65.99897-8097

Operation & Maintenance Manual

Diesel Engine

DL08

PS-MMA0417-E1

FOREWORD

This maintenance manual is designed to serve as a reference for DOOSAN Infracore (here after DOOSAN's) customers and distributors who wish to gain basic product knowledge on DOOSAN 's **DL08** Diesel engine.

This economical and high-performance diesel engine (6 cylinders, 4 strokes, in-line, direct injection type) has been so designed and manufactured to be used for the overland transport or industrial purpose. That meets all the requirements such as low noise, fuel economy, high engine speed, and durability.

To maintain the engine in optimum condition and retain maximum performance for a long time, CORRECT OPERATION and PROPER MAINTENANCE are essential.

In this manual, the following symbols are used to indicate the type of service operations to be performed.


Removal


Installation


Disassembly


Reassembly


Align the marks


Directional indication


Inspection


Measurement


Adjustment


Cleaning


Pay close attention-Important


Tighten to specified torque


Use special tools of manufacturer's


Lubricate with oil


Lubricate with grease

During engine maintenance, please observe following instructions to prevent environmental damage;

- Take old oil to an old oil disposal point only.
- Ensure without fail that oil and diesel fuel will not get into the sea or rivers and canals or the ground.
- Treat undiluted anti-corrosion agents, antifreeze agents, filter element and cartridges as special waste.
- The regulations of the relevant local authorities are to be observed for the disposal of spent coolants and special waste.

If you have any question or recommendation in connection with this manual, please do not hesitate to contact our head office, dealers or authorized service shops near by your location for any services.

For the last, the content of this maintenance instruction may be changed without notice for some quality improvement. Thank you.

Apr. 2005

CONTENTS

1. Safety Regulations & Specifications

1.1. Safety Regulations

1.1.1. General notes

- Day-to-day use of power engines and the service products necessary for running them presents no problems if the persons occupied with their operation, maintenance and care are given suitable training and think as they work.
- This summary is a compilation of the most important regulations, These are broken down into main sections which contain the information necessary for preventing injury to persons, damage to property and pollution. In addition to these regulations those dictated by the type of engine and its site are to be observed also.

IMPORTANT:
If despite all precautions, an accident occurs, in particular through contact with caustic acids, fuel penetrating the skin, scalding from oil, antifreeze being splashed in the eyes etc, consult a doctor immediately.

1.1.2. To prevent accidents with injury to persons

(1) Engine starting and operation

- Before putting the engine into operation for the first time, read the operating instructions carefully and familiarize yourself with the “critical” points. If you are unsure, ask your DOOSAN representative or service man.
- For reason of safety we recommend you attach a notice to the door of the engine room prohibiting the access of unauthorized persons and that you draw the attention of the operating personal to the fact that they are responsible for the safety of person who enter the engine room.
- The engine must be started and operated only by authorized personnel.
- Ensure that the engine cannot be started by unauthorized person.
- When the engine is running, do not get too close to the rotating parts.
- Do not touch the engine with bare hands when it is warm from operation risk of bums.
- Exhaust gases are toxic. If it is necessary to run an engine in an enclosed area, remove the exhaust gases from the area with an exhaust pipe extension.

(2) Maintenance and care

- Always carry out maintenance work when the engine is switched off. If the engine has to be maintained while it is running, e.g. changing the elements of change-over filters, remember that there is a risk of scalding. Do not get too close to rotating parts.
- Change the oil when the engine is warm from operation.

CAUTION:
There is a rise of burns and scalding. Do not touch oil drain plug or oil filters with bare hands.

- Take into account the amount of oil in the sump. Use a vessel of sufficient size to ensure that the oil will not overflow.
- If change or refill the cooling water, disassemble the drain plug when the engine has cooled down. Heated cooling water has the risk of scalding and safety accidents.
- Neither tighten up nor open pipes and hoses (lube oil circuit, coolant circuit and any additional hydraulic oil circuit) during the operation. The fluids which flow out can cause injury.
- Fuel is inflammable. Do not smoke or use naked lights in its vicinity. The tank must be filled only when the engine is switched off.
- Keep service products (anti-freeze) only in containers which can not be confused with drinks containers.
- Comply with the manufacturer's instructions when handling batteries.

CAUTION:
Accumulator acid is toxic and caustic. Battery gases are explosive.
Therefore it should be done by an expert of the handling professionally.

(3) When carrying out checking, setting and repair work

- Checking, setting and repair work must be carried out by authorized personnel only.
- Use only tools which are in satisfactory condition. Slip caused by the worn open-end wrench could lead to injury.

- When the engine is hanging on a crane, no-one must be allowed to stand or pass under it. Keep lifting gear in good condition.
- When do electric weld, stop the engine, power off, then remove the wire harness' connector which is connected to the ECU.
- Do not weld the electric control unit (ECU) absolutely, and do not damage on it by electrical or mechanical shock.
- When working on the electrical system disconnect the battery earth cable first. Connect it up again last in prevent short circuits.

1.1.3. To prevent damage to engine and premature wear

(1) Never demand more of the engine than it was designed to yield for its intended purpose.
Detailed information on this can be found in the sales literature**. Engine control unit must not be adjusted without prior written permission of DOOSAN.**

(2) If faults occur, find the cause immediately and have it eliminated in order to prevent more serious of damage.

(3) Use only genuine DOOSAN spare parts. DOOSAN will accept no responsibility for damage resulting from the installation of other parts which are supposedly "just as good".

(4) In addition to the above, note the following points.

- Never let the engine run when dry, i.e. without lube oil or coolant.
- Pay attention to cleanliness. The Diesel fuel must be free of water.
- Use only DOOSAN approved service products (engine oil, anti-freeze and anticorrosion agent)
- Refer to the subjects of recommendation of the fuel.
- Have the engine maintained at the specified intervals.
- Do not switch off the engine immediately when it is warm, but let it run without load for about 5 minutes so that temperature equalization can take place.
- Never put cold coolant into an overheated engine.
- Do not add so much engine oil that the oil level rises above the max. marking on the dipstick. Do not exceed the maximum permissible tilt of the engine.
- Always ensure that the testing and monitoring equipment (for battery charge, oil pressure, coolant temperature) function satisfactorily.

- Do not let the raw water pump run dry, If there is a risk of frost, drain the pump when the engine is switched off.

