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521

Wheel Loader



Service Manual

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Specifications wheel loaders 520 / 620 (models 303 58 / 304 59)

Specifications 520 / 620

Frame

sturdy U-section frame, rubber-mounted operator cab and engine

Engine

Engine 520 (303 58) ➜I 303 58 0477

Product:	Perkins diesel engine
Model:	1004-4 LR
Cylinder arrangement:	In line
Number of cylinders:	4, water cooled
Capacity:	3990 cm^3
Nominal bore and stroke:	100 x 127 mm
Compression ratio:	16.5 : 1
Output:	53 kW / 72 HP, 2.200 rpm (DIN ISO 3046)
Rated engine torque:	230 Nm
Max. engine torque:	270 Nm, 1.200 rpm
Fuel consumption	230 g/KWh minimum
Fuel injection system:	Direct fuel injection
Injection pressure:	250 bar
Firing order:	1 – 3 – 4 – 2
Start of delivery:	17.5° before top dead centre
Starting aid:	Flame heater system (preheating time 10 – 15 seconds)
Oil lubrication of engine is ensured up to the following inclined position:	Max. lateral inclination left/right: 67/67 % Max. inclination upward/downward: 67/67 % **Observe tilting limit of the machine!**
Oil pressure:	Min. 2.1 bar minimum, 2,200 rpm
Valve tip clearance:	Inlet 0.20 mm Outlet 0.45 mm Engine at cold or warm temperature respectively

