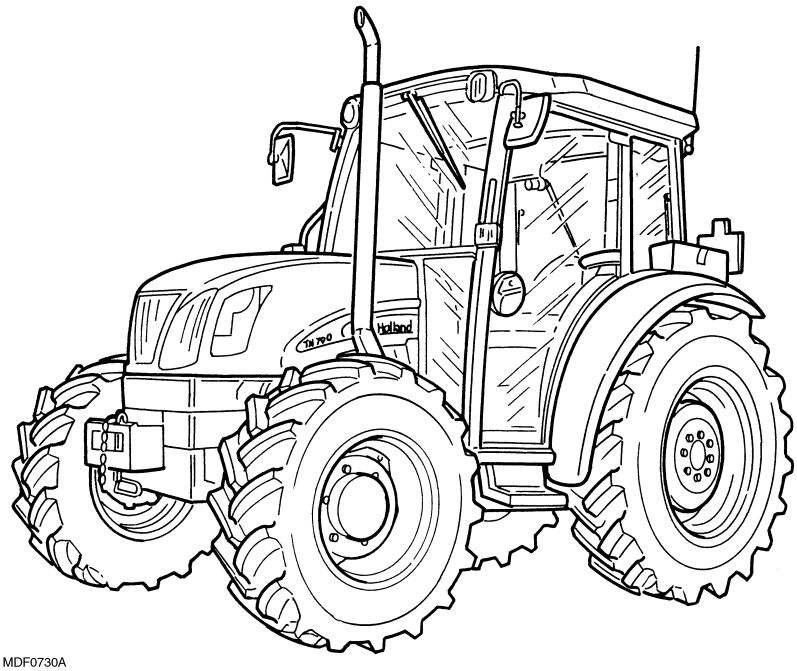
NEW HOLLAND



MDF0730A

TN60DA – TN60SA – TN70DA – TN70SA – TN75DA – TN75SA TRACTORS

SERVICE MANUAL

SECTIONS

S E R V I C E

INTRODUCTION

– *This manual is divided into sections identified by two–figure numbers and each section has independent page numbering.*
For easy reference, these sections have the same numbers and names as the Repairs Rate Book sections.

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

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

– *Pages updated in the future will be identified by the same document number followed by a two–figure update number (e.g.: 1st Update 603.54.431.01; 2nd Update 603.54.431.02; etc.) and by the corresponding issue date.*
These pages will be supplemented by a reprint of the updated contents page.

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 As NEW HOLLAND constantly improves its product range, some information may be out of date subsequent to modifications implemented for technical or commercial reasons, or to meet legal requirements in different countries.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

IMPORTANT WARNINGS

– *All maintenance and repair work described in this manual must be performed exclusively by NEW HOLLAND 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.*

– *The Manufacturer and all organisations belonging to the Manufacturer's distribution network, including but not restricted to national, regional or local distributors, will accept no responsibility for personal injury or damage to property caused by abnormal function of parts and/or components not approved by the Manufacturer, including those used for maintenance and/or repair of the product manufactured or marketed by the Manufacturer.*
In any case, the product manufactured or marketed by the Manufacturer is covered by no guarantee of any kind against personal injury or damage to property caused by abnormal function of parts and/or components not approved by the Manufacturer.

PRINTED IN ITALY

CNH ITALIA S.p.A. – Viale delle Nazioni, 55 – 41100 MODENA – Italy
TECHNICAL SUPPORT – Technical Information
Print No. **603.54.431.00** – 10 – 2003 – 200

CONTENTS VOLUME 1

GENERAL INSTRUCTIONS

IMPORTANT NOTICE

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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;
– coat the sealing lip with a thin layer of lubricant (use oil rather than grease) and fill the gap between the sealing lip and the dust lip on double lip seals with grease;
– insert the seal 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: RTV SILMATE, RHODORSIL CAF 1 or LOCTITE PLASTIC GASKET.
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 to 176 to 194 °F (80 to 90 °C) 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

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 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.

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 vehicle in the normal direction of movement.

MOVING THE TRACTOR WITH THE BATTERY REMOVED

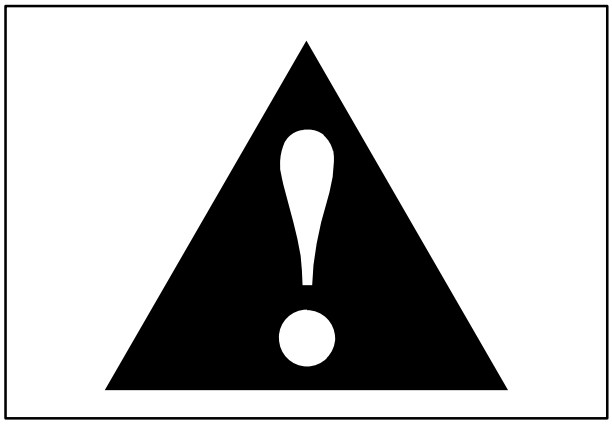
External power supply cables should only be connected to the respective positive and negative cable terminals, using efficient clamps that guarantee adequate and secure contact.
Disconnect all services (lights, windshield wipers, etc.) before starting the vehicle.
If the vehicle electrical system requires 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

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:

***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.*



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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 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 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.
– 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 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. 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 tractor. 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 tractor 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 30.45 psi (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.
– 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 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 tractor or implement range of action.
– Do not keep into your pockets any object which might fall unobserved into the tractor’s inner compartments.
– 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 bring your head, body, arms, legs, feet, hands, 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 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, 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

– Check 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 tractor 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 bystanders.