1.1.4. To prevent pollution

(1) Engine oil, filter elements, fuel filters

- Take old oil only to an oil collection point.
- Take strict precautions to ensure that oil does not get into the drains or into the ground. The drinking water supply could be contaminated.
- Filter elements are classed as dangerous waste and must be treated as such.

(2) Coolant

- Treat undiluted anti-corrosion agent and / or antifreeze as dangerous waste.
- When disposing of spent coolant comply with the regulations of the relevant local authorities.

1.1.5. Notes on safety in handling used engine oil

Prolonged or repeated contact between the skin and any kind of engine oil decreases the skin.

Drying, irritation or inflammation of the skin may therefore occur. Used engine oil also contains dangerous substances which have caused skin cancer in animal experiments. If the basic rules of hygiene and health and safety at work are observed, health risks are not to the expected as a result of handling used engine oil .

< Health precautions >

- Avoid prolonged or repeated skin contact with used engine oil.
- Protect your skin by means of suitable agents (creams etc.) or wear protective gloves.
- Clean skin which has been in contact with engine oil.
  - Wash thoroughly with soap and water.
  - Do not use petrol, Diesel fuel, gas oil, thinners or solvents as washing agents.
- After washing apply a fatty skin cream to the skin.
- Change oil-soaked clothing and shoes.
- Do not put oily rags into your pockets.

CAUTION:

Ensure that used engine oil is disposed of properly.

- Engine oil can endanger the water supply.

For this reason do not let engine oil get into the ground, waterways, the drains or the sewers. Violations are punishable. Collect and dispose of used engine oil carefully. For information on collection points please contact the seller, the supplier or the local authorities.

1.1.6. General repair instructions

1. Before performing service operation, disconnect the grounding cable from the battery for reducing the chance of cable damage and burning due to short-circuiting.
2. Use covers for preventing the components from damage or pollution.
3. Engine oil and anti-freeze solution must be handled with reasonable care as they cause paint damage.
4. The use of proper tools and special tools where specified is important to efficient and reliable service operation.
5. Use genuine DOOSAN parts necessarily.
6. Used cotter pins, gaskets, O-rings, oil seals, lock washer and self-lock nuts should be discarded and new ones should be prepared for installation as normal function of the parts can not be maintained if these parts are reused.
7. To facilitate proper and smooth reassemble operation, keep disassembled parts neatly in groups. Keeping fixing bolts and nut separate is very important as they vary in hardness and design depending on position of installation.
8. Clean the parts before inspection or reassembly. Also clean oil ports, etc. using compressed air to make certain they are free from restrictions.
9. Lubricate rotating and sliding faces of parts with oil or grease before installation.
10. When necessary, use a sealer on gaskets to prevent leakage.
11. Carefully observe all specifications for bolts and nuts torques.
12. When service operation is completed, make a final check to be sure service has been done property.
13. Work the fuel line after the common rail pressure and engine temperature is checked with the SCAN-200. (past about 5 minutes after engine stop)

1.2. Engine Specifications

Items / Engine model		DL08
Engine type		Water-cooled, 4 cycle, In-line, Turbo charged & inter-cooled
Combustion chamber type		Direct injection type
Cylinder liner type		Replaceable dry liner
Timing gear system		Gear driven type
No. of piston ring		2 compression ring, 1 oil ring
No. of cylinder-bore x stroke (mm)		6 – 108 ×139
Total piston displacement (cc)		7,640
Compression ratio		17 : 1
Engine dimension (length x width x height) (mm)		1,356 x 919 x 1,153
Rotating direction (from flywheel)		Counter clockwise
Engine weight (kg)		836
Firing order		1 – 5 – 3 – 6 – 2 - 4
Fuel high pressure pump type		Bosch CP3.3 fuel high pressure pump type
Engine control type		Electric control type (ECU)
Injector type		Multi – hole (8 x Ø0.147)
Fuel injection pressure (kg/cm^2)		250bar(operating pressure 1,600bar)
Valve clearance	Intake valve	0.3
	Exhaust valve	0.4
	Jake brake	1.5
Intake valve	Open at	26.3° (B.T.D.C)
	Close at	34.3° (A.B.D.C)
Exhaust valve	Open at	53° (B.B.D.C)
	Close at	13° (A.T.D.C)
Fuel filter type		Full-flow (cartridge)
Oil pressure (kg/cm^2)	at idle speed	1.0 ~ 3.0
	at rated speed	3.0 ~ 5.5
Using lubrication oil		ACEA-E5(API CI-4 class)
Lubrication method		Full forced pressure feed type
Oil pump type		Gear type driven by crankshaft
Oil filter type		Cartridge type
Lubricating oil capacity (max./min.) (lit)		Bus : 27 / 21 , Truck : 32 / 25
Oil cooler type		Water cooled
Hydraulic indicator		Oil pressure unit
Water pump		Belt driven centrifugal type
Cooling method		Pressurized circulation
Cooling water capacity(engine only) (lit)		13.3
Thermostat	Type	Wax pallet type
	Open at (° C)	83°C
	Open wide at (° C)	95°C
	Valve lift (mm)	8

Items / Engine model		DL08
Water temperature indicator		Water temperature sensor mounted
Air compressor	Type	Water cooled
	Capacity (cc/rev)	440
	Revolution ratio	1 : 1 (engine speed : air compressor speed)
Steering pump	Type	Gear driven, vane type
	Capacity (l/min)	16 or 18
	Adjusting pressure (kg/cm^2)	125
	Revolution ratio	1 : 1.303 (engine speed : pump speed)
Turbo charger		Exhaust gas driven type (waste gate)
Engine stop system		Fuel feeding shut-off by ECU
Engine brake		Control by ECU
Alternator (voltage – capacity) (V - A)		24 - 60
Starting motor(voltage–output) (V - kW)		24 – 4.5
Air heater capacity (V – A)		12V – 1.3kW x 2ea
Battery capacity (V - AH)		24 - 150

