SHOP MANUAL

4D92E, 4D94E, 4D98E

DIESEL ENGINE

ENGINE MODEL	MACHINE MODEL	
4D92E	**FD10/14/15/18-16**	**622001 and up**
4D94E	**FD20/23/25/28/30-12**	**538001 and up**
4D98E	**FD20H/25H/30H-12**	**538001 and up**

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⚠ SAFETY

GENERAL PRECAUTIONS

Mistakes in operation are extremely dangerous. Read the Operation and Maintenance Manual carefully BEFORE operating the machine.

1. Before carrying out any greasing or repairs, read all the precautions given on the decals which are fixed to the machine.
2. When carrying out any operation, always wear safety shoes and helmet. Do not wear loose work clothes, or clothes with buttons missing.
   - Always wear safety glasses when hitting parts with a hammer.
   - Always wear safety glasses when grinding parts with a grinder, etc.
3. If welding repairs are needed, always have a trained, experienced welder carry out the work. When carrying out welding work, always wear welding gloves, apron, glasses, cap and other clothes suited for welding work.
4. When carrying out any operation with two or more workers, always agree on the operating procedure before starting. Always inform your fellow workers before starting any step of the operation. Before starting work, hang UNDER REPAIR signs on the controls in the operator's compartment.
5. Keep all tools in good condition and learn the correct way to use them.
6. Decide a place in the repair workshop to keep tools and removed parts. Always keep the tools and parts in their correct places. Always keep the work area clean and make sure that there is no dirt or oil on the floor. Smoke only in the areas provided for smoking. Never smoke while working.

PREPARATIONS FOR WORK

7. Before adding oil or making any repairs, park the machine on hard, level ground, and block the wheels or tracks to prevent the machine from moving.
8. Before starting work, lower blade, ripper, bucket or any other work equipment to the ground. If this is not possible, insert the safety pin or use blocks to prevent the work equipment from falling. In addition, be sure to lock all the control levers and hang warning signs on them.
9. When disassembling or assembling, support the machine with blocks, jacks or stands before starting work.
10. Remove all mud and oil from the steps or other places used to get on and off the machine. Always use the handrails, ladders or steps when getting on or off the machine. Never jump on or off the machine. If it is impossible to use the handrails, ladders or steps, use a stand to provide safe footing.

HOISTING INSTRUCTIONS

⚠ Heavy parts (25 kg or more) must be lifted with a hoist etc.

1. If a part cannot be smoothly removed from the machine by hoisting, the following checks should be made:
   - Check for removal of all bolts fastening the part to the relative parts.
   - Check for existence of another part causing interference with the part to be removed.

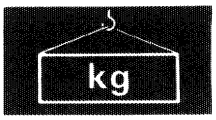
2. **Wire ropes**
   1) Use adequate ropes depending on the weight of parts to be hoisted, referring to the table below:

Wire ropes
(Standard "Z" or "S" twist ropes without galvanizing)

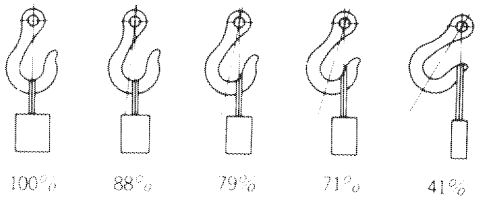
Rope diameter (mm)	Allowable load (tons)
10	1.0
11.2	1.4
12.5	1.6
14	2.2
16	2.8
18	3.6
20	4.4
22.4	5.6
30	10.0
40	18.0
50	28.0
60	40.0

The allowable load value is estimated to be one-sixth or one-seventh of the breaking strength of the rope used.

2) Sling wire ropes from the middle portion of the hook.



Slinging near the edge of the hook may cause the rope to slip off the hook during hoisting, and a serious accident can result. Hooks have maximum strength at the middle portion.