REMOVAL AND INSTALLATION

– Lift and handle all heavy parts using suitable hoisting equipment. Ensure that parts are supported by appropriate slings and hooks. Use lifting eyes provided to this purpose. 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 US gal. (litres)	RECOMMENDED NEW HOLLAND PRODUCTS	NEW HOLLAND SPECIFICATIONS	INTERNATIONAL SPECIFICATIONS
Cooling system: without cab with cab	 2.64 (10.0) 3.17 (12.0)	Water and **AMBRA AGRIFLU liquid 50% + 50%**	NH 900 A	–
Windscreen washer reservoir	0.52 (2.0)	Water and liquid	–	–
Fuel tank:	19.81 (75)	Decanted and filtered diesel fuel	–	–
Engine sump: without filter: . . . . . with filter:	 1.76 (6.7) 1.98 (7.5)	**AMBRA SUPER GOLD oil**	NH 324G (SAE 10W–30) NH 330G (SAE 15W–40)	API CF–4/SG CCMC D4 MIL–L–2104E
Brake circuit . . . . . With front brakes	0.18 (0.7) 0.13 (0.5)	**AMBRA BRAKE LHM fluid**	NH 610 A	ISO 7308
Front axle: axle housing . . . . . final drives without brakes (each) . . . . . final drives with brakes (each)	 1.18 (4.5) 0.26 (1.0) 0.39 (1.5)	**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:	11.09 (42)			
Grease fittings	–	**AMBRA GR9 grease**	NH 710 A	NLGI 2
Air conditioning system – coolant . . . . . – oil	– 0.21 (0.80) 0.03 (0.15)	–	–	R–134a SPA

SECTION 10 – ENGINE

Chapter 1 – Engine

CONTENTS

GENERAL SPECIFICATIONS	
Engine, technical type:	
– Models TN 60DA and TN 60SA – type 8035.05C.615/619/919 (BOSCH pump)	See data on page 6–7
– Models TN 70DA and TN 70SA – type 8035.25R.615/619/919 (BOSCH pump)	See data on page 8–9
– Models TN 75DA and TN 75SA – type 8035.25.615/619/919 (BOSCH pump)	See data on page 10–11
Cycle	diesel, 4–stroke
Fuel injection	direct
Number of cylinders in line	3
Cylinder liners	in cylinder block
Piston diameter	
– Models TN 60DA and TN 55SA	4.0944 in. (104 mm)
– Models TN 70DA and TN 70SA	4.0944 in. (104 mm)
– Models TN 75DA and TN 75SA	4.0944 in. (104 mm)
Piston stroke	4.5275 in. (115 mm)
Total displacement:	
– Models TN 60DA and TN 60SA	178.8496 $in.^3$ (2931 cm^3)
– Models TN 70DA and TN 70SA	178.8496 $in.^3$ (2931 cm^3)
– Models TN 75DA and TN 75SA	178.8496 $in.^3$ (2931 cm^3)
Compression ratio for models TN 60DA, TN 60SA	17:1 normally aspirated
Compression ratio for models TN70DA, TN70SA, TN 75DA and TN 75SA	16.5:1 turbocharged
Maximum power:	
– Models TN 60DA and TN 60SA	44 kW (60 HP)
– Models TN 70DA and TN 70SA	48 kW (65 HP)
– Models TN 75DA and TN 75SA	53 kW (72 HP)
Maximum power speed	2300 rpm
Maximum torque speed for Models TN 60DA and TN 60SA	1400 rpm
Maximum torque speed for Models TN 70DA and TN 70SA	1400 rpm
Maximum torque speed for Models TN 75DA and TN 75SA	1400 rpm
Number of main bearings	4
Sump pan	structural, cast iron

(continued)

(cont)