1.3. Engine Power

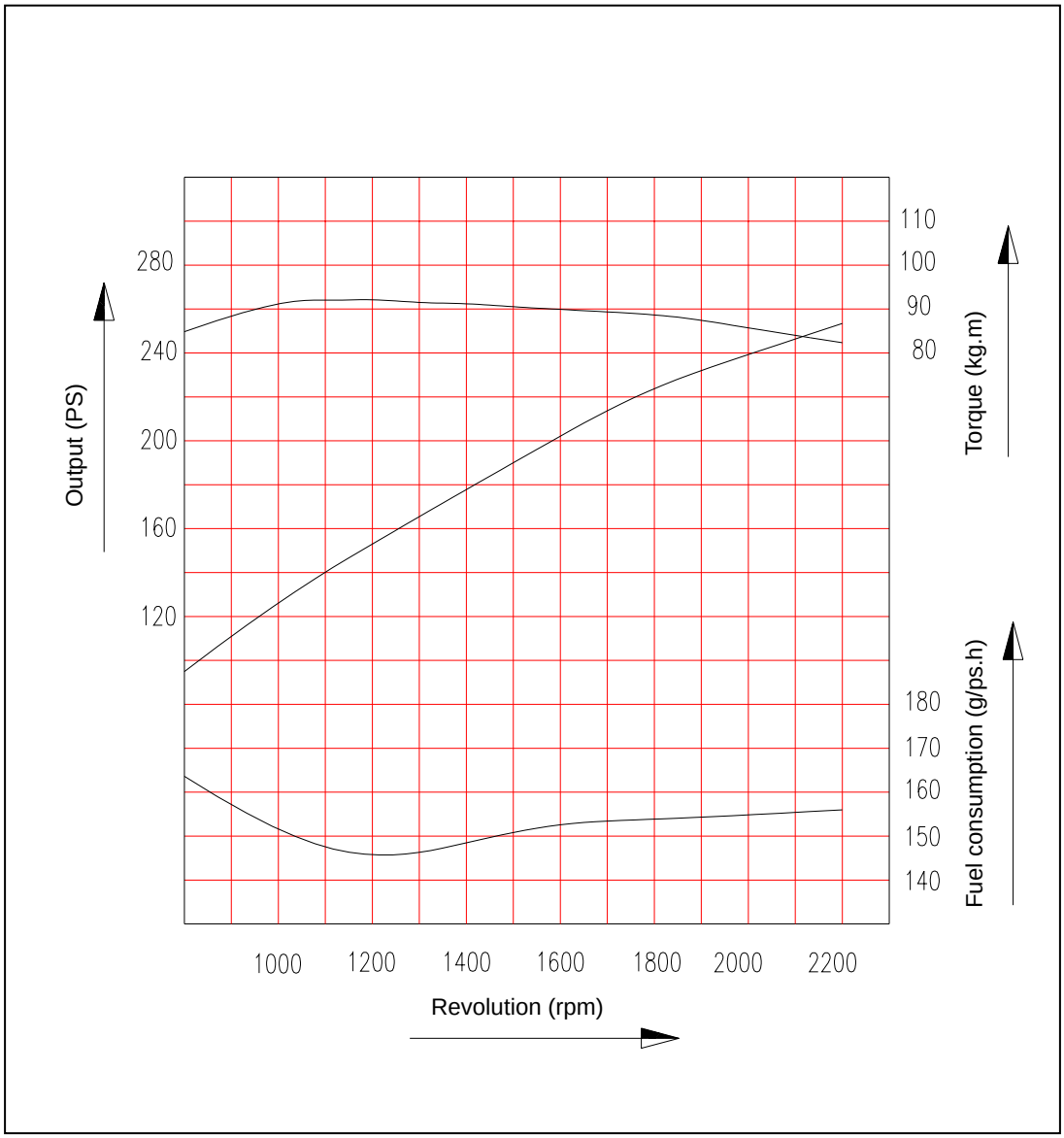
tolerance : ±5%

Engine model		Performance				Remark
Model	Suffix	**Power** (PS / rpm)	**Torque** (kg.m / rpm)	**Low idle** (rpm)	**High idle** (rpm)	
DL08	EUPBA	300 / 2,200	115 / 1,200	600	2420↓	W/ Jake brake
	EUPBE					W/o Jake brake
	EUPBB	310 / 2,200	125 / 1,200	600	2420↓	W/ Jake brake
	EUPBF					W/o Jake brake
	EUPBC	250 / 2,200	90 / 1,200	600	2420↓	W/ Jake brake
	EUPBG					W/o Jake brake
	EUPBD	270 / 2,200	100 / 1,200	600	2420↓	W/ Jake brake
	EUPBH					W/o Jake brake
	EUPCA	320 / 2,200	135 / 1,200	600	2420↓	W/o Jake brake
	EUPCE					W/ Jake brake
	EUPCC	320 / 2,200	135 / 1,200	600	2420↓	W/o Jake brake
	EUPCF					W/ Jake brake
	EUPCB	250 / 2,200	90 / 1,200	600	2420↓	W/o Jake brake
	EUPCG					W/ Jake brake
	EUPCD	250 / 2,200	90 / 1,200	600	2420↓	W/o Jake brake
	EUPCH					W/ Jake brake
	EUPXA	320 / 2,200	135 / 1,200	600	2420↓	W/o Jake brake
	EUPXC					W/ Jake brake
	EUPXB	300 / 2,200	115 / 1,200	600	2420↓	W/o Jake brake
	EUPXD					W/ Jake brake
	EUPXE	300 / 2,200	115 / 1,200	600	2420↓	W/o Jake brake
	EUPXF					W/ Jake brake

* Note : All data are based on operation without cooling fan at ISO 1585(SAE J1349)

