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NEW HOLLAND

TK65 - TK75 - TK76 - TK85 - TK95 TRACTORS

SERVICE MANUAL

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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;
- 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 510 or SILASTIC AP black.
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 80 to 90 ^{0}C (176 to 194 ^{0}F) before fitting on the shafts;
- allow the bearings to cool before installing them from the outside.

SPRING PINS

When fitting split socket elastic pins, ensure that the pin notch is positioned in the direction of the force required to stress the pin.
Spiral spring pins do not require special positioning.

FRONT SEALS

Carefully check the metal rings, making sure that the sealing surfaces show no signs of scoring, dents or wear caused by ring pair misalignment or surface flatness errors.

Even if only one of the rings is faulty, change the entire seal.

Never pair a used ring with a new one or use different pairs of rings.

To fit the seals, proceed as follows.

1. Eliminate any sharp edges or burr and carefully clean the seats for the rubber rings.
2. Thoroughly clean the rings on the seals.
3. Insert each metal ring (2) on the respective rubber ring (1), as shown in the drawing, acting on the points indicated by the arrows.

1

4. Make sure that the metal ring is fitted correctly, checking that measurement (A) is constant on all of the circumference.
5. Assemble each pair of rings in their respective seats (1), manually positioning the rubber ring (as shown in figure

2

6. Before terminating assembly operations, clean the sealing surfaces (1) with a clean (not frayed) cloth and pour a thin covering of fluid oil over the surfaces.

3

SPARE PARTS

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

4

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 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.*

5

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.
- 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 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 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 tractor 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 tractor 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 dm^3 (gallons)	RECOMMENDED NEW HOLLAND PRODUCTS	NEW HOLLAND SPECIFICATIONS	INTERNATIONAL SPECIFICATIONS
Cooling system: - models TK65, TK75 ..... - models TK76, TK85, TK95	10.5 (2.31) 13.0 (2.86)	Water & liquid **AMBRA AGRIFLU 50% + 50%**	NH 900 A	-
Fuel tank: - models TK65, TK75 ..... - models TK76, TK85, TK95	80 (17.6) 129 (28.38)	Decanted and filtered diesel fuel	-	-
Engine sump: without filter: - models TK65, TK75 ..... - models TK76, TK85, TK95 with filter: - models TK65, TK75 ..... - models TK76, TK85, TK95	6.7 (1.47) 10.5 (2.31) 7.3 (1.61) 11.2 (2.46)	**AMBRA SUPER GOLD 15W - 40** oil or **10W - 30**	NH 330G (SAE 15W-40) NH 24G (SAE 10W-30)	API CF-4/SG CCMC D4 MIL-L-2104E
Steering clutches	1.4 (0.31)	**AMBRA SUPER** oil **10W**	NH 301 C	API CE CCMC D4 MIL-L-2104C SAE 10W
Transmission: (gears, bevel drive, brakes and hydraulic lift) - models TK65, TK75 ..... - models TK76, TK85, TK95 Track tension wheel, carriage rollers, track support rollers	33.3 (7.32) 39.0 (7.92) -	**AMBRA MULTI F** oil	NH 420 A	API GL4 ISO 46/68 SAE 20W-30
Final drives (each)	2.0 (0.44)	**AMBRA HYPOIDE 90** oil	NH 520 A	API GL5 MIL-L-2105D SAE 80W-90
Grease fittings	-	**AMBRA GR9** grease	NH 710 A	NLGI 2