GENERAL SPECIFICATIONS	
Lubrication	forced, with gear pump
Pump drive	camshaft
Engine speed/oil pump speed ratio	2:1
Oil cleaning	mesh filter on oil intake and filtering cartridge on delivery line
Normal oil pressure with motor warmed–up and running at maximum speed:	
For models TN 60DA and TN 60SA	42.05 to 56.55 psi (2.9 to 3.9 bar)
For models TN70DA, TN70SA; TN 75DA and TN 75SA (start of action)	≥ 29 psi (≥ 2 bar)
Pressure relief valve	incorporated in oil pump housing
Valve initial opening pressure	50.75 psi (3.5 bar)
For further lubrication technical data	See page 19
Cooling system	coolant circulation
Radiator on models TN 60DA/SA	3 lines of vertical pipes with copper fins
Radiator on model TN 70DA/SA and TN 75DA/SA	4 lines of vertical copper pipes
Fan, attached to coolant pump pulley	intake, 6–blade in sheet–metal
Coolant pump	centrifugal vane–type
Engine speed/coolant pump speed ratio	1:1.25
Temperature control	thermostat
Coolant thermometer	coloured scale divided into 3 sections
Temperature ranges corresponding to each section:	
– initial white section	86° to 149 °F (30° to 65 °C)
– middle green section (normal working conditions)	149° to 221 °F (65° to 105 °C)
– final red section	221° to 239 °F (105° to 115 °C)
For further cooling system technical data	See page 19
Rev counter/hourmeter	incorporated in control panel
Operating system	from gear on camshaft
Hour counter calibrated for engine speed of	1800 rpm

(continued)

(cont)

GENERAL SPECIFICATIONS	
Timing system	overhead valves operated by tappets, rods and rocker arms via the camshaft located in the engine block; the camshaft is driven by the crankshaft using 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–rocker arm clearance for timing check	0.0177 in. (0.45 mm)
Valve–rocker arm clearance (with engine cold):	
– intake	0.0118 ± 0.0019 in. (0.30 ± 0.05 mm)
– exhaust	0.0118 ± 0.0019 in. (0.30 ± 0.05 mm)
For further timing system technical data	See page 16
Fuel system	
Air cleaning	dual cartridge dry air filter, with clogged filter indicator with centrifugal pre–filter and automatic dust ejector
Fuel pump	with double diaphragm
Fuel filtering	through wire 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 litres/hour
Cam operated	via engine timing
BOSCH injection pump	rotating distributor type
All–speed governor, incorporated in pump:	
BOSCH	centrifugal counterweights
Automatic advance regulator, incorporated in pump:	
BOSCH	hydraulic
For further fuel system technical data:	
Fixed advance (pump setting for start of delivery before TDC) – Pressure setting – Injection order, and other information regarding the BOSCH pump	refer to the data for the relevant engine type in the table on page 2

FUEL SYSTEM DATA

Turbocharger (models TN 70DA/SA and TN 75DA/SA):	
– GARRETT type	T 25
Injection pump	rotating distributor with speed governor and advance regulator incorporated
BOSCH pump:	
– Models TN 60DA and TN 60SA	VE 3/11 F 1150 L 767 – 504041420
– Models TN 70DA and TN 70SA	VE 3/11 F 1150 L 764–2 – 504054475
– Models TN 75DA and TN 75SA	VE 3/11 F 1150 L 764 – 504042213
Direction of rotation	anti–clockwise
Injection order	1–2–3

Fuel injectors:	
BOSCH type:	
TN 60DA and TN 60SA	504054021
TN 70DA, TN 70SA, DT 75DA and TN 75SA	500307714
– Nozzle holder type	4791124
– Nozzle type:	
TN 60DA and TN 60SA	DLLA 132 SV3 143 221 – 504051747
TN 70DA, TN 70SA, DT 75DA and TN 75SA	DLLA 132S 1320 – 99469341
Number of nozzle holes:	
TN 60DA and TN 60SA	6
TN 70DA, TN 70SA, DT 75DA and TN 75SA	5
Nozzle hole diameter:	0.23
TN 60DA and TN 60SA	0.0074 in. (0.19 mm)
TN 70DA, TN 70SA, DT 75DA and TN 75SA	0.0090 in. (0.23 mm)
Pressure setting	3770 to 3944 psi (260 to 272 bar)
Delivery lines for BOSCH pump	
– type	99441952
– Pipe dimensions	87 x 25.37 x 7830 in. (6 x 1.75 x 540 mm)

MODELS TN 60DA AND TN 60SA – BOSCH INJECTION PUMP CALIBRATION DATA TYPE VE 3/11 F 1150 L 766 – VE 3/11 F 1150 L 766–1 – 504041420

ASSEMBLY DATA

Pump timing on engine: delivery start 9° ± 0.5° before TDC of cylinder 1 on compression stroke.
Plunger pre–lift for timing on engine: 0.0393 in. (1 mm) from BDC (with tools **380000228** – **380000229**).
Cylinder No. 1 delivery line union on pump: marked with letter A.