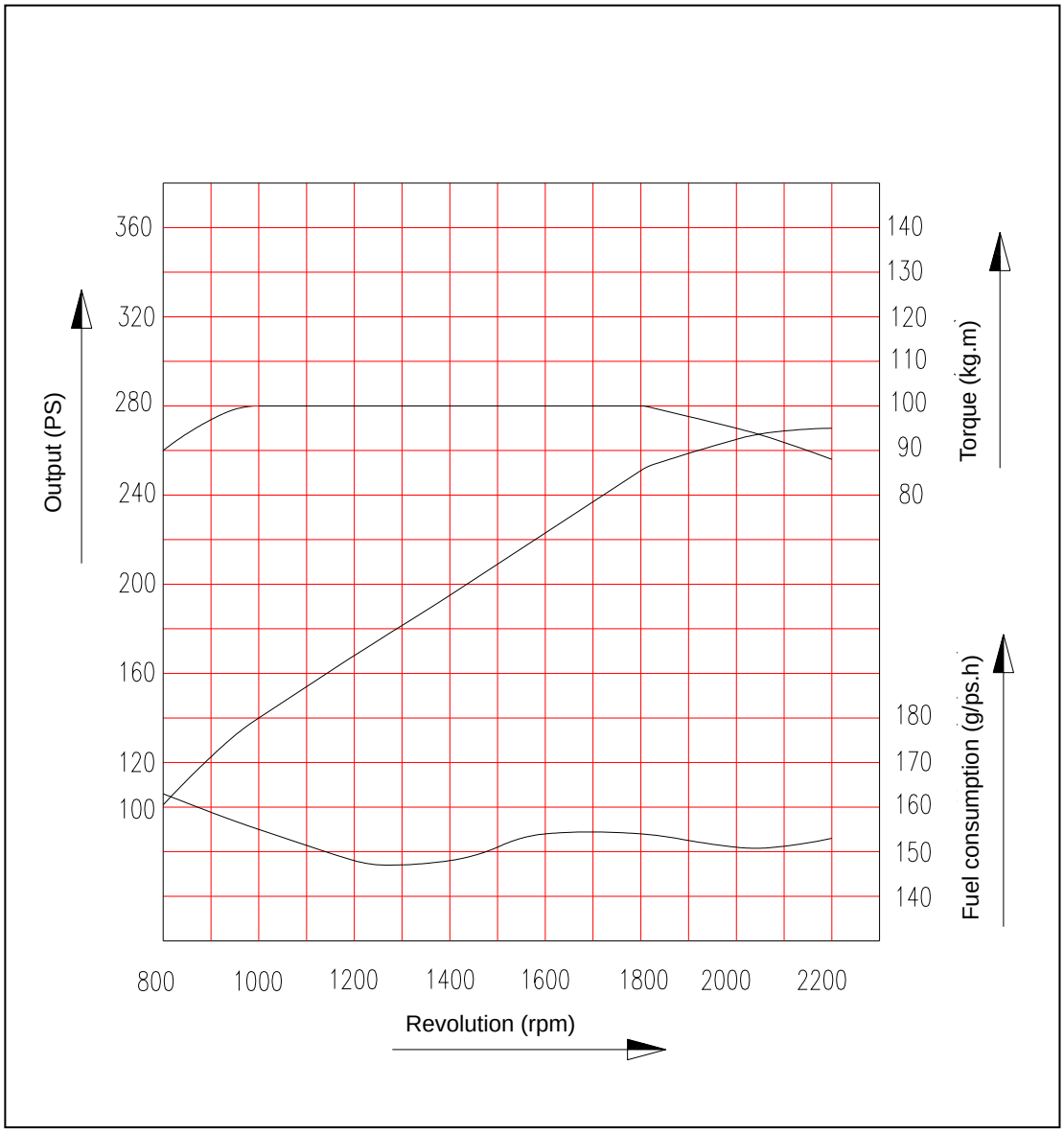
1.4. Engine Performance Curve

1.4.1. Performance curve (250PS)



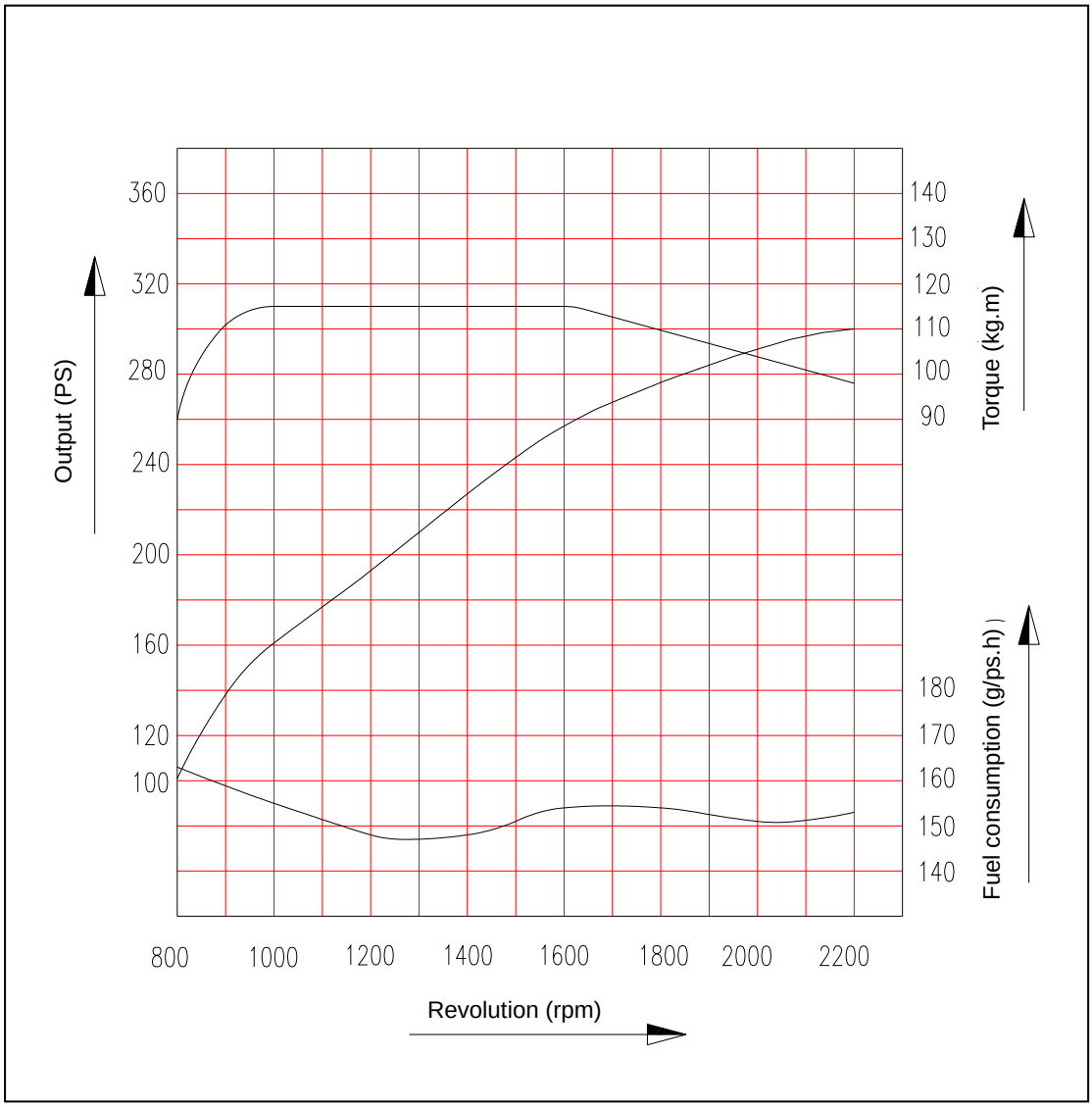
Performance		ISO 1585 (SAE J1349)
Output	(max.)	184 kW (250PS) / 2,200 rpm
Torque	(max)	883 N.m (90 kg.m) / 1,200 rpm
Fuel consumption	(min.)	197 g/kW.h (145 g / PS.h)