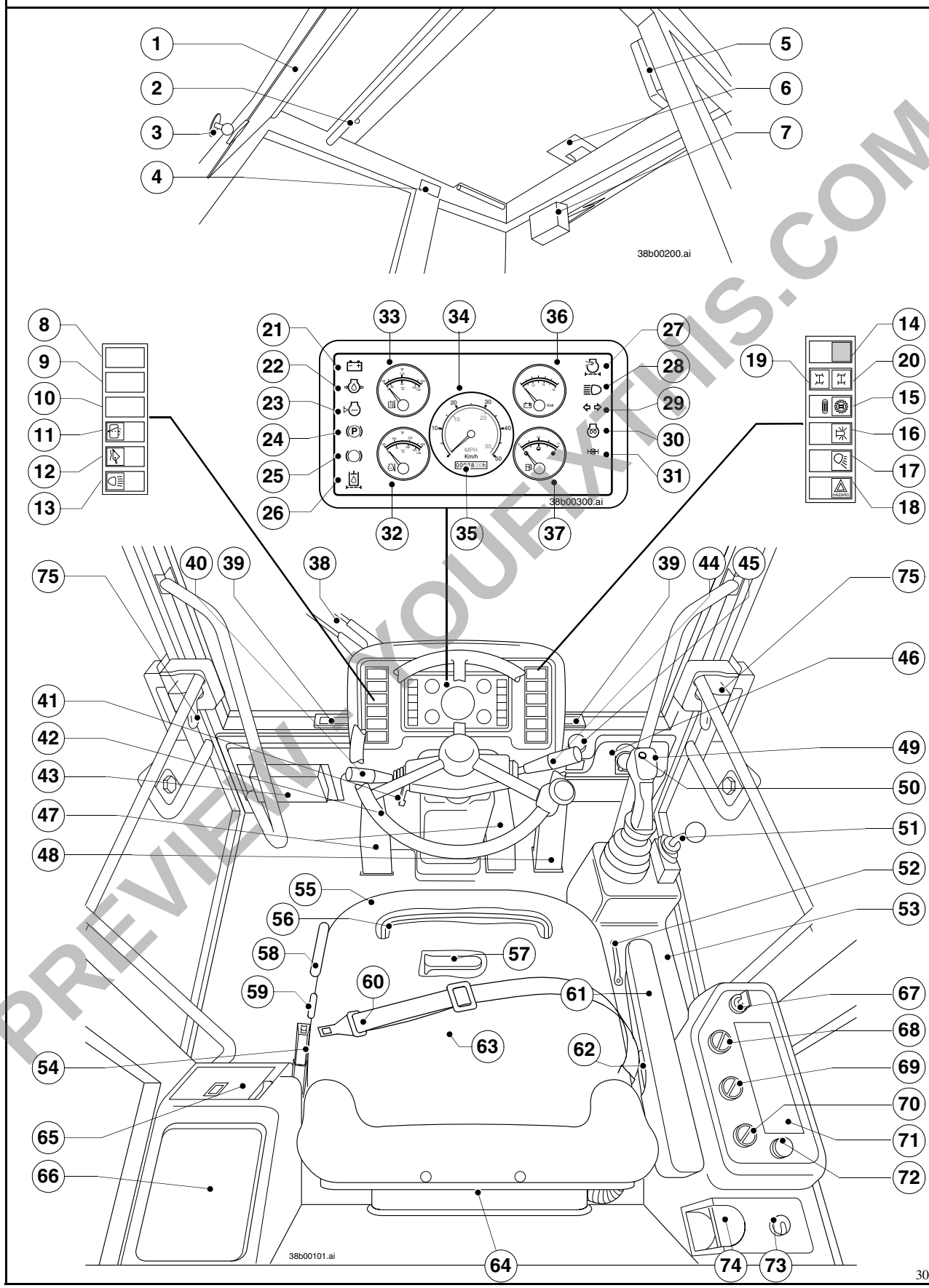
Engine 620 (304 59) ➜I 304 59 0328

Product:	Perkins diesel engine
Model:	1004-4 HR
Cylinder arrangement:	In line
Number of cylinders:	4, water cooled
Capacity:	3990 cm^3
Nominal bore and stroke:	100 x 127 mm
Compression ratio:	16.5 : 1
Output:	58.5 kW / 79.5 HP, 2.200 rpm (DIN ISO3046)
Rated engine torque:	243 Nm
Max. engine torque:	279 Nm, 1.400 rpm
Fuel consumption	230 g/KWh minimum
Fuel injection system:	Direct fuel injection
Injection pressure:	250 bar
Firing order:	1 – 3 – 4 – 2
Start of delivery:	17.5° before top dead centre
Starting aid:	Flame heater system (preheating time 10 – 15 seconds)
Oil lubrication of engine is ensured up to the following inclined position:	Max. lateral inclination left/right: 67/67 % Max. inclination upward/downward: 67/67 % **Observe tilting limit of the machine!**
Oil pressure:	Min. 2.1 bar minimum, 2,200 rpm
Valve tip clearance:	Inlet 0.20 mm Outlet 0.45 mm Engine at cold or warm temperature respectively

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Operator's compartment wheel loaders 520 / 620 (models 303 58 / 304 59)



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Maintenance plan 520/620 models 303 58/304 59; (overview of service and maintenance work)