ASSEMBLY DIMENSIONS

SYMBOL	K	MS	ya	yb
in. (mm)	–	–	1.437 to 1.5157 (36.5 to 38.5)	1.6299 to 1.8346 (41.4 to 46.6)

CALIBRATION TEST CONDITIONS

Test bench conforming to ISO 4008/1.../2
Injectors conforming to ISO 7440–A61 – (1.688.901.027 with pad ∅ 0.0196 in. (0.5 mm)).
Injector pressure setting 3625 to 3668 psi (250 to 253 bar)
Fuel supply pressure:
5.075 ± 0.725 psi (0.35 ± 0.05 bar).
Delivery pipes (conforming to ISO 4093.2):
0.2362 x 0.0787 x 17.71 in. (6 x 2 x 450 mm)
Graduate drain time . . . . . : 30”.
Test liquid: ISO 4113 at a temperature of 113° ± 33.8 °F (45° ± 1 °C).

1. START OF DELIVERY

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

2. ADVANCE REGULATOR STROKE

rpm: 1240	Advance stroke: 0.0157 to 0.0551 in. (0.4 to 1.4 mm)

3. FUEL SUPPLY PUMP PRESSURE

rpm: 1200	Internal pressure: 111.65 to 129.05 psi (7.7 to 8.9 bar)

4. FULL LOAD DELIVERY

rpm: 700	Delivery per 1000 shots: cm^3 64.1 to 69.1	Spread: $cm^3 \leq 3.5$

5. SPREAD GOVERNOR AT IDLE SPEED

rpm: 325	Delivery per 1000 shots: cm^3 15.9 to 23.9	Spread: $cm^3 \leq 4.0$

6. SPREAD GOVERNOR AT MAXIMUM SPEED

rpm: 1200	Delivery per 1000 shots: cm^3 43.5 to 54.5	Spread:–

7. DELIVERY AT STARTING SPEED

rpm: 100	Delivery per 1000 shots: cm^3 55 to 95

8. INJECTION ADVANCE PROGRESSION

Rev/min		1240	1280
Advance stroke	in (mm)	0.0157 to 0.0551 (0.4 to 1.4)	0.0511 to 0.0748 (1.3 to 1.9)

9. TRANSFER PRESSURE PROGRESSION

Rev/min		1200	400	
Internal pressure	psi (bar)	111.65 to 129.05 (7.7 to 8.9)	50.75 to 68.15 (3.5 to 4.7)	

10. BACKFLOW

Rev/min		400	1100
Backflow	l/h	14 to 22	22 to 42

(continued)

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

(cont)

11. DELIVERY PROGRESSION

Rev/min	Delivery per 1000 shots: cm^3
1270	0 to 3
1200	43.5 to 54.5
700	64.1 to 69.1
1100	63.5 to 69.5
400	55.8 to 63.8
1150	61.5 to 69.5

12. ZERO DELIVERY (STOP)

Rev/min	Voltage (volts)	Delivery per 1000 shots: cm^3
325	0	0 to 3

13. DELIVERY CHECK AT IDLE SPEED

Rev/min		325	360	275
Delivery per 1000 shots:	cm^3	15.9 to 23.9	0 to 3.0	37.6 to 51.6

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

15. AUTOMATIC START SUPPLEMENT

Rev/min	Delivery per 1000 shots: cm^3
100	55 to 95
270	52.5 to 62.5
180	73 to 103

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.

Relative humidity 70% ± 5.

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

Specific gravity of diesel fuel 840 g/l.

Throttle lever position	Braking load applied	Engine speed rev/min	Power output with engine run–in for a total of: Production running–in kW (Hp)	Power output with engine run–in for a total of: 50 hours (total) kW (Hp)	Fuel consumption kg/h
Maximum	For maximum power output	2300	≥ 42 (57.1)	43 to 45.6 (58.5 to 62)	9.9 to 10.5
Maximum	For maximum torque	1400	≥ 29.4 (40)	30.0 to 31.8 (40.8 to 43.2)	6.4 to 6.8
Maximum	None (no–load)	2450 to 2500	–	–	–
Minimum	None (no–load)	625 to 675	–	–	–

MODEL TN 70DA AND TN 70 SA – BOSCH INJECTION PUMP CALIBRATION DATA TYPE VE 4/11 F 1150 L... – VE 4/11 F 1150 L 764–2 – 504054475

ASSEMBLY DATA

Pump timing on engine: delivery start 6° ± 0.5° before TDC of cylinder 1 on compression stroke.
Plunger pre–lift for timing on engine: 0.0393 in. (1 mm) from BDC (with tools **380000228** – **380000229**).
Cylinder No. 1 delivery line union on pump: marked with letter A.