1.4.2. Performance curve (270PS)



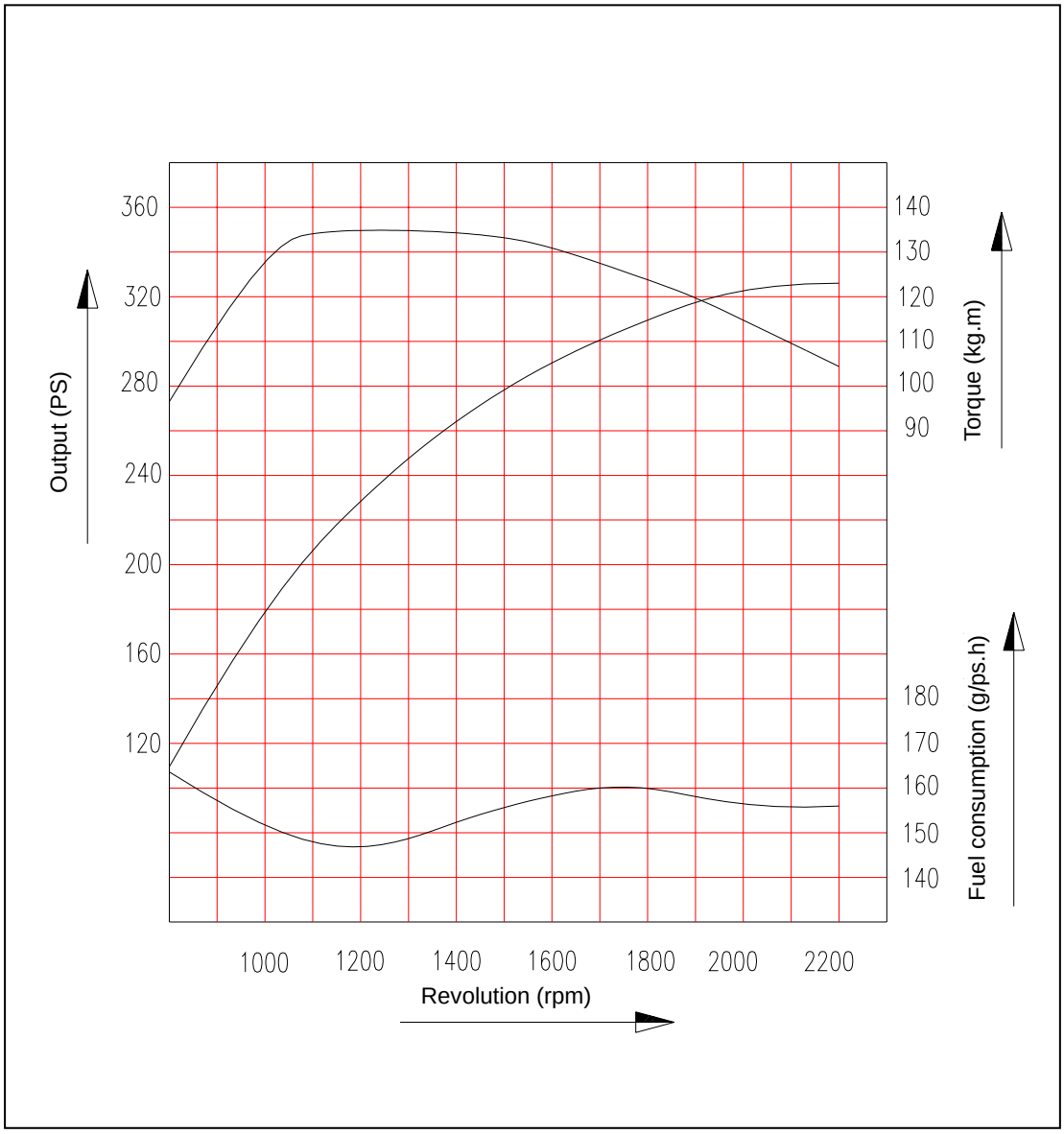
Performance	ISO 1585 (SAE J1349)
Output (max.)	199 kW (270PS) / 2,200 rpm
Torque (max)	981 N.m (100 kg.m) / 1,200 rpm
Fuel consumption (min.)	197 g/kW.h (145 g / PS.h)

1.4.3. Performance curve (300PS)



Performance	ISO 1585 (SAE J1349)
Output (max.)	221 kW (300PS) / 2,200 rpm
Torque (max)	1,128 N.m (115 kg.m) / 1,200 rpm
Fuel consumption (min.)	197 g/kW.h (145 g / PS.h)