SECTION 10 - ENGINE

Chapter 1 - Engine

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GENERAL SPECIFICATIONS	3 cylinders	4 cylinders
Engine, technical type:		
- model TK 65 - type 8035.05.421 (BOSCH pump)	See data on page 6-7	-
- model TK 75 - type 8035.25.421 (BOSCH pump)	See data on page 8-9	-
- model TK 76 - type 8045.06.421/521 (BOSCH pump) .	-	See data on page 10-11
- model TK 85 - type 8045.05.421/521 (BOSCH pump) .	-	See data on page 12-13
- model TK 95 - type 8045.25L.421 (BOSCH pump)	-	See data on page 14-15
Cycle	diesel, 4-stroke	
Injection	direct	
Number of on-line cylinders	3	4
Cylinder liners	dry force-fitted in cylinder block	
Piston diameter		
- models TK 65, TK 75	104 mm (4.0945 in.)	-
- model TK 76	-	100 mm (3.937 in.)
- models TK 85, TK 95	-	104 mm (4.0945 in.)
Piston stroke	115 mm (4.37 in.)	
Total displacement:		
- model TK 65	2931 cm^3 (0.6447 gal.)	-
- model TK 75	2931 cm^3 (0.6447 gal.)	-
- model TK 76	-	3613 cm^3 (0.7947 gal.)
- model TK 85	-	3908 cm^3 (0.8596 gal.)
- model TK 95	-	3908 cm^3 (0.8596 gal.)
Compression ratio for models TK 65, TK 76 and TK 85	17 to 1 normally aspirated	
Compression ratio for models TK 75 and TK 95	16.5 to 1 turbocharged	
Maximum power:		
- model TK 65	44.5 kW (60 Hp)	-
- model TK 75	54 kW (72 Hp)	-
- model TK 76	-	53 kW (71 Hp)
- model TK 85	-	58.8 kW (80 Hp)
- model TK 95	-	66.5 kW (90 Hp)
Maximum power speed - models TK 65, TK 75	2300 rpm	
Maximum power speed - TK 76, TK 85, TK 95	2500 rpm	
Maximum torque speed - model TK 65	1400 rpm	-
Maximum torque speed - model TK 75	1400 rpm	-
Maximum torque speed - model TK 76	-	1500 rpm
Maximum torque speed - model TK 85	-	1500 rpm
Maximum torque speed - model TK 95	-	1500 rpm
Number of main bearings	4	5
Sump pan	structural, cast iron	

(continued)

(continued)

GENERAL SPECIFICATIONS	3 cylinders	4 cylinders
Lubrication system	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 TK 65, TK 76, TK 85	2.9 to 3.9 bar (42.1 to 56.6 psi)	
For models TK 75, TK 95 (starting pressure)	6 bar (87 psi)	
Pressure relief valve	incorporated in oil pump housing	
Valve initial opening pressure	3.5 bar (50.8 psi)	
For further lubrication technical data	See page 23	
Cooling system	coolant circulation	
Radiator on models TK 65, TK 75	3 lines of vertical pipes with copper fins	
Radiator on models TK 76, TK 85, TK 95	4 lines of vertical copper pipes	
Fan, attached to coolant pump pulley	intake, 4-blade in sheet-metal	
Coolant pump	centrifugal vane-type	
Engine speed/coolant pump speed ratio	1:1.403	
Temperature control	thermostat	
Coolant thermometer	coloured scale divided into 3 sections	
Temperature ranges corresponding to each section:		
- initial white section	30 to 65 °C (86 to 149 °F)	
- middle green section (normal working conditions)	65 to 105 °C (149 to 221 °F)	
- final red section	105 to 115 °C (221 to 239 °F)	
For further cooling system technical data	See page 23	
Rev counter	incorporated in control panel	
Operating system	from gear on camshaft	
Hour counter calibrated for engine speed of	1800 rpm	

(continued)

(continued)

GENERAL SPECIFICATIONS	3 cylinders	4 cylinders
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	
Inlet:		
- start: before TDC.	12°	
- end: after BDC.	31°	
Exhaust:		
- start: before BDC.	50°	
- end: after TDC.	16°	
valve-rocker arm clearance for timing check	0.45 mm (0.248 in.)	
valve-rocker arm clearance (with engine cold):		
- intake	0.30 ± 0.05 mm (0.1654 ± 0.0276 in.)	
- exhaust	0.30 ± 0.05 mm (0.1654 ± 0.0276 in.)	
For further timing system technical data	See page 20	
Fuel system		
Air cleaning	dual cartridge dry air filter, with clogged filter indicator with centrifugal pre-filter and automatic dust ejector	
Fuel pump	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 (22 gal./hour)	
Cam operated	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 TK 75, TK 95):	
- GARRETT type	TA 3118-0.82 A/R-57
Injection pump	rotating distributor with speed governor and advance variator incorporated
BOSCH pump:	
- model TK 65	VE 3/11 F 1150 L 766 - 99441586
- model TK 75	VE 3/11 F 1150 L 764 - 99441587
- model TK 76	VE 4/11 F 1250 L 794 - 99472104
- model TK 76	VE 4/11 F 1250 L 810 - 500324959
- model TK 85	VE 4/11 F 1250 L 773 - 99472102
- model TK 85	VE 4/11 F 1250 L 787 - 500324962
- model TK 95	VE 4/11 F 1250 L 850 - 500358111
Direction of rotation	counter-clockwise
Injection order	1-2-3 (TK 65, TK 75) 1-3-4-2 (TK 76, TK 85, TK 95)