ASSEMBLY DIMENSIONS

SYMBOL	K	VHA	ya	yb
in. (mm)	–	30.1	1.5196 to 1.5984 (38.6 to 40.6)	1.5905 to 1.7952 (40.4 to 45.6)

CALIBRATION TEST CONDITIONS

Test bench conforming to ISO 4008/1.../2
Injectors conforming to ISO 7440–A61 – (1.688.901.027 with pad 0.0196 in. (0.5 mm)).
Injector pressure setting 3625 to 3668.5 psi (250 to 253 bar)
Fuel supply pressure:
5.075 ± 0.725 psi (0.35 ± 0.05 bar).
Delivery pipes (conforming to ISO 4093.2):
0.2362 x 0.0787 x 17.71 in. (6 x 2 x 450 mm).
Graduate drain time . . . . : 30”.
Test liquid: ISO 4113 at a temperature of 113° ± 32.9 °F (45° ± 0.5 °C).

1. START OF DELIVERY

Plunger pre–lift from TDC: mm –	Pump rotation (viewed from drive side): anti–clockwise	Injection order: 1–3–4–2

2. ADVANCE REGULATOR STROKE

rpm: 900	Advance stroke: 0.0472 to 0.0551 in. (1.2 to 1.4 mm)

3. FUEL SUPPLY PUMP PRESSURE

rpm: 900	Internal pressure: 98.6 to 107.3 psi (6.8 to 7.4 bar)

4. FULL–LOAD DELIVERY WITH BOOSTER PRESSURE

rpm: 700	LDA pressure: kPa 100	Delivery per 1000 shots: cm^3 80.5 to 81.5	Spread: $cm^3 \leq 3.5$

5. FULL–LOAD DELIVERY WITHOUT BOOSTER PRESSURE

rpm: 600	Delivery per 1000 shots: cm^3 73.5 to 74.5

6. SPREAD GOVERNOR AT IDLE SPEED

rpm: 325	Delivery per 1000 shots: cm^3 10.5 to 12.5	Spread: $cm^3 \leq 4.5$

7. SPREAD GOVERNOR AT MAXIMUM SPEED

rpm: 1200	LDA pressure: kPa 100	Delivery per 1000 shots: cm^3 53 to 54

8. DELIVERY AT STARTING SPEED

rpm: 100	Delivery per 1000 shots: cm^3 80 to 110

9. TRANSFER PRESSURE PROGRESSION

LDA pressure	kPa	100	
Rev/min		400	900
Internal pressure supply	psi (bar)	49.3 to 63.8 (3.4 to 4.4)	98.6 to 107.3 (6.8 to 7.4)

10. INJECTION ADVANCE PROGRESSION

LDA pressure	kPa	100	
Rev/min		900	1000
Advance stroke	in. (mm)	0.0472 to 0.0551 (1.2 to 1.4)	0.0511 to 0.0748 (1.3 to 1.9)

11. BACKFLOW

Rev/min		600	1150
LDA pressure	kPa	0	100
Backflow	$in.^3$ cm^3	1.1593 to 1.7695 (19 to 29)	1.4644 to 2.3187 (24 to 38)

(continued)

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

(cont)

12. DELIVERY PROGRESSION

Rev/min	Pressure LDA kPa	Delivery per 1000 shots: cm^3
600	35	78.9 to 79.9
1270	100	0 to 3
1200	100	53 to 54
1150	100	67.5 to 71.5
700	100	80.5 to 81.5
600	0	73.5 to 74.5

13. DELIVERY CHECK AT IDLE SPEED

Rev/min		325	410
Delivery per 1000 shots	cm^3	10.5 to 12.5	0 to 3

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

14. ZERO CAPACITY (STOP)

Rev/min	Voltage (volts)	Delivery per 1000 shots: cm^3
325	0	0 to 3

15. AUTOMATIC START SUPPLEMENT

Rev/min	Pressure LDA kPa	Delivery per 1000 shots: cm^3
100	–	80 to 110
250	–	74 to 86

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 29.13 ± 0.1968 in. (740 ± 5 mm) mercury.

Relative humidity 70% ± 5.

Ambient temperature 77 °F (25 °C).

Specific gravity of diesel fuel 840 g/l at a temperature of 59 °F (15 °C).

Throttle lever position	Braking load applied	Engine speed rev/min	Power output with engine run–in for a total of: Production running–in kW (Hp)	Power output with engine run–in for a total of: 50 hours (total) kW (Hp)	Fuel consumption kg/h
Maximum	For maximum power output	2300	≥ 45.6 (62)	46.5 to 49.5 (63 to 67)	10.2 to 10.8
Maximum	For maximum torque	1400	≥ 35.8 (48.7)	36.5 to 39.4 (49.6 to 53.6)	7.95 to 8.45
Maximum	None (no–load)	2475 to 2525	–	–	–
Minimum	None (no–load)	625 to 675	–	–	–

MODELS TN 75DA AND TN 75SA – BOSCH INJECTION PUMP CALIBRATION DATA TYPE VE 3/11 F 1150 L 764 – VE 3/11 F 1150 L 764–1 – 504042213

ASSEMBLY DATA

Pump timing on engine: delivery start 6° ± 0.5° before TDC of cylinder 1 on compression stroke.
Plunger pre–lift for timing on engine: 0.0393 in. (1 mm) from BDC (with tools **380000228** – **380000229**).
Cylinder No. 1 delivery line union on pump: marked with letter A.

