SERVICE MANUAL

TD3.50

Tractor

Part number 47840677
English
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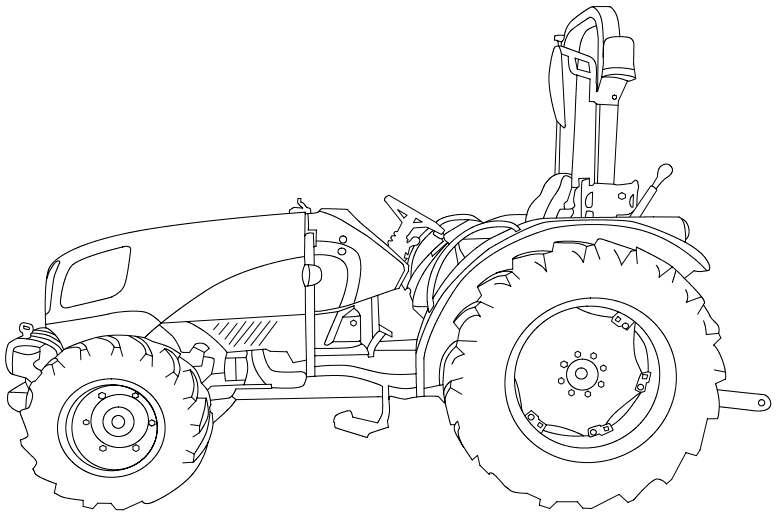
NEW HOLLAND



TD 3.50

MODEL TRACTOR REPAIR MANUAL

SECTION

S E R V I C E

INTRODUCTION

(*This manual is divided into sections identified by two-figure numbers. Each section has independent page numbering.*
For ease of reference, these sections have the same numbers and names as the Repairs Rate Book sections.

(*The different sections can easily be found by consulting the table of contents on the following pages.*

(*The document number of the manual and the edition/update dates are given at the bottom of each page.*

(*The information contained in this manual was current on the date printed on each section. As NEW HOLLAND constantly improves its product range, some information may be out of date subsequent to modifications implemented for technical or commercial reasons or to meet legal requirements in different countries.*
In the event of conflicting information, consult the NEW HOLLAND Sales and Service Departments.

IMPORTANT WARNINGS

(*All maintenance and repair work described in this manual must be performed exclusively by NEW HOLLAND AGRICULTURE service technicians, in strict accordance with the instructions given and using any specific tools necessary.*

(*Anyone who performs the operations described herein without strictly following the instructions is personally responsible for resulting injury or damage to property.*

(*The Manufacturer and all organisations belonging to the Manufacturer's distribution network, including but not restricted to national, regional or local distributors, will accept no responsibility for personal injury or damage to property caused by abnormal function of parts and/or components not approved by the Manufacturer, including those used for maintenance and/or repair of the product manufactured or marketed by the Manufacturer.*
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Part No:47840677

NEW HOLLAND

Service Manual - TD3.50 Tractor

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GENERAL INSTRUCTIONS

IMPORTANT NOTICE

All maintenance and repair operations described in this manual should be carried out exclusively by the NEW HOLLAND authorised workshops. All instructions detailed should be carefully observed and special equipment indicated should be used if necessary.
Everyone who carries out service operations described without carefully observing these prescriptions will be directly responsible of deriving damages.

SHIMS

At each adjustment, select adjusting shims, measure them individually using a micrometer and then sum up recorded values. Do not rely on measuring the entire shimming set, which may be incorrect, or the rated value indicated on each shim.

ROTATING SHAFT SEALS

To correctly install rotating shaft seals, observe the following instructions:

- Let the seal soak into the same oil as it will seal for at least half an hour before mounting
- Thoroughly clean the shaft and ensure that the shaft working surface is not damaged.
- Place the sealing lip towards the fluid. In case of a hydrodynamic lip, consider the shaft rotation direction and orient grooves in order that they deviate the fluid towards the inner side of the seal.
- coat the sealing lip with a thin layer of lubricant (use oil rather than grease) and fill the gap between the sealing lip and the dust lip on double lip seals with grease;
- Insert the seal into its seat and press it down using a flat punch. Do no tap the seal with a hammer or a drift;
- Take care to insert the seal perpendicularly to its seat while you are pressing it. Once the seal is settled, ensure that it contacts the thrust element if required;

  To prevent damaging the sealing lip against the shaft, place a suitable protection during installation.

O RINGS

Lubricate the O rings before inserting them into their seats. This will prevent the O rings from rolling over and twine during mounting which will jeopardise sealing.

SEALANTS

Apply one of the following sealers: RTV SILMATE, RHODORSIL CAF 1, or LOCTITE PLASTIC GASKET over the mating surfaces marked with an X.
Before applying the sealer, prepare the surface as follows:

remove possible scales using a metal brush;

- thoroughly de-grease the surfaces using one of the following cleaning agents: trichlorethylene, petrol or a water and soda solution.

BEARINGS

It is advisable to heat the bearings to 80 to 90 C before mounting them on their shafts and cool them down before inserting them into their seats with external tapping.

ROLL PINS

When fitting straight roll pins, ensure that the pin notch is oriented in the direction of the effort to stress the pin. Coil roll pins can be installed in any position.

NOTES FOR SPARE PARTS

Use exclusively genuine NEW HOLLAND spare parts, the only ones bearing this logo.

Only genuine parts guarantee same quality, life, safety as original components as they are the same as mounted in production.
Only NEW HOLLAND genuine spare parts can offer this guarantee.
All spare parts orders should be complete with the following data:

- tractor model (commercial name) and frame number;
- engine type and number;
- part number of the ordered part, which can be found in the “Microfiches” or the “Spare Parts Catalogue”, used for order processing.

NOTES FOR EQUIPMENT

Equipment which NEW HOLLAND proposes and shows in this manual are as follows:

- studied and designed expressly for use on NEW HOLLAND tractors;
- necessary to make reliable repair;
- accurately built and strictly tested to offer efficient and long--lasting working means.

We also remind the Repair Personnel that having these equipment means:

- operating in optimal technical conditions;
- obtaining the best results;
- saving time and effort;
- work more safely.

NOTICES

Wear limits indicated for some details should be intended as advised, but not binding values. The words ”front”, ”rear”, ”right hand”, and ”left hand” referred to the different parts should be intended as seen from the operator’s seat oriented to the normal sense of movement of the tractor.

HOW TO MOVE THE TRACTOR WITH THE BATTERY REMOVED

Cables from the external power supply should be connected exclusively to the respective terminals of the tractor positive and negative cables using pliers in good condition which allow proper and steady contact.
Disconnect all services (lights, wind-shield wipers, etc.) before starting the tractor.
If it is necessary to check the tractor electrical system, check it only with the power supply connected. At check end, disconnect all services and switch the power supply off before disconnecting the cables.