	TK 65	TK 75	TK 85	TK 95	TK 76
Injectors:					
BOSCH type	500307714				500317389
- Nozzle holder type	4791124 (KBEL83S35)				
- Nozzle type	99469341 (DLLA132S1320)				500317390 (DLLA132S 1335)
Number of nozzle holes	5				5
Nozzle hole diameter mm (in.)	0.23 (0.0091)				0.21 (0.0083)
Calibration pressure bar (psi)	260 to 272 (3771 to 3945)				260 to 272 (3771 to 3945)
Delivery lines for BOSCH pump					
- type	99441952		-	99449006	-
- Line dimension mm (in.)	6x1.75x540 (0.2362x0.0689x21.260)		6x1.75x530 (0.2362x 0.0689x 20.866)	6x1.75x530 (0.2362x 0.0689x 20.866)	-

MODEL TK 65 - CALIBRATION DATA FOR BOSCH INJECTION PUMP TYPE VE 3/11 F 1150 L 766 - 99441586

ASSEMBLY DATA

Pump timing on engine: delivery start 9° ± 0.5° before TDC of cylinder 1 compression stroke.
Plunger pre-lift for timing on engine: 1 mm (0.0394 in.) from BDC (with tools **291754** - **291755**).
Cylinder No.1 delivery line union on pump: marked with letter A.

ASSEMBLY DIMENSIONS

SYMBOL	VHA	MS	ya	yb
mm (in.)	30.1 (1.185)	-	36.5 to 38.5 (1.437 to 1.5157)	40.4 to 45.6 (1.5905 to 1.7953)

CALIBRATION TEST CONDITIONS

Test bench conforming to ISO 4008/1 .../2
Injectors conforming to ISO 7440-A61 - (1.688.901.020 with calibrated pad ∅ 0.6 mm - 0.0236 in.).

Injector pressure setting 172 to 175 bar (2495 to 2538 psi).

Fuel supply pressure:
. . . . . 0.35 + 0.05 bar (5.1 + 0.7 psi).

Pipes (conforming to ISO 4093.2):
. . . . . 6 x 2 x 840 mm (0.2362 x 0.0787 x 33.071 in.).

Graduate drain time . . . . . : 30".

Test liquid: ISO 4113 at a temperature of 45° ± 1°C (113° ± 33.8°F) at outlet.

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: 1220	Advance stroke: 0.7 to 1.1 mm (0.0276 to 0.0433 in.)

3. FUEL SUPPLY PUMP PRESSURE

rpm: 1220	Internal pressure: 7.9 to 8.5 bar (114.5 to 123.3 psi)

4. FULL LOAD DELIVERY

rpm: 700	Delivery per 1000 shots: 66.7 to 67.7 cm^3 (0.0147 to 0.0149 gal.)	Spread: ≤ 3.5 cm^3 (0.0008 gal.)

5. SPREAD GOVERNOR AT IDLE SPEED

rpm: 325	Delivery per 1000 shots: 16.3 to 17.3 cm^3 (0.0036 to 0.0038 gal.)	Spread: ≤ 5.5 cm^3 (0.0012 gal.)