Work description For service and maintenance work on the diesel engine/implement, please refer to the operation and maintenance manual of the engine/implement manufacturer as well.	**Maintenance plan/service hours**					
	Maintenance work daily	**"A" every 50 hours** every week	1st Inspection[1] at 100 hours	**"B" every 300 service hours**	**"C" every 600 service hours**[2]	**"D" every 1200 service hours** yearly
Oil and filter changes ( ):						
Carry out the following oil and filter changes (check oil levels after test run):						
• Engine oil			X	X	X	X
• Engine oil filter			X	X	X	X
• Fuel filter			X	X	X	X
• Air filter insert[3]						X
• Gearbox oil in front and rear axle differentials/gearbox			X		X[4]	X
• Gearbox oil in front and rear axle planetary drives, left and right side			X		X[4]	X
• Brake fluid						X
• Hydraulic oil						X
• Hydraulic oil filter insert[3]			X			X
• Breather – hydraulic oil tank						X
Inspection work ( ):						
Check the following material. Refill if necessary:						
• Engine oil	X	X				
• Coolant[5]	X	X	X	X	X	X
• Hydraulic oil	X	X	X	X	X	
• Brake fluid	X	X	X	X	X	
• Gearbox oil in front and rear axle differentials/gearbox			X	X	X	
• Gearbox oil in front and rear axle planetary drives, left and right side			X	X	X	
Check cooler for engine and hydraulic oil for contamination. Clean if necessary[6]		X	X	X	X	X
Clean dust valve on air filter housing	X	X	X	X	X	X
Water separator: drain water and clean		X	X	X	X	X
V-belt: Check condition and pretension. Retighten or replace if necessary	X	X	X	X	X	X
Check valve tip clearance. Adjust if necessary						X
Battery: Check electrolyte level and charge condition		X	X	X	X	X
Service and parking brake: check thickness of brake pads. Replace if necessary					X	X
Check toe-in. Correct if necessary					X	X
Tyre check (damage, air pressure, tread depth)	X	X	X	X	X	X
Check screws and nuts or screw connections for tightness on the following assemblies / components. Retighten if necessary:						
• Engine and engine bearing		X	X	X	X	X
• Steering system		X	X	X	X	X
• Hydraulic system		X	X	X	X	X
• Axle mounting, axle suspension		X	X	X	X	X
• Fastening screws of the propshafts			X	X	X	X
• Wheel nuts			X	X	X	X
Lubrication ( ):						
Lubricate the following assemblies / components:						
• Front axle oscillating bearing		X	X	X	X	X
• Double cardan shaft of front and rear axle planetary drives, left and right side		X	X	X	X	X
• Loader unit:						
– Lift frame bearing		X	X	X	X	X
– Lift ram bearing		X	X	X	X	X
– Tilt ram bearing		X	X	X	X	X
– Tilt lever bearing	X	X	X	X	X	X
– Tilt rod bearing	X	X	X	X	X	X
– Quickhitch frame (lock pins, lift frame bearing)	X	X	X	X	X	X
Functional check(?):						
Check function of the following assemblies / components. Rectify if necessary:						
• Service and parking brake	X	X	X	X	X	X
• Steering system	X	X	X	X	X	X
• Hydraulic system	X	X	X	X	X	X
• Hydrostatic drive / gearshift	X	X	X	X	X	X
• Light system	X	X	X	X	X	X
• Electrical system (heater blower, horn, windscreen wiper, washer system, etc)	X	X	X	X	X	X
Leakage check ( ):						
Check pipe and flexible lines, as well as screw connections of the following assemblies / components for tightness, leakage and chafings. Rectify if necessary:						
• Air intake line (air filter – engine)		X	X	X	X	X
• Engine lubrication (engine – filter)		X	X	X	X	X
• Fuel lines		X	X	X	X	X
• Cooling system (engine and hydraulic oil cooler)		X	X	X	X	X
• Brake system		X	X	X	X	X
• Steering system		X	X	X	X	X
• Hydraulic system		X	X	X	X	X
• Hydrostatic drive		X	X	X	X	X
Leakage check of the following hydraulic rams and components. Rectify if necessary:						
• Front and rear axle		X	X	X	X	X
• Front and rear axle steering rams		X	X	X	X	X
• Loader unit:						
– Lift ram		X	X	X	X	X
– Tilt ram		X	X	X	X	X

1: Work to be carried out once only after the first 100 service hours. Must be carried out by an authorized workshop for warranty claims to be acknowledged.
2: Work after the first 600 service hours (2nd Inspection) must be carried out by an authorized workshop for warranty claims to be acknowledged.
3: Clean/replace the filter insert as indicated by the telltale in the instrument panel, however replace at least every 12 months or 1200 service hours.
4: Change after the first 600 service hours (2nd Inspection) and the first 1200 service hours, and then every 1200 service hours. Change gearbox oil
5: Also check antifreeze in autumn/winter and at temperatures below 4° C
6: Depending on operation and dust conditions, it may be necessary to clean the cooler more frequently.

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01.1.2 Removing and fitting the rocker assembly

Removing

- Remove the cylinder-head cover as per section 12A-01.
- Evenly and gradually release the fasteners of the rocker shaft brackets. Begin with the end brackets and move toward the centre. Remove the fasteners and washers and lift off the rocker assembly.

Important!

The latest engines do not have washers between nuts/bolts and the tilt lever bearing blocks. The retaining bolts have been changed.

- Remove the rubber oil seal (B) from the oil supply connection or the oil supply hole in the cylinder head.

Fitting

- Fit a new rubber oil seal in the oil supply hole in the oil supply hole in the cylinder head.
- Check that the push rods fit correctly in the cams of the camshaft. Fit the rocker assembly. Make sure the oil supply connection is fitted correctly into the oil seal of the cylinder head. Check that the ends of the adjustment screws of the rocker levers fit correctly in the sockets of the push rods.
- Fit the washers (if existing) and the fasteners onto the stud bolts of the rocker shaft brackets. Tighten the fasteners evenly and gradually. Begin with the inner fasteners and work towards the end fasteners. Make sure all fasteners are tightened evenly to the correct torque, see section 11 B.

