



- **SECTION 11 GENERAL DESCRIPTION OF WD618 SERIES ENGINES**
- **I. General**
- WD618 diesel engines are made by China National Heavy Duty Truck Group Co. Ltd. (SINOTRUCK) with advanced manufacturing technologies introduced from Austria STEYR Trucks Company. The power of this type of the engine is increased by increasing its stroke from that (130mm) of WD615 to 155mm. The engine basically adopts the technology of WD615. So its structure will be introduced briefly. For more information, refer to the description of WD615 engine given above.





Training Document

HOWO ZZ4257S3241V

II. Main performance parameters and technical specifications, see Table 2-16 and Table 2-17

Table 2-16 Technical specifications of WD618 diesel engines

Model Item	WD61836	WD61839	WD61882	WD61844
Cylinder bore mm	126			
Stroke mm	155			
Displacement L	11.6			
Mode of air intake	Inter-cooling			
Average piston speed m/s	11.36			
Performance per litre kW/L	22.8	24.7	26.6	27.8
Compression ratio	16.5:1			
Type of starting	Electric starting			
Type of lubrication	Pressure lubrication			
Type of cooling	Water-cooling forced circulation			
Lubricating oil capacity L	27			



Training Document

HOWO ZZ4257S3241V

Table 2-17 Performance parameters of WD618 diesel engines

Model	Rated power kW	Rotating speed rpm	Max. torque Nm	Rotating speed rpm	Min. fuel consumption g/kWh	Weight kg	Type of cylinder head
WD6183 6	265	2,200	1,500	1,300-1,600	198	905	2-valve*
WD6183 9	287	2,200	1,600	1,300-1,600	198	905	2-valve
WD6188 2	309	2,200	1,750	1,300-1,600	198	905	2-valve
WD6184 4	323	2,200	1,850	1,300-1,400	195	915	2-valve



Training Document

HOWO ZZ4257S3241V

III. Main structural features of WD618 diesel engines

1. Overall configuration

WD618 engine is developed on the basis of WD615 by increasing the stroke. Its overall configuration is similar to that of WD615 with the following differences:

- ① It adopts duplex thermostat. The two elements of the thermostat are located inside water pipe. The structure is more compact.
- ② The water pump is composed of the pump body, impeller and cover. The pump is fixed in the gear box and driven by gears.
- ③ It uses a special fan bracket. The center position of the fan is the same as that of WD615 engine.
- ④ The fuel injection pump is fixed onto the gear box by means of flange. To compare with WD615 engine, there is no the driving shaft in the fuel injection pump. The fuel injection pump is directly driven by gears via camshaft.
- ⑤ The air compressor is mounted on one side of the exhaust pipe in front of the gear box.

2. Cylinder block

To compare with WD615, as the stroke of WD618 engine is increased, the height of the cylinder block is also increased from 363.8mm to 419mm. As a plate-fin type lubricating oil cooler is adopted, the structure of the oil cooler chamber in the cylinder block has been changed greatly, and the fuel and vapor separator is located at the top of the oil cooler chamber. This location is more reasonable. The width of the engine is increased from 352mm to 372mm. The main reason is that a thicker plate-fin type lubricating oil cooler is adopted. As the main journal of the crankshaft used in WD618 is increased, the main bearing bore is increased from



- **3. Crankshaft**

- In order to meet the requirement on the strength of the crankshaft as the power of the engine is increased, the dimensions and local structure of the crankshaft of WD618 engine are changed. The main journal is increased from 100mm to 104mm. The connecting rod journal is increased from 82mm to 83mm. The number of the lubricating oil orifices in the main journal and connecting rod journal are reduced from 2 to 1. The result of calculation and experiment shows that the reduction of the number of the lubricating oil orifices can not only meet the requirement of lubrication ,but also increased the strength of the crankshaft journal. Other structure parameters and the material of the WD618 diesel engine crankshaft are the same as those of the WD615 engines.

- **4. Piston and connecting rod**

- (1) Connecting rod
- The small end of the connecting rod of WD618 is wedge-shaped and has no lubricating orifice in the top. The piston pin, the connecting rod bushing and the piston pin boss are lubricated by the slant structure of the small end of the connecting rod. The connecting rod bolt is still $M14 \times 1.5$, and its material is the same as that of WD615 engine, but the bolt length is increased from 60mm to 67.5mm. As the stroke is increased, the center distance between the holes in the big and small ends is increased to 253mm (that of WD615 engine is 219mm), and other structural parameters are the same as those of WD615 engine.



