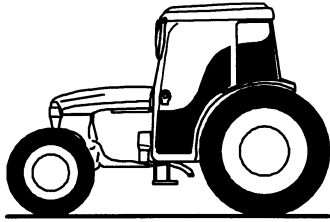


Product: New Holland TN55V/TN65V/TN75V Tractor Service Repair Manual

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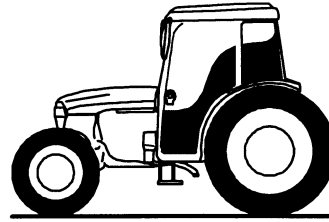
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**TNV, TNN
TRACTOR
REPAIR**

**TN55V, TN65V, TN75V,
TN65N, TN75N**

**Vol. 1
86627058**



**TNV, TNN
TRACTOR
REPAIR**

**TN55V, TN65V, TN75V,
TN65N, TN75N**

**Vol. 1
86627058**



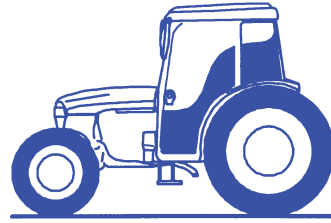
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NEW HOLLAND

TN55V TN65V

TN75V TN65N

TN75N

REPAIR MANUAL

Section 00 - General
Section 10 - Engine
Section 18 - Clutch
Section 21 - Transmissions



NEW HOLLAND

SERVICE

TN55V, TN65V, TN75V, TN65N, TN75N REPAIR MANUAL CONTENTS



SECTION 00 - GENERAL

SECTION 10 - ENGINE

SECTION 18 - CLUTCH

SECTION 21 - TRANSMISSIONS

SECTION 23 - DRIVE LINES

SECTION 25 - FRONT AXLE MECHANICAL TRANSMISSION

SECTION 27 - REAR MECHANICAL WHEEL DRIVE

SECTION 31 - MECHANICAL POWER TAKE-OFF

SECTION 33 - BRAKING SYSTEM

SECTION 35 - HYDRAULIC SYSTEMS

SECTION 41 - STEERING

SECTION 44 - AXLES AND WHEELS

SECTION 50 - CAB AIR CONDITIONING SYSTEM

SECTION 55 - ELECTRICAL SYSTEM

SECTION 90 - PLATFORM, CAB, BODYWORK

The sections used through out all New Holland product Repair manuals may not be used for each product. Each Repair manual will be made up of one or several books. Each book will be labeled as to which sections are in the overall Repair manual and which sections are in each book.

The sections listed above are the sections utilized for the TNV/TNN Tractors.

GENERAL INSTRUCTIONS**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 operations, disconnect and isolate the battery negative lead, unless otherwise requested for specific operations (e.g.: operations that require the engine running). Once the specific operation has been completed, disconnect the lead in order to complete the operation.

SHIMMING

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

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

- remove any incrustations using a wire brush;
- thoroughly de-grease the surfaces using one of the following cleaning agents: trichlorethylene, petrol or a water and soda solution.

BEARINGS

When installing bearings it is advised to:

- heat the bearings at 80 to 90 °C (176 to 194 °F) before fitting on the shafts;
- allow the bearings to cool before installing them from the outside.

SPRING PINS

When fitting split socket spring 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

Only use original NEW HOLLAND spare parts bearing the logo shown below.



1

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

Only **original NEW HOLLAND spare parts** can offer this guarantee.

When ordering spare parts, always provide the following information:

- vehicle 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.

TOOLS

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

- specifically researched and designed for use with NEW HOLLAND vehicles;
- essential for reliable repair operations;
- accurately built and rigorously tested so as to offer efficient and long-lasting operation.

By using these tools, repair personnel will benefit from:

- operating in optimal technical conditions;
- obtaining the best results;
- saving time and effort;
- working in safe conditions.

CAUTION

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 vehicle 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 vehicle 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.

SAFETY REGULATIONS

WARNING AND DANGER SYMBOL

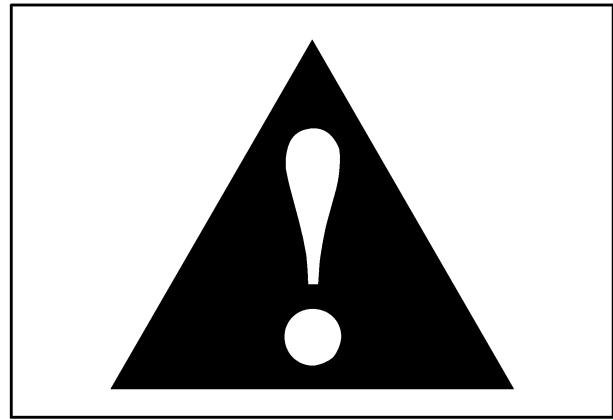
This warning symbol points out important messages concerning your safety.

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:

CAUTION – Warnings concerning unsuitable repair operations that may jeopardise the safety of Service personnel.

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

**ACCIDENT PREVENTION**

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 vehicles, 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 REGULATIONS**GENERAL GUIDELINES**

- Carefully follow specified repair and maintenance procedures.
 - Do not wear rings, wristwatches, jewellery, unbuttoned or loose articles of clothing such as: ties, torn clothing, scarves, open jackets or shirts with open zips that may remain entangled in moving parts. It is advised to wear approved safety clothing, e.g.: non-slip 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.
- 2
- Stop the engine and check that the hydraulic circuits are pressure-free 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 the workshop or elsewhere should be built according to standard accident prevention regulations.
 - Disconnect the batteries and label all controls to indicate that the vehicle is being serviced. Any parts that are to be raised must be locked in position.
 - 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 position until filling operations are completed in order to avoid possible sparks caused by the accumulation of static electricity.
 - 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 gasoline 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 (30.46 psi), 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.
 - Never use naked flames for lighting when working on the machine or checking for leaks.
 - All movements must be carried out carefully when working under, on or near the vehicle. Wear protective equipment: helmets, goggles and special footwear.
 - 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.
 - 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 store rags in a closed metal container. Before starting the vehicle or implements, make sure that the driver's seat is locked in position. 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 carefully. Do not put your hands or fingers between moving parts. Wear suitable safety clothing - safety goggles, gloves and shoes.
- ### START UP
- 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 the engine 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 not 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, **NEVER USE HANDS TO CHECK FOR LEAKS.** use a piece of cardboard or wood for this purpose. 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 the rims and tyres for damage.
- 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 use parts of recovered wheels as incorrect welding brazing or heating may weaken and eventually cause damage to the wheel.
- 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 objects that may be jammed in the tyre tread.
- Never inflate tyres using inflammable gases; as this may result in explosions and injury to bystanders.

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 carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.
- Avoid twisting chains or metal cables. Always wear safety gloves when handling cables or chains.

CONSUMABLES

COMPONENT TO BE FILLED OR TOPPED UP	QUANTITY litres (gallons)	RECOMMENDED NEW HOLLAND PRODUCTS	NEW HOLLAND SPECIFICATIONS	INTERNATIONAL SPECIFICATIONS
Cooling system: without cab with cab	10 (2.64) 12 (3.17)	Water and AMBRA AGRIFLU liquid 50% + 50%	NH 900 A	-
Windscreen washer bottle ...	2 (0.53)	Water and liquid detergent	-	-
Fuel tank: - TN55V, TN65V, TN75V - TN65N, TN75N)	57 (15.06) 55 (14.53)	Decanted and fil- tered diesel fuel	-	-
Engine sump: without filter: with filter:	6.7 (1.77) 7.5 (1.98)	AMBRA SUPER GOLD oil 15W - 40	NH 330G (SAE 15W-40)	API CF-4/SG CCMC D4 MIL-L-2104E
Brake circuit With front brakes	0.5 (0.13) 0.7 (0.18)	AMBRA BRAKE LHM oil	NH 610 A	ISO 7308
Front axle: - housing casing models TN65N, TN75N - housing casing models TN55V, TN65V, TN75V with brake without brake - lateral reduction gear units models TN65N, TN75N (each): with brake without brake - lateral reduction gear units models TN55V, TN65V, TN75V (each):	2.8 (0.74) 4.0 (1.06) 4.0 (1.06) 1.75 (0.46) 1.0 (0.26) 0.6 (0.16)	AMBRA MULTI G oil	NH 410 B	API GL4 ISO 32/46 SAE 10W-30
Rear transmission (bevel drive, final drives and brakes), gearbox, hydraulic lift, PTO and hydraulic steering:	44 (11.62)			
Grease fittings	-	AMBRA GR9 grease	NH 710 A	NLGI 2

SECTION 10 - ENGINE**Chapter 1 - Engine****CONTENTS**

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GENERAL SPECIFICATIONS	
Engine type:	
- 65 Hp TN 55V – type 8035.05B.227/228/527 (BOSCH pump)	See data page 6–7
- 65 Hp TN 65V and TN 65N – type 8035.05R.237/238/537 (BOSCH pump)	See data page 8–9
- 65 Hp TN 75V and TN 75N – type 8035.25.227/228/527 (BOSCH pump) .	See data page 10–11
Cycle	diesel, 4–stroke
Fuel injection	direct
No. of in–line cylinders	3
Cylinder liners	dry force–fitted in cylinder block
Piston diameter:	
- 65 Hp TN 55V	104 mm (4.09 inches)
- 65 Hp TN 65V and TN 65N	104 mm (4.09 inches)
- 65 Hp TN 75V and TN 75N	104 mm (4.09 inches)
Piston stroke	115 mm (4.53 inches)
Total displacement:	
- 65 Hp TN 55V	2931 cm ³ (0.77 gallons)
- 65 Hp TN 65V and TN 65N	2931 cm ³ (0.77 gallons)
- 65 Hp TN 75V and TN 75N	2931 cm ³ (0.77 gallons)
Compression ratio, models TN 55V, TN 65V and TN 65N	17:1 normal intake
Compression ratio, model TN 75V and TN 75N	16.5:1 turbocharged
Maximum power:	
- 65 Hp TN 55V	37 kW (50 HP)
- 65 Hp TN 65V and TN 65N	44 kW (60 HP)
- 65 Hp TN 75V and TN 75N	53 kW (72 HP)
Max. power speed	2300 rpm
Max. torque speed: model TN 55V	1400 rpm
Max. torque speed: model TN 65V and TN 65N	1400 rpm
Max. torque speed: model TN 75V and TN 75N	1400 rpm
Number of main bearings	4
Sump pan	structural, cast iron

(continued)

(continued)

GENERAL SPECIFICATIONS	
Lubrication Pump drive Engine speed/oil pump speed ratio Oil cleaning Normal oil pressure, warm engine running at max. speed: For models TN 55V, TN 65V and TN 65N For model TN 75V and TN 75N (opening pressure) Pressure relief valve Valve opening pressure For further lubrication technical data	forced, with gear pump camshaft 2:1 mesh screen on oil pick-up and filter cartridge in delivery line 2.9 to 3.9 bar (42.06 to 56.57 psi) ~ 6 bar (87 psi) built into pump housing 3.5 bar (50.8 psi) See page 19
Cooling system Radiator on models TN 55V, TN 65V and TN 65N Radiator on model TN 75V and TN 75N Fan, attached to coolant pump pulley Coolant pump Engine speed/coolant pump speed ratio Temperature control Coolant thermometer Temperature ranges corresponding to each section: – initial white section – middle green section (normal working conditions) – final red section For further cooling system data	water circulation 3-row vertical pipes with copper fins 4-row vertical pipes with copper fins 6-blade steel exhauster fan centrifugal vane-type 1:1.25 thermostat coloured scale divided into 3 sections 30° to 65° C (86° to 149° F) 65° to 105° C (149° to 221° F) 105° to 115° C (221° to 239° F) See page 19
Rev counter Operating system Hour counter calibrated for engine speed of	incorporated in control panel from gear on camshaft 1800 rpm

(continued overleaf)

GENERAL SPECIFICATIONS	
Timing Inlet: - start: before TDC - end: after BDC Exhaust: - start: before BDC - end: after TDC Valve clearance for timing check Valve clearance for normal running (engine cold): - inlet - exhaust For further timing data	overhead valves operated camshaft located in engine block through tappets, pushrods and rockers; camshaft is driven by the crankshaft through helical gears 12° 31° 50° 16° 0.45 mm (0.02 inches) 0.30 ± 0.05 mm (0.01 ± 0.002 inches) 0.30 ± 0.05 mm (0.01 ± 0.002 inches) See page 16
Fuel system Air cleaning Fuel supply pump Fuel filtering Minimum fuel flow rate with pump shaft rotating at 1600 rpm . Operated by eccentric cam BOSCH injection pump All-speed governor, incorporated in pump: BOSCH Automatic advance regulator, incorporated in pump: BOSCH 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	dual cartridge dry air filter, with clogged filter indicator with centrifugal pre-filter and automatic dust ejector double diaphragm through wire filter in fuel supply pump, and replaceable cartridge on delivery line to injection pump 100 litres/hour (26.42 gallons/hour) on camshaft distributor type centrifugal counterweights hydraulic refer to the data for the relevant engine type in the table on page 2