SAFETY RULES

PAY ATTENTION TO THIS SYMBOL

This warning symbol points out important messages involving personal safety. Carefully read the safety rules contained herein and follow advised precautions to avoid potential hazards and safeguard your safety and personal integrity. In this manual you will find this symbol together with the following key-words:

WARNING *-it gives warning about improper repair operations and potential consequences affecting the service technician's personal safety.*

DANGER *- it gives specific warning about potential dangers for personal safety of the operator or other persons directly or indirectly involved in the operation.*

TO PREVENT ACCIDENTS

Most accidents and personal injuries taking place in workshops are due from non-observance of some simple and essential prudential rule and safety precautions. For this reason, IN MOST CASES THEY CAN BE AVOIDED. It suffices to foresee possible causes and act consequently with necessary caution and care.

The possibility that an accident might occur with any type of machines should not be disregarded, no matter how well the machine in question was designed and built.

A wise and careful service technician is the best precautions against accidents.

Careful observance of this only basic precaution would be enough to avoid many severe accidents.

DANGERNever carry out any cleaning, lubrication or maintenance operations when the engine is running.

SAFETY RULES

GENERAL

(Carefully follow specified repair and maintenance procedures.

(Do not wear rings, wrist watches, jewelry, unbuttoned or loose articles of clothing such as: ties, torn clothing, scarves, open jackets or shirts with open zips which may remain entangled in moving parts. We advise to use approved safety clothing such as anti-slipping footwear, gloves, safety goggles, helmets, etc.

(Never carry out any repair on the machine if someone is sitting on the operator's seat, except if they are certified operators to assist in the operation to be carried out.

(Never operate the machine or use attachments from a place other than sitting at the operator's seat.

(Never carry out any operation on the machine when the engine is running, except when specifically indicated.

(Stop the engine and ensure that all pressure is relieved from hydraulic circuits before removing caps, covers, valves, etc.

(All repair and maintenance operations must be carried out using extreme care and attention.

(Service steps and platforms used in a workshop or in the field should be built in compliance with the safety rules in force.

(Disconnect the batteries and label all controls to indicate that the vehicle is being serviced. Block the machine and all equipment which should be raised.

(Never check or fill fuel tanks or batteries, nor use starting liquid if you are smoking or near open flames as such fluids are flammable.

(Brakes are inoperative when they are manually released for maintenance purposes. In such cases, the machine should be kept constantly under control using blocks or similar devices.

(The fuel filling gun should always remain in contact with the filler neck. Maintain this contact until the fuel stops flowing into the tank to avoid possible sparks due to static electricity build-up.

(Use exclusively specified towing points for towing the tractor. Connect parts carefully. Ensure that foreseen pins and/or locks are steadily fixed before applying traction. Do not stop near towing bars, cables or chains working under load.

(To transfer a failed tractor, use a trailer or a low loading platform trolley if available.

(To load and unload the machine from the transportation means, select a flat area providing a firm support to the trailer or truck wheels. Firmly tie the machine to the truck or trailer platform and block wheels as required by the forwarder.

(For electrical heaters, battery-chargers and similar equipment use exclusive auxiliary power supplies with a efficient ground to avoid electrical shock hazard.

(Always use lifting equipment of appropriate capacity to lift or move heavy components.

(Pay special attention to bystanders.

(Never pour gasoline or diesel oil into open, wide and low containers.

(Never use petrol, diesel oil or other inflammable liquids as cleaning agents. Use non-flammable non-toxic proprietary solvents.

(Wear safety glasses with side guards when cleaning parts using compressed air.

(Do not exceed a pressure of 2.1 bar, in accordance with local regulations.

(Do not run the engine in a closed building without proper ventilation.

(Do not smoke, use naked flames, or cause sparks in the area when fuel filling or handling highly inflammable liquids.

(Do not use flames as light sources when working on a machine or checking for leaks.

(Move with caution when working under a tractor, and also on or near a tractor. Wear proper safety accessories: helmets, goggles and special footwear.

(During checks which should be carried out with the engine running, ask an assistant to seat at the operator's seat and keep the service technician under visual control at any moment.

(In case of operations outside the workshop, drive the tractor to a flat area and block it. If working on an incline cannot be avoided, first block the tractor carefully. Move it to a flat area as soon as possible with a certain extent of safety.

(Ruined or plied cables and chains are unreliable. Do not use them for lifting or trailing. Always handle them wearing gloves of proper thickness.

(Chains should always be safely fastened. Ensure that fastening device is strong enough to hold the load foreseen. No persons should stop near the fastening point, trailing chains or cables.

(The working area should be always kept CLEAN and DRY. Immediately clean any spillage of water or oil.

(Do not pile up grease or oil soaked rags, as they constitute a great fire hazard. Always place them into a metal container.
Before starting the tractor or its attachments, check, adjust and block the operator's seat. Also ensure that there are no persons within the tractor or attachment operating range.

(Do not keep in your pockets any object which might fall unobserved into the tractor's inner compartments.

(Whenever there is the possibility of being reached by ejected metal parts or similar, use protection eye mask or goggles with side guards, helmets, special footwear and heavy gloves.

(Wear suitable protection such as tinted eye protection, helmets, special clothing, gloves and footwear whenever it is necessary to carry out welding procedures. All persons standing in the vicinity of the welding process should wear tinted eye protection. NEVER LOOK AT THE WELDING ARC IF YOUR EYES ARE NOT SUITABLY PROTECTED.

(Metal cables with the use get frayed. Always wear adequate protections (heavy gloves, eye protection, etc.)

(Handle all parts with the greatest caution. Keep your hands and fingers far from gaps, moving gears and similar. Always use approved protective equipment, such as eye protection, heavy gloves and protective footwear.

STARTUP

(Never run the engine in confined spaces that are not equipped with adequate ventilation for exhaust gas extraction.

(Never place the head, body, limbs, feet, hands or fingers near fans or rotating belts.

ENGINE

(Always loosen the radiator cap very slowly before removing it to allow pressure in the system to dissipate. Coolant should be topped up only when the engine is stopped or idle if hot.

(Do not fill up fuel tank when the engine is running, mainly if it is hot, to avoid ignition of fires in case of fuel spilling.

(Never check or adjust fan belt tension when the engine is running.
Never adjust the fuel injection pump when the tractor is moving.

(Never lubricate the tractor when the engine is running.

ELECTRICAL SYSTEMS

(If it is necessary to use auxiliary batteries, cables must be connected at both sides as follows: (+) with (+) and (-) with (-). Avoid short-circuiting the terminals. GAS RELEASED FROM BATTERIES IS HIGHLY FLAMMABLE. During charging, leave the battery compartment uncovered to improve ventilation. Avoid checking the battery charge by means of ”jumpers” made by placing metallic objects across the terminals. Avoid sparks or flames near the battery zone. Do not smoke to prevent explosion hazards.

(Before servicing operations, check for fuel or current leaks. Remove these leaks before going on with the work.

(Do not charge batteries in confined spaces. Ensure that ventilation is appropriate to prevent accidental explosion hazard due to build-up of gases released during charging.

(Always disconnect the batteries before performing any type of service on the electrical system.

HYDRAULIC SYSTEMS

(Some fluid slowly coming out from a very small port can be almost invisible and be strong enough to penetrate the skin. Therefore, NEVER USE HANDS TO CHECK FOR LEAKS but use a piece of cardboard or wood for this purpose. If any fluid is injected into the skin, seek medical aid immediately. Lack of immediate medical attention, serious infections or dermatosis may result.