- (2)Piston
- WD618 engines have two types of pistons different in structure. One is used on two-valve diesel engines below 420 hp, and the other used on four-valve diesel engines. The material of both types of pistons are the same as that of the WD615 engines. The structure of the piston used on WD618 two-valve engine is similar to that of the WD615 engine, but the combustion chamber volume has been increased to $104.9\pm 0.75\text{ml}$ (that of WD615 is 84ml). The size of the piston skirt of the WD618 four-valve engine is exactly the same as that of the two-valve engine, but the combustion chamber volume and shape are different. As the center of the fuel injector of the four-valve engine is located at the center of the cylinder, hence the piston center is also at the center of the cylinder. The combustion chamber volume of WD618 four-valve engine is $106\pm 0.75\text{ml}$.
- **5. Cylinder head**
- The main structure of the cylinder head of the WD618 two-valve engine is basically the same as that of WD615, but the intake and exhaust passages are changed. The cooling water jacket and the intake and exhaust passages of the cylinder head of WD618 four-valve engine have been changed greatly. The changes are made mainly for positioning the four intake valves and providing sufficient strength for the cylinder head. There is a 24mm water-crossing hole between the cylinder head and the cylinder block. Inside the water-crossing hole a water-crossing pipe is set. The water-crossing pipe also functions to locate the cylinder head and the cylinder block.





Training Document

HOWO ZZ4257S3241V

- There is no external water outlet pipe on WD618 four-valve engine. The connecting pipe between the cylinder heads will be used instead of the water-crossing pipe. There is one 50mm water-crossing hole at either side of the cylinder head. Both ends of connecting pipe are inserted and sealed into the water-crossing holes. In order to guarantee uniform water supply and appropriate water temperature, water from No.1, No.2 and No.3 cylinders is drawn from the front end face of the head of No.1 cylinder, and water from No.4, No.5 and No.6 cylinders is drawn from the rear end face of the head of No.6 cylinder. The two water flows flow separately to two independent thermostats to form water circulation.
- **6. The structure of intermediate gear shaft**
- The bearing of the intermediate gear shaft is sliding bearing which is lubricated by force.





- **7. Rocker arm system**

- The rocker arm system of WD618 two-valve diesel engine is basically the same as that of WD615. But that of WD618 four-valve diesel engine differs greatly. A valve bridge is used to ensure that the two intake valves or two exhaust valves in the rocker arm system of WD618 four-valve diesel engine open at the same time. There are two types of valve bridges (different in structure). One is an all-in-one type with the top of the valve bridge in contact with the rocker head hardened; another type of the valve bridge is composed of two parts, i.e. a hard piece is fit on its top.

- **8. Cooling system**

- The cooling system of WD618 engine includes water pump, fan, thermostat, plate-fin type lubricating oil cooler, cooling water pipelines, etc.
- (1)Water pump
- The water pump is still located at the front end of the engine. As there are many accessories at the front end of the engine, the structure of the water pump has been changed a lot so as to facilitate the location of these accessories. The water pump casing of WD615 engine is located on the gear box. Its structure is rather compact. WD618 adopts a separate water pump. Water out from the pump flows into the engine body cooling water jacket through water passage in the gear box.
- (2)Fan
- The fan is driven by a belt. The fan bracket is fixed on the gear box. Changing the structure of the fan bracket may get different fan rotating speed and height so as to meet the requirements for cooling and installation. This kind of structure has also eliminated the impact of fan load to the water





Training Document

HOWO ZZ4257S3241V

- (3)The structure of thermostat
- The structure of the thermostat of WD618 two-valve engine differs from that of the four-valve engine. The lower housing of the thermostat of WD618 two-valve engine is forged together with the water outlet pipe, two same elements of the thermostat are mounted inside its lower housing, there is a water outlet pipe on the top cover of the thermostat, and the outlet pipe is connected to the water tank. Water out of No.1, No.2 and No.3 cylinder heads enters a thermostat, and water out of No.4, No.2 and No.6 cylinder heads enters another thermostat. The two thermostats are connected in parallel. The opening temperature of the thermostat is 79°C, full-open temperature is 90°C, and its minimum travel is 8mm.
- (4)WD618 diesel engine cooling water passage
- Water out of the water pump flows into the engine body through a long water passage in the gear box. It first cool the oil in the plate-fin type lubricating oil cooler, enter the cooling water jackets of various cylinders to cool the cylinder block, then enter the cylinder head through water-crossing hole to cool the cylinder head, and finally enter water pump or water tank through outlet pipe or water-crossing pipe for circulation.