Cylinder head assembly

Removing

- Drain the coolant.
- Disconnect the battery terminals.
- Remove the pipe fitted between the cold start device in the intake manifold and the fuel filter. Disconnect the electrical connection.
- Engine types AB, AD, YB and YD: Remove the boost control pipe fitted between the front of the intake manifold and the fuel pump.
- Remove the intake manifold.
- Engine types AB, AC, YB, YC and YD: Disconnect all connections to the turbocharger and remove the turbocharger, operation 18A-01.
- Remove the injection nozzles, operation 20A-02. Fit suitable covers to the nozzles and the open connections.
- Disconnect the coolant temperature sensor.
- Engine types AB, AD and certain AA: Remove the oil cooler, operation 21A-07A.
- Remove the cylinder-head cover, operation 12A-01.
- Remove the rocker assembly, operation 12A-02.
- Remove the push rods.
- Release the cylinder-head bolts evenly and gradually in the reverse order to that shown in figures 12A.08/A or B. Check the cylinder-head bolt for deformations with a straight edge (A1) as per figure (A2). If there is a visual reduction in the diameter of the thread outside the cylinder block (A3), the cylinder-head bolt must be discarded.
- Remove the cylinder head and put it on a surface that will not damage the sealing surface of the cylinder head. Do not use a lever to separate the cylinder head from the cylinder block.

Fitting

Special tools required:
Angle gauge MS.1531 for tightening the cylinder-head bolts

- Clean the sealing surface of the cylinder head and the upper surface of the cylinder block. Make sure there is no debris in the cylinder bores.
- Put the cylinder-head gasket in position. The cylinder-head gasket must be fitted without sealing compound. It is stamped “FRONT TOP” for correct assembly (12A.07/B).
- To hold the gasket in the correct position when the cylinder head is fitted, fit two suitable 1/2 UNF studs, figure (C), in positions 15 and 20 as per figure (B) or in positions 25 and 30 as per figure (A). Put the cylinder head on the cylinder block.
- Lightly lubricate the threads of the cylinder-head bolts and the thrust faces of the screw heads. Engage some of the cylinder-head bolts as per figures (A) or (B) and remove the guide studs. Engage the remainder of the cylinder-head bolts.
- Gradually and evenly tighten the cylinder-head bolt to 110 Nm (80 lbf ft) 11.1 kgf in the order shown in figures (A) or (B).
- Repeat the work steps as per section 5 to make sure all cylinder-head bolt are tightened to the correct torque.
- Tighten the cylinder-head bolts in the order shown in figures (A) or (B), taking into account the length. Short screws (S) must be turned a further 150° (2.5 flats). Medium screws (M) must be turned a further 180° (3 flats). Long screws (L) must be turned a further 210° (3.5 flats). A special tool can be used for this operation as per figure (D). Fit the tool between the socket and the handle. Position the stop mark against a suitable protrusion on the cylinder head to prevent movement of the degree dial in a clockwise direction, figure (D1). Turn the pointer to align it with the angle of the degree dial corresponding to the length of the cylinder-head bolt. Tighten the cylinder-head bolt until the pointer is at the zero position of the degree dial.
  If no special tool is available, make a suitable mark on the cylinder head in line with a corner of each screw , see figure 12A.09/A. Then make another mark, at the correct angle (anticlockwise), on the edge of the flange of each screw according to the length of the screw. Tighten these screws in the correct order until the marks on the flange are next to, and in line with, the marks on the cylinder head.

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01.1.3 Recommended tightening torques