6. SPREAD GOVERNOR AT MAXIMUM SPEED

rpm: 1200	Delivery per 1000 shots: 48.5 to 49.5 cm^3 (0.0107 to 0.0109 gal.)	Spread: cm^3 -

7. DELIVERY AT STARTING SPEED

rpm: 100	Delivery per 1000 shots: 60 to 100 cm^3 (0.0132 to 0.022 gal.)

8. TRANSFER PRESSURE PROGRESSION

rpm		1220	400
Internal pressure	bar (psi)	7.9 to 8.5 (114.6 to 123.3)	3.4 to 4.4 (49.3 to 63.8)

9. INJECTION ADVANCE PROGRESSION

rpm		1220	1260
Advance stroke	mm (in.)	0.7 to 1.1 (0.276 to 0.0433)	1.3 to 1.9 (0.0512 to 0.0748)

10. BACKFLOW

rpm		400	1150
Backflow	cm^3 (gal.)/10 sec	16 to 28 (0.0035 to 0.0062)	20 to 36 (0.0044 to 0.0079)

(continued)

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

(continued)

11. DELIVERY PROGRESSION

rpm	Delivery per 1000 shots: cm^3 (gal.)
1270	0 to 3 (0 to 0.0007)
1200	48.5 to 49.5 (0.0107 to 0.0109)
700	66.7 to 67.7 (0.0147 to 0.0149)
1150	64.4 to 68.4 (0.0142 to 0.0150)

12. DELIVERY CHECK AT IDLE SPEED

rpm	325	275
Delivery per 1000 shots: cm^3 (gal.)	16.3 to 17.3 (0.0036 to 0.0038)	46 to 47 (0.0101 to 0.0103)

13. ZERO CAPACITY (STOP)

rpm	Voltage (volts)	Delivery per 1000 shots: cm^3 (gal.)
325	0	0 to 3 (0 to 0.0070)

14. AUTOMATIC START SUPPLEMENT

rpm	Delivery per 1000 shots: cm^3 (gal.)
100	60 to 100 (0.0132 to 0.022)
270	59 to 69 (0.0130 to 0.0152)

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

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 740 ± 5 mm (29.1339 ± 0.1968 in.) mercury.

Relative humidity 70°/o ± 5.

Ambient temperature 20 ± 3 °C (68 ± 37.4 °F).

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

Throttle lever position	Braking load applied	Engine speed rpm	Power output with engine run-in for a total of: Production speed kW (Hp)	Power output with engine run-in for a total of: 50 hours (total) kW (Hp)	Fuel consumption kg (lbs.)/h
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 to 31.8 (40.8 to 43.2)	6.4 to 6.8 (14.11 to 23.15)
Maximum	None (no-load)	2450 to 2500	-	-	-
Minimum	None (no-load)	625 to 675	-	-	-

MODELS TK 75 - CALIBRATION DATA FOR BOSCH INJECTION PUMP TYPE VE 3/11 F 1150 L 764 - 99441587

ASSEMBLY DATA

Pump timing on engine: delivery start 6° ± 0.5° before TDC of cylinder 1 compression stroke.
Plunger pre-lift for timing on engine: 1 mm (0.0394 in.) from BDC (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 (1.5197 to 1.5984)	40.4 to 45.6 (1.5905 to 1.7953)

CALIBRATION TEST CONDITIONS

Test bench conforming to ISO 4008/1 .../2
Injectors conforming to ISO 7440-A61 - (1.688.901.027 with calibrated pad ∅ 0.5 mm - 0.0197 in.).

Injector pressure setting 250 to 253 bar (3626 to 3669 psi).

Fuel 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 (0.2362 x 0.0787 x 17.716 in.).

Graduate drain time ..... : 30".

Test liquid: ISO 4113 at a temperature of 45° ± 1°C (113° ± 33.8°F) at outlet.

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: 850	LDA pressure: kPa 100	Advance stroke: 0.2 to 1.2 mm (0.0079 to 0.0472 in.)