• 9. Lubricating system

- The lubricating system of WD618 diesel engine is basically the same as that of WD615 with the following features:
- ① In order to increase the cooling efficiency, The plate-fin type lubricating oil cooler more compact in structure is adopted.
- ② Main bearing shell and connecting rod bearing shell with grooves are adopted, that increased the reliability and prolonged the service life of the bearing shells.
- ③ The intermediate gear uses sliding bearing with pressure lubrication.
- ④ The water pump uses sliding bearing with pressure lubrication. The lubricating oil flow is secondary oil passage → water pump → fuel injection pump. The lubrication oil return pipe is removed. Oil flows back to the gear box through the flange face at the side of the fuel injection pump.
- ⑤ The structure of the oil pump is similar to that of WD615 diesel engine. The gear width of the oil pump is 53mm. However, its gear and shaft are of all-in-one structure.
- ⑥ In order to meet the requirements of cooling and lubrication, the capacity of the oil pan is 27L.



- **10. Fuel supply system**

- (1) Fuel injection pump drive system

- As compared with WD615, the fuel injection pump drive system of WD618 has changed greatly. WD618 diesel engine uses a flange-mounted fuel injection pump, which is directly fixed on the gear box of the engine. The crankshaft gear drives the gear of the fuel pump via the intermediate gear. The angle of fuel supply commencement will be maintained by the scale lines on the locating pin and the gear. The drive system change is made on the following considerations: Firstly, in order to guarantee accurate angle of fuel supply commencement for proper emission of WD618 diesel engine. The drive system of the fuel pump of WD615 is composed of such elastic parts as drive shaft, coupling, etc. They can not guarantee that the angle of fuel supply commencement remain unchanged during the operation of the diesel engine. Besides, the air compressor in the drive system of WD615 engine is driven by the fuel pump gear and the compressor in operation is an impact load. This also exhibits some difficulty to guarantee the accuracy and steadiness of the angle of fuel supply commencement. As for the drive system of WD618 engine, the fuel pump gear drives the water pump gear. Because the load of the water pump is constant, there is no impact load, and it is good for ensuring the accuracy of fuel supply. Secondly, in order to meet the requirement of emission, the pump end pressure of the fuel injection pump of WD618 engine may reach 105Mpa. It is a big increase as compared with WD615 and the impact load is also increased remarkably. If we still adopt the driving form and structure of WD615, it would certainly result in deformation and unreliability of the elastic system.





Training Document

HOWO ZZ4257S3241V

(2) Main parameters of fuel supply system

The main parameters of fuel supply system are given in Table 3.

Table 3 The main parameters of fuel supply system of WD618 diesele engines

Model Item	WD61836	WD61839	WD61882	WD61844
Type of fuel injection pump	PE6P120A 720RV17 429RP25			
Type of fuel delivery valve	2418552069	2418552063	2418552063	
Volume of fuel delivery valve mm ³	100	120	120	
Plunger diameter mm	12	12	12	12
Type of governor	RQ300/110PA V18461			
Pump end pressure Mpa	105	105	105	105
The opening pressure of the fuel injection nozzle Mpa	25	25	25	25
Fuel orifice size	7×0.282×155°			6×0.262×155°
High-pressure fuel pipe	φ6×2	φ6×2	φ6×2	φ6×2.25



Training Document

HOWO ZZ4257S3241V

- (3)Features of fuel injection pump of WD618 diesel engines
- WD618 two-valve diesel engine adopts conventional fuel injection pump (with DV) and conventional governor. The main structure of the fuel injection pump is the same as that of WD615 engine. WD618 four-valve diesel engine adopts fuel injection pump without delivery valve (RDV), and the governor is type RDV-K.
- RDV fuel injection pump has the following three features: 1) It can guarantee higher fuel supply pressure; 2) The pressure inside the fuel pipe is comparatively low when fuel injection is stopped, and there is not secondary injection; and 3) In the fuel system using such fuel pump, there is no need to use a fuel injector return pipe.