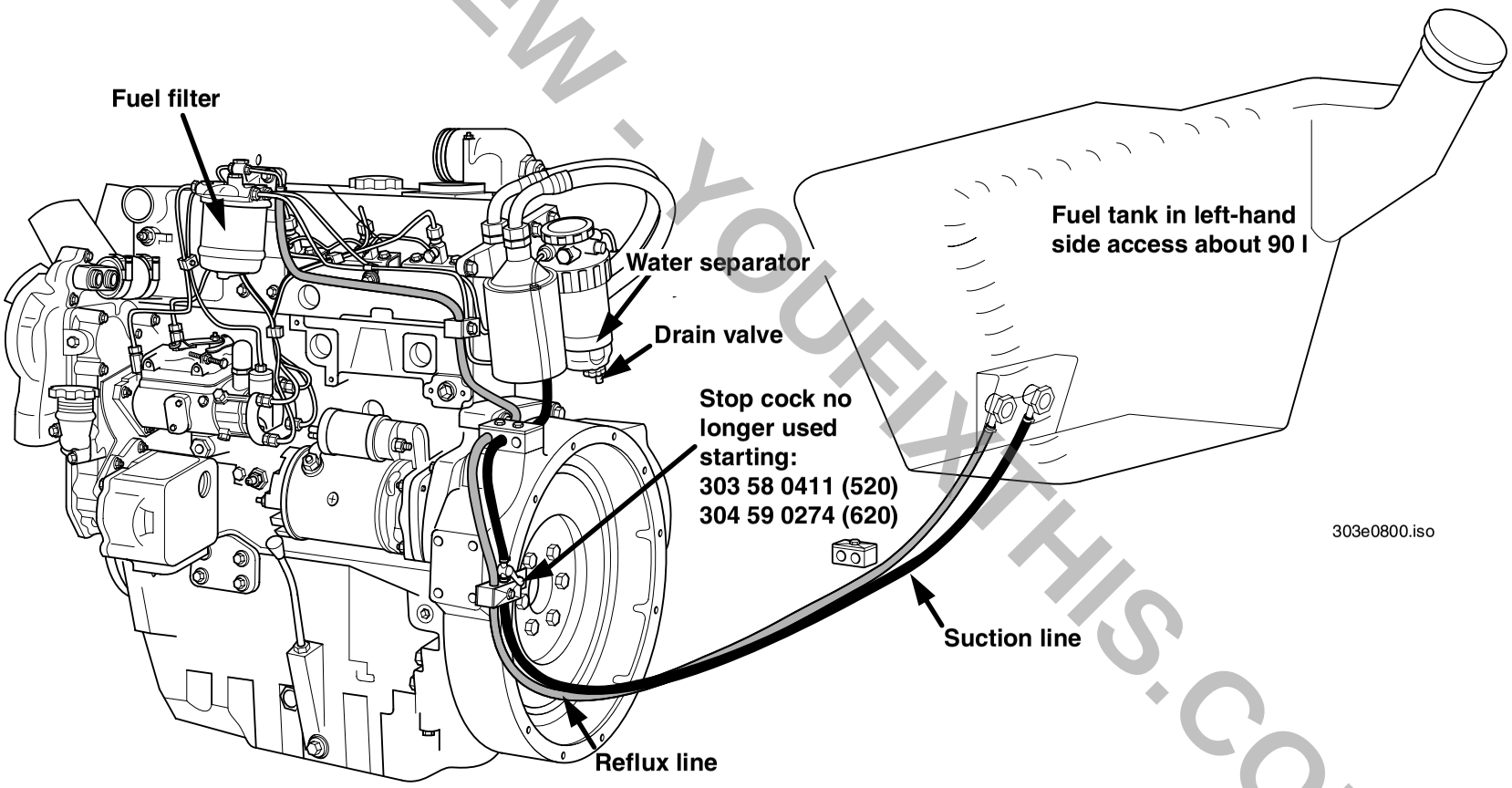
Tightening torques valid for lightly lubricated threads.

Description	Thread size	Torque		
		Nm	lbf ft	kgf m
Cylinder head				
Cylinder-head bolts	1/2 UNF	See section 12		
Fasteners, rocker shaft brackets:				
• Aluminium bracket	M 12	40	30	4,1
• Cast iron bracket	M 12	75	55	7,6
Cap nut, cylinder-head cover	M 12	20	15	2,1
Cap nut, cylinder-head cover (with washer)	M 12	30	22	3,0
Screws, intake manifold to cylinder head	M 10	44	32	4,5
Nuts (plated), exhaust manifold to cylinder head	M 10	44	32	4,5
Nuts (not plated), exhaust manifold to cylinder head	M 10	50	37	5,1
Pistons and connecting rods				
Connecting rod nuts	1/2 UNF	125	92	12,7
Connecting-rod bolts	1/2 UNF	155	114	15,8
Banjo bolt for piston cooling nozzles	3/8 UNF	27	20	2,8
Crankshaft				
Screws for main bearing	5/8 UNF	265	196	27,0
Screws, crankshaft pulley	7/16 UNF	115	85	11,8
Cap nuts for crankshaft pulley damper	M 8	35	26	3,6
Screws, rear oil seal housing to cylinder block	M 8	22	16	2,2
Cap nut, rear oil seal housing to bridge piece	M 8	18	13	1,9
Cap nuts, rear oil seal ring housing to bridge piece	M 6	13	10	1,3
Screw, idler gear of balancer unit	M 12	93	68	9,5
Nut, drive pinion of balance weight	1/2 UNF	82	60	8,4
Screws, rear cover of balancer frame	M 10	54	40	5,5
Screws, oil transfer plate	M 10	30	22	3,1
Screws, oil pump to balancer frame	M 8	22	16	2,2
Screws, balancer to cylinder block	M 10	54	40	5,5
Timing case and drive assembly				
Screws, timing case to cylinder block	M 8	22	16	2,2
	M 10	44	33	4,5
Screws, idler gear hub	M 10	44	33	4,5
Screws, camshaft gear	M 12	78	58	8,0
Screws, timing case cover to timing case	M 8	22	16	2,2
Nuts, timing case cover to timing case	M 8	22	16	2,2
Cylinder block				
Screws, fitted instead of piston cooling nozzles	3/8 UNF	27	20	2,8
Aspiration system				
Nuts, turbocharger to manifold	M 10	44	33	4,5
Lube oil system				
Oil drain plug	3/4 UNF	34	25	3,5
Screws, oil pump to front bearing cover	M 8	22	16	2,2
Screws, cover for oil pump	M 8	28	21	2,9
Screws, oil pan	M 8	22	16	2,2