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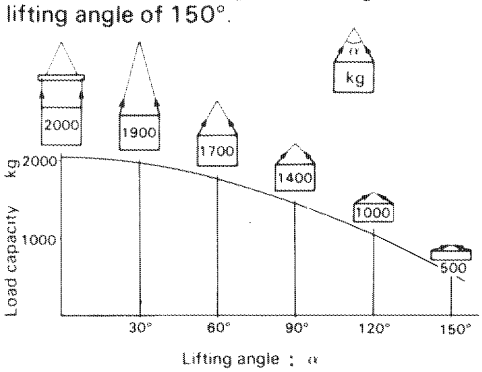
3) Do not sling a heavy load with one rope alone, but sling with two or more ropes symmetrically wound on to the load.
⚠ Slinging with one rope may cause turning of the load during hoisting, untwisting of the rope, or slipping of the rope from its original winding position on the load, which can result in a dangerous accident.

4) Do not sling a heavy load with ropes forming a wide hanging angle from the hook.
When hoisting a load with two or more ropes, the force subjected to each rope will increase with the hanging angles. The table below shows the variation of allowable load (kg) when hoisting is made with two ropes, each of which is allowed to sling up to 1000 kg vertically, at various hanging angles.
When two ropes sling a load vertically, up to 2000 kg of total weight can be suspended. This weight becomes 1000 kg when two ropes make a 120° hanging angle. On the other hand, two ropes are subjected to an excessive force as large as 4000 kg if they sling a 2000 kg load at a lifting angle of 150°.



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GENERAL DESCRIPTION

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0.1 Major Specification

Engine name			4D92E	4D94E	4D98E
Engine specification			For standard forklift truck		
Type			Vertical series water-cooled 4-cycle diesel engines		
Combustion chamber type			Swirl chamber type		
No. of cylinders			4		
Cylinder ID x stroke		mm (in)	92 x 100 (3.62 x 3.94)	94 x 100 (3.70 x 3.94)	98 x 110 (3.86 x 4.33)
Total piston displacement		ℓ (cu.in)	2.659 (162)	2.775 (169)	3.318 (202)
At rated continuos operation	Output/rotating speed	kW/rpm(PS/rpm)	—	—	—
	Net average effective speed	MPa(kgf/cm²)<psi>	—	—	—
	Average piston speed	m/s	—	—	—
At rated output (Limited output)	Output/rotating speed	kW/rpm(PS/rpm)	33.8/2450(46/2450)	44.1/2450(60/2450)	50/2400(68/2400)
	Net average effective speed	MPa(kgf/cm²)<psi>	0.624 (6.36)<90.3>	0.779 (7.94)<112.7>	0.754 (7.69)<109.2>
	Average piston speed	m/s	8.17	8.17	8.8
(Torque converter stall rotating speed)		rpm	2100	2150	2200
Compression ratio			21.9		
Fuel injection timing degrees		A.T.D.C.degrees	6 (with plunger lift at 1 mm)		
Fuel injection pressure		MPa(kgf/cm²)<psi>	11.8 – 12.7 (120 – 130) <1706 – 1848>		
Engine weight (dry)		kg (lb)	225 (496)		
Power take-off position			Flywheel side		
Rotating direction			Left when viewed from the power side		
Firing order			1 – 3 – 4 – 2		
Cooling system			Radiator		
Lubrication system			Forced lubrication by a trochoid pump		
Starting system			Electric		
Engine size	Overall length	mm (in)	700 (27.6) (Fan – flywheel)		
	Overall width	mm (in)	508 (20.0) (Fuel filter – generator)		
	Overall height	mm (in)	706 (27.8) (Oil pan – top surface of the valve arm chamber)		
Lubrication capacity	Full	ℓ (cu.in)	7.5 (458)		
	Effective	ℓ (cu.in)	2.0 (122)		
Lubrication capacity (only engine)		ℓ (cu.in)	4.2 (256)		
Cooling fan type, diameter		mm (in)	Six resin fans, Fan diameter 410 (16)		
Pulley diameter (crank/fan)		mm (in)	130/140 (0.93)	130/140 (0.93)	130/130 (1.0)