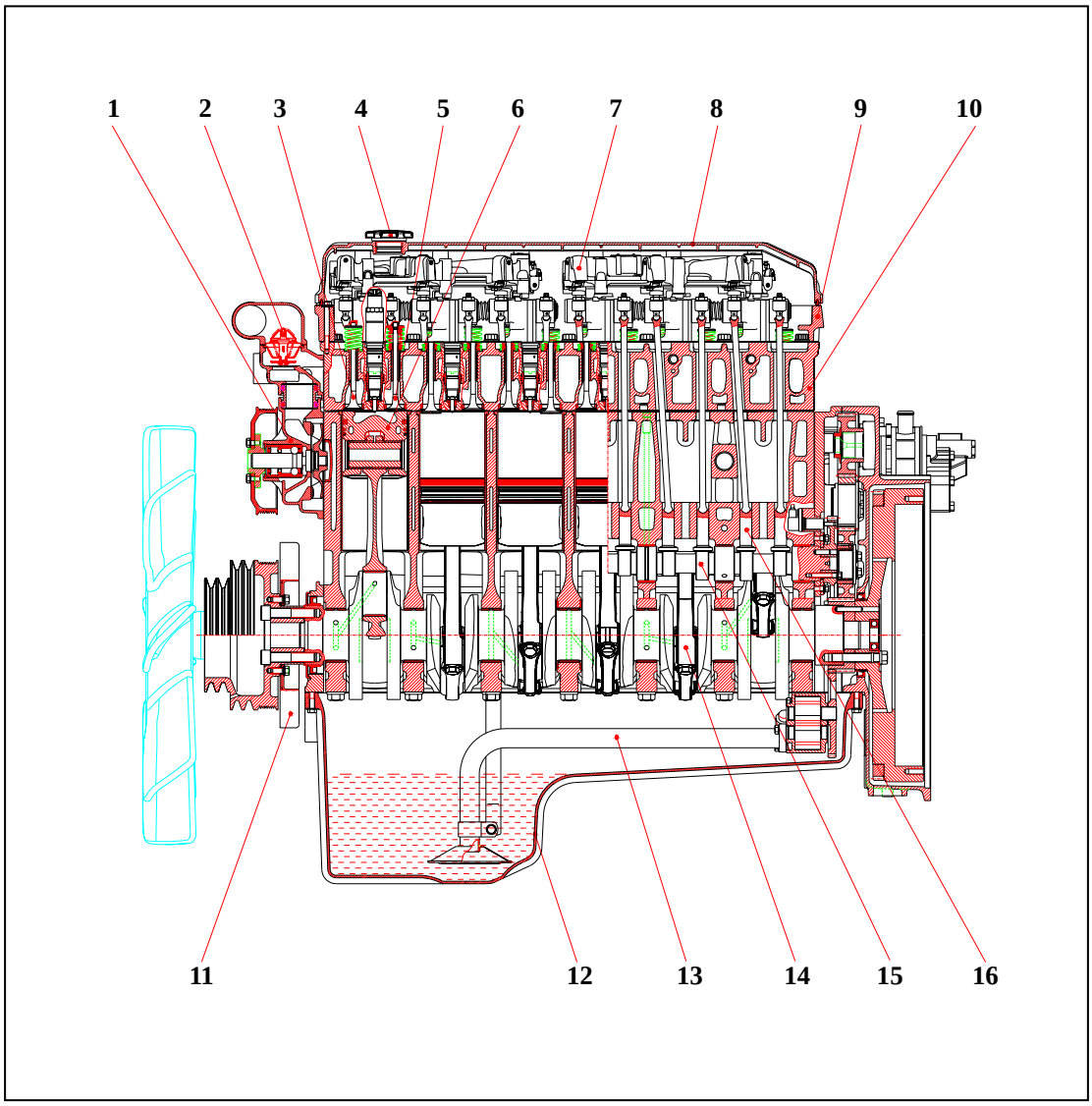
1.4.4. . Performance curve (320PS)



Performance	ISO 1585 (SAE J1349)
Output (max.)	235 kW (320PS) / 2,200 rpm
Torque (max)	1,324 N.m (135 kg.m) / 1,200 rpm
Fuel consumption (min.)	197 g/kW.h (145 g / PS.h)