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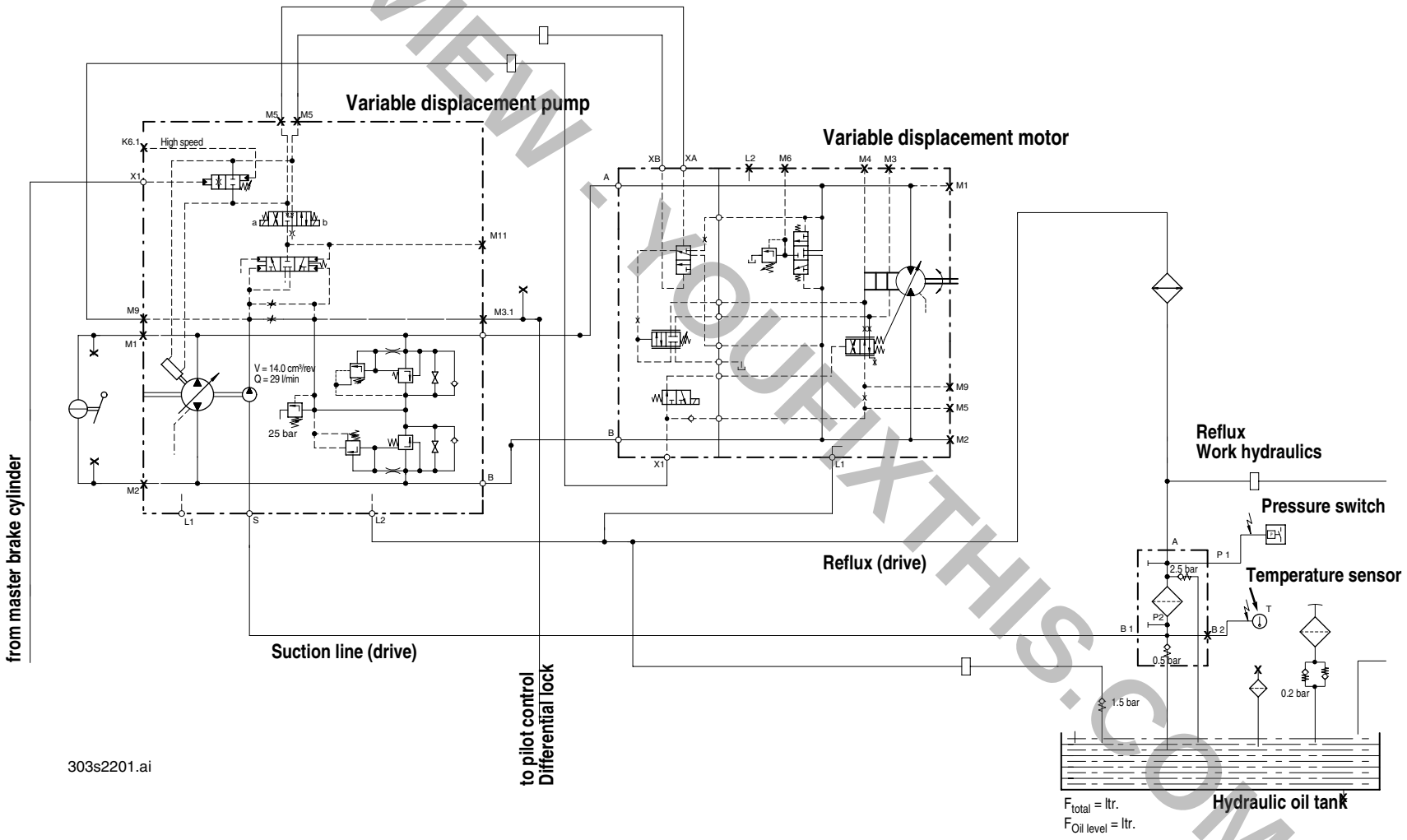
Fuel feed system 520 / 620 wheel loaders (models 303 58 / 304 59)