3. FUEL SUPPLY PUMP PRESSURE

rpm: 1220	LDA pressure: kPa 100	Internal pressure: 8.3 to 9.5 bar (129.1 to 137.8 psi)

4. FULL-LOAD DELIVERY WITH BOOSTER PRESSURE

rpm: 700	LDA pressure: kPa 100	Delivery per 1000 shots: 88.4 to 93.4 cm^3 (0.0194 to 0.0205 gal.)	Spread: ≤ - cm^3

5. FULL-LOAD DELIVERY WITHOUT BOOSTER PRESSURE

rpm: 600	LDA pressure: kPa 0	Delivery per 1000 shots: 70.5 to 75.5 cm^3 (0.0155 to 0.0166 gal.)	Spread: - cm^3

6. SPREAD GOVERNOR AT IDLE SPEED

rpm: 325	LDA pressure: kPa 0	Delivery per 1000 shots: 6.3 to 17.3 cm^3 (0.0014 to 0.0038 gal.)	Spread: ≤ - cm^3

7. SPREAD GOVERNOR AT MAXIMUM SPEED

rpm: 1210	LDA pressure: kPa 100	Delivery per 1000 shots: 37 to 53 cm^3 (0.0081 to 0.0117 gal.)	Spread: - cm^3

8. DELIVERY AT STARTING SPEED

rpm: 100	Delivery per 1000 shots: 85 to 125 cm^3 (0.0187 to 0.0275 gal.)

9. INJECTION ADVANCE PROGRESSION

LDA pressure:	kPa	100	
rpm		850	950
Advance stroke	mm (in.)	0.2 to 1.2 (0.0079 to 0.0473)	1.3 to 1.9 (0.0512 to 0.0748)

10. TRANSFER PRESSURE PROGRESSION

LDA pressure:	kPa	100		
rpm		500	1220	1180
Internal pressure supply:	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		600	1150
LDA pressure:	kPa	0	100
Backflow for 10 sec.	l (gal.)/h	17 to 31 (3.7395 to 6.819)	21 to 39 (4.6193 to 8.5788)

(continued)

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

(continued)

12. DELIVERY PROGRESSION

rpm	LDA pressure kPa	Delivery per 1000 shots: cm^3 (gal.)
1270	100	0 to 3 (0 to 0.0007)
1210	100	37 to 53 (0.0081 to 0.0117)
700	100	88.4 to 93.4 (0.0194 to 0.0205)
600	40	80 to 87 (0.0176 to 0.0191)
600	0	70.5 to 75.5 (0.0155 to 0.0166)
1150	100	76 to 82 (0.0167 to 0.0180)

13. ZERO CAPACITY (STOP)

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

14. DELIVERY CHECK AT IDLE SPEED

rpm	325	410
Delivery per 1000 shots: cm^3 (gal.)	6.3 to 17.3 (0.0014 to 0.0038)	0 to 3 (0 to 0.0007)

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 (gal.)
100	85 to 125 (0.0187 to 0.0275)
250	74.6 to 86.6 (0.0164 to 0.0190)
160	100 to 130 (0.220 to 0.0286)

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 (1.8855 psi).	Relative humidity 70°/o ± 5. Ambient temperature 20 ± 3 °C (68 ± 37.4 °F). Specific gravity of diesel fuel 840 g/l at a temperature of 15 °C (59 °F).

Throttle lever position	Braking load applied	Engine speed rpm	Power output with engine run-in for a total of: Production speed kW (Hp)	Power output with engine run-in for a total of: 50 hours (total) kW (Hp)	Fuel consumption kg (lbs.)/h
Maximum	For maximum power output	2300	≥ 50.4 (68.5)	51.4 to 54.5 (1) (69.9 to 74.1)	11.6 to 12.3 (25.57 to 27.12)
Maximum	For maximum torque	1400	≥ 39.3 (53.4)	40.1 to 42.6 (2) (54.5 to 57.9)	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) 0.875 to 1.025 bar (12.6908 to 14.8664 psi) - (2) 0.55 to 0.65 bar (7.9771 to 9.4275 psi).

MODELTK 76 - CALIBRATION DATA FOR BOSCH INJECTION PUMP TYPE VE 4/11 F 1250 L 794 - 99472104 / VE 4/11 F 1250 L 810 - 500324959

ASSEMBLY DATA

Pