SERVICE MANUAL

T3.50F / T3.55F / T3.65F / T3.75F

Tractor

Part number 47977155
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SERVICE MANUAL

T3.50F
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INTRODUCTION

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Safety rules

T3.F	WE

Pay attention to this symbol

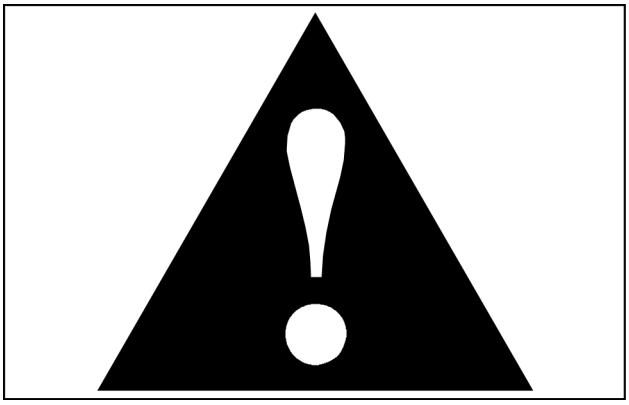
This warning symbol points out important messages concerning your safety.

Carefully read the following safety regulations and observe advised precautions in order to avoid potential hazards and safeguard your health and safety.

In this manual the symbol is accompanied by the following key-words:

WARNING: Warnings concerning unsuitable repair operations that may jeopardise the safety of Repair personnel.

DANGER: Specific warnings concerning potential hazards for operator safety or for other persons directly or indirectly involved.



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To prevent accidents

Most accidents or injuries that occur in workshops are the result of non-observance of simple and fundamental safety regulations. For this reason, IN MOST CASES THESE ACCIDENTS CAN BE AVOIDED by foreseeing possible causes and consequently acting with the necessary caution and care.

Accidents may occur with all types of vehicle, regardless of how well it was designed and built.

A careful and judicious service technician is the best guarantee against accidents.

Precise observance of the most basic safety rule is normally sufficient to avoid many serious accidents.

DANGER: Never carry out any cleaning, lubrication or maintenance operations when the engine is running.

Safety rules

General guidelines:

- Carefully follow specified repair and maintenance procedures.
- Do not wear rings, wristwatches, jewels, unbuttoned or flapping clothing such as ties, torn clothes, scarves, open jackets or shirts with open zips which could get caught on moving parts.
  Use approved safety clothing such as anti-slipping footwear, gloves, safety goggles, helmets, etc.
- Do not carry out repair operations with someone sitting in the driver's seat, unless the person is a trained technician who is assisting with the operation in question.
- Do not operate the vehicle or use any of the implements from different positions, other than the driver's seat.
- Do not carry out operations on the vehicle with the engine running, unless 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.
- Do not check or fill fuel tanks, accumulator batteries, nor use starting liquid when smoking or near naked flames, as these fluids are inflammable.

- Brakes are inoperative when manually released for repair or maintenance purposes. Use blocks or similar devices to control the machine in these conditions.
- The fuel nozzle should always be in contact with the filling aperture: Maintain this contact until the fuel stops flowing into the tank to avoid possible sparks due to static electricity buildup.
- Only use specified towing points for towing the vehicle. Connect parts carefully. Make sure that all pins and/or locks are secured in position before applying traction. Never remain near the towing bars, cables or chains that are operating under load.
- Transport vehicles that cannot be driven using a trailer or a low-loading platform trolley, if available.
- When loading or unloading the vehicle from the trailer (or other means of transport), select a flat area capable of sustaining the trailer or truck wheels. Firmly secure the vehicle to the truck or trailer and lock the wheels in the position used by the carrier.
- Electric heaters, battery-chargers and similar equipment must only be powered by auxiliary power supplies with efficient ground insulation to avoid electrical shock hazards.
- Always use suitable hoisting or lifting devices when raising or moving heavy parts.
- Take extra care if bystanders are present.
- Never pour petrol or diesel oil into open, wide or low containers.
- Never use gasoline, diesel oil or other inflammable liquids as cleaning agents. Use non-inflammable, non-toxic commercially available solvents.
- Wear safety goggles with side guards when cleaning parts with compressed air.
- Limit the air pressure to a maximum of **2.1 bar**, according to local regulations.
- Do not run the engine in confined spaces without suitable ventilation.
- Do not smoke, use naked flames, or cause sparks in the area when fuel filling or handling highly inflammable liquids.
- All movements must be carried out carefully when working under, on or near the vehicle. Wear suitable safety clothing, i.e., hard hat, safety goggles and special shoes.
- When carrying out checks with the engine running, request the assistance of an operator in the driver's seat. The operator must maintain visual contact with the service technician at all times.
- If operating outside the workshop, position the vehicle on a flat surface and lock in position. If working on a slope, lock the vehicle in position. Move to a flat area as soon as is safely possible.
- If operating outside the workshop, position the vehicle on a flat surface and lock in position. If working on a slope, lock the vehicle in position.
  Move to a flat area as soon as is safely possible.
- Damaged or bent chains or cables are unreliable. Do not use them for lifting or towing. Always use suitable protective gloves when handling chains or cables.
- Chains should always be safely secured. Make sure that the hitch-up point is capable of sustaining the load in question. Keep the area near the hitch-up point, chains or cables free of all bystanders.
- Maintenance and repair operations must be carried out in a CLEAN and DRY area. Eliminate any water or oil spillage immediately.
- Do not create piles of oil or grease-soaked rags as they represent a serious 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 check that there are no persons within the vehicle or implement range of action.
- Empty pockets of all objects that may fall unobserved into the vehicle parts.
- In the presence of protruding metal parts, use protective goggles or goggles with side guards, helmets, special footwear and gloves.
- When welding, use protective safety devices: tinted safety goggles, helmets, special overalls, gloves and footwear. All persons present in the area where welding is taking place must wear tinted goggles. NEVER LOOK DIRECTLY AT THE WELDING ARC WITHOUT SUITABLE EYE PROTECTION.
- Metal cables tend to fray with repeated use. Always use suitable protective devices (gloves, goggles, etc.) when handling cables.
- Handle all parts with great care. Do not put your hands or fingers between moving parts. Always wear suitable safety clothing-safety goggles, gloves and shoes.

Starting

- 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 slowly before removing it to allow any remaining pressure in the system to be discharged. Filling up with coolant should only be carried out with theengine stopped or idling (if hot).
- Never fill up with fuel when the engine is running, especially if hot, in order to prevent the outbreak of fire as a result of fuel spillage.
- Never check or adjust fan belt tension when the engine is running.
  Never adjust the fuel injection pump when the vehicle is moving.
- Never lubricate the vehicle when the engine is running.

Electrical systems

- If it is necessary to use auxiliary batteries, remember that both ends of the cables must be connected as follows: (+) with (+) and (–) with(–).
  Avoid short-circuiting the terminals. GAS RELEASED FROM BATTERIES IS HIGHLY INFLAMMABLE. During charging, leave the battery compartment uncovered to improve ventilation. Never check the battery charge using “jumpers” (metal objects placed on the terminals). Avoid sparks or flames near the battery zone. Do no smoke to prevent explosion hazards.
- Before servicing operations, check for fuel or current leaks. Eliminate any eventual leaks before proceeding with work.
- Never charge batteries in confined spaces. Make sure that there is adequate ventilation in order to prevent accidental explosion hazards as a result of the accumulation of gases released during charging operations.
- Always disconnect the batteries before performing any kind of servicing on the electrical system.

Hydraulic systems

- A liquid leaking from a tiny hole may be almost invisible but, at the same time, be powerful enough to penetrate the skin. Therefore, use a piece of cardboard or wood for this purpose. NEVER DO IT WITH YOUR HANDS: If any liquid penetrates skin tissue, call for medical aid immediately. Failure to treat this condition with correct medical procedure may result in serious infection or dermatosis.
- In order to check the pressure in the system use suitable instruments.