(Always take system pressure readings using the appropriate gauges.

WHEELS AND TYRES

(Check that the tyres are correctly inflated at the pressure specified by the manufacturer. Periodically check possible damages to the rims and tyres.

(Keep off and stay at the tyre side when correcting the inflation pressure.

(Check the pressure only when the tractor is unloaded and tyres are cold to avoid wrong readings due to over-pressure. Do not reuse parts of recovered wheels as improper welding, brazing or heating may weaken the wheel and make it fail.

(Never cut, nor weld a rim with the inflated tyre assembled.

(To remove the wheels, block both front and rear tractor wheels. Raise the tractor and install safe and stable supports under the tractor in accordance with regulations in force.

(Deflate the tyre before removing any object caught into the tyre tread.

(Never inflate tires using flammable gases, as this may result in explosions and injury to bystanders.

REMOVAL AND INSTALLATION

(Lift and handle all heavy components using lifting equipment with adequate capacity. Ensure that parts are supported by appropriate slings and hooks. Use lifting eyes provided to this purpose. Take care of the persons near the loads to be lifted.

(Handle all parts with care. Do not place your hands or fingers between two parts. Wear approved protective clothing such as safety goggles, gloves and footwear.

(Do not twine chains or metal cables. Always wear safety gloves when handling cables or chains.

LUBRICANT CAPACITIES AND SPECIFICATIONS

COMPONENT TO BE FILLED OR TOPPED UP	QUANTITY		RECOMMENDED PRODUCTS	INTERNATIONAL SPECIFICATIONS
	liter/dm3	US gallon		
Cooling System:	10	2.6	Water & liquid NEW HOLLAND AMBRA AGRIFLU **50% + 50%** (NH 900 A)	-
Fuel tank.....	52	13.75	Decanted and filtered diesel fuel	-
Engine sump: without filter with filter	5.8 6.0	1.5 1.6	**NEWHOLLAND AMBRA MASTERGOLD HSP ENGINE OIL SAE 15W - 40** or **10W-30** (NH 330-324 H)	API CI-4/CH-4 or CI-4
Hydrostatic steering	2.0	0.53	Oil **AMBRA MULTI 20W-30** (NH 410B)	API GL4 ISO VG 32/46 SAE 10W-30
Front axle -axle housing -final drives (each):	4.5 0.8	1.2 0.2		
Rear transmission (bevel drive and brakes), gearbox, hydraulic lift and PTO	23 25	6,01 6.6		
Front wheel hubs	-	-	Grease **NEW HOLLAND AMBRA GR-9 MULTI-PURPOSE** (NH 710A)	NLHI 2
Grease fittings	-	-		

CHAPTER 1 - ENGINE

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TECHNICAL INFORMATION	3 cylinders
Engine type:	-
- TD 3.50 Turbocharged – - (BOSCH pump)	TTF8035.25F313T
Type	Diesel, 4 stroke
Injection method	Direct
Number of cylinders	3
Piston diameter	
- TD 3.50 model	104 mm
Stroke	115 mm
Cylinder displacement:	
- TD 3.50 model	2930 cm^3
Compression rate	18:1
Maximum power:	
- TD 3.50 model	35.3 kW (48 HP)
Torque Values:	
Max.tork (Nm) at 1400 d/dak: TD 3.50 model	180
Number of bearings	4
Oil sump	Cast iron

(continued)

TECHNICAL INFORMATION	
Lubrication	Forced feeding, gear pump
Pump drive	Through camshaft
Engine speed/pump speed ratio	2:1
Oil filter	Strainer at the intake and full output cartridge
Normal oil pressure at engine running at full throttle:	2.9 - 3.9 bar (3 - 4 kg/cm^2)
All models	
Pressure safety valve	In pump body
Opening pressure	3.5 bar (3.6 kg/cm^2)
For detailed information about lubrication	see page 13
Cooling system	Water cooled
Radiator in TD 3.50models	3 rows of vertical pipes, aluminum channels
Fan installed on water pump pulley In TD 3.50model	Air sucking type with 10 blades
Water pump	Centrifugal type
Engine speed/water pump speed ratio	1.03/1
Temperature control	Via thermostat
Temperature gauge	with colored scale divided into three sectors
Temperature values corresponding to each sectors:	
- First, white sector	30° - 65° C
- Middle, green sector	65° - 105° C
- Last, red sector	105° - 115° C
For detailed information about cooling system	see page 13
Tractor meter	Instrument panel (from alternator)

(continued)

TECHNICAL INFORMATION	
Timing gears	Top valves operated through push rods on camshaft Camshaft is driven by crankshaft.
Inlet:	
- Opening: Before TDC	12°
- Closing: After BDC	31°
Exhaust:	
- Opening:Before BDC	50°
- Closing: After TDC	16°
Valve Clearance (engine cold):	
- Inlet	0.30 ± 0.05 mm
- Exhaust	0.30 ± 0.05 mm
For more information	see page 10
Fuel System	
Air filter	Dry type, with centrifugal prefilter and automatic dust extractor and filter clogged indicator
Supply pump	with double diaphragm
Fuel Filtering	through wire filter in supply pump, and replaceable cartridge on delivery line to injection pump.
Minimum fuel flow rate with pump shaft rotating at 1600 rpm	100 liter/hour
Operated by camshaft	Through camshaft
BOSCH injection pump	distributor type
Governor for all speeds, installed within the pump: BOSCH	Centrifugal, with counterweights
For more information about fuel system Fixed advance (pump setting for start of delivery before TDC) - Pressure setting - Injection order, and other information regarding the BOSCH pump	see Section 10 page 99

TECHNICAL INFORMATION

Turbocharger	
-Holset	HX25
Injection pump	distributor type with speed governor and automatic advance
BOSCH pump:	
-TD 3.50model	L 1135
Rotation direction	counter clockwise
Firing order	1-2-3

Injectors:	
BOSCH	84300592 84404382
- Injector nipple holder type	KBAL 86P163
- Injector type	0432291494
Number of holes	6
Nipple orifice diameter	0.19 mm
Pressure setting	260-272 bar

High pressure pipes - BOSCH pump	
- Type	4797506
- Pipe sizes	6 x 1,6 x 530mm

FUEL LIFT PUMP DATA	mm
Shaft eccentricity	3
Shaft diameter	31.975 - 32.000
Bushing inner diameter (after reaming)	32.050 - 32.075
Bushing seat snug fit size	0.063 - 0.140
Bushing shaft gap	0.050 - 0.100
Internal thrust washer thickness	1.45 - 1.50
External thrust washer thickness	2.93 - 3.00

ENGINE OIL SUMP AND CRANKCASE DATA	mm
Cylinder block	Cast monoblock houses crankshaft, camshaft, valve push rod cups.
Inner diameter	104.000 - 104.024 (1)
Outer diameter	107.020 - 107.050
Block snug fit size	106.850 - 106.900
Inner diameter upper range	0.120 - 0.200
Outer diameter upper range	0.4 - 0.8
Ovality and taper	0.2
Main bearing race diameter	0.12
Main bearing race diameter	84.200 - 84.230
Camshaft bushings race diameter:	
- Front	54.780 - 54.805
- Middle	54.280 - 54.305
- Rear	53.780 - 53.805
Valve push rod cup seat diameter	15.000 - 15.018
Valve push rod cup upper range	0.1 - 0.2 - 0.3

(1) After honing.
(2) Take measures parallel and perpendicular to the axis of the engine, where snap rings are operating.