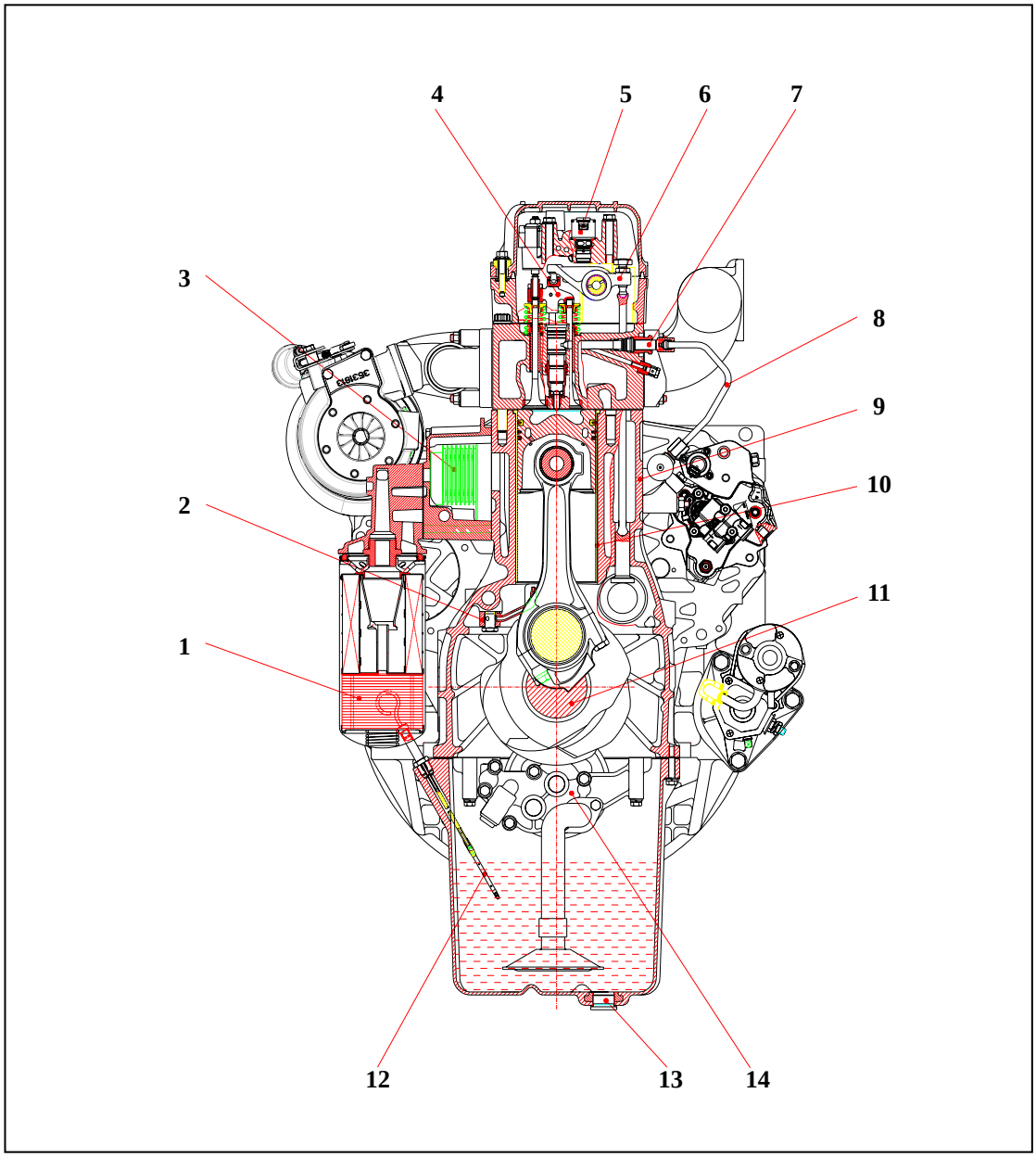
1.5. Engine Assembly

1.5.1. Sectional drawing (longitudinal)



1	Cooling water pump	2	Thermostat	3	Exhaust valve
4	Oil filler cap	5	Intake valve	6	Piston
7	Engine brake	8	Cylinder head cover	9	Intermediate cover
10	Cylinder head	11	Vibration damper	12	Oil pan
13	Oil suction pipe	14	Connecting rod	15	Cam shaft
16	Tappet				

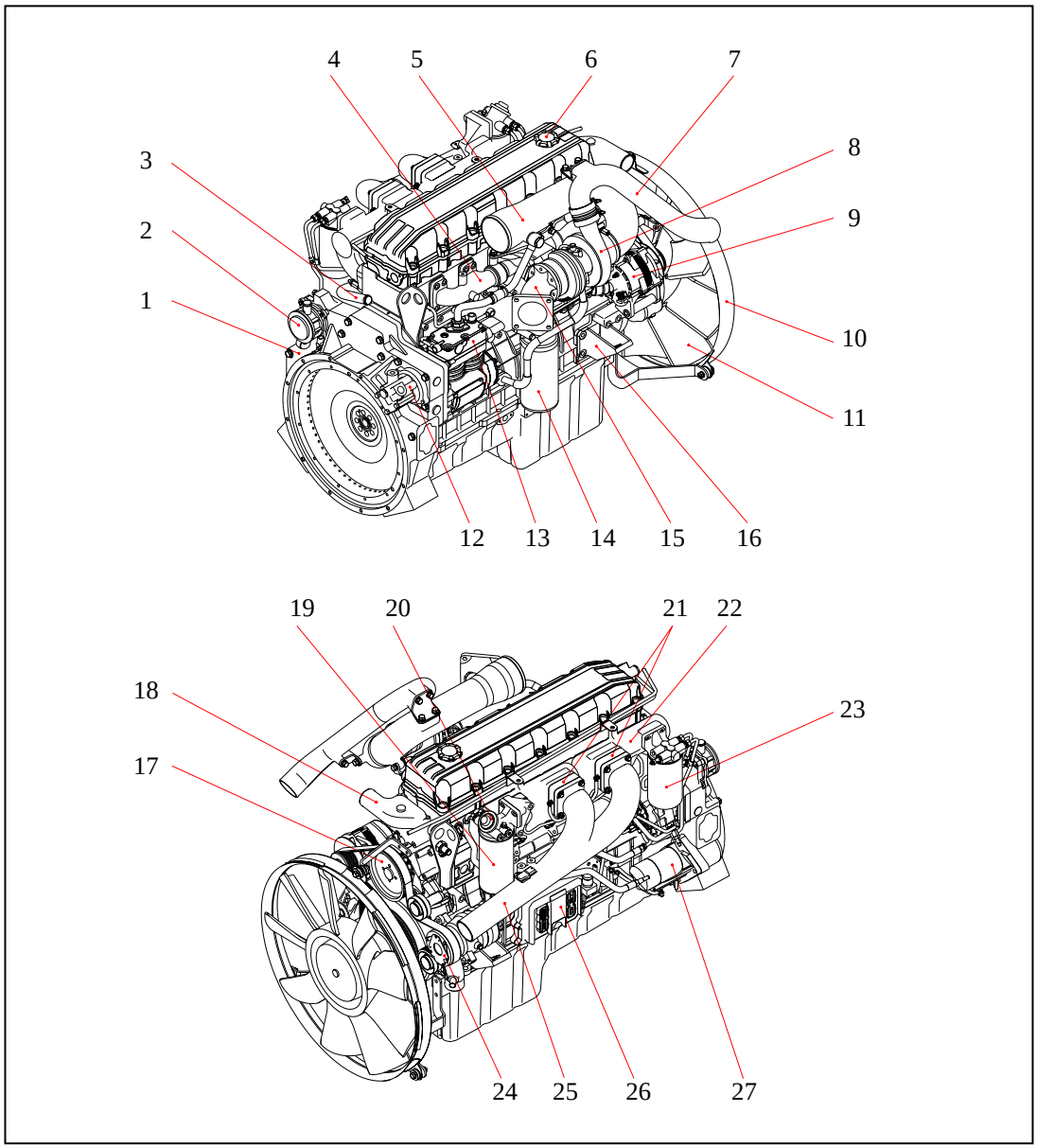
1.5.2. Sectional drawing



1	Oil filter	8	Fuel high pressure pipe
2	Oil spray nozzle	9	Cylinder block
3	Oil cooler	10	Cylinder liner
4	Caliper	11	Crank shaft
5	Solenoid valve (engine brake)	12	Oil level gauge
6	Rocker arm	13	Oil drain plug
7	Fuel high pressure connector	14	Oil pump