Wheels and tyres

- Make sure that the tyres are correctly inflated at the pressure specified by the manufacturer. Periodically check possible damages to the rims and tyres.
- Stand away from (at the side of) the tyre when checking inflation pressure.
- Only check pressure when the vehicle is unloaded and the tyres are cold, to avoid incorrect readings as a result of 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 or weld a rim mounted with an inflated tyre.
- To remove the wheels, lock both the front and rear vehicle wheels. After having raised the vehicle, position supports underneath, according to regulations in force.
- Deflate the tyre before removing any object caught in the tyre tread.
- Never inflate tyres using inflammable gases, as this may result in explosions and injury to by standards.

Removal and re-fitting

- Lift and handle all heavy parts using suitable hoisting equipment. Make sure that parts are sustained by appropriate hooks and slings. Use the hoisting eyebolts for lifting operations. Extra care should be taken if persons are present near the load to be lifted.
- Handle all parts with carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing, i.e. safety goggles, gloves and footwear.
- Avoid twisting chains or metal cables. Always wear safety gloves when handling cables or chains.

Basic instructions

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Important notice

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

Anyone performing the operations described herein without strictly following the instructions is personally responsible for any eventual injury or damage to property.

Battery

Before carrying out any kind of service operation disconnect and isolate the battery negative lead, unless otherwise requested for specific operations (e.g.: operations requiring the engine to be running), after which it is necessary to disconnect the above mentioned lead to complete the work.

Shimming

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

Rotating shaft seals

For correct rotating shaft seal installation, proceed as follows:

- Before assembly, allow the seal to soak in the oil it will be sealing for at least thirty minutes.
- Thoroughly clean the shaft and check that the working surface on the shaft is not damaged.
- Position the sealing lip facing the fluid; with hydrodynamic lips, take into consideration the shaft rotation direction and position the grooves so that they will deviate the fluid towards the inner side of the seal.
- Smear 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 in its seat and press down using a flat punch, do not tap the seal with a hammer or mallet.
- Whilst inserting the seal, check that the it is perpendicular to the seat; once settled, make sure that it makes contact with the thrust element, if required.
- To prevent damaging the seal lip on the shaft, position a protective guard during installation operations.

O-ring seals

Lubricate the O-ring seals before inserting them in the seats, this will prevent them from overturning and twisting, which would jeopardise sealing efficiency.

Sealing compounds

Apply one of the following sealing compounds on the mating surfaces marked with an X: **LOCTITE® 518™** or **LOCTITE® 5205** or SUPERBOND 559 or BETALOK A272M.

Before applying the sealing compound, prepare the surfaces as follows:

- Remove any incrustations using a wire brush.
- Thoroughly decrease the surfaces using one of the following cleaning agent: trichlorethylene, petrol or water and soda solution.

Bearings

When installing bearings it is advised to:

- Heat the bearings to **80 - 90 °C** (**176 - 194 °F**) before fitting on the shafts.

- Allow the bearings to cool before installing them from the outside.

Spring pins

When fitting split socket elastic pins, ensure that the pin notch is positioned in the direction of the force required to stress the pin.

Spiral spring pins do not require special positioning.

Spare parts

Use genuine parts only.

Only genuine spare parts guarantee the same quality, duration and safety as they are the same parts that are assembled during production.

Only genuine parts can offer this guarantee.

When ordering spare parts, always provide the following information:

- Tractor model (commercial name) and frame number.
- Engine type and number.
- Part number of the ordered part, which can be found on the “Spare Parts Catalogue”, which is the base for order processing.

Notes for equipment

The tools that NEW HOLLAND offer and illustrate in this manual are:

- Specifically researched and designed for use with NEW HOLLAND vehicles.
- Necessary to make a reliable repair.
- Accurately built and strictly tested to offer efficient and long-lasting working means.

By using these tools, repair personnel will benefit from:

- Operating in optimal technical conditions.
- Obtaining the best results.
- Save time and effort.
- Working in safe conditions.

Important notes

Wear limit values indicated for certain parts are recommended, but not binding. The terms “front”, “rear”, “right-hand” and “left-hand” (when referred to different parts) are intended as seen from the driving position with the tractor in the normal direction of movement.

Moving the tractor with the battery removed

External power supply cables should only be connected to the respective positive and negative cable terminals, using efficient clamps that guarantee adequate and secure contact.

Disconnect all services (lights, windshield wipers, etc.) before starting the vehicle.

If the tractor electrical system requires checking, carry out operations with the power supply connected. Once checking is completed, disconnect all services and switch off the power supply before disconnecting the cables.

General specification

T3.F	WE

General specification	3 cylinder
Engine type :	–
T 3.50F model turbocharged – 8035.25A.313T-(BOSCHpompa)	BOSCH 1068-1 T
T 3.55F model turbocharged – 8035.25B.313T (BOSCHpompa)	BOSCH 1068-1
T 3.65F model turbocharged - 8035.25C.313T (BOSCHpompa)	BOSCH 1068-2
T 3.75F model turbocharged - 8035.25D.313T (BOSCHpompa)	BOSCH 1089
Type:	
Fuel injection	Diesel 4 stroke
Number of cylinders in line	Direct 3
Piston diameter	
T 3.50 F model	**104 mm**
T 3.55 F model	**104 mm**
T 3.65 F model	**104 mm**
T 3.75 F model	**104 mm**
Piston stroke	**115 mm**
Total displacement :	
T 3.50 F model	**2930 cm³**
T 3.55 F model	**2930 cm³**
T 3.65 F model	**2930 cm³**
T 3.75 F model	**2930 cm³**
Compression ratio	18:1
Maximum power	
T 3.50 F model	**36.8 kW** (**50 Hp**)
T 3.55 F model	**40.4 kW** (**55 Hp**)
T 3.65 F model	**47.8 kW** (**65 Hp**)
T 3.75 F model	**53.0 kW** (**72 Hp**)
Maximum torque	
Maximum torque (Nm) at 1400 d/dak: T 3.50 F model	**201 N·m**
Maximum torque (Nm) at 1400 d/dak: T 3.55 F model	**220 N·m**
Maximum torque (Nm) at 1400 d/dak: T 3.65 F model	**261 N·m**
Maximum torque (Nm) at 1400 d/dak: T 3.75 F model	**295 N·m**
Number of main bearings	4
Sump	Structural cast iron
Lubrication	Forced, with gear pump
Pump drive	From camshaft
Engine speed / oil pump speed ratio	2:1
Oil cleaning	Mesh filter on oil intake and cartridge filter on delivery line
Normal oil pressure, with engine hot and at fast idling speed:	**2.9 - 3.9 bar** (**42.0 - 56.6 psi**)
All models	
Lube pressure relief valve	Built into pump housing
Valve opening pressure	**3.5 bar** (**50.8 psi**)
For further lubrication data	See page 19
Cooling system	Coolant circulation
Radiator on T 3.50 F and T 3.55 F models	3 row vertical pipes with copper fins
Radiator on T 3.65 F and T 3.75 F models	4 row vertical pipes with copper fins
Fan, attached to coolant pump pulley T 3.50 F, T 3.55 F, T 3.65F, T 3.75 F models	10 blade steel exhauster fan
Coolant pump	Centrifugal vane-type