CRANKSHAFT BEARINGS	mm
Crankshaft	balanced with counterweights
Main journal and crank pin diameter	79.791 - 79.810 (1)
Main journal and crank pin undersize range	0.254 - 0.508 - 0.762 - 1.016
Main journal wall thickness	2.168 - 2.178
Main journal undersize range	0.254 - 0.508 - 0.762 - 1.016
Main journal and crank pin end float	0.034 - 0.103
Maximum end float after wear out	0.180
Crank pin diameter	63.725 - 63.744 (1)
Crank pin undersize range	0.254 - 0.508 - 0.762 - 1.016
Connecting rod wall thickness	1.805 - 1.815
Connecting rod undersize range	0.254 - 0.508 - 0.762 - 1.016
Connecting rod oversize bearing end float	0.033 - 0.087
Maximum end float after wear out	0,180
Crankshaft thrust bearing thickness	3.378 - 3.429
Thrust bearing upper range	0.127 - 0.254 - 0.381 - 0.508
Main bearing width of the thrust bearings	31.766 - 31.918
Main journal and crank pin length	32.000 - 32.100
Axial play of crankshaft	0.082 - 0.334
Maximum axial play	0.40
Maximum ovality and taper of main journal and crank pins after grinding	0.01
Maximum ovality and taper of main journal and crank pins after wear	0.05
Eccentricity of crankshaft main journal and crank pins, housed between front and rear crank pins (maximum)	0.10
Eccentricity and parallelism of error crank pin pairs in relation to the main journal	0.25
Distance tolerance of the external surfaces of the crank pins in relation to main journal axis (maximum)	± 0.10

(continued)

(1) During manufacturing 0,1 mm undersized main journals and crank pins are installed together with correspondingly oversized bearings.

(continued)

CRANKSHAFT BEARINGS	mm
The crankshaft is measured with a 1/100 sensitivity micrometer, with comparator tip being on point A.	0,025
Wobbling of flywheel seat surfaces in relation to main journal axis	0.04

CONNECTING ROD (TD 3.50)	mm
Connecting rod	Cast iron oil passage
Connecting rod bushing seat diameter	41.846 - 41.884
Connecting rod bushing seat outer diameter	41.979 - 42.017
Connecting rod bushing snug fit size	0.095 - 0.171
Connecting rod bush inner diameter (pressed in)	38.004 - 38.014
Connecting rod seat diameter	67.407 - 67.422
Connecting rod axes twist (over 125 mm distance) maximum	± 0,07
Weight difference of the connecting rods in the same engine (maximum) . . .	25 gram

PISTON DATA	mm
	TD 3.50
Piston	Light alloy, with compression, double compression and oil wiper piston rings
Piston diameter (measured at the axis of piston pin at 57 mm above the skirt)	103.852 - 103.870
End float after wear out	0.30
Piston diameter upper range	0.6
Protrusion of the piston from the surface of the head at TDC	0.355 - 0.761
Piston Pin diameter	37.983 - 37.990
Pin housing diameter on piston	37.994 - 38.000
Piston Pin - pin housing gap	0.004 - 0.017
Connecting rod bushing - piston pin gap	0.014 - 0.031
Gap after wear out (maximum)	0.06
Weight difference of the pistons used in the same engine (maximum)	20 gram
Piston ring - ring groove clearance :	
- Top	0.090 - 0.122
- Second	0.060 - 0.092
- Bottom	0.040 - 0.075
Maximum end float after wear out:	
- Top	0.50
- Second and bottom	0.20
Piston ring opening gap (on the piston):	
- Top	0.40 - 0.65
- Second	0.30 - 0.55
- Bottom	0.30 - 0.55
Maximum opening after wear out	1.20

TIMING GEARS AND CAMSHAFT	mm
Gap between timing gear teeth	0.160
Idle gear bushing inner diameter (after pressing and reaming)	37.050 - 37.075
Idle gear shaft diameter	36.975 - 37.000
Idle gear shaft bushing gap	0.050 - 0.100
Maximum gap after wear out	0.15
Idle gear bushing snug fit size	0.063 - 0.140
Camshaft bushing outer diameter:	
- Front	54.875 - 54.930
- Middle	54.375 - 54.430
- Rear	53.875 - 53.930
Bushing-housing snug fit size	0.070 - 0.150
Camshaft bushing inner diameter (after pressing and reaming):	
- Front	51.080 - 51.130
- Middle	50.580 - 50.630
- Rear	50.080 - 50.130
Camshaft diameter:	
- Front	50.970 - 51.000
- Middle	50.470 - 50.500
- Rear	49.970 - 50.000
Camshaft-bushing gap	0.080 - 0.160
Maximum gap after wear out	0.20
Backlash of the camshaft (with thrust plate installed)	0.070 - 0.220
For more information	see page 4

VALVE PUSH ROD CUPS	mm
Valve push rod cup seat diameter	15.000 - 15.018
Valve push rod cup outer diameter	14.950 - 14.970
Valve push rod cup seat gap in the cylinder block	0.030 - 0.068
Maximum gap after wear out	0.15
Valve push rod cup upper range	0.1 - 0.2 - 0.3

ROCKER ARM SHAFT - VALVES	mm
Rocker arm shaft support hole diameter	18.016 - 18.034
Rocker arm shaft diameter . . . . . :	17.982 - 18.000
Rocker arm support clearance	0.016 - 0.052
Maximum gap after wear out	0.15
Rocker arm intermediate spring length:	
- Free	59.5
- Under load (46 - 52 N (4.7 - 5.3 kg))	44
Valve clearance (during timing check)	0.45
Valve clearance for normal running (engine cold):	
-inlet	5.97
-exhaust	6.25

CYLINDER HEAD	mm
Cylinder head	Valve guides press installed
Original height of the cylinder head	92
Cylinder head chipping depth	0.5
Valve guide seat diameter on cylinder head	13.950 - 13.983
Standard valve guide seat outer diameter	13.993 - 14.016
Valve guide seat snug fit size	0.010 - 0.066
Valve guide inner diameter (after pressed and reaming)	8.023 - 8.043
Valve stem diameter	7.985 - 8.000
Clearance between valve guide and its stem	0.023 - 0.058
Maximum gap after wear out	0.13
Maximum eccentricity of working surface in relation to valve stem (measured while turning the stem once with the tip of the comparator being on the working surface)	0.03
Valve guide upper range	0.2
Valve seat angle on the cylinder head:	
-Inlet	60° ± 5’
-Exhaust	45° ± 5’
Valve working surface tapering angles:	
-Inlet	60° 30’ ± 7’
-Exhaust	45° 30’ ± 7’
Valve head diameter:	
-Inlet	45.300 - 45.500
-Exhaust	37.500 - 37.750
Valve indent	0.7 - 1.0
Maximum valve indent	1.3
Inlet and exhaust valve springs:	
- Free	44.6
- 256 - 284 N with the valve closed (26.1-28.9 kg) under load	34
- 502 - 544 N with the valve open (51.2 - 56.6 kg) under load	23.8
Injector protrusion relative to head face:	
BOSCH injector	0.3 - 1.1

LUBRICATION SYSTEM INFORMATION	mm	
	TD 3.50	
Long shaft - bush clearance	0.016 - 0.055	-
Driven gear - short shaft clearance	0.033 - 0.066	-
Clearance between the gears	0,100	-
Gear pump body clearance	0.060 - 0.170	-
Driving and driven gears width	40.961 - 41.000	-
Pump body gear housing depth	41.025 - 41.087	-
Driving and driven gears backlash	0.025 - 0.126	-
Bypass valve spring length:		-
- Free	45	-
- Under load of 45 - 49 N (4.6 - 5 kg)	37.5	-
- Under load of 88 - 94 N (9 - 9.6 kg)	30.5	-
- Under the load of 127.8 - 141.2 N (130 - 144 kg) (2, Figure 130)	-	-
- Under load of 233.4 - 258 N (238 - 263 kg130)	-	-
For more information about lubrication system	page 3	

COOLING SYSTEM INFORMATION	mm
Shaft - propeller snug fit size	0.017 - 0.059
Shaft - fan hub snug fit size	0.024 - 0.058
Propeller - sealant bush snug fit size	0.012 - 0.058
For information about cooling system	see page 3

ANGULAR TIGHTENING TORQUE VALUES

DESCRIPTION	Thread size	Pre-torque		Angle
		Nm	kgm	
Cylinder head bolts	M 12 x 1.25	40	4	120° + 120°
Main journal cap screws	M 14 x 1.5	80	8.2	90°
Connecting rod cap screws	M 12 x 1.5	40	4.1	60°
Flywheel bolts	M 12 x 1.25	40	4.1	60°

TIGHTENING TORQUES

DESCRIPTION	Thread size	Tightening torque	
		Nm	kgm
Rocker arm shaft support clearance	M 8	25	2.5
Crank pulley hub bolt	M 30 x 1.5	294	30
Fan and alternator pulley bolts	M 10 x 1.25	55	5.6
Intake manifold retaining bolts	M 8	25	2.6
Alternator and belt tensioner adjuster nut	M 10 x 1.25	55	5.6
Water pump fixing bolts	M 10 x 1.25	55	5.6
Rocker cover bolts	M 8	25 **(*)**	2.6 **(*)**
Rocker arm shaft support clearance	M 8	25	2.6
Oil pump and pump cover fixing bolts	M 8	25	2.6
Timing gear housing and cover bolts	M 8	25	2.6
Idle gear flange bolts	M 10 x 1.25	55	5.6
Camshaft clearance adjustment plate fixing bolt	M 8	35	3.6
Crankshaft back cover bolts	M 8	25	2.6
Rocker shaft adjustment nut	M 8	22	2.2
Exhaust manifold retaining bolts	M 8	25	2.6
Injection pump fixing bolts	M 8	25	2.6
Bolts fixing, - Oil sump cover to back cover - Cylinder block and flywheel ...All models	 M 10 X 1.25 M 10 X 1.25	 39 - 49 49 - 59	 4 - 5 5 - 6

(*)

SPECIAL TOOLS

The tools listed below must be manufactured and used in order to work safely and efficiently and obtain the best results.

List of special tools necessary to carry out the different operations described in this Section.

380000226 Engine front pulley puller.

380000322 Fuel pump gear puller

296044 Valve adjustment wrench.

380000223 Water pump propeller puller

999900015 Advance adjustment apparatus (suitable for 8-10 mm connection)

380000219 Valve guide removal/installation punch.

380000242 Valve guide installation bush (used together with Tool **380000219**)

380000222 Reamer Bit for Valve Guide

380000276 Drill Bit for Valve Guide (7.9 mm)

380000277 Exhaust Valve Guide Reamer Set.

380000302 Valve Spring Compressor

380000301 Graduated protractor for angular tightening measurements.

380000247 Water Pump Propeller Seal Installation Punch

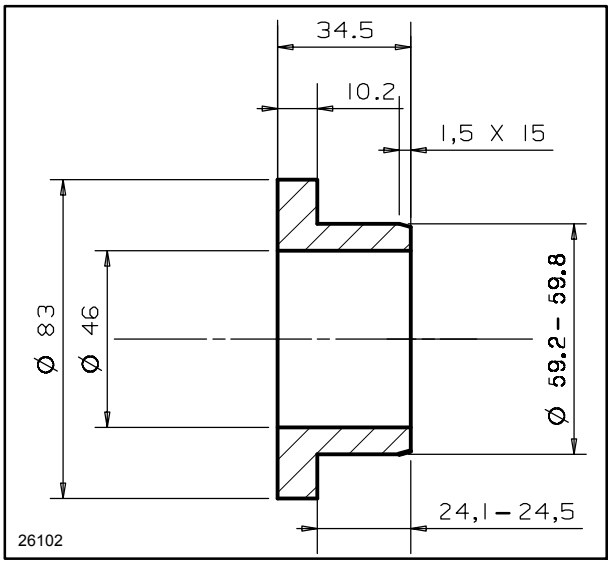
380000303 Cylinder Compression Test Set

380000246 Injector Seat Refurbishment Set

380000308 Injector Detachment Support

380000309 Injector Detachment Wrench Set

Measurements necessary for manufacturing crankshaft front seat installation apparatus, are given in mm.
Material UNI C40.



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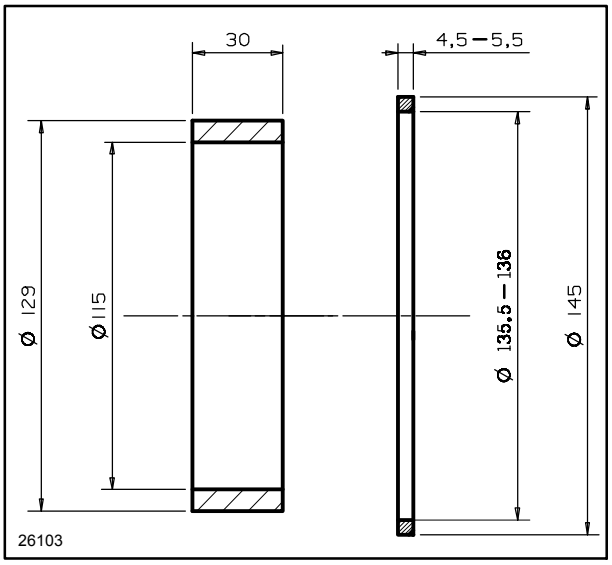
Measurements necessary for manufacturing crankshaft front seat installation apparatus, are given in mm.
Material UNI C40.



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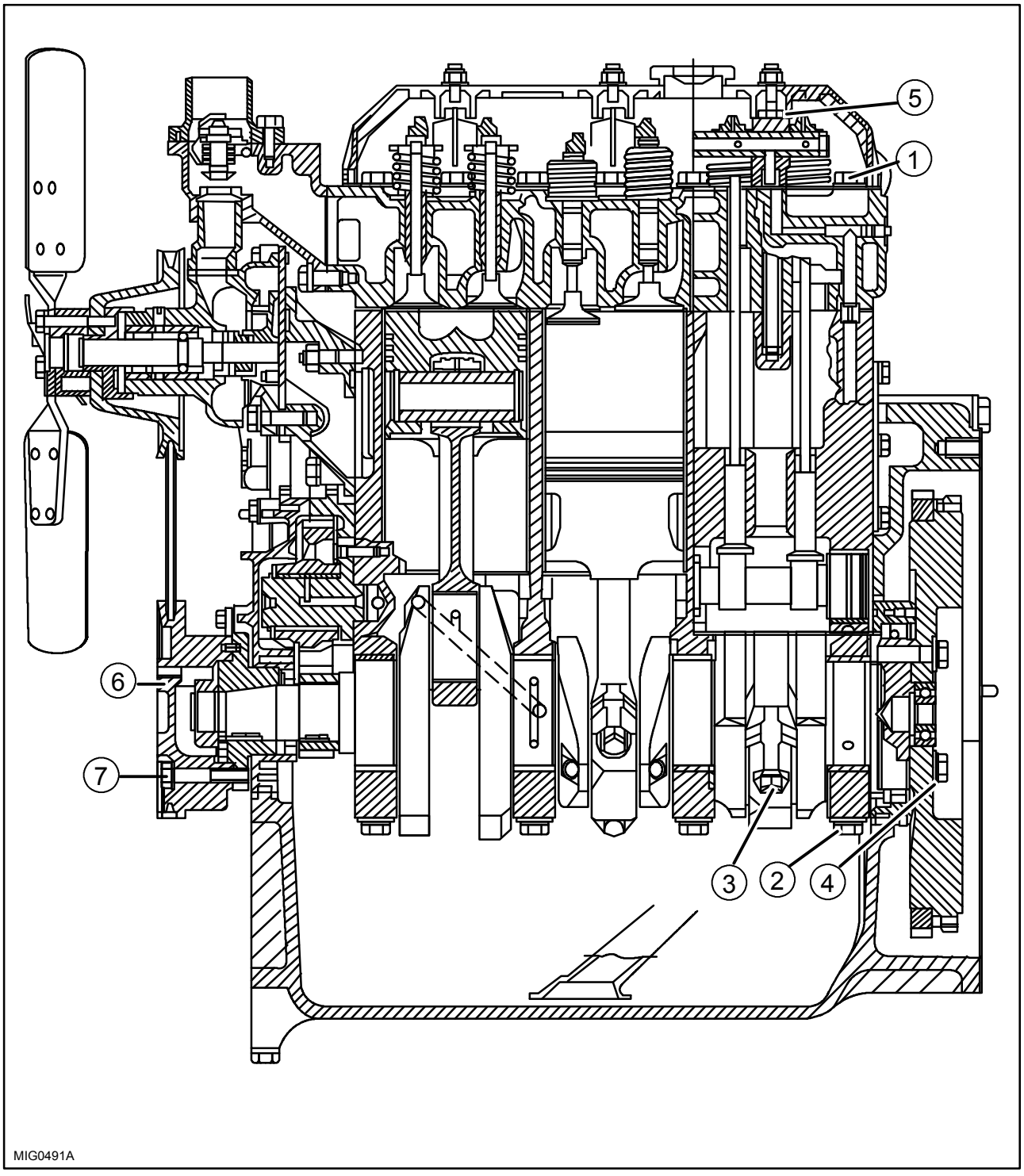
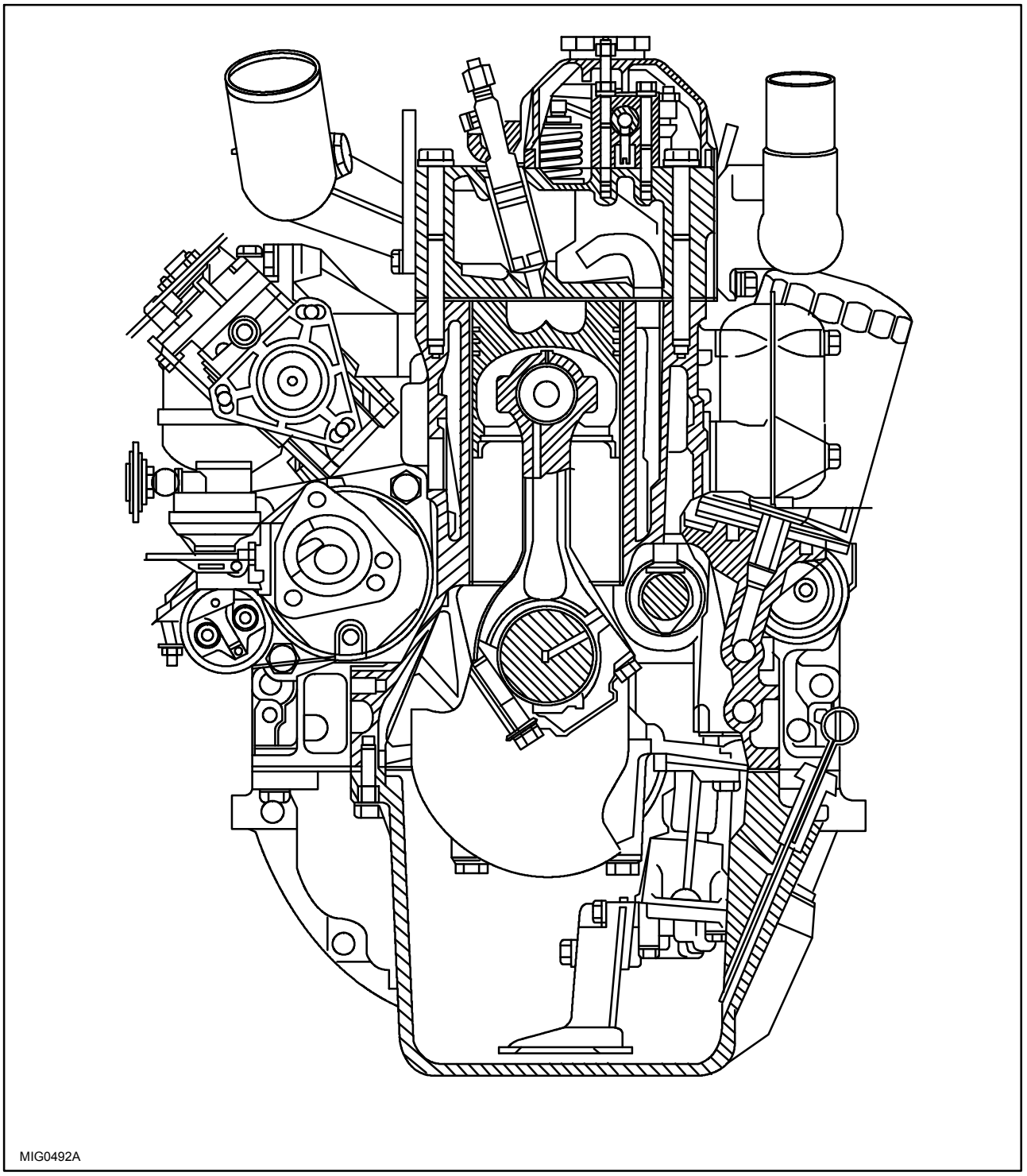


3

LONGITUDINAL SECTION OF 3 CYLINDER ENGINE



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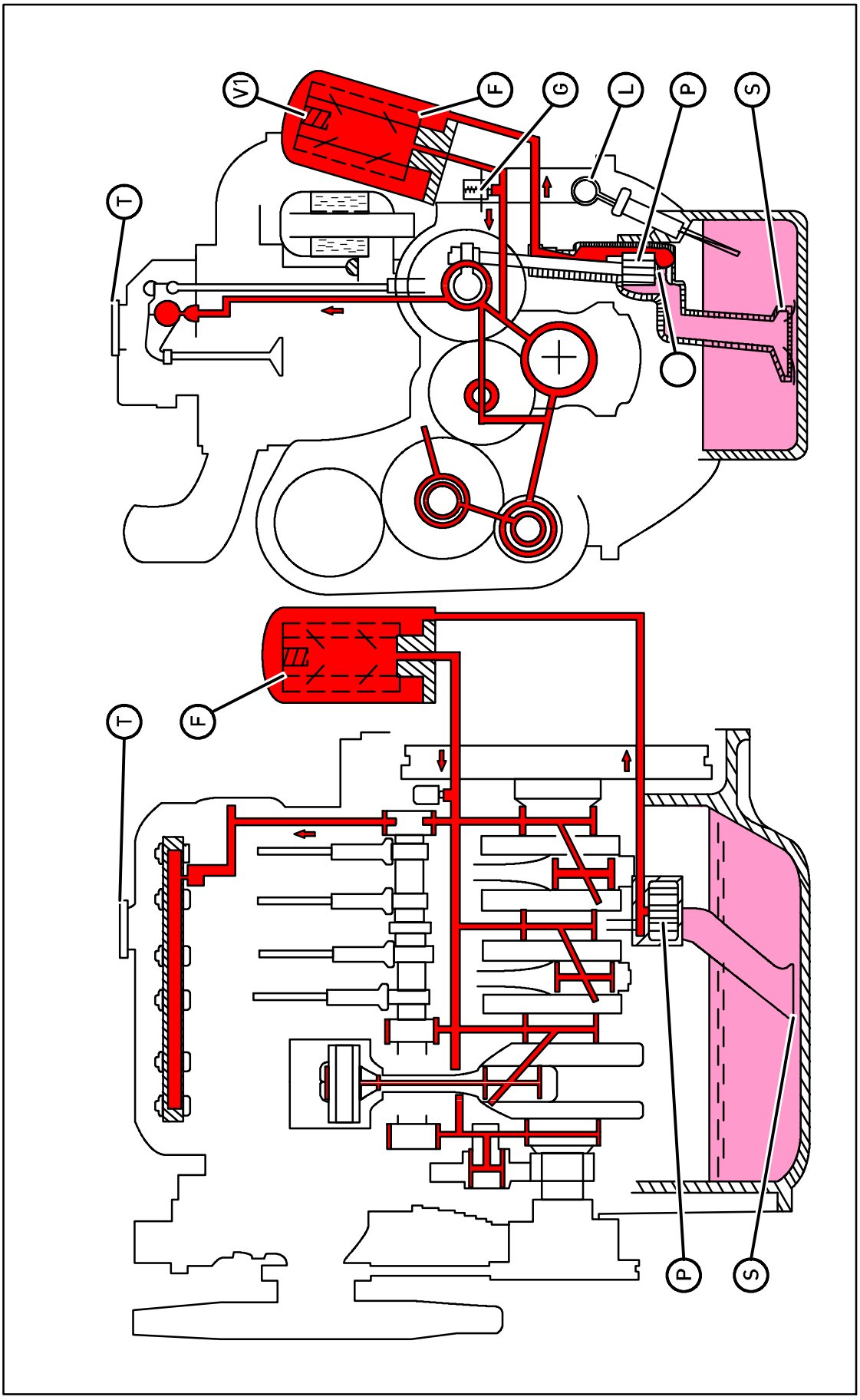
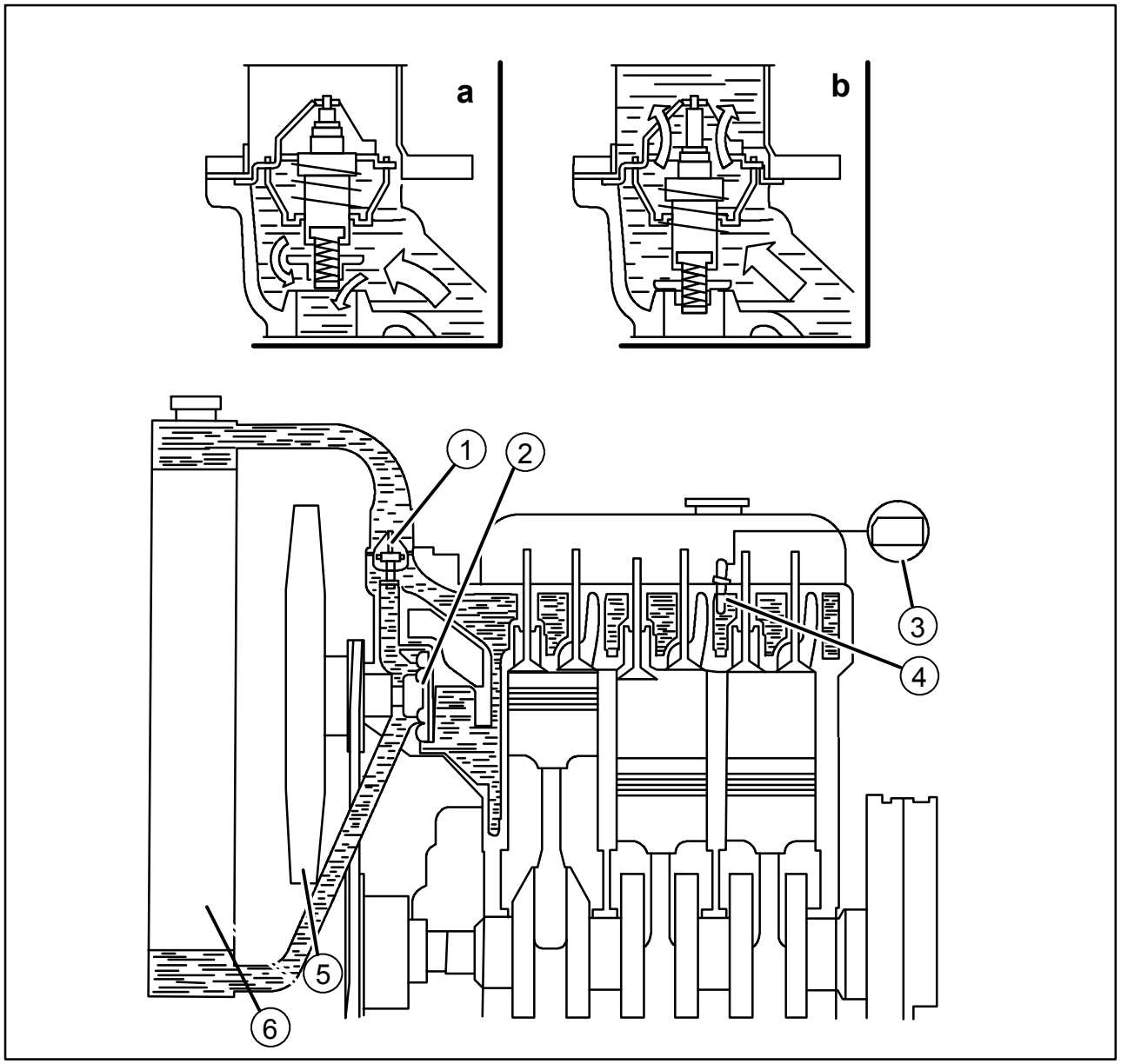
CROSS SECTION OF 3 CYLINDER ENGINE



5

LUBRICATION SYSTEM OF 3 CYLINDER ENGINE

F. Filter G. Oil pressure gage L. Oil dipstick P. Pump S. Suction screen T. Oil fill cover V. Pressure bypass valve V1. Filter bypass valve



6

ENGINE COOLING SYSTEM

a. Thermostat open
b. Thermostat closed
c. 3-cylinder models
1. Thermostat
2. Pump
3. Water temperature gage
4. Engine coolant temperature sender
5. Fan
6. Radiator

TROUBLESHOOTING

Problem	Possible Causes	Suggested solutions
Engine does not start.	1. Battery is partially flat.	Check and charge the battery. If necessary, re place the battery.
	2. Battery poles have been corroded or loose connections.	Clean, check and tighten the battery pole nuts. If necessary replace them.
	3. Injection pump timing is incorrect.	Readjust pump timing.
	4. Impurities or water in fuel lines.	Disconnect fuel lines from injection pump and clean thoroughly. If necessary clean and dry the fuel tank.
	5. Fuel tank is empty.	Fill the tank.
	6. Fuel delivery pump is not running.	Check and replace pump if necessary.
	7. Air in fuel system.	Check if there is air in the fuel lines, connectors, filters and injection pump and if necessary bleed the system.
	8. Starter motor is faulty.	Repair or replace.
	9. Thermostarter is faulty.	Check and if necessary replace.
Engine speed decreases and engine stops.	10. Idle speed is low.	Adjust the idle speed.
	11. Irregular fuel distribution from injection pump.	Check the quantity of fuel distributed by the injection pump on test instrument.
	12. Impurities or water in fuel lines.	Disconnect fuel lines from injection pump and clean thoroughly. If necessary, clean and dry the fuel tank.
	13. Oil filter is clogged.	Replace the filter elements.
	14. Valve setting is incorrect.	Adjust the Valve setting.
	15. Valves are charred or cracked.	Replace the valves.
	16. Air in fuel system.	Check if there is air in the fuel lines, connectors, filters and injection pump. Bleed fuel system.
	17. Injection pump drive mechanism is faulty.	Replace the defective parts.

(continued in the next page)

TROUBLESHOOTING

(continued)

Problem	Possible Causes	Suggested solutions
Water pump is not running.	18. Pump is defective.	Repair or replace.
	19. Thermostat is defective.	Replace thermostat.
	20. Radiator is not running effectively.	Wash the channels of the radiator core. Check for leaks. Repair if there is any punctures.
	21. There are deposits in the water passages within the cylinder head and engine block.	Clean the cooling system.
	22. Pump and fan drive belt is loose.	Check and adjust.
	23. Water level is low.	Add and adequate quantity of coolant to the radiator.
	24. Incorrect timing.	Check and adjust.
	25. Incorrect calibration of the injection pump (it pumps excessive fuel).	Calibrate the pump to the values stated on calibration charts, by means of test instrument.
	26. Air filter is clogged.	Clean the filter. If necessary replace the filter element.
Engine does not build up power and runs irregularly.	27. Incorrect timing of the injection pump.	Adjust the pump timing.
	28. Automatic advance governor within the pump is damaged.	Calibrate the pump to the values stated on calibration charts, by means of test instrument.
	29. Distributor shaft is worn.	Calibrate the pump to the values stated on calibration charts, by means of test instrument.
	30. Irregular distribution by the injection pump.	Calibrate the pump to the values stated on calibration charts, by means of test instrument.
	31. Governor is defective for all speeds.	Calibrate the pump to the values stated on calibration charts, by means of test instrument.
	32. Injectors are partially clogged or damaged.	Clean, repair and calibrate the injectors.
	33. Impurities or water in fuel lines.	Disconnect fuel lines from injection pump and clean thoroughly. If necessary, clean and dry the fuel tank.

(continued in the next page)

TROUBLESHOOTING

(continued)

Problem	Possible Causes	Suggested solutions
	34. Fuel delivery pump is damaged.	Replace pump.
	35. Valve setting is incorrect.	Adjust the Valve setting.
	36. Cylinder pressure is low.	Test compression and if necessary, rectify the engine.
	37. Air filter is clogged.	Clean the air filter and if necessary, replace the filter element.
	38. The link between the accelerator pedal and injection pump is incorrectly adjusted.	Adjust to the correct length.
	39. Maximum speed adjusting screw on the pump is incorrectly adjusted.	Adjust to the correct value.
Abnormal knocking noises from the engine.	40. Injectors are partially clogged or damaged.	Clean, repair and calibrate the injectors.
	41. Impurities in fuel lines.	Clean and if necessary, replace the fuel lines. If necessary, clean the injection pump too.
	42. Incorrect timing of the injection pump.	Adjust the pump timing.
	43. Excessive gap or backlash in one or more of the crankshaft main journal or crank pin bearings.	Rectify the crankshaft and bushes. Install a suitable set of oversized bearings and washers.
	44. Crankshaft is not balanced.	Check balance of crankshaft. If necessary, replace crankshaft.
	45. Flywheel bolts are loose.	Tighten all loose bolts to the prescribed angular torque values.
	46. Axes of the connecting rods are not parallel.	Straighten the connecting rods and check their axes. If necessary, re place them.
	47. Piston knocks due to excessive wear-out.	Grind the cylinder surfaces and install an oversized piston.
	48. Noise stems from excessive clearance of the piston pins or lose bush.	Install an oversized gudgeon pin. Grind the bush seats. Replace the bushes.
	49. Valve push rod cup/valve noise.	Check if there is excessive gap or pieces of broken spring between valve stems, valve guides and valve push rod roller and cylinders. Adjust the valve settings.

(continued in the next page)