FUEL SYSTEM DATA

Turbocharger (model TN 75V and TN 75N):	
- GARRETT type	T 25
Injection pump	distributor type with incorporated speed governor and automatic advance regulator
BOSCH pump:	
- 65 Hp TN 55V	VE 3/11 F 1150 L 767 - 99441584
- 65 Hp TN 65V and TN 65N	VE 3/11 F 1150 L 766 - 99441586
- 65 Hp TN 75V and TN 75N	VE 3/11 F 1150 L 764 - 99441587
Direction of rotation	counter-clockwise
Injection order	1-2-3

Injectors:	
BOSCH type	500307714
- Nozzle holder type	4791124
- Nozzle type	DLLA 132S 1320 - 99469341
Number of nozzle orifices	5
Diameter of nozzle orifices	0.23 mm (0.01 inches)
Pressure setting	260 to 272 bar (3771.2 to 3945.2 psi)
Fuel delivery lines - BOSCH pump	
- type	99441952
- dimensions	6 x 1.75 x 540 mm (0.24 x 0.07 x 21.26 in.)

MODEL TN 55V - CALIBRATION DATA FOR BOSCH INJECTION PUMP
TYPE VE 3/11 F 1150 L 767 - VE 3/11 F 1150 L 767-1 - 99441584 - 500324953

ASSEMBLY DATA

Pump timing on engine: delivery start $9^{\circ} \pm 0.5^{\circ}$ before TDC of cylinder 1 compression stroke.

Plunger pre-lift for timing on engine: mm 1 from P.M.I. (with tools **291754** - **291755**).

Cylinder No.1 delivery line union on pump: marked with letter A.

ASSEMBLY DIMENSIONS

SYMBOL	K	MS	ya	yb
mm (in.)	-	-	38.5 to 40.5 (1.52 to 1.59)	42.8 to 48.0 (1.69 to 1.89)

CALIBRATION TEST CONDITIONS

Test bench conforming to ISO 4008/1 .../2

Injectors conforming to ISO 7440-A61 - (1.688.901.027 and pad with calibrated hole $\varnothing$ 0.5 mm; 0.02 in.).

Injector pressure setting 250 to 253 bar (3626.1 to 5120.1 psi).

Supply pressure:

..... 0.35 $\pm$ 0.05 bar (5.1 $\pm$ 0.7 psi).

Delivery pipes (conforming to ISO 4093.2):

..... 6 x 2 x 450 mm (0.24 x 0.08 x 17.72 in.)

Graduate drain time: : 30".

Test liquid: ISO 4113 at a temperature of $45^{\circ} \pm 1^{\circ}\text{C}$ ($113^{\circ} \pm 2^{\circ}\text{F}$).

1. START OF DELIVERY

Plunger pre-lift from TDC: mm -	Pump rotation (viewed from drive side): counter-clockwise	Injection order: 1-2-3
------------------------------------	--	------------------------

2. ADVANCE REGULATOR STROKE

Rpm: 1200	Advance stroke: mm 0.7 to 1.1 (inches 0.03 to 0.04)
-----------	---

3. FUEL SUPPLY PUMP PRESSURE

Rpm: 1200	Internal pressure: bar 8.1 to 8.7 (psi 117.5 to 126.2)
-----------	--

4. FULL LOAD DELIVERY

Rpm: 700	Delivery per 1000 shots: cm ³ 59.5 to 60.5 (gal. 0.0157 to 0.0159)	Spread: cm ³ - 3.5 (gal. -0.000925)
----------	--	---

5. SPREAD GOVERNOR AT IDLE SPEED

Rpm: 325	Delivery per 1000 shots: cm ³ 8.4 to 12.4 (gal. 0.0022 to 0.0032)	Spread: cm ³ (gal.)
----------	---	--------------------------------

6. SPREAD GOVERNOR AT MAXIMUM SPEED

Rpm: 1220	Delivery per 1000 shots: cm ³ 27 to 33 (gal. 0.007 to 0.008)	Spread: -
-----------	--	-----------

7. DELIVERY AT STARTING

Rpm: 100	Delivery per 1000 shots: cm ³ 60 to 100 (gal. 0.016 to 0.026)
----------	--

8. INJECTION ADVANCE PROGRESSION

Rpm	1200	1250
Advance stroke	mm (in.) 0.7 to 1.1 (0.03 to 0.04)	1.4 to 1.8 (0.06 to 0.07)

9. TRANSFER PRESSURE PROGRESSION

Rpm	1200	400	700
Internal pressure supply	bar (psi) 8.1 to 8.7 (117.5 to 126.2)	3.2 to 3.8 (46.4 to 55.1)	4.7 to 6.1 (68.1 to 88.5)

10. BACKFLOW

Rpm	400	1150
Backflow	l/h (gal./h) 13 to 33 (3.43 to 8.72)	25 to 37 (6.60 to 9.77)

(continued overleaf)

Note: the values shown above in brackets must be used for checking purposes only.

11. DELIVERY PROGRESSION

Rpm	Delivery per 1000 shots: cm ³ (gallons)
1280	0 to 3.0 (0 to 0.0008)
1220	27 to 33 (0.007 to 0.008)
1150	50.5 to 53.5 (0.013 to 0.014)
700	59.5 to 60.5 (0.0157 to 0.0159)
400	52.8 to 60.8 (0.0139 to 0.016)

12. ZERO CAPACITY (STOP)

Rpm	Voltage (volts)	Delivery per 1000 shots: cm ³ (gal.)
325	0	0 to 3 (0 to 0.0008)

13. DELIVERY CHECK AT IDLE SPEED

Rpm		325	400	250
Delivery per 1000 shots:	cm ³ (gal.)	8.4 to 12.4 (0.002 to 0.003)	0 to 3.0 (0 to 0.0008)	31.2 to 39.2 (0.008 to 0.010)

Note: the values shown above in brackets must be used for checking purposes only.

15. AUTOMATIC START SUPPLEMENT

Rpm	Delivery per 1000 shots: cm ³ (gallons)
100	60 to 100 (0.0158 to 0.0264)
250	49 to 57 (0.0129 to 0.0151)
150	75 to 105 (0.0198 to 0.0277)

BENCH TEST PERFORMANCE DATA**Test conditions**

Fixed advance before TDC cylinder No.1 in compression stroke:
(see previous page)

Engine without fan, air filter and exhaust silencer.

Atmospheric pressure 990 ± 10 mbar (14.36 ± 0.15 psi).

Relative humidity 70%_o ± 5.

Ambient temperature
25° ± 3° C (77° ± 37.4° F).

Specific gravity of diesel fuel
840 g/l. (7 lb./gal.)

Throttle lever position	Braking load applied	Engine speed rpm	Power output with engine run-in for a total of:		Fuel consumption kg/h (lb./h)
			2 hours kW (hp)	50 hours kW (hp)	
Maximum	For maximum power output	2300	≥ 34.9 (47.4)	35.7 to 37.9 (48.5 to 51.5)	8.0 to 8.5 (17.64 to 18.74)
Maximum	For maximum torque	1400	≥ 27.3 (37.1)	27.9 to 29.6 (37.9 to 40.3)	6.0 to 6.4 (13.23 to 14.11)
Maximum	None (no-load)	2470 to 2500	-	-	-
Minimum	None (no-load)	625 to 675	-	-	-

MODEL TN 65V AND TN 65N - CALIBRATION DATA FOR BOSCH INJECTION PUMP

TYPE VE 3/11 F 1150 L 766 - VE 3/11 F 1150 L 766-1 - 99441586 - 500324955

ASSEMBLY DATA

Pump timing on engine: delivery start $9^{\circ} \pm 0.5^{\circ}$ before TDC of cylinder 1 compression stroke.

Plunger pre-lift for timing on engine: mm 1 (0.04 in.) from P.M.I. (with tools **291754** – **291755**).

Cylinder No.1 delivery line union on pump: marked with letter A.

ASSEMBLY DIMENSIONS

SYMBOL	K	MS	ya	yb
mm (in.)	–	–	36.5 to 38.5 (1.44 to 1.52)	41.4 to 46.6 (1.63 to 1.83)

CALIBRATION TEST CONDITIONS

Test bench conforming to ISO 4008/1 .../2

Injectors conforming to ISO 7440-A61 – (1.688.901.027 and pad with calibrated hole $\varnothing$ 0.5 mm; 0.02 in.).

Injector pressure setting 250 to 253 bar (3626.1 to 5120.1 psi).

Supply pressure:

..... 0.35 $\pm$ 0.05 bar (5.1 $\pm$ 0.7 psi).

Delivery pipes (conforming to ISO 4093.2):

..... 6 x 2 x 450 mm (0.24 x 0.08 x 17.72 in.)

Graduate drain time: : 30".

Test liquid: ISO 4113 at a temperature of $45^{\circ} \pm 1^{\circ}\text{C}$ ($113^{\circ} \pm 2^{\circ}\text{F}$).

1. START OF DELIVERY

Plunger pre-lift from TDC: mm –	Pump rotation (viewed from drive side): counter-clockwise	Injection order:1–2–3
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2. ADVANCE REGULATOR STROKE

Rpm: 1240	Advance stroke: mm 0.4 to 1.4 (inches 0.016 to 0.055)
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3. FUEL SUPPLY PUMP PRESSURE

Rpm: 1200	Internal pressure: bar 7.7 to 8.9 (psi 111.7 to 129.1)
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4. FULL LOAD DELIVERY

Rpm: 700	Delivery per 1000 shots: cm ³ 64.1 to 69.1 (gal. 0.017 to 0.018)	Spread: cm ³ $\leq$ 3.5 (gal. $\leq$ 0.000925)
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5. SPREAD GOVERNOR AT IDLE SPEED

Rpm: 325	Delivery per 1000 shots: cm ³ 15.9 to 23.9 (gal. 0.004 to 0.006)	Spread: cm ³ $\leq$ 4.0 (gal. $\leq$ 0.00106)
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6. SPREAD GOVERNOR AT MAXIMUM SPEED

Rpm: 1200	Delivery per 1000 shots: cm ³ 43.5 to 54.5 (gal. 0.011 to 0.014)	Spread:–
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7. DELIVERY AT STARTING

Rpm: 100	Delivery per 1000 shots: cm ³ 55 to 95 (gal. 0.015 to 0.025)
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8. INJECTION ADVANCE PROGRESSION

Rpm	1240	1280
Advance stroke mm (in.)	0.4 to 1.4 (0.016 to 0.055)	1.3 to 1.9 (0.051 to 0.075)

9. TRANSFER PRESSURE PROGRESSION

Rpm	1200	400	
Internal pressure supply bar (psi)	7.7 to 8.9 (111.7 to 129.1)	3.5 to 4.7 (50.8 to 68.17)	

10. BACKFLOW

Rpm	400	1100
Backflow l/h (gal./h)	14 to 22 (3.70 to 5.81)	22 to 42 (5.81 to 11.10)

(continued overleaf)

Note: the values shown above in brackets must be used for checking purposes only.

11. DELIVERY PROGRESSION

Rpm	Delivery per 1000 shots: cm ³ (gallons)
1270	0 to 3.0 (0 to 0.0008)
1200	43.5 to 54.5 (0.0114 to 0.0144)
700	64.1 to 69.1 (0.0169 to 0.01825)
1100	63.5 to 69.5 (0.0167 to 0.01836)
400	55.8 to 63.8 (0.0147 to 0.01685)
1150	61.5 to 69.5 (0.1625 to 0.01836)

12. ZERO CAPACITY (STOP)

Rpm	Voltage (volts)	Delivery per 1000 shots: cm ³ (gal.)
325	0	0 to 3.0 (0 to 0.0008)

13. DELIVERY CHECK AT IDLE SPEED

Rpm	325	360	275
Delivery per 1000 shots: cm ³ (gal.)	15.9 to 23.9 (0.004 to 0.006)	0 to 3.0 (0 to 0.0008)	37.6 to 51.6 (0.010 to 0.014)

Note: the values shown above in brackets must be used for checking purposes only.

15. AUTOMATIC START SUPPLEMENT

Rpm	Delivery per 1000 shots: cm ³ (gallons)
100	55 to 95 (0.0145 to 0.0251)
270	52.5 to 62.5 (0.0139 to 0.0165)
180	73 to 103 (0.0193 to 0.0272)

BENCH TEST PERFORMANCE DATA

Test conditions Fixed advance before TDC cylinder No.1 in compression stroke: (see previous page) Engine without fan, air filter and exhaust silencer. Atmospheric pressure 990 ± 10 mbar (14.36 ± 0.15 psi).					
			Relative humidity 70% ± 5. Ambient temperature 25° ± 3° C (77° ± 37.4° F). Specific gravity of diesel fuel 840 g/l. (7 lb./gal.)		
Throttle lever position	Braking load applied	Engine speed rpm	Power output with engine run-in for a total of:		Fuel consumption kg/h (lb./h)
			2 hours kW (hp)	50 hours kW (hp)	
Maximum	For maximum power output	2300	≥ 42 (57.1)	43 to 45.6 (58.5 to 62)	9.9 to 10.5 (21.83 to 23.15)
Maximum	For maximum torque	1400	≥ 29.4 (40)	30.0 to 31.8 (40.8 to 43.2)	6.4 to 6.8 (14.11 to 14.99)
Maximum	None (no-load)	2450 to 2500	-	-	-
Minimum	None (no-load)	625 to 675	-	-	-

MODEL TN 75V AND TN 75N - CALIBRATION DATA FOR BOSCH INJECTION PUMP

TYPE VE 3/11 F 1150 L 764 - VE 3/11 F 1150 L 764-1 - 99441587 - 500324965

ASSEMBLY DATA

Pump timing on engine: delivery start $6^{\circ} \pm 0.5^{\circ}$ before TDC of cylinder 1 compression stroke.

Plunger pre-lift for timing on engine: mm 1 (0.04 in.) from P.M.I. (with tools **291754** – **291755**).

Cylinder No.1 delivery line union on pump: marked with letter A.

ASSEMBLY DIMENSIONS

SYMBOL	K	MS	ya	yb
mm (in.)	–	–	38.6 to 40.6 (1.45 to 1.60)	42.9 to 48.1 (1.69 to 1.89)

CALIBRATION TEST CONDITIONS

Test bench conforming to ISO 4008/1 .../2

Injectors conforming to ISO 7440-A61 – (1.688.901.027 and pad with calibrated hole $\varnothing$ 0.5 mm; 0.02 in.).

Injector pressure setting 250 to 253 bar (3626.1 to 5120.1 psi).

Supply pressure:

..... 0.35 ± 0.05 bar (5.1 ± 0.7 psi).

Delivery pipes (conforming to ISO 4093.2):

..... 6 x 2 x 450 mm (0.24 x 0.08 x 17.72 in.)

Graduate drain time: : 30".

Test liquid: ISO 4113 at a temperature of $45^{\circ} \pm 1^{\circ}\text{C}$ ($113^{\circ} \pm 2^{\circ}\text{F}$).

1. START OF DELIVERY

Plunger pre-lift from TDC: mm –	Pump rotation (viewed from drive side): counter-clockwise	Injection order: 1–2–3
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2. ADVANCE REGULATOR STROKE

Rpm: 1240	LDA pressure: kPa 100	Advance stroke: mm 1.3 to 1.9 (inches 0.051 to 0.075)
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3. FUEL SUPPLY PUMP PRESSURE

Rpm: 1220	LDA pressure: kPa 100	Internal pressure: bar 8.3 to 9.5 (psi 120.4 to 137.8)
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4. FULL-LOAD DELIVERY WITH BOOSTER PRESSURE

Rpm: 700	LDA pressure: kPa 100	Delivery per 1000 shots: cm^3 88 to 93 (gal. 0.023 to 0.025)	Spread: $\text{cm}^3 \leq 3.5$ (gal. ≤ 0.000925)
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5. FULL-LOAD DELIVERY WITHOUT BOOSTER PRESSURE

Rpm: 500	LDA pressure: kPa 0	Delivery per 1000 shots: cm^3 78.2 to 83.2 (gal. 0.021 to 0.022)	Spread: cm^3 – (gal. –)
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6. SPREAD GOVERNOR AT IDLE SPEED

Rpm: 325	LDA pressure: kPa 0	Delivery per 1000 shots: cm^3 3.5 to 14.5 (gal. 0.0009 to 0.0038)	Spread: $\text{cm}^3 \leq 4.5$ (gal. ≤ 0.001189)
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7. SPREAD GOVERNOR AT MAXIMUM SPEED

Rpm: 1200	LDA pressure: kPa 100	Delivery per 1000 shots: cm^3 47.5 to 63.5 (gal. 0.0125 to 0.01677)	Spread: cm^3 – (gal. –)
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8. DELIVERY AT STARTING

Rpm: 100	Delivery per 1000 shots: cm^3 85 to 125 (gal. 0.0224 to 0.033)
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9. INJECTION ADVANCE PROGRESSION

LDA pressure	kPa	100		
Rpm		1180	1240	
Advance stroke	mm (in.)	0.5 to 1.5 (0.02 to 0.06)	1.3 to 1.9 (0.05 to 0.07)	

10. TRANSFER PRESSURE PROGRESSION

LDA pressure	kPa	100		
Rpm		500	1220	1180
Internal supply pressure	bar (psi)	3.8 to 5.0 (55.1 to 72.5)	8.3 to 9.5 (120.4 to 137.8)	7.9 to 9.1 (114.6 to 132)

11. BACKFLOW

Rpm		500	1150
LDA pressure	kPa	0	100
Backflow for 10 s	l/h (gal./h)	15 to 31 (3.96 to 8.19)	15 to 45 (8.19 to 12.68)

(continued overleaf)

Note: the values shown above in brackets must be used for checking purposes only.

(continued)

11. DELIVERY PROGRESSION

Rpm	LDA pressure kPa	Delivery per 1000 shots: cm ³ (gal.)
1300	100	0 to 3.0 (0 to 0.0008)
1200	100	47.5 to 63.5 (0.01254 to 0.0168)
700	100	88 to 93 (0.0232 to 0.0246)
600	42.5	82.8 to 90.8 (0.0219 to 0.0240)
500	0	78.2 to 83.2 (0.0207 to 0.0220)
1150	100	74.6 to 80.6 (0.0197 to 0.0213)
500	100	89.5 to 96.5 (0.0236 to 0.0255)

12. ZERO CAPACITY (STOP)

Rpm: 325	Voltage (volts): 0	Delivery per 1000 shots: cm ³ 0 to 3.0 (gal. 0 to 0.0008)
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13. DELIVERY CHECK AT IDLE SPEED

Rpm	325	410	
Delivery per 1000 shots: cm ³ (gal.)	3.5 to 14.5 (0.0009 to 0.0038)	0 to 3.0 (0 to 0.0008)	

Note: the values shown above in brackets must be used for checking purposes only.

14. AUTOMATIC START CAPACITY SUPPLEMENT

Rpm	Delivery per 1000 shots: cm ³ (gal.)
100	85 to 125 (0.0225 to 0.0330)
250	71 to 91 (0.0188 to 0.0240)
160	100 to 130 (0.0264 to 0.0343)

BENCH TEST PERFORMANCE DATA

Test conditions Fixed advance before TDC cylinder No.1 in compression stroke: (see previous page) Engine without fan, air filter and exhaust silencer. Atmospheric pressure 990 ± 10 mbar (14.36 ± 0.15 psi).			Relative humidity 70% ± 5. Ambient temperature 25° ± 3° C (77° ± 37.4° F). Specific gravity of diesel fuel 840 g/l. (7 lb./gal.)		
Throttle lever position	Braking load applied	Engine speed rpm	Power output with engine run-in for a total of:		Fuel consumption kg/h (lb./h)
			2 hours kW (hp)	50 hours kW (hp)	
Maximum	For maximum power output	2300	≥ 50.4 (68.5)	51.4 to 54.5 (1) (69.9 to 74.1)	11.9 to 12.6 (26.24 to 27.78)
Maximum	For maximum torque	1400	≥ 40.8 (55.4)	41.6 to 44.2 (2) (56.6 to 60.1)	9.1 to 9.6 (20.06 to 21.16)
Maximum	None (no-load)	2475 to 2525	-	-	-
Minimum	None (no-load)	625 to 675	-	-	-

Note: Air delivery pressure (1) bar 0.95 to 1.1 (psi 13.8 to 16) – (2) bar 0.55 to 0.65 (psi 8 to 9.4).

FUEL SUPPLY PUMP DATA	mm (inches)
Eccentricity of drive shaft	3 (0.1181)
Diameter of drive shaft at bushings	31.975 to 32.000 (1.2588 to 1.2598)
Internal diameter of installed and reamed bushings	32.050 to 32.075 (1.2618 to 1.2628)
Interference between bushings and seats	0.063 to 0.140 (0.0025 to 0.0055)
Assembly clearance between shaft and bushings	0.050 to 0.100 (0.0020 to 0.0039)
Thickness of internal washer	1.45 to 1.50 (0.0571 to 0.0496)
Thickness of external washer	2.93 to 3.00 (0.1154 to 0.1181)

CRANKCASE/CYLINDER BLOCK DATA	mm (inches)
Cylinder block	cast-iron monobloc with replaceable dry-fitted cylinder liners, incorporating seatings for crankshaft bearings, camshaft and pushrod/tappet assemblies
Internal diameter of cylinder liners	104.000 to 104.024 (4.0945 to 4.0954) ⁽¹⁾
External diameter of cylinder liners	107.020 to 107.050 (4.2134 to 4.2146)
Diameter of cylinder bores	106.850 to 106.900 (4.2067 to 4.2087)
Interference fit between cylinder liners and bores	0.120 to 0.200 (0.0047 to 0.0079)
Liner internal diameter oversizes	0.4 to 0.8 (0.0157 to 0.0315)
Liner external diameter oversizes	0.2 (0.0079)
Maximum permissible liner ovality or taper due to wear ⁽²⁾	0.12 (0.0047)
Diameter of main shell bearing seats	84.200 to 84.230 (3.3150 to 3.3161)
Diameter of camshaft bearing seats:	
- front	54.780 to 54.805 (2.1567 to 2.1577)
- centre	54.280 to 54.305 (2.1370 to 2.1380)
- rear	53.780 to 53.805 (2.1173 to 2.1183)
Diameter of standard tappet bores in crankcase	15.000 to 15.018 (0.5906 to 0.5913)
Tappet oversizes	0.1 - 0.2 - 0.3 (0.0039 - 0.0079 - 0.0118)

⁽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 (inches)
Crankshaft	balanced with integral counterweights
Standard journal diameter	79.791 to 79.810 (3.1414 to 3.1421) ⁽¹⁾
Journal undersizes	0.254 – 0.508 – 0.762 – 1.016 (0.01 – 0.02 – 0.03 – 0.04)
Standard main bearing shell thickness	2.168 to 2.178 (0.0854 to 0.0857)
Main bearing shell undersizes (internal diameter)	0.254 – 0.508 – 0.762 – 1.016 (0.01 – 0.02 – 0.03 – 0.04)
Bearing shell to journal clearance	0.034 to 0.103 (0.0013 to 0.0041)
Maximum permitted wear clearance	0.180 (0.0071)
Standard crankpin diameter	63.725 to 63.744 (2.5089 to 2.5096) ⁽¹⁾
Crankpin undersizes	0.254 – 0.508 – 0.762 – 1.016 (0.01 – 0.02 – 0.03 – 0.04)
Standard big-end bearing shell thickness	1.805 to 1.815 (0.0711 to 0.0715)
Big-end bearing shell undersizes (internal diameter)	0.254 – 0.508 – 0.762 – 1.016 (0.01 – 0.02 – 0.03 – 0.04)
Big-end bearing shell to crankpin clearance	0.033 to 0.087 (0.0013 to 0.0034)
Wear limit endfloat	0.180 (0.0071)
Standard crankshaft thrust washer thickness	3.378 to 3.429 (0.1330 to 0.1350)
Thrust washer oversizes (thickness)	0.127 – 0.254 – 0.381 – 0.508 (0.005 – 0.01 – 0.015 – 0.02)
Width of main bearing including thrust washers	31.766 to 31.918 (1.2506 to 1.2566)
Width of corresponding crankshaft journal	32.000 to 32.100 (1.2598 to 1.2638)
Crankshaft assembly endfloat	0.082 to 0.334 (0.0032 to 0.0131)
Maximum permitted wear endfloat	0.40 (0.0157)
Maximum ovality or taper of journals and crankpin after regrinding	0.01 (0.0004)
Maximum ovality or taper of journals and crankpin	0.05 (0.0020)
Maximum tolerance for alignment of crankshaft journals with crankshaft supported on the two outer journals	0.10 (0.0039)
Maximum tolerance for alignment, in both directions, of each pair of crankpins relative to crankshaft journals	0.25 (0.0098)
Maximum tolerance for run-out between the outer surfaces of the crankshaft journals and the crankshaft centreline	± 0.10 (0.0039)

(continued overleaf)

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

(continued)

CRANKSHAFT AND BEARINGS DATA	mm (inches)
Maximum permitted tolerance on run-out of flywheel mounting flange surface relative to the crankshaft centreline, measured with 1/100 mm scale dial gauge resting on front flange surface (A, page 63) at a diameter of 108 mm (4.25 in.) (total gauge reading)	0.025 (0.0010)
Maximum permitted tolerance on co-axial alignment of flywheel centering (B, page 63) relative to the crankshaft journals (total gauge reading)	0.04 (0.0002)

CONNECTING ROD DATA	mm (inches)
Connecting rods	cast-iron with oil way
Diameter of small end bushing seat	41.846 to 41.884 (1.6475 to 1.6490)
Outside diameter of small end bushing	41.979 to 42.017 (1.6527 to 1.6542)
Interference between small end bushing and seat	0.095 to 0.171 (0.0037 to 0.0067)
Inside diameter of small end bushing (measured after fitting) . . .	38.004 to 38.014 (1.4962 to 1.4966)
Diameter of big end bearing seats	67.407 to 67.422 (2.6538 to 2.6544)
Max. tolerance for parallelism between the small end and the big end axes measured at 125 mm (4.92 in.)	± 0.07 (0.0028)
Maximum weight difference between con rods in same engine . .	25 grams (0.055 lb.)

PISTON DATA	mm (inches)
Pistons	light alloy with two compression rings and one oil control ring
Standard piston diameter, measured at 57 mm (2.24 in.) from skirt base and perpendicularly to the gudgeon pin axis	103.812 to 103.826 (4.0871 to 4.0876)
Piston clearance in cylinder liner	0.174 to 0.212 (0.0068 to 0.0083)
Wear limit endfloat	0.30 (0.0118)
Piston oversizes	0.4 - 0.8 (0.0157 - 0.0315)
Piston protrusion at TDC from cylinder block face	0.355 to 0.761 (0.0140 to 0.0300)
Gudgeon pin diameter	37.983 to 37.990 (1.4954 to 1.4957)
Diameter of gudgeon pin seat in piston	37.993 to 38.000 (1.4958 to 1.4961)
Gudgeon pin to seat clearance	0.003 to 0.017 (0.0001 to 0.0007)
Gudgeon pin to small end bearing clearance	0.014 to 0.031 (0.0006 to 0.0012)
Wear limit endfloat	0.06 (0.0024)
Maximum weight difference between pistons in same engine ...	20 grams (0.044 lb.)
Piston ring groove clearance (measured vertically):	
- top	0.090 to 0.122 (0.0035 to 0.0048)
- second	0.060 to 0.092 (0.0024 to 0.0036)
- bottom	0.040 to 0.075 (0.0016 to 0.0030)
Max. permissible clearance (wear limit):	
- top	0.50 (0.0197)
- second and bottom	0.20 (0.0079)
Piston ring end gap (fitted):	
- top	0.40 to 0.65 (0.0157 to 0.0256)
- second	0.30 to 0.55 (0.0118 to 0.0217)
- bottom	0.30 to 0.60 (0.0118 to 0.0236)
Maximum permissible gap (wear limit)	1.20 (0.0472)

VALVE TIMING GEAR DATA	mm (inches)
Timing gear tooth backlash	0.160 (0.0063)
Inside diameter of intermediate gear bushings (fitted and reamed)	37.050 to 37.075 (1.4587 to 1.4596)
Diameter of intermediate gear journal	36.975 to 37.000 (1.4557 to 1.4567)
Journal to bushing clearance	0.050 to 0.100 (0.0020 to 0.0039)
Wear limit endfloat	0.15 (0.0059)
Bushing interference fit in seat in intermediate gear	0.063 to 0.140 (0.0025 to 0.0055)
Outside diameter of camshaft bearings:	
– front	54.875 to 54.930 (2.1604 to 2.1626)
– centre	54.375 to 54.430 (2.1407 to 2.1429)
– rear	53.875 to 53.930 (2.1211 to 2.1232)
Interference between bearings and seats in cylinder block	0.070 to 0.150 (0.0028 to 0.0059)
Inside diameter of camshaft bearings (fitted and reamed):	
– front	51.080 to 51.130 (2.0110 to 2.0130)
– centre	50.580 to 50.630 (2.1604 to 2.1626)
– rear	50.080 to 50.130 (2.1604 to 2.1626)
Diameter of camshaft journals:	
– front	50.970 to 51.000 (1.9913 to 2.0079)
– centre	50.470 to 50.500 (1.9870 to 1.9882)
– rear	49.970 to 50.000 (1.9673 to 1.9685)
Clearance between camshaft journals and bearings	0.080 to 0.160 (0.0031 to 0.0063)
Wear limit endfloat	0.20 (0.0079)
Camshaft endfloat between thrust plate and seat on camshaft ..	0.070 to 0.220 (0.0028 to 0.0087)
For further timing data	See page 4

TAPPET DATA	mm (inches)
Tappet bore in crankcase	15.000 to 15.018 (0.5906 to 0.5913)
Outside diameter of standard tappet	14.950 to 14.970 (0.5886 to 0.5894)
Tappet running clearance	0.030 to 0.068 (0.0012 to 0.0027)
Wear limit endfloat	0.15 (0.0059)
Tappet oversizes	0.1 – 0.2 – 0.3 (0.0039 – 0.0078 – 0.0118)

ROCKER ARM - VALVE DATA	mm (inches)
Diameter of shaft bores in rocker arms	18.016 to 18.034 (0.7093 to 0.7100)
Diameter of rocker arm shaft	17.982 to 18.000 (0.7080 to 0.7087)
Rocker shaft to rocker arm bore clearance	0.016 to 0.052 (0.0006 to 0.0020)
Wear limit endfloat	0.15 (0.0059)
Rocker arm spacing springs:	
- free length	59.5 (2.3425)
- length under load of 46 to 52 N (4.7 to 5.3 kg)	44 (1.7323)
Valve clearance for timing check	0.45 (0.0177)
Valve clearance for normal running (engine cold):	
- inlet valve	0.30 ± 0.05 (0.0118 ± 0.0020)
- exhaust valve	0.30 ± 0.05 (0.0118 ± 0.0020)
Cam lift:	
- inlet valve	5.67 (0.2232)
- exhaust valve	5.95 (0.2343)

CYLINDER HEAD DATA	mm (inches)
Cylinder head	with valve seats cut directly in the casting and press-fitted steel valve guides.
Original height of cylinder head	92 (3.6220)
Maximum face re-grinding depth	0.5 (0.0197)
Diameter of standard valve guide bores in head	13.950 to 13.983 (0.5492 to 0.5505)
Outside diameter of standard valve guides	13.993 to 14.016 (0.5509 to 0.5518)
Guide interference fit in bores	0.010 to 0.066 (0.0004 to 0.0026)
Inside diameter of valve guide (fitted in head)	8.023 to 8.043 (0.3159 to 0.3167)
Valve stem diameter	7.985 to 8.000 (0.3144 to 0.3150)
Assembly clearance between valve stem and guide	0.023 to 0.058 (0.0009 to 0.0023)
Wear limit endfloat	0.13 (0.0051)
Maximum run-out of valve guided on its stem measured through 360° with dial gauge contact point resting on valve head contact band	0.03 (0.0012)
Valve guide oversizes	0.2 (0.0079)
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 to 45.500 (1.7835 to 1.7913)
- exhaust valve	37.500 to 37.750 (1.4764 to 1.4862)
Valve stand-in relative to cylinder head face	0.7 to 1.0 (0.0276 to 0.0394)
Maximum permissible valve stand-in	1.3 (0.0512)
Inlet and exhaust valve springs:	
- free length	44.6 (1.7559)
- length with valve closed, under load of 256 to 284 N (26.1 to 28.9 kg – 57.5 to 63.7 lb.)	34 (1.3386)
- length with valve open, under load of 502 to 554 N (51.2 to 56.5 kg – 112.9 to 124.6 lb.)	23.8 (0.9370)
Injector protrusion relative to head face:	
• BOSCH injector	0.3 to 1.1 (0.0118 to 0.0433)

LUBRICATION SYSTEM DATA	mm (inches)	
	TN 55V, TN 65V and TN 65N	TN 75V and TN 75N
Assembly clearance between oil pump drive shaft and bushing .	0.016 to 0.055 (0.0006 to 0.0022)	-
Clearance between shaft and driven gear	0.033 to 0.066 (0.0013 to 0.0026)	-
Tooth backlash between drive and driven gears	0.100 (0.0039)	-
Radial clearance between drive and driven gears and housing . .	0.060 to 0.170 (0.0024 to 0.0067)	-
Thickness of drive and driven gears	40.961 to 41.000 (1.6126 to 1.6142)	-
Height of gear seat in pump	41.025 to 41.087 (1.6152 to 1.6176)	-
Endfloat between gears and gear housing in pump	0.025 to 0.126 (0.0010 to 0.0050)	-
Pressure relief valve spring		-
- spring free length	45 (1.7717)	35.9 (1.4134)
- spring length under load of 45 to 49 N (4.6 to 5 kg)	37.5 (1.4764)	-
- spring length under load of 88 to 94 N (9 to 9.6 kg)	30.5 (1.2008)	-
- spring length (2, fig. 149) under load of 127.8 to 141.2 N (130 to 144 kg).	-	29 (1.1417)
- spring length (2, fig. 149) under load of 233.4 to 258 N (238 to 263 kg)	-	23.2 (0.9134)
For further lubrication technical data	See page 3	-

COOLING SYSTEM DATA	mm (inches)
Interference fit between pump impeller and shaft	0.017 to 0.059 (0.0007 to 0.0023)
Interference fit between fan hub and shaft	0.024 to 0.058 (0.0009 to 0.00228)
Interference fit between front seal bushing and impeller	0.012 to 0.058 (0.0005 to 0.00228)
For further cooling system data	See page 3

TORQUE SETTINGS WITH ANGLE

PART	Thread	Torque setting		Angle
		Nm	lbf.ft	
Cylinder head bolts (2, page 23)	M 12 x 1.25	70	51	90° + 90°
Main bearing cap bolts (4)	M 14 x 1.5	80	59	90°
Big-end cap bolts (5)	M 11 x 1.5	40	30	60°
Flywheel mounting bolts (3)	M 12 x 1.25	40	30	60°

TIGHTENING TORQUE DATA

PART	Thread	Tightening torque	
		Nm	lbf.ft
Rocker shaft pedestal bolts (1, page 23)	M 8	25	18
Crankshaft hub retaining nut (7)	M 30 x 1.5	294	217
Fan and alternator pulley bolts (6)	M 10 x 1.25	55	40
Additional counterweight retaining bolts (1, page 24)	M 12 x 1.25	110	81
Inlet manifold retaining bolts	M 8	25	19
Alternator and belt tension adjustment nut	M 10 x 1.25	55	40
Coolant pump retaining bolts	M10x1.25	55	40
Tappet cover nuts (1, fig. 48)	M 8	15	11
Rocker shaft pedestal bolts (2, fig. 49)	M 8	25	19
Oil pump and pump cover retaining bolts (1, fig. 57)	M 8	25	19
Timing gear case and cover bolts (1, fig. 61)	M 8	25	19
Intermediate flanged journal bolts (1, fig. 64)	M 10 x 1.25	55	40
Camshaft thrust plate retaining bolts (2, fig. 65)	M 8	35	26
Rear crankcase cover bolts (2, fig. 85)	M 8	25	19
Tappet adjuster locknuts (1, fig. 98)	M 8	22	16
Nuts for injector mounting studs	M 8	25 (*)	19 (*)
Exhaust manifold retaining bolts	M 8	25	19
Injection pump mounting bolts	M 8	25	19
Sump pan retaining bolts	M 10 x 1.25	69	51
- timing gear seal, cover and casing	M 10 x 1.25	39 to 49	29 to 36
- flywheel housing crankcase and casing:			
models TN 55V and TN 65V and TN 65N	M 10 x 1.25	49 to 59	36 to 43
model TN 75V and TN 75N	M 10 x 1.25	49 to 69	36 to 51

(*) Tighten nuts in two stages: see operations described in fig. 99.