General specification	3 cylinder
Engine speed/coolant pump speed ratio	1.403/1
Temperature control	Thermostat
Coolant temperature gauge	Coloured scale, divided into 3 sections
Temperature ranges corresponding to each section:	
Initial white section	**30 - 65 °C**
Middle green section	**65 - 105 °C**
Final red section	**105 - 115 °C**
For further cooling system data	See page 20
Rev counter	Incorporated in instrument panel
Rev counter drive	From gear on camshaft
Timing	Overhead valves operated by a camshaft located in the engine block through tappets, pushrods and rockers. Camshaft is driven by the crankshaft through helical gears.
Intake:	
Start: Before T.D.C	**12 °**
End: After B.D.C	**31 °**
Exhaust:	
Start: Before B.D.C	**50 °**
End: After T.D.C	**16 °**
Valve clearance for timing check	**0.45 mm**
Valve clearance for normal running (engine cold):	
Intake	**0.25 - 0.35 mm**
Exhaust	**0.25 - 0.35 mm**
For further timing data	For valve timing check see **Camshaft - Check (10.106)**.
Fuel system	
Air filter	Dual cartridge dry air filter with clogged filter indicator, centrifugal pre-filter and automatic dust ejector
Fuel pump	Double diaphragm
Fuel Filter	Mesh filter in fuel supply pump and replaceable cartridge on delivery line to injection pump.
Minimum fuel flow rate with pump shaft rotating at **1600 RPM**	**100 L/hour**
Operated by eccentric cam	On camshaft
BOSCH injection pump	Distributor type
All-speed governor, incorporated in pump: BOSCH	Centrifugal counterweights
For further fuel system data:	
For fixed advance (pump setting for start of delivery before TDC) – Pressure setting – Injection order, and other information regarding the BOSCH pump	See pages 10 to 99

Technical specifications

Turbocharger	
Holset	HX25
Fuel injection pump	Distributor type with incorporated speed governor and automatic advance regulator
BOSCH pump:	
T 3.50 F model	L 1135
T 3.55 F model	L 1134
T 3.65 F model	L 1136
T 3.75 F model	L 1137
Direction of rotation	Anti-clockwise
Injection order	1-2-3

Fuel Injectors:	
BOSCH	5090726 5090725
Nozzle holder type	KBEL 83.535
Nozzle type	0432291494
Number of nozzles	6
Diameter of nozzle orifices	**0.23 mm**
Pressure setting	**260 - 272 bar**
Fuel delivery lines – BOSCH pump	
Type	4797506 (TT65) 5090730 (TT50, TT55, TT60)
Dimensions	**6 mm** x **1.5 mm** x **475 mm**

Fuel supply pump data	**mm**
Eccentricity of drive shaft	**3 mm**
Diameter of drive shaft at bushings	**31.975 - 32.000 mm**
Internal diameter of installed and reamed bushings	**32.050 - 32.075 mm**
Interference between bushings and seats	**0.063 - 0.140 mm**
Assembly clearance between shaft and bushings	**0.050 - 0.100 mm**
Thickness of internal washer	**1.45 - 1.50 mm**
Thickness of external washer	**2.93 - 3.00 mm**

Crankcase / cylinder block data	**mm**
Cylinder block	Cast-iron mono-block without cylinder liners, incorporating seatings for crankshaft bearings, camshaft and push rod / tappet assemblies
Internal diameter of cylinder liners	**104.000 - 104.024 mm** (1)
External diameter of cylinder liners	**107.020 - 107.050 mm**
Diameter of cylinder bores	**106.850 - 106.900 mm**
Interference fit between cylinder liners and bores	**0.120 - 0.200 mm**
Liner internal diameter over sizes	**0.4 - 0.8 mm**
Liner external diameter over sizes	**0.2 mm**
Maximum permissible liner ovality or taper due to wear (2)	**0.12 mm**
Diameter of main shell bearing seats	**84.200 - 84.230 mm**
Diameter of camshaft bearing seats:	
Front	**54.780 - 54.805 mm**
Middle	**54.280 - 54.305 mm**
Rear	**53.780 - 53.805 mm**
Diameter of standard tappet bores in crankcase	**15.000 - 15.018 mm**
Spare tappet over sizes	**0.1 mm** – **0.2 mm** – **0.3 mm**

(1) Measured after press-fitting and reaming.
(2) Measure in the area swept by piston rings, both parallel and perpendicular to the crankshaft axis.

Crankshaft and bearings data	**mm**
Crankshaft	Balanced with integral counterweights
Standard journal diameter	**79.791 - 79.810 mm** (1)
Journal under sizes	**0.254 mm** – **0.508 mm** – **0.762 mm** – **1.016 mm**
Standard main bearing shell thickness	**2.168 - 2.178 mm**
Main bearing shell under sizes (internal diameter)	**0.254 mm** – **0.508 mm** – **0.762 mm** – **1.016 mm**
Bearing shell to journal clearance	**0.034 - 0.103 mm**
Maximum permitted wear clearance	**0.180 mm**
Standard crankpin diameter	**63.725 - 63.744 mm** (1)
Crankpin under sizes	**0.254 mm** – **0.508 mm** – **0.762 mm** – **1.016 mm**
Standard big-end bearing shell thickness	**1.805 - 1.815 mm**
Big-end bearing shell under sizes (internal diameter)	**0.254 mm** – **0.508 mm** – **0.762 mm** – **1.016 mm**
Big-end bearing shell to crankpin clearance	**0.033 - 0.087 mm**

Crankshaft and bearings data	mm
Maximum permitted wear clearance	**0.180 mm**
Standard crankshaft thrust washer thickness	**3.378 - 3.429 mm**
Thrust washer over sizes (thickness)	**0.127 mm – 0.254 mm – 0.381 mm – 0.508 mm**
Width of main bearing including thrust washers	**31.766 - 31.918 mm**
Width of corresponding crankshaft journal	**32.000 - 32.100 mm**
Crankshaft assembly end float	**0.082 - 0.334 mm**
Maximum permitted wear end float	**0.40 mm**
Maximum ovality or taper of journals and crankpin after regrinding	**0.01 mm**
Maximum ovality or taper of journals and crankpin	**0.05 mm**
Maximum tolerance for alignment of crankshaft journals with crankshaft supported on the two outer journals	**0.10 mm**
Maximum tolerance for alignment, in both directions, of crankpins or each pair of crankpins	**0.25 mm**
Maximum tolerance for run-out between the outer surfaces of the crankshaft journals and the crankshaft centre line	+ **0.10 mm**

(1) Crankshafts with **0.1 mm** undersize journals and crankpins and consequently undersize bearing shells may be fitted in factory production.

Bench test performance data	mm
Maximum permitted tolerance on run-out of flywheel mounting flange surface relative to the crankshaft centre line, measured with **1 mm**/ **100 mm** scale dial gauge resting on front flange surface at a diameter of **108 mm** (total gauge reading)	**0.025 mm**
Maximum permitted tolerance on co-axial alignment of flywheel centering seat relative to the crankshaft journals (total gauge reading)	**0.04 mm**

Connecting rod data	mm
Connecting rods	Cast-iron with oil way
Diameter of small end bushing seat	**41.846 - 41.884 mm**
Outside diameter of small end bushing	**41.979 - 42.017 mm**
Interference between small end bushing and seat	**0.095 - 0.171 mm**
Inside diameter of small end bushing (measured after fitting)	**38.004 - 38.014 mm**
Diameter of big end shell bearing seats	**67.407 - 67.422 mm**
Maximum tolerance for parallelism between the small end and big end axes measured at **25 mm**	+ **0.07 mm**
Maximum weight difference between con rods in same engine	**25 g**

Piston data	mm
	T3.50F, T3.55F, T3.65F and T3.75F
Pistons	Light alloy with two compression rings and one oil control ring
Standard piston diameter, measured at **57 mm** from base and perpendicularly to the gudgeon pin axis	**103.852 - 103.870 mm**
Piston clearance in cylinder liner	**0.130 - 0.172 mm**
Maximum permitted wear clearance	**0.30 mm**
Piston over sizes	**0.6 mm**
Piston protrusion at TDC from cylinder block face	**0.355 - 0.761 mm**
Gudgeon Pin Diameter	**37.983 - 37.990 mm**
Diameter of gudgeon pin seat in piston	**37.994 - 38.000 mm**
Gudgeon pin to seat clearance	**0.004 - 0.017 mm**

Piston data	mm
Gudgeon pin to small end bearing clearance	**0.014 - 0.031 mm**
Maximum permitted wear clearance	**0.06 mm**
Maximum weight difference between pistons in same engine	**20 g**
Piston ring groove clearance (measured vertically):	
Top	**0.090 - 0.122 mm**
Second	**0.060 - 0.092 mm**
Bottom	**0.040 - 0.075 mm**
Maximum permissible clearance (wear limit):	
Top	**0.50 mm**
Second and bottom	**0.20 mm**
Piston ring end gap (fitted):	
Top	**0.40 - 0.65 mm**
Second	**0.30 - 0.55 mm**
Bottom	**0.30 - 0.55 mm**
Maximum permissible gap (wear limit)	**1.20 mm**

Valve timing gear data	mm
Timing gear tooth backlash	**0.160 mm**
Inside diameter of intermediate gear bushings (fitted and reamed)	**37.050 - 37.075 mm**
Diameter of intermediate gear journal	**36.975 - 37.000 mm**
Journal to bushing clearance	**0.050 - 0.100 mm**
Maximum permissible clearance (wear limit)	**0.15 mm**
Bushing interference fit in seat in intermediate gear	**0.063 - 0.140 mm**
Outside diameter of camshaft bearings:	
Front	**54.875 - 54.930 mm**
Middle	**54.375 - 54.430 mm**
Rear	**53.875 - 53.930 mm**
Interference between bearings and seats in cylinder block	**0.070 - 0.150 mm**
Inside diameter of camshaft bearings (fitted and reamed):	
Front	**51.080 - 51.130 mm**
Middle	**50.580 - 50.630 mm**
Rear	**50.080 - 50.130 mm**
Diameter of camshaft journals:	
Front	**50.970 - 51.000 mm**
Middle	**50.470 - 50.500 mm**
Rear	**49.970 - 50.000 mm**
Clearance between camshaft journals and bearings	**0.080 - 0.160 mm**
Maximum permissible clearance (wear limit)	**0.20 mm**
Camshaft end float between thrust plate and seat on camshaft	**0.070 - 0.220 mm**
For further valve timing gear data	

Tappet data	mm
Tappet bore in crankcase	**15.000 - 15.018 mm**
Outside diameter of standard tappet	**14.950 - 14.970 mm**
Tappet running clearance	**0.030 - 0.068 mm**
Maximum permissible clearance (wear limit)	**0.15 mm**
Spare tappet over sizes	**0.1 mm – 0.2 mm – 0.3 mm**

Rocker arm – valve data	mm
Diameter of shaft bores in rocker arms	**18.016 - 18.034 mm**
Rocker-arm shaft diameter	**17.982 - 18.000 mm**
Rocker shaft to rocker arm bore clearance	**0.016 - 0.052 mm**
Maximum permissible clearance (wear limit)	**0.15 mm**

Rocker arm – valve data	mm
Rocker arm spacing springs:	
Free spring length	**59.5 mm**
Length under load of **46 - 52 N** (**10.3 - 11.7 lb**)	**44 mm**
Length under load of **46 - 52 N** (**10.3 - 11.7 lb**)	**0.45 mm**
Cam lift:	
Inlet valve	**5.97 mm**
Exhaust valve	**6.25 mm**

Cylinder head data	mm
Cylinder head	With valve seats cut directly in the casting and press-fitted steel valve guides.
Original height of cylinder head	**92 mm**
Maximum surface regrinding depth	**0.5 mm**
Diameter of standard valve guide bores in head	**13.950 - 13.983 mm**
Outside diameter of standard valve guides	**13.993 - 14.016 mm**
Guide interference fit in bores	**0.010 - 0.066 mm**
Inside diameter of valve guide (fitted in head)	**8.023 - 8.043 mm**
Valve stem diameter	**7.985 - 8.000 mm**
Assembly clearance between valve stem and guide	**0.023 - 0.058 mm**
Maximum permissible clearance (wear limit)	**0.13 mm**
Maximum run-out of valve guide on its stem measured through **360 °** with dial gauge contact point resting on valve head contact band	**0.03 mm**
Valve guide over sizes	**0.2 mm**
Valve seat angle in head:	
Inlet valve	**60 °** + 5’
Exhaust valve	**45 °** + 5’
Valve face angle:	
Inlet valve	**60 °** 30’ ± 7’
Exhaust valve	**45 °**30’ ± 7’
Valve head diameter:	
Inlet valve	**45.300 - 45.500 mm**
Exhaust valve	**37.500 - 37.750 mm**
Valve stand-in relative to cylinder head face	**0.7 - 1.0 mm**
Maximum permissible valve stand-in	**1.3 mm**
Inlet and exhaust valve springs:	
Free spring length	**44.6 mm**
Length with valve closed, under load of **256 - 284 N** (**57.6 - 63.8 lb**)	**34 mm**
Length with valve open, under load of **502 - 544 N** (**112.9 - 122.3 lb**)	**23.8 mm**
Injector protrusion relative to pump head face:	
• BOSCH injector	**0.3 - 1.1 mm**

Lubrication system data	mm	
	T3.50F , T3.55F	T3.65F , T3.75F
Assembly clearance between oil pump drive shaft and bushing	**0.016 - 0.055 mm**	–
Clearance between shaft and driven gear	**0.033 - 0.066 mm**	–
Tooth backlash between drive and driven gears	**0.100 mm**	–
Radial clearance between drive and driven gears and housing	**0.060 - 0.170 mm**	–
Thickness of drive and driven gears	**40.961 - 41.000 mm**	–
Height of gear seat in pump	**41.025 - 41.087 mm**	–

Lubrication system data	mm	
End float between gears and gear housing in pump	**0.025 - 0.126 mm**	–
Pressure relief valve spring:		–
Free length	**45 mm**	**35.9 mm**
Length under load of **45 - 49 N** (**10.1 - 11.0 lb**)	**37.5 mm**	–
Length under load of **88 - 94 N** (**19.8 - 21.1 lb**)	**30.5 mm**	–
Length under load of **127.8 - 141.2 N** (**28.7 - 31.7 lb**) (2, Fig 146)	–	**29 mm**
length under load of **233.4 - 258 N** (**52.5 - 58.0 lb**) (2, Fig 146)	–	**23.2 mm**
For further lubrication system data	See page 19	

Cooling system data	mm
Interference fit between pump impeller and shaft	**0.017 - 0.059 mm**
Interference fit between fan hub and shaft	**0.024 - 0.058 mm**
Interference fit between front seal bushing and impeller	**0.012 - 0.058 mm**
For further cooling system data	See page 20

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Loctite® 518™	Basic instructions	7
Loctite® 5205	Basic instructions	7

SERVICE MANUAL

Engine

T3.50F
T3.55F
T3.65F
T3.75F

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Loctite®	Engine - Install	10.1 / 27
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Engine - General specification

T3.F	WE

General specification	3 cylinder
Engine type :	–
T 3.50F model turbocharged – 8035.25A.313T-(BOSCHpompa)	BOSCH 1068-1 T
T 3.55F model turbocharged – 8035.25B.313T (BOSCHpompa)	BOSCH 1068-1
T 3.65F model turbocharged - 8035.25C.313T (BOSCHpompa)	BOSCH 1068-2
T 3.75F model turbocharged - 8035.25D.313T (BOSCHpompa)	BOSCH 1089
Type:	
Fuel injection	Diesel 4 stroke
Number of cylinders in line	Direct 3
Piston diameter	
T 3.50 F model	**104 mm**
T 3.55 F model	**104 mm**
T 3.65 F model	**104 mm**
T 3.75 F model	**104 mm**
Piston stroke	**115 mm**
Total displacement :	
T 3.50 F model	**2930 cm³**
T 3.55 F model	**2930 cm³**
T 3.65 F model	**2930 cm³**
T 3.75 F model	**2930 cm³**
Compression ratio	18:1
Maximum power	
T 3.50 F model	**36.8 kW** (**50 Hp**)
T 3.55 F model	**40.4 kW** (**55 Hp**)
T 3.65 F model	**47.8 kW** (**65 Hp**)
T 3.75 F model	**53.0 kW** (**72 Hp**)
Maximum torque	
Maximum torque (Nm) at 1400 d/dak: T 3.50 F model	**201 N·m**
Maximum torque (Nm) at 1400 d/dak: T 3.55 F model	**220 N·m**
Maximum torque (Nm) at 1400 d/dak: T 3.65 F model	**261 N·m**
Maximum torque (Nm) at 1400 d/dak: T 3.75 F model	**295 N·m**
Number of main bearings	4
Sump	Structural cast iron
Lubrication	Forced, with gear pump
Pump drive	From camshaft
Engine speed / oil pump speed ratio	2:1
Oil cleaning	Mesh filter on oil intake and cartridge filter on delivery line
Normal oil pressure, with engine hot and at fast idling speed:	**2.9 - 3.9 bar** (**42.0 - 56.6 psi**)
All models	
Lube pressure relief valve	Built into pump housing
Valve opening pressure	**3.5 bar** (**50.8 psi**)
For further lubrication data	See page 19
Cooling system	Coolant circulation
Radiator on T 3.50 F and T 3.55 F models	3 row vertical pipes with copper fins
Radiator on T 3.65 F and T 3.75 F models	4 row vertical pipes with copper fins
Fan, attached to coolant pump pulley T 3.50 F, T 3.55 F, T 3.65F, T 3.75 F models	10 blade steel exhauster fan
Coolant pump	Centrifugal vane-type

General specification	3 cylinder
Engine speed/coolant pump speed ratio	1.403/1
Temperature control	Thermostat
Coolant temperature gauge	Coloured scale, divided into 3 sections
Temperature ranges corresponding to each section:	
Initial white section	**30 - 65 °C**
Middle green section	**65 - 105 °C**
Final red section	**105 - 115 °C**
For further cooling system data	See page 20
Rev counter	Incorporated in instrument panel
Rev counter drive	From gear on camshaft
Timing	Overhead valves operated by a camshaft located in the engine block through tappets, pushrods and rockers. Camshaft is driven by the crankshaft through helical gears.
Intake:	
Start: Before T.D.C	**12 °**
End: After B.D.C	**31 °**
Exhaust:	
Start: Before B.D.C	**50 °**
End: After T.D.C	**16 °**
Valve clearance for timing check	**0.45 mm**
Valve clearance for normal running (engine cold):	
Intake	**0.25 - 0.35 mm**
Exhaust	**0.25 - 0.35 mm**
For further timing data	For valve timing check see **Camshaft - Check (10.106)**.
Fuel system	
Air filter	Dual cartridge dry air filter with clogged filter indicator, centrifugal pre-filter and automatic dust ejector
Fuel pump	Double diaphragm
Fuel Filter	Mesh filter in fuel supply pump and replaceable cartridge on delivery line to injection pump.
Minimum fuel flow rate with pump shaft rotating at **1600 RPM**	**100 L/hour**
Operated by eccentric cam	On camshaft
BOSCH injection pump	Distributor type
All-speed governor, incorporated in pump: BOSCH	Centrifugal counterweights
For further fuel system data:	
For fixed advance (pump setting for start of delivery before TDC) – Pressure setting – Injection order, and other information regarding the BOSCH pump	See pages 10 to 99

Technical specifications

Turbocharger	
Holset	HX25
Fuel injection pump	Distributor type with incorporated speed governor and automatic advance regulator
BOSCH pump:	
T 3.50 F model	L 1135
T 3.55 F model	L 1134
T 3.65 F model	L 1136
T 3.75 F model	L 1137
Direction of rotation	Anti-clockwise
Injection order	1-2-3

Fuel Injectors:	
BOSCH	5090726 5090725
Nozzle holder type	KBEL 83.535
Nozzle type	0432291494
Number of nozzles	6
Diameter of nozzle orifices	**0.23 mm**
Pressure setting	**260 - 272 bar**
Fuel delivery lines – BOSCH pump	
Type	4797506 (TT65) 5090730 (TT50, TT55, TT60)
Dimensions	**6 mm** x **1.5 mm** x **475 mm**

Fuel supply pump data	**mm**
Eccentricity of drive shaft	**3 mm**
Diameter of drive shaft at bushings	**31.975 - 32.000 mm**
Internal diameter of installed and reamed bushings	**32.050 - 32.075 mm**
Interference between bushings and seats	**0.063 - 0.140 mm**
Assembly clearance between shaft and bushings	**0.050 - 0.100 mm**
Thickness of internal washer	**1.45 - 1.50 mm**
Thickness of external washer	**2.93 - 3.00 mm**

Crankcase / cylinder block data	**mm**
Cylinder block	Cast-iron mono-block without cylinder liners, incorporating seatings for crankshaft bearings, camshaft and push rod / tappet assemblies
Internal diameter of cylinder liners	**104.000 - 104.024 mm** (1)
External diameter of cylinder liners	**107.020 - 107.050 mm**
Diameter of cylinder bores	**106.850 - 106.900 mm**
Interference fit between cylinder liners and bores	**0.120 - 0.200 mm**
Liner internal diameter over sizes	**0.4 - 0.8 mm**
Liner external diameter over sizes	**0.2 mm**
Maximum permissible liner ovality or taper due to wear (2)	**0.12 mm**
Diameter of main shell bearing seats	**84.200 - 84.230 mm**
Diameter of camshaft bearing seats:	
Front	**54.780 - 54.805 mm**
Middle	**54.280 - 54.305 mm**
Rear	**53.780 - 53.805 mm**
Diameter of standard tappet bores in crankcase	**15.000 - 15.018 mm**
Spare tappet over sizes	**0.1 mm** – **0.2 mm** – **0.3 mm**

(1) Measured after press-fitting and reaming.
(2) Measure in the area swept by piston rings, both parallel and perpendicular to the crankshaft axis.

Crankshaft and bearings data	**mm**
Crankshaft	Balanced with integral counterweights
Standard journal diameter	**79.791 - 79.810 mm** (1)
Journal under sizes	**0.254 mm** – **0.508 mm** – **0.762 mm** – **1.016 mm**
Standard main bearing shell thickness	**2.168 - 2.178 mm**
Main bearing shell under sizes (internal diameter)	**0.254 mm** – **0.508 mm** – **0.762 mm** – **1.016 mm**
Bearing shell to journal clearance	**0.034 - 0.103 mm**
Maximum permitted wear clearance	**0.180 mm**
Standard crankpin diameter	**63.725 - 63.744 mm** (1)
Crankpin under sizes	**0.254 mm** – **0.508 mm** – **0.762 mm** – **1.016 mm**
Standard big-end bearing shell thickness	**1.805 - 1.815 mm**
Big-end bearing shell under sizes (internal diameter)	**0.254 mm** – **0.508 mm** – **0.762 mm** – **1.016 mm**
Big-end bearing shell to crankpin clearance	**0.033 - 0.087 mm**

Crankshaft and bearings data	mm
Maximum permitted wear clearance	**0.180 mm**
Standard crankshaft thrust washer thickness	**3.378 - 3.429 mm**
Thrust washer over sizes (thickness)	**0.127 mm – 0.254 mm – 0.381 mm – 0.508 mm**
Width of main bearing including thrust washers	**31.766 - 31.918 mm**
Width of corresponding crankshaft journal	**32.000 - 32.100 mm**
Crankshaft assembly end float	**0.082 - 0.334 mm**
Maximum permitted wear end float	**0.40 mm**
Maximum ovality or taper of journals and crankpin after regrinding	**0.01 mm**
Maximum ovality or taper of journals and crankpin	**0.05 mm**
Maximum tolerance for alignment of crankshaft journals with crankshaft supported on the two outer journals	**0.10 mm**
Maximum tolerance for alignment, in both directions, of crankpins or each pair of crankpins	**0.25 mm**
Maximum tolerance for run-out between the outer surfaces of the crankshaft journals and the crankshaft centre line	+ **0.10 mm**

(1) Crankshafts with **0.1 mm** undersize journals and crankpins and consequently undersize bearing shells may be fitted in factory production.

Bench test performance data	mm
Maximum permitted tolerance on run-out of flywheel mounting flange surface relative to the crankshaft centre line, measured with **1 mm**/ **100 mm** scale dial gauge resting on front flange surface at a diameter of **108 mm** (total gauge reading)	**0.025 mm**
Maximum permitted tolerance on co-axial alignment of flywheel centering seat relative to the crankshaft journals (total gauge reading)	**0.04 mm**

Connecting rod data	mm
Connecting rods	Cast-iron with oil way
Diameter of small end bushing seat	**41.846 - 41.884 mm**
Outside diameter of small end bushing	**41.979 - 42.017 mm**
Interference between small end bushing and seat	**0.095 - 0.171 mm**
Inside diameter of small end bushing (measured after fitting)	**38.004 - 38.014 mm**
Diameter of big end shell bearing seats	**67.407 - 67.422 mm**
Maximum tolerance for parallelism between the small end and big end axes measured at **25 mm**	+ **0.07 mm**
Maximum weight difference between con rods in same engine	**25 g**

Piston data	mm
	T3.50F, T3.55F, T3.65F and T3.75F
Pistons	Light alloy with two compression rings and one oil control ring
Standard piston diameter, measured at **57 mm** from base and perpendicularly to the gudgeon pin axis	**103.852 - 103.870 mm**
Piston clearance in cylinder liner	**0.130 - 0.172 mm**
Maximum permitted wear clearance	**0.30 mm**
Piston over sizes	**0.6 mm**
Piston protrusion at TDC from cylinder block face	**0.355 - 0.761 mm**
Gudgeon Pin Diameter	**37.983 - 37.990 mm**
Diameter of gudgeon pin seat in piston	**37.994 - 38.000 mm**
Gudgeon pin to seat clearance	**0.004 - 0.017 mm**

Piston data	mm
Gudgeon pin to small end bearing clearance	**0.014 - 0.031 mm**
Maximum permitted wear clearance	**0.06 mm**
Maximum weight difference between pistons in same engine	**20 g**
Piston ring groove clearance (measured vertically):	
Top	**0.090 - 0.122 mm**
Second	**0.060 - 0.092 mm**
Bottom	**0.040 - 0.075 mm**
Maximum permissible clearance (wear limit):	
Top	**0.50 mm**
Second and bottom	**0.20 mm**
Piston ring end gap (fitted):	
Top	**0.40 - 0.65 mm**
Second	**0.30 - 0.55 mm**
Bottom	**0.30 - 0.55 mm**
Maximum permissible gap (wear limit)	**1.20 mm**

Valve timing gear data	mm
Timing gear tooth backlash	**0.160 mm**
Inside diameter of intermediate gear bushings (fitted and reamed)	**37.050 - 37.075 mm**
Diameter of intermediate gear journal	**36.975 - 37.000 mm**
Journal to bushing clearance	**0.050 - 0.100 mm**
Maximum permissible clearance (wear limit)	**0.15 mm**
Bushing interference fit in seat in intermediate gear	**0.063 - 0.140 mm**
Outside diameter of camshaft bearings:	
Front	**54.875 - 54.930 mm**
Middle	**54.375 - 54.430 mm**
Rear	**53.875 - 53.930 mm**
Interference between bearings and seats in cylinder block	**0.070 - 0.150 mm**
Inside diameter of camshaft bearings (fitted and reamed):	
Front	**51.080 - 51.130 mm**
Middle	**50.580 - 50.630 mm**
Rear	**50.080 - 50.130 mm**
Diameter of camshaft journals:	
Front	**50.970 - 51.000 mm**
Middle	**50.470 - 50.500 mm**
Rear	**49.970 - 50.000 mm**
Clearance between camshaft journals and bearings	**0.080 - 0.160 mm**
Maximum permissible clearance (wear limit)	**0.20 mm**
Camshaft end float between thrust plate and seat on camshaft	**0.070 - 0.220 mm**
For further valve timing gear data	

Tappet data	mm
Tappet bore in crankcase	**15.000 - 15.018 mm**
Outside diameter of standard tappet	**14.950 - 14.970 mm**
Tappet running clearance	**0.030 - 0.068 mm**
Maximum permissible clearance (wear limit)	**0.15 mm**
Spare tappet over sizes	**0.1 mm – 0.2 mm – 0.3 mm**

Rocker arm – valve data	mm
Diameter of shaft bores in rocker arms	**18.016 - 18.034 mm**
Rocker-arm shaft diameter	**17.982 - 18.000 mm**
Rocker shaft to rocker arm bore clearance	**0.016 - 0.052 mm**
Maximum permissible clearance (wear limit)	**0.15 mm**

Rocker arm – valve data	mm
Rocker arm spacing springs:	
Free spring length	**59.5 mm**
Length under load of **46 - 52 N** (**10.3 - 11.7 lb**)	**44 mm**
Length under load of **46 - 52 N** (**10.3 - 11.7 lb**)	**0.45 mm**
Cam lift:	
Inlet valve	**5.97 mm**
Exhaust valve	**6.25 mm**

Cylinder head data	mm
Cylinder head	With valve seats cut directly in the casting and press-fitted steel valve guides.
Original height of cylinder head	**92 mm**
Maximum surface regrinding depth	**0.5 mm**
Diameter of standard valve guide bores in head	**13.950 - 13.983 mm**
Outside diameter of standard valve guides	**13.993 - 14.016 mm**
Guide interference fit in bores	**0.010 - 0.066 mm**
Inside diameter of valve guide (fitted in head)	**8.023 - 8.043 mm**
Valve stem diameter	**7.985 - 8.000 mm**
Assembly clearance between valve stem and guide	**0.023 - 0.058 mm**
Maximum permissible clearance (wear limit)	**0.13 mm**
Maximum run-out of valve guide on its stem measured through **360 °** with dial gauge contact point resting on valve head contact band	**0.03 mm**
Valve guide over sizes	**0.2 mm**
Valve seat angle in head:	
Inlet valve	**60 °** + 5’
Exhaust valve	**45 °** + 5’
Valve face angle:	
Inlet valve	**60 °** 30’ ± 7’
Exhaust valve	**45 °**30’ ± 7’
Valve head diameter:	
Inlet valve	**45.300 - 45.500 mm**
Exhaust valve	**37.500 - 37.750 mm**
Valve stand-in relative to cylinder head face	**0.7 - 1.0 mm**
Maximum permissible valve stand-in	**1.3 mm**
Inlet and exhaust valve springs:	
Free spring length	**44.6 mm**
Length with valve closed, under load of **256 - 284 N** (**57.6 - 63.8 lb**)	**34 mm**
Length with valve open, under load of **502 - 544 N** (**112.9 - 122.3 lb**)	**23.8 mm**
Injector protrusion relative to pump head face:	
• BOSCH injector	**0.3 - 1.1 mm**

Lubrication system data	mm	
	T3.50F , T3.55F	T3.65F , T3.75F
Assembly clearance between oil pump drive shaft and bushing	**0.016 - 0.055 mm**	–
Clearance between shaft and driven gear	**0.033 - 0.066 mm**	–
Tooth backlash between drive and driven gears	**0.100 mm**	–
Radial clearance between drive and driven gears and housing	**0.060 - 0.170 mm**	–
Thickness of drive and driven gears	**40.961 - 41.000 mm**	–
Height of gear seat in pump	**41.025 - 41.087 mm**	–

Lubrication system data	mm	
End float between gears and gear housing in pump	**0.025 - 0.126 mm**	–
Pressure relief valve spring:		–
Free length	**45 mm**	**35.9 mm**
Length under load of **45 - 49 N** (**10.1 - 11.0 lb**)	**37.5 mm**	–
Length under load of **88 - 94 N** (**19.8 - 21.1 lb**)	**30.5 mm**	–
Length under load of **127.8 - 141.2 N** (**28.7 - 31.7 lb**) (2, Fig 146)	–	**29 mm**
length under load of **233.4 - 258 N** (**52.5 - 58.0 lb**) (2, Fig 146)	–	**23.2 mm**
For further lubrication system data	See page 19	

Cooling system data	mm
Interference fit between pump impeller and shaft	**0.017 - 0.059 mm**
Interference fit between fan hub and shaft	**0.024 - 0.058 mm**
Interference fit between front seal bushing and impeller	**0.012 - 0.058 mm**
For further cooling system data	See page 20

Engine - Torque

T3.F	WE

Angle tightening torque data

Fasteners	Thread	Preliminary torque		Angle tightening
Cylinder head bolts **(1)** Fig. 3	M 12 x 1.25	**39.2 N·m** + **39.2 N·m**	**4 kgm** + **4 kgm**	**120 °** + **120 °**
Main bearing cap bolts **(2)** Fig. 3	M 14 x 1.5	**80 N·m**	**8.2 kgm**	**90 °**
Big-end cap bolts **(3)** Fig. 3	M 12 x 1.5	**40 N·m**	**4.1 kgm**	**60 °**
Flywheel mounting bolts **(4)** Fig. 3	M 12 x 1.25	**40 N·m**	**4.1 kgm**	**60 °**

Tightening torque data

Fasteners	Thread	Tightening torque	
Rocker shaft pedestal bolts **(5)** Fig. 3 (ref. **Engine and crankcase - Sectional view (10.001)**)	M8	**25 N·m**	**2.5 kgm**
Crankshaft hub retaining nut **(6)** Fig. 3 (ref. **Engine and crankcase - Sectional view (10.001)**)	M30 x 1.5	**294 N·m**	**30 kgm**
Fan and alternator pulley bolts **(7)** Fig. 3 (ref. **Engine and crankcase - Sectional view (10.001)**)	M10 x 1.25	**55 N·m**	**5.6 kgm**
Inlet manifold retaining bolts	M8	**25 N·m**	**2.6 kgm**
Alternator and belt tension adjustment nut	M10 x 1.25	**55 N·m**	**5.6 kgm**
Coolant pump retaining bolts	M10 x 1.25	**55 N·m**	**5.6 kgm**
Rocker cover nuts	M8	**25 N·m**	**2.6 kgm**
Oil pump and pump cover retaining bolts	M8	**25 N·m**	**2.6 kgm**
Timing gear case and cover bolts	M8	**25 N·m**	**2.6 kgm**
Intermediate flanged journal bolts	M10 x 1.25	**55 N·m**	**5.6 kgm**
Camshaft thrust plate retaining bolts	M8	**35 N·m**	**3.6 kgm**
Rear crankcase cover bolts	M8	**25 N·m**	**2.6 kgm**
Tappet adjuster screw locknuts	M8	**22 N·m**	**2.2 kgm**
Exhaust manifold retaining bolts	M8	**25 N·m**	**2.6 kgm**
Injection pump mounting nuts	M8	**25 N·m**	**2.6 kgm**
Sump pan retaining bolts, to			
Inner rear timing cover and gear case	M10 x 1.25	**39 - 49 N·m**	**4 - 5 kgm**
Cylinder block and flywheel case	M10 x 1.25	**49 - 59 N·m**	**5 - 6 kgm**

Engine - Special tools

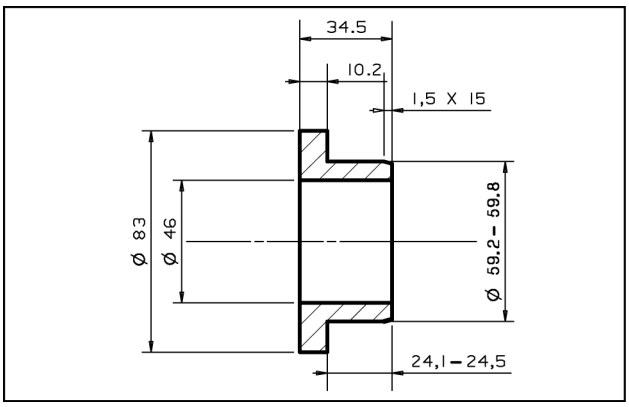
T3.F	WE

⚠ WARNING: The operations described in this section can only be carried out with the ESSENTIAL tools indicated by an **(X)**.
To work safely and efficiently and obtain the best results, it is also necessary to use the recommended specific tools listed below and certain other tools which are to be made according to the drawings included in this manual.

List of specific tools required for the various operations described in this section.

X	292320	Tractor dismantling stand
	290740	Engine lifting hook
	290090	Rotating engine service stand
	293860	Engine mounting brackets for rotating stand 290090
X	291309	Compression test kit (complete with dummy injector 293862)
	291966	Digital rev counter
	291979	Digital temperature gauge
	292870	Engine oil pressure test kit
	293679	Filter cartridge removal tool
X	296118	Drive belt tension test tool
X	291160	Piston ring pliers
X	291048	Piston ring clamp
X	292248	Protractor for angular torque measurement
X	291504	Puller for crankshaft pulley hub
X	291883	Wrench for valve clearance adjustment
X	291046	Punch for valve guide extraction / installation
X	294027	Twist bit for enlarging valve guide bore
X	294028	**8 °** tapered grinder for swaging exhaust valve guides
X	293231	Bush for valve guide installation (with 291046)
X	291177	Valve guide reamer
X	291050	Valve spring compressor
X	293270	Set of grinding tools for regrinding injector seat
X	291182	Puller for coolant pump impeller
X	293280	Drift for installation of coolant pump impeller seal
	293814	Check set, turbocharger (TT65)
	293786	Wrench for injection pump delivery line unions
	293671	Injector cleaning kit
X	293761	Wrench set for injector dismantling
	293780	Injection check hand pump
	290284	Hand pump for injector calibration test
	Injection pump bench test	
	291754	Dial gauge (**1 mm** / **100 mm** scale, **5 mm** stroke, Ø **40 mm** with 291755)
	291755	Device for BOSCH injection pump timing on engine.
X	295042	Extractor for injection pump drive gear

Splining tool to be manufactured for assembling the crankshaft front seal.
Material UNI C40.



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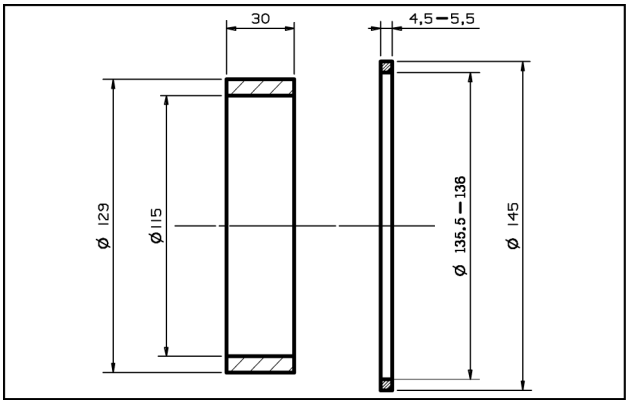
Splining tool to be manufactured for assembling the crankshaft front seal.
Material UNI C40.



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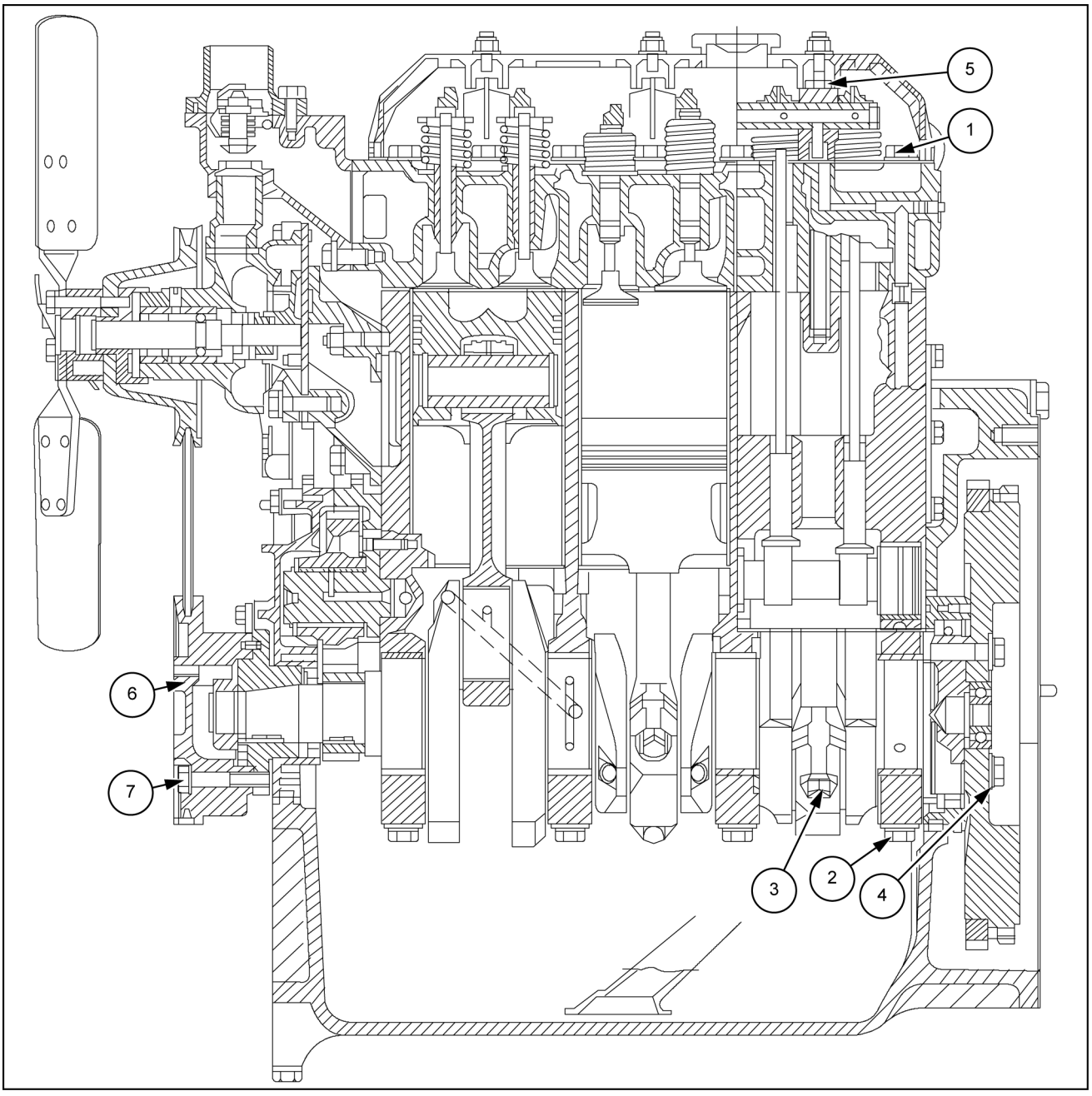
Engine and crankcase - Sectional view

T3.F	WE

Longitudinal section of 3–cylinder



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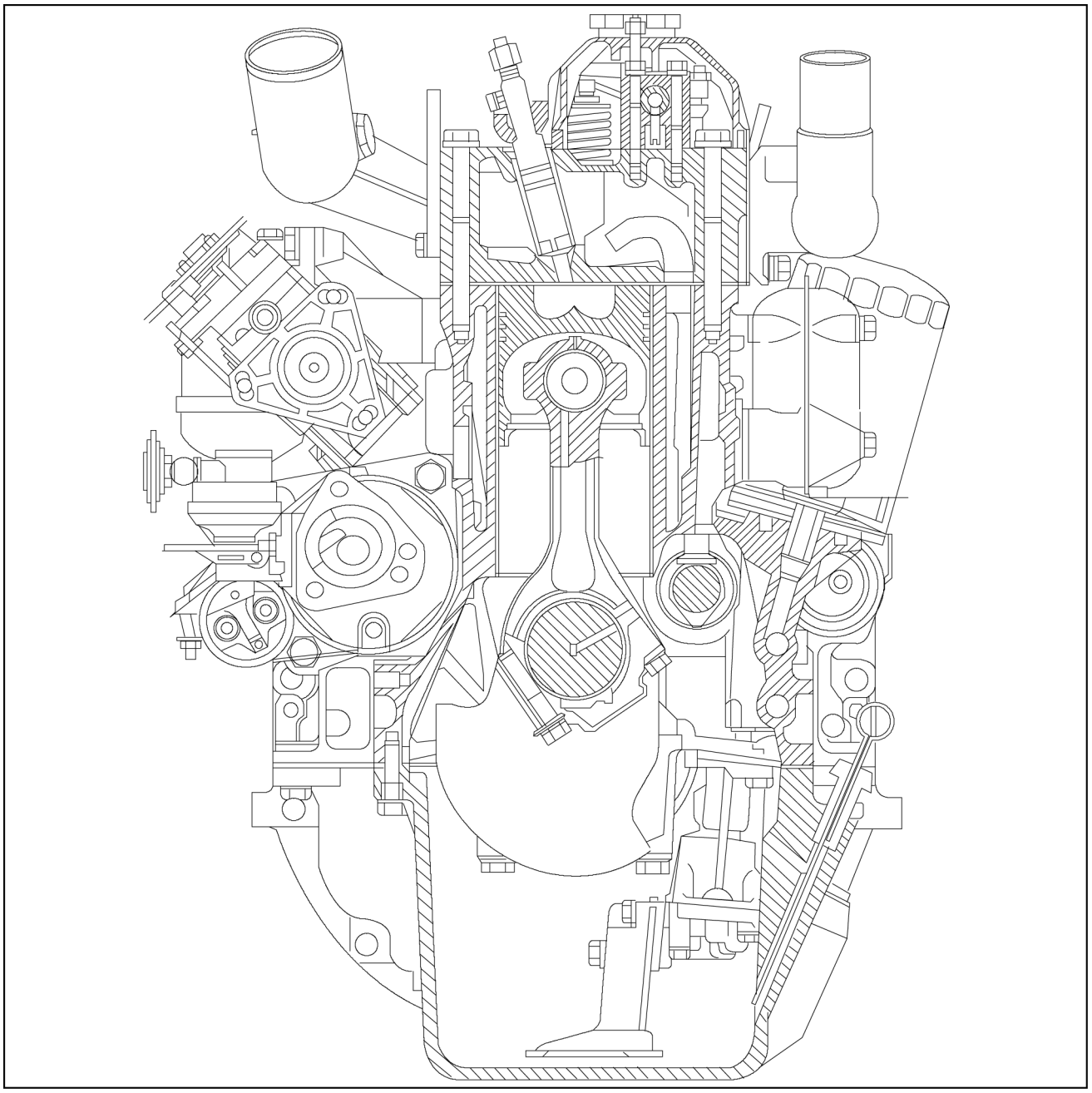
Cross–section of 3–cylinder engine



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