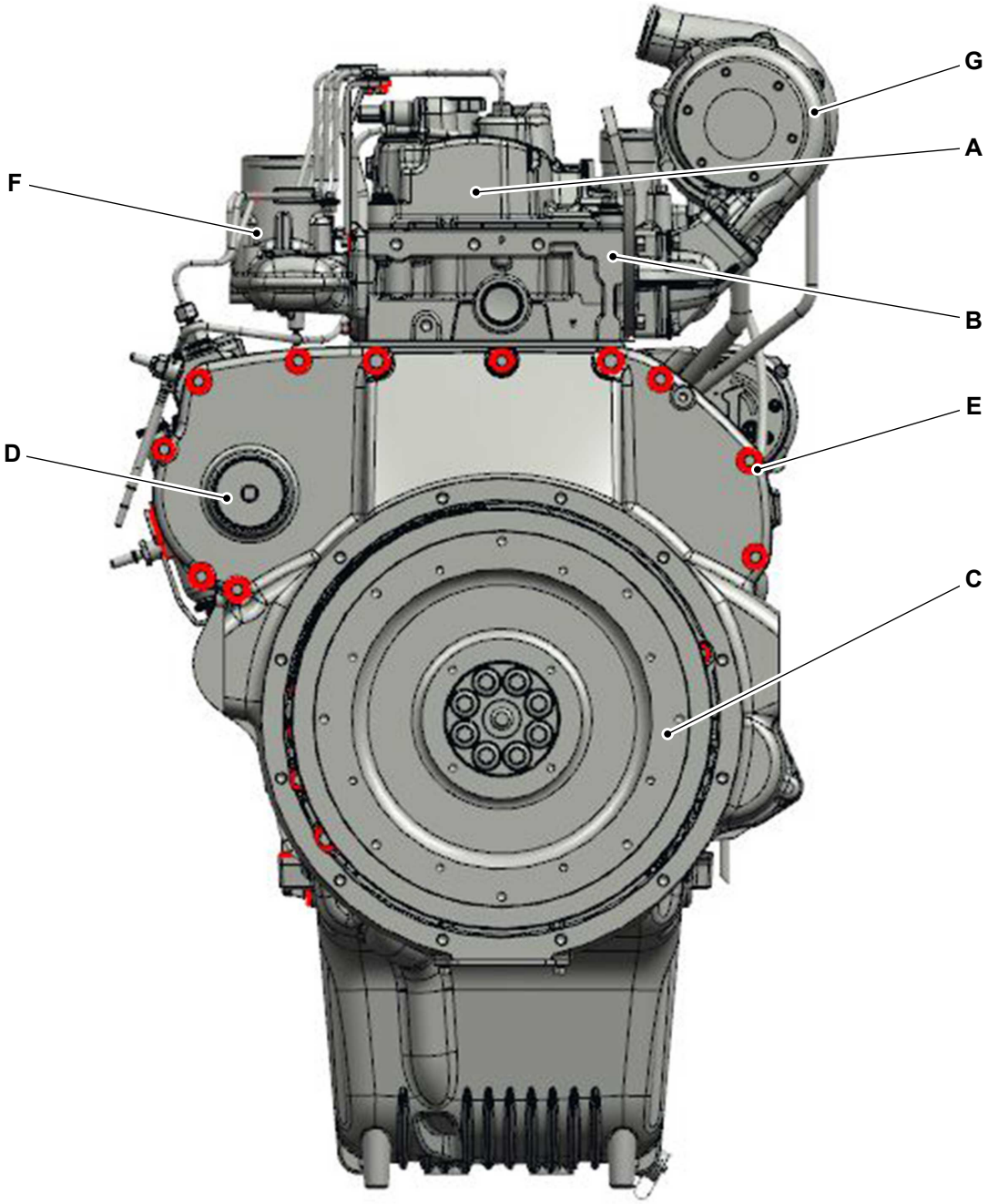
A Timing gear case
B Flywheel housing
C Bedplate housing
D Lubrication oil sump
E Turbocharger
F Exhaust manifold
G Alternator
H Coolant pump housing (crankcase)
J Coolant inlet/radiator hose connector
K Heavy duty PTO (Power Take-Off) (blanking cover if no device is installed)
L Starter motor assembly
M Turbocharger oil drain line
N Turbocharger oil feed line
P Oil drain plug (sump)

Figure 8. Crankshaft pulley (front) end



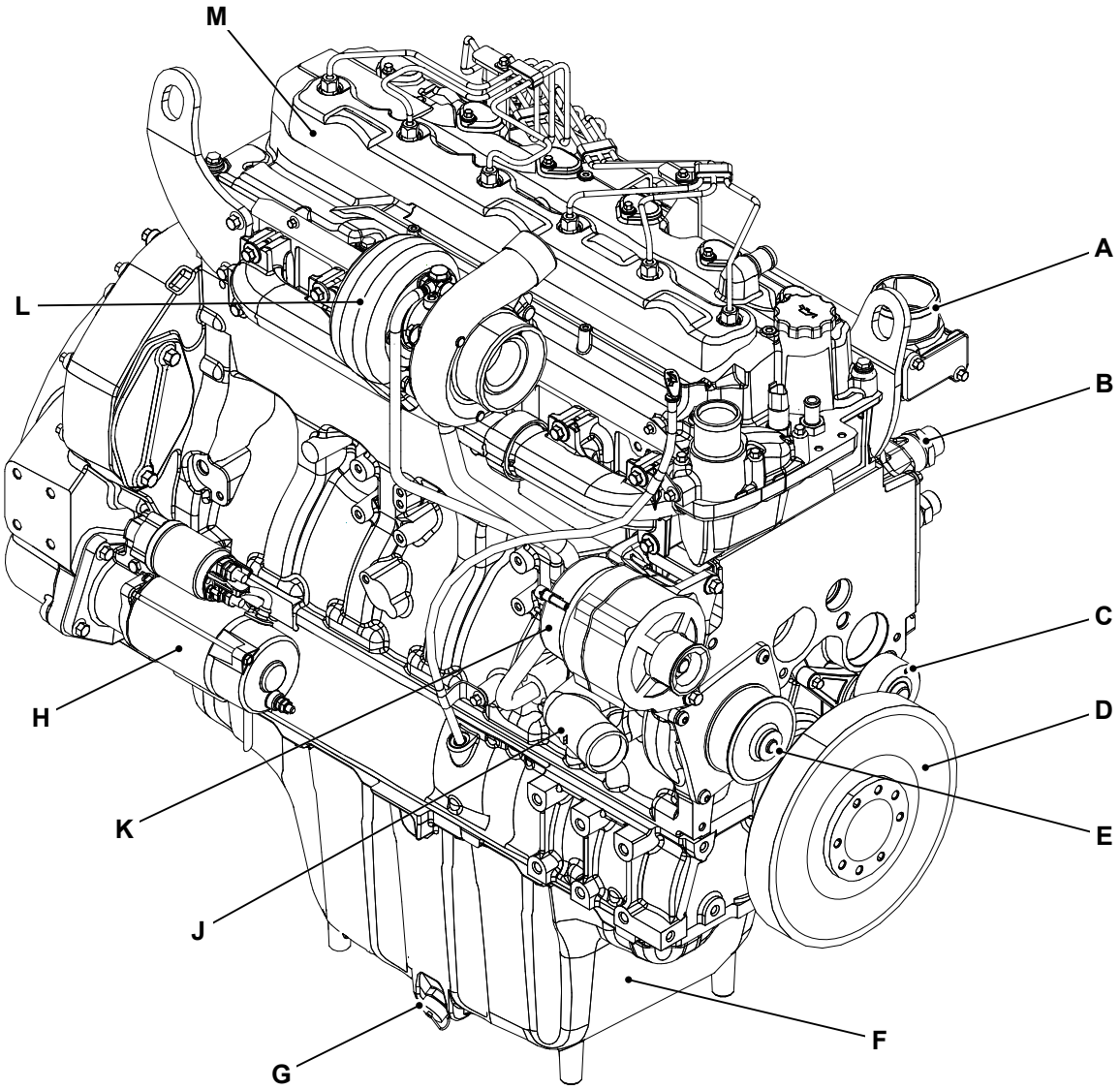
A Rocker cover
B Cylinder head
C Crankcase
D Bedplate
E Lubrication oil sump
F Torsional vibration damper
G FEAD (Front End Accessory Drive) tensioner
H Starter motor
J Alternator and drive pulley assembly
K Twin thermostat
L Turbocharger

Figure 9. Flywheel (rear) end



A Rocker cover
B Cylinder head
C Flywheel
D Fuel injection pump gear access cover
E Timing case
F Inlet manifold
G Turbocharger

Figure 10. 6 Cylinder mechanical engine (ISO) view



A Inlet manifold
B Oil cooler remote
C FEAD belt tensioner
D Torsional vibration damper
E Coolant pump drive pulley
F Lubrication oil sump
G Oil drain plug (sump)
H Starter motor assembly
J Water inlet connector
K Alternator and drive pulley assembly
L Turbocharger
M Fuel injector cover
J Coolant inlet connector

Operation

The Four Stroke Cycle

This section describes the cycle sequence, for the 6 cylinders of the diesel engine.