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22.1.1 Hydrostatic drive wheel loaders 520 / 620 (models 303 58 / 304 59)



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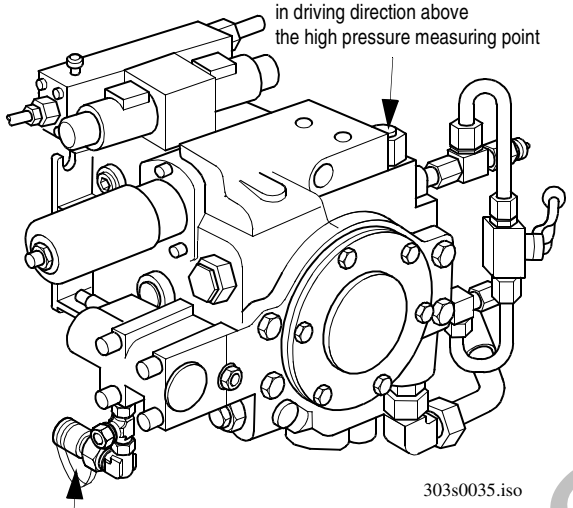
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22.4 Adjustment work

Info

The hydraulic oil temperature must be **min. 45° C** for all adjustment work on the hydrostatic drive!

22.4.1 Boost pressure



Engine revs	Rated value	Correction
750 - 800 rpm	23 - 25 bar	On boost pressure limiting valve on hydraulic pump
about 2420 rpm max. revs	26 - 29 bar	Make use of boost pressure tolerance at diesel engine speed n = 800 rpm

Tools required:

- Measuring line
- Pressure gauge 60 bar
- Open-end wrenches WAF 27 and WAF 13
- Screwdriver

Notes:

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22.5 Test reports

22.5.1 Test report 520 model 303 58

Serial number			
Hydraulic pump – serial number			
Hydraulic motor – serial number			
Settings at oil temperature 45°C -5°:	**Nominal value**	**Actual value**	**Adjusted**
Hydraulic pump			
Boost pressure min. (800 rpm)	23 - 25 bar		
Boost pressure max. (n> 2400 rpm)	26 - 29 bar		
Starting RPMs	950 - 1050 rpm		
Boost pressure drop	1.5 - 2.5 bar		
High pressure	450 - 480 bar		
Traction force (check value only)	5100 kp		
Droop without work hydraulics	1950 - 2100 rpm		
Droop with work hydraulics	≥ 1700 rpm		
Dynamic droop 220 - 250 bar high pressure	2050 - 2200 rpm		
High pressure with work hydraulics	320 - 400 bar		
Pilot pressure (2350 rpm)	30 - 34 bar		
Hydraulic motor:			
Control pressure M3 ~ 30 bar	1700 - 2000 rpm		
Driving on slopes M4	220 - 250 bar		
Brake-inching	20 - 50 bar		
Speed of wheels at nominal speed n = 2200 rpm			
20 kph	100 - 120 rpm		
30 kph	140 - 160 rpm		
37 kph	187 - 207 rpm		
Work and steering hydraulics:			
Work hydraulics	230 - 245 bar		
Tilt ram pressure	115 - 135 bar		
Steering pressure	160 - 180 bar		
Lowering speed of loader unit (oil temperature **60**°C, pressure in ram p = 100 bar, time t = 10 min)			
Lift ram	Max. 14 mm		
Tilt ram	Max 15 mm		

Remarks:

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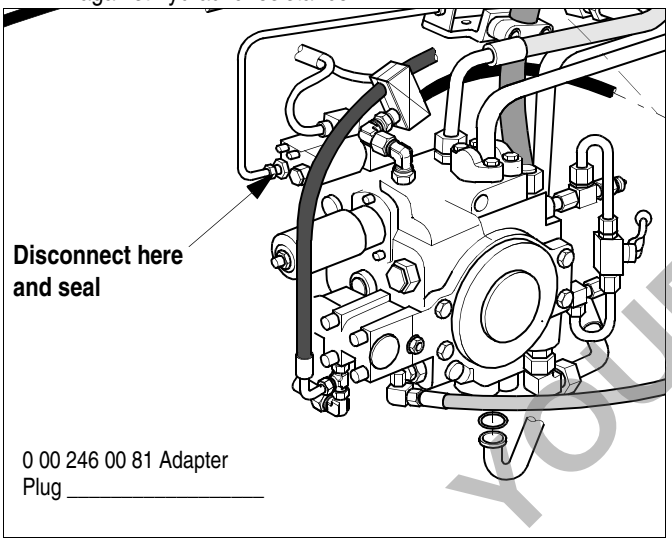
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22.6 Troubleshooting