ASSEMBLY DIMENSIONS

SYMBOL	K	MS	ya	yb
in. (mm)	–	–	1.5196 to 1.5984 (38.6 to 40.6)	1.6889 to 1.8936 (42.9 to 48.1)

CALIBRATION TEST CONDITIONS

Test bench conforming to ISO 4008/1.../2
Injectors conforming to ISO 7440–A61 – (1.688.901.027 with pad ∅ 0.0196 in. (0.5 mm)).
Injector pressure setting 3625 to 3668 psi (250 to 253 bar).
Fuel supply pressure:
5.075 to 0.725 psi (0.35 ± 0.05 bar).
Delivery pipes (conforming to ISO 4093.2):
0.2362 x 0.0787 x 17.71 in. (6 x 2 x 450 mm).
Graduate drain time . . . . . : 30”.
Test liquid: ISO 4113 at a temperature of 113° ± 33.8 °F (45° ± 1 °C).

1. START OF DELIVERY

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

2. ADVANCE REGULATOR STROKE

rpm: 1240	LDA pressure: kPa 100	Advance stroke: 0.0511 to 0.0748 in. (1.3 to 1.9 mm)

3. FUEL SUPPLY PUMP PRESSURE

rpm: 1220	LDA pressure: kPa 100	Internal pressure: 0.3267 to 0.3740 psi (8.3 to 9.5 bar)

4. FULL–LOAD DELIVERY WITH BOOSTER PRESSURE

rpm: 700	LDA pressure: kPa 100	Delivery per 1000 shots: cm^3 88 to 93	Spread: $cm^3 \leq 3.5$

5. FULL–LOAD DELIVERY WITHOUT BOOSTER PRESSURE

rpm: 500	LDA pressure: kPa 0	Delivery per 1000 shots: cm^3 78.2 to 83.2	Spread: cm^3 –

6. SPREAD GOVERNOR AT IDLE SPEED

rpm: 325	LDA pressure: kPa 0	Delivery per 1000 shots: cm^3 3.5 to 14.5	Spread: $cm^3 \leq 4.5$

7. SPREAD GOVERNOR AT MAXIMUM SPEED

rpm: 1200	LDA pressure: kPa 100	Delivery per 1000 shots: cm^3 47.5 to 63.5	Spread: cm^3 –

8. DELIVERY AT STARTING SPEED

rpm: 100	Delivery per 1000 shots: cm^3 85 to 125

10. INJECTION ADVANCE PROGRESSION

LDA pressure	kPa	100		
Rev/min		1180	1240	
Advance stroke	in. (mm)	0.0196 to 0.0590 (0.5 to 1.5)	0.0511 to 0.0748 (1.3 to 1.9)	

9. TRANSFER PRESSURE PROGRESSION

LDA pressure	kPa	100		
Rev/min		500	1220	1180
Internal pressure supply:	psi (bar)	55.1 to 72.5 (3.8 to 5.0)	120.3 to 137.7 (8.3 to 9.5)	114.5 to 131.9 (7.9 to 9.1)

11. BACKFLOW

Rev/min		500	1150
LDA pressure:	kPa	0	100
Backflow for 10 sec.	l/h	15 to 31	15 to 45

(continued)

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

(cont)

11. DELIVERY PROGRESSION

Rev/min	LDA pressure kPa	Delivery per 1000 shots: cm^3
1300	100	0 to 3.0
1200	100	47.5 to 63.5
700	100	88 to 93
600	42.5	82.8 to 90.8
500	0	78.2 to 83.2
1150	100	74.6 to 80.6
500	100	89.5 to 96.5

12. ZERO DELIVERY (STOP)

rpm: 325	Voltage (volts): 0	Delivery per 1000 shots: cm^3 0 to 3

13. DELIVERY CHECK AT IDLE SPEED

Rev/min		325	410	
Delivery per 1000 shots:	cm^3	3.5 to 14.5	0 to 3.0	

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

14. AUTOMATIC START SUPPLEMENT

Rev/min	Delivery per 1000 shots: cm^3
100	85 to 125
250	71 to 91
160	100 to 130

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.

Relative humidity 70% ± 5.

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

Specific gravity of diesel fuel 840 g/l.

Throttle lever position	Braking load applied	Engine speed rev/min	Power output with engine run–in for a total of: Production running–in kW (Hp)	Power output with engine run–in for a total of: 50 hours (total) kW (Hp)	Fuel consumption kg/h
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
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
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 – (2) bar 0.55 to 0.65.