The stages in the four stroke cycle for each cylinder are as follows:

Table 6. The Four Stroke Cycle

Stage number	Piston operation	Valve operation
1	The piston is at the top of its Compression stroke and is about to start its Power stroke.	Inlet and exhaust valves closed.
2	The piston is at the bottom of its Power stroke and is about to start its Exhaust stroke.	Inlet valves closed, exhaust valves about to open.
3	The piston is at the bottom of its Induction stroke and is about to start its Compression stroke.	Exhaust valves closed, inlet valves about to close.
4	The piston is at the top of its Exhaust stroke and is about to start its Induction stroke.	Valve operation exhaust valves about to close, inlet valves about to open.

Firing order

A cylinder is said to be firing, when the fuel/air mixture ignites and the piston is about to start its power stroke.

Four Stroke Cycle

Induction

As the piston travels down the cylinder, it draws filtered air at atmospheric pressure and ambient temperature through an air filter and inlet valves into the cylinder.

Compression

When the piston reaches the bottom of its stroke the inlet valves close. The piston then starts to rise up the cylinder compressing the air trapped in the cylinder. This causes the temperature and pressure of the air to rise. Fuel is injected into the cylinder when the piston is near to top dead centre.

Power

The piston continues to rise after the start of fuel injection causing a further increase in pressure and temperature.

The temperature rises to a point at which the fuel/air mixture ignites. A cylinder is said to be firing, when the fuel/air mixture ignites.

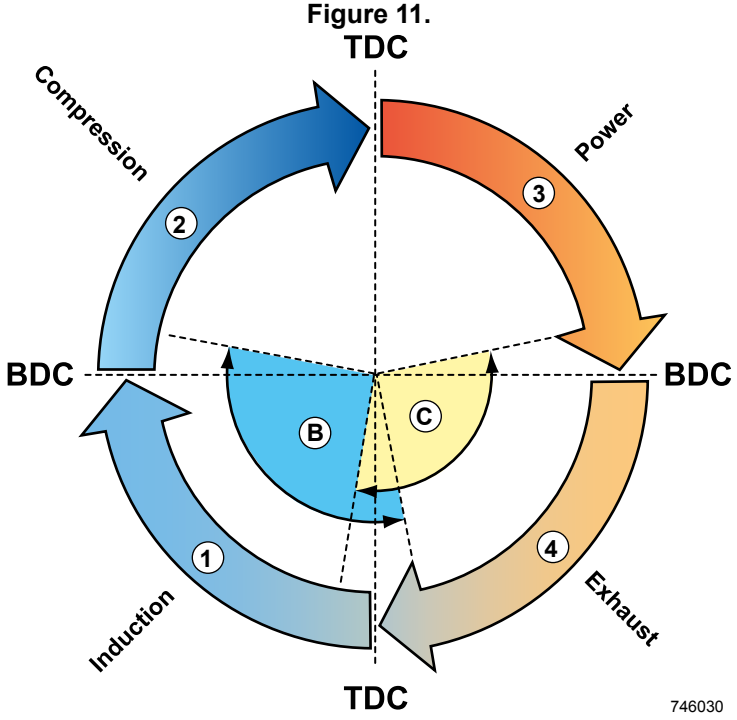
This combustion causes a very rapid rise in both temperature and pressure. The high pressure generated propels the piston downward turning the crankshaft and producing energy.

Exhaust

Once the piston has reached the bottom of its travel, the exhaust valves open and momentum stored in the flywheel forces the piston up the cylinder expelling the exhaust gases.

In a running engine these four phases are continuously repeated. Each stroke is half a revolution of the crankshaft, thus, in one cycle of a four stroke engine, the crankshaft revolves twice.

Figure 11.



1 Induction
2 Compression stroke
3 Power stroke
4 Exhaust stroke
A Camshaft
B Camshaft lobe - Inlet valve operation
C Camshaft lobe - Exhaust valve operation
BDC Bottom dead centre
TDC TDC (Top Dead Centre)

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