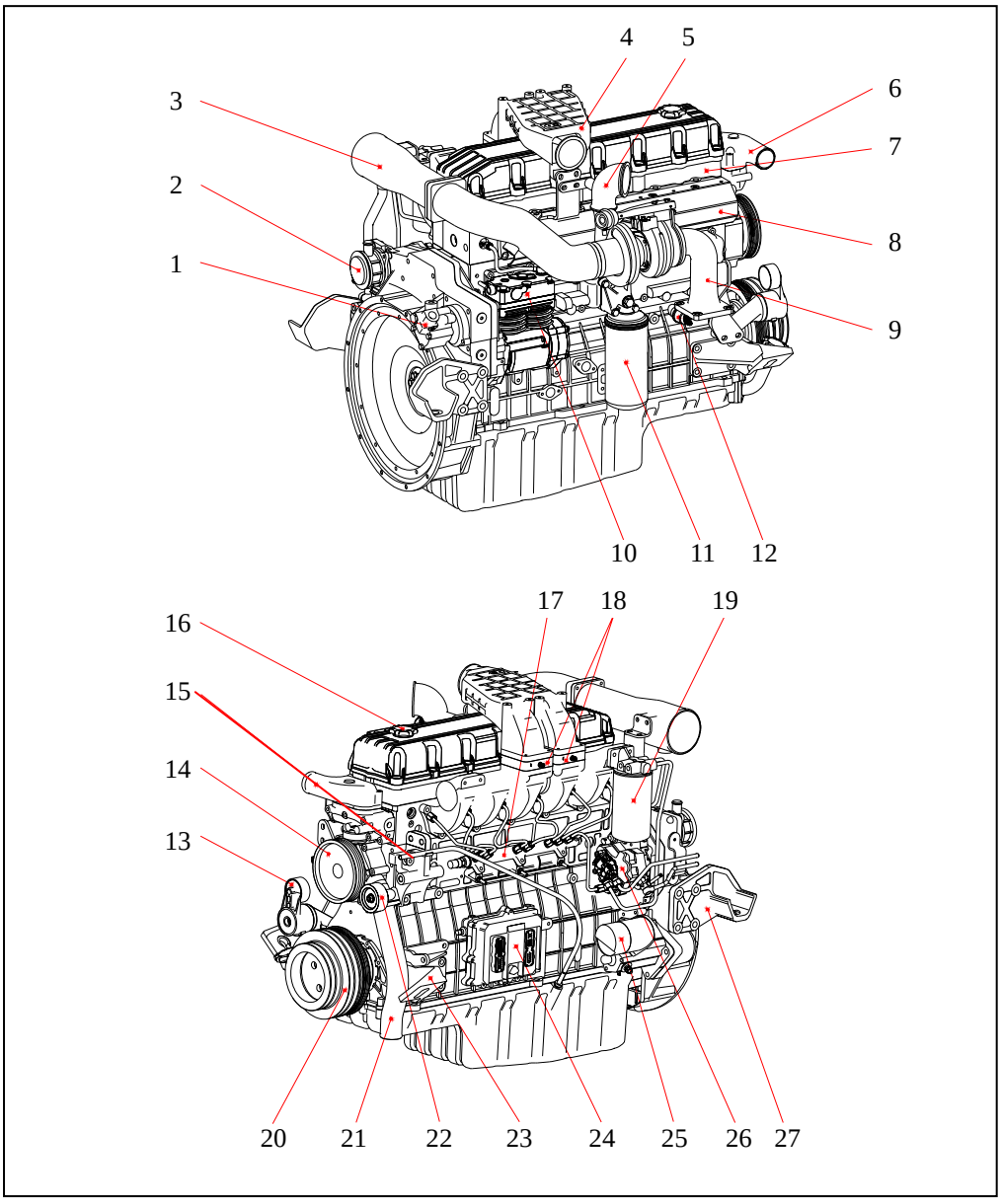
1.5.3. Engine assembly

(1) DL08 (Truck)



1	Flywheel housing	9	Alternator	19	Primary fuel filter
2	Breather (CCV)	10	Fan guide	20	Priming pump
3	Cooling water pipe	11	Cooling fan	21	Air heater
4	Exhaust manifold	12	Power steering pump	22	Intake manifold
5	Air pipe	13	Air compressor	23	2nd Fuel filter
	(Air cleaner to turbocharger)	14	Oil filter	24	Air con. compressor
6	Oil filler cap	15	Exhaust elbow	25	Air pipe
7	Air pipe	16	Mounting bracket		(Inter cooler to intake manifold)
	(Turbocharger to inter cooler	17	Water pump	26	Engine control unit(ECU)
8	Turbo charger	18	Water outlet	27	Starter

(2) DL08 (Bus)

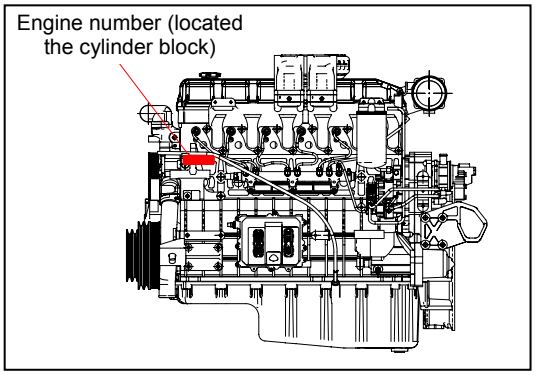


1	Power steering pump	8	Heat screen	18	Air heater
2	Breather (CCV)	9	Exhaust elbow	19	Fuel filter
3	Air pipe	10	Air compressor	20	Crank shaft pulley
	(Air cleaner to turbocharger)	11	Oil filter	21	Water inlet
4	Air pipe	12	Oil pressure unit	22	Idle pulley
	(Inter cooler to intake manifold)	13	Auto tensioner	23	Mounting bracket
5	Air pipe	14	Water pump	24	Engine control unit(ECU)
	(Turbocharger to inter cooler)	15	Oil level gauge	25	Starter
6	Water outlet	16	Oil filler cap	26	Fuel high pressure pump
7	Intermediate cover	17	Common rail	27	Mounting bracket

2. Technical Information

2.1. Engine Model and Serial Number

- The engine model and serial number is located on the engine as illustrated.
- These numbers are required when requesting warranty and ordering parts. They are also referred to as engine model and serial number because of their location.



● **Engine serial No. (example 1 : DL08 Bus)**

DL08 5 00001BA

- **Engine model suffix (EUPBA)**
- **Serial no.**
- **Production year (2005)**
- **Engine model**

● **Engine serial No. (example 2 : DL08 Truck)**

DL08 5 00001CA

- **Engine model suffix (EUPCA)**
- **Serial no.**
- **Production year (2005)**
- **Engine model**

2.2. Diagnostic tool (SCAN-200)

The SCAN-200 is a powerful tool to support the service personal diagnosing and repairing of electric system for vehicle with installed DL08 engine.