FUEL SUPPLY PUMP DATA	in. (mm)
Eccentricity of drive shaft	0.1181 (3)
Diameter of drive shaft at bushings	1.2588 to 1.2598 (31.975 to 32.000)
Internal diameter of installed and reamed bushings	1.2618 to 1.2627 (32.050 to 32.075)
Interference between bushings and seats	0.0024 to 0.0055 (0.063 to 0.140)
Assembly clearance between shaft and bushings	0.0019 to 0.0039 (0.050 to 0.100)
Thickness of internal washer	0.0570 to 0.0590 (1.45 to 1.50)
Thickness of external washer	0.1153 to 0.1181 (2.93 to 3.00)

CRANKCASE/CYLINDER BLOCK DATA	in. (mm)
Crankcase	cast–iron monobloc with replaceable dry–fitted cylinder liners, incorporating seatings for crankshaft, camshaft and tappets
Internal diameter of cylinder liners	4.0944 to 4.0954 (104.000 to 104.024) ([1])
Cylinder liners internal diameter oversizes	0.0157 to 0.0314 (0.4 to 0.8)
Maximum permissible liner ovality or taper due to wear ([2])	0.0047 (0.12)
Main journal half bearing seat diameter	3.3149 to 3.3161 (84.200 to 84.230)
Camshaft bushing seat diameter:	
– front	2.1566 to 2.1576 (54.780 to 54.805)
– intermediate	2.1370 to 2.1379 (54.280 to 54.305)
– rear	2.1173 to 2.1183 (53.780 to 53.805)
Diameter of standard tappet bores in crankcase	0.5905 to 0.5912 (15.000 to 15.018)
Spare tappet oversizes	0.0039 – 0.0078 – 0.0118 (0.1 – 0.2 – 0.3)

([1]) Measure in the area swept by piston rings, both parallel and perpendicular to the crankshaft axis.

CRANKSHAFT AND BEARINGS DATA	**in. (mm)**
Crankshaft	balanced with integral counterweights
Standard journal diameter	3.1413 to 3.1421 (79.791 to 79.810) (1)
Journal undersizes	0.0099 – 0.0199 – 0.0299 – 0.0399 (0.254 – 0.508 – 0.762 – 1.016)
Main journal half bearing thickness	0.0853 to 0.0857 (2.168 to 2.178)
Main half bearing undersizes (internal diameter)	0.0099 – 0.0199 – 0.0299 – 0.0399 (0.254 – 0.508 – 0.762 – 1.016)
Bearing shell to journal clearance	0.0013 to 0.0040 (0.034 to 0.103)
Maximum permitted wear clearance	0.0070 (0.180)
Standard crankpin diameter	2.5088 to 2.5096 (63.725 to 63.744) (1)
Crankpin undersizes	0.0099 – 0.0199 – 0.0299 – 0.0399 (0.254 – 0.508 – 0.762 – 1.016)
Standard connecting rod half bearing thickness	0.0710 to 0.0714 (1.805 to 1.815)
Connecting rod half bearing undersizes (internal diameter)	0.0099 – 0.0199 – 0.0299 – 0.0399 (0.254 – 0.508 – 0.762 – 1.016)
Bearing to crankpin clearance	0.0012 to 0.0034 (0.033 to 0.087)
Maximum permitted wear clearance	0.0070 (0.180)
Standard crankshaft thrust washer thickness	0.1329 to 0.1349 (3.378 to 3.429)
Thrust washer oversizes (thickness)	0.0049 – 0.0099 – 0.0149 – 0.0199 (0.127 – 0.254 – 0.381 – 0.508)
Width of main bearing including thrust washers	1.2506 to 1.2566 (31.766 to 31.918)
Width of corresponding crankshaft journal	1.2598 to 1.2637 (32.000 to 32.100)
Crankshaft assembly endfloat	0.0032 to 0.0131 (0.082 to 0.334)
Maximum permitted wear endfloat	0.0157 (0.40)
Maximum ovality or taper of journals and crankpin after regrinding	0.0003 (0.01)
Maximum ovality or taper of journals and crankpin	0.0019 (0.05)
Maximum tolerance for alignment of crankshaft journals with crankshaft supported on the two outer journals	0.0039 (0.10)
Maximum tolerance for alignment, in both directions, of each pair of crankpins relative to crankshaft journals	0.0098 (0.25)
Maximum tolerance for run–out between the outer surfaces of the crankshaft journals and the crankshaft centreline	0.0039 (± 0.10)

(continued)

(1) Crankshafts with 0.0039 in. (0.1 mm) undersize journals and crankpins and consequently undersize bearing shells may be fitted in factory production.