22.6.1 Introduction

Troubleshooting on the hydrostatic drive requires the following:

- The hydraulic oil temperature in the tank must be 60°C for each measurement.
- The diesel engine must be OK i.e.
  - ➥ Fuel supply OK (filter)
  - ➥ Air intake OK (filter)
- The brake-inching line must be disconnected and sealed with a dummy cap.
  - ➥ The service brake can also be used to hold the vehicle against hydraulic resistance.



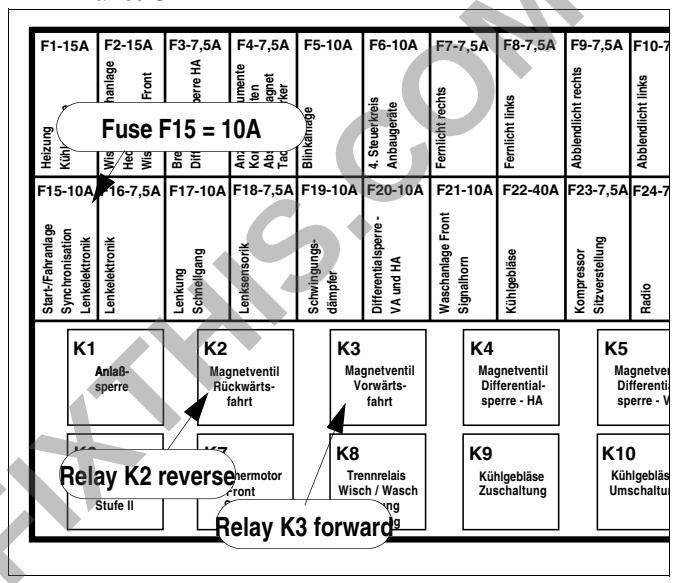
Tools required:

- 2 measuring lines
- 2 pressure gauges 60 bar (or 250 bar)
- 2 pressure gauges 600 bar
- Tachometer
- Thermometer
- Fork spanners WAF 10, 13, 27
- Allen keys 3, 5
- Screwdriver, if necessary

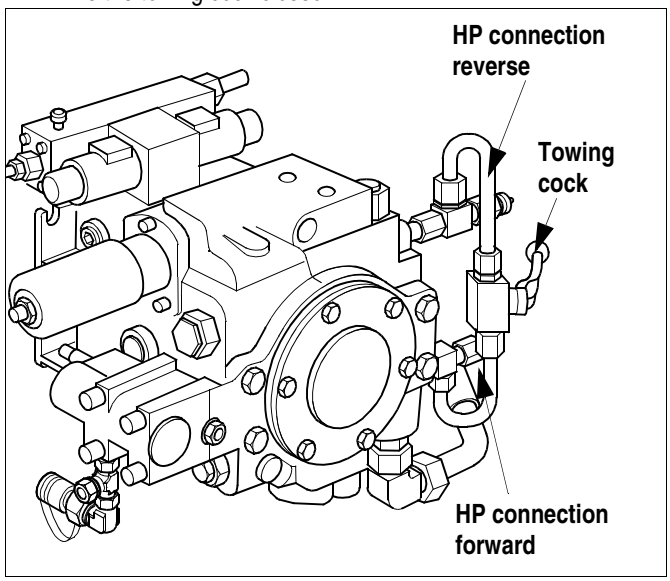
The vehicle does not move when the diesel engine is running!

☞ Check the following points:

- Is the parking brake released? (switch setting)
- Is fuse F15 (10A) in the fuse box OK?
- Are relays K2 and K3 for the forwards and reverse solenoid valves OK?



- Reflux filter in hydraulic oil tank OK? (by-pass valve, contamination)
- Is boost pressure present?
- Is current reaching the solenoid valve of the pump?
- Can the piston move freely in the solenoid valve?
- Is the towing cock closed?



- Is high pressure present?

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