(cont)

CRANKSHAFT AND BEARINGS DATA	in. (mm)
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 4.2519 in. (108 mm) (total gauge reading)	0.0009 (0.025)
Maximum permitted tolerance on co–axial alignment of flywheel centering (B, page 63) relative to the crankshaft journals (total gauge reading)	0.0015 (0.04)

CONNECTING ROD DATA	in. (mm)
Connecting rods	cast–iron with oil way
Diameter of small end bushing seat	1.6474 to 1.6489 (41.846 to 41.884)
Outside diameter of small end bushing	1.6527 to 1.6542 (41.979 to 42.017)
Interference between small end bushing and seat	0.0037 to 0.0067 (0.095 to 0.171)
Inside diameter of small end bushing (measured after fitting) . . .	1.4962 to 1.4966 (38.004 to 38.014)
Diameter of big end bearing seats	2.6538 to 2.6544 (67.407 to 67.422)
Max. tolerance for parallelism between the small end and the big end axes measured at 4.9212 in. (125 mm)	± 0.0027 (0.07)
Maximum weight difference between con rods in same engine . .	0.0551 lb. (25 g)

PISTON DATA	**in. (mm)**
Pistons	light alloy with three compression rings, including two seal rings and one scraper ring
Standard piston diameter, measured at 2.244 in. (57 mm) from skirt base and perpendicularly to the gudgeon pin axis	4.0870 to 4.0876 (103.812 to 103.826)
Piston clearance in cylinder liner	0.0068 to 0.0083 (0.174 to 0.212)
Maximum permitted wear clearance	0.0118 (0.30)
Piston oversizes	0.0157 – 0.0314 (0.4 – 0.8)
Piston protrusion at TDC from cylinder block face	0.0139 to 0.0299 (0.355 to 0.761)
Gudgeon pin diameter	1.4957 to 1.4956 (37.983 to 37.990)
Diameter of gudgeon pin seat in piston	1.4957 to 1.4960 (37.993 to 38.000)
Gudgeon pin to seat clearance	0.0001 to 0.0006 (0.003 to 0.017)
Gudgeon pin to small end bearing clearance	0.0005 to 0.0012 (0.014 to 0.031)
Maximum permitted wear clearance	0.0023 (0.06)
Maximum weight difference between pistons in same engine	0.0441 (20 g)
Piston ring groove clearance (measured vertically):	
– 1st ring	0.0035 to 0.0048 (0.090 to 0.122)
– 2nd ring	0.0023 to 0.0036 (0.060 to 0.092)
– 3rd ring	0.0015 to 0.0029 (0.040 to 0.075)
Maximum permitted wear clearance:	
– 1st ring	0.0196 (0.50)
– 2nd and 3rd ring	0.0078 (0.20)
Assembly clearance between piston ring ends in cylinder sleeves:	
– 1st ring	0.0157 to 0.0255 (0.40 to 0.65)
– 2nd ring	0.0118 to 0.0216 (0.30 to 0.55)
– 3rd ring	0.0118 to 0.0236 (0.30 to 0.60)
Maximum permissible gap (wear limit)	0.0472 (1.20)

VALVE TIMING GEAR DATA	in. (mm)
Timing gear tooth backlash	0.0062 (0.160)
Inside diameter of intermediate gear bushings (fitted and reamed)	1.4586 to 1.4596 (37.050 to 37.075)
Diameter of intermediate gear journal	1.4557 to 1.4566 (36.975 to 37.000)
Clearance between pin and corresponding bushings	0.0019 to 0.0039 (0.050 to 0.100)
Maximum permitted wear clearance	0.0059 (0.15)
Bushing interference fit in seat in intermediate gear	0.0024 to 0.0055 (0.063 to 0.140)
Outside diameter of camshaft bearings:	
– front	2.1604 to 2.1625 (54.875 to 54.930)
– intermediate	2.1407 to 2.1429 (54.375 to 54.430)
– rear	2.1210 to 2.1232 (53.875 to 53.930)
Interference between bearings and seats in cylinder block	0.0027 to 0.059 (0.070 to 0.150)
Inside diameter of camshaft bearings (fitted and reamed):	
– front	2.0110 to 2.0129 (51.080 to 51.130)
– intermediate	1.9913 to 1.9933 (50.580 to 50.630)
– rear	1.9716 to 1.9736 (50.080 to 50.130)
Diameter of camshaft journals:	
– front	2.0066 to 2.0078 (50.970 to 51.000)
– intermediate	1.9870 to 1.9881 (50.470 to 50.500)
– rear	1.9673 to 1.9685 (49.970 to 50.000)
Clearance between camshaft journals and bushings	0.0031 to 0.0062 (0.080 to 0.160)
Maximum permitted wear clearance	0.0078 (0.20)
Camshaft endfloat between thrust plate and seat on camshaft	0.0027 to 0.0086 (0.070 to 0.220)
For further timing system technical data	see page 4

TAPPET DATA	in. (mm)
Tappet bore in crankcase	0.5905 to 0.5912 (15.000 to 15.018)
Outside diameter of standard tappet	0.5885 to 0.5893 (14.950 to 14.970)
Tappet running clearance	0.0011 to 0.0026 (0.030 to 0.068)
Maximum permitted wear clearance	0.0059 (0.15)
Tappet oversizes	0.0039 – 0.0078 – 0.0118 (0.1 – 0.2 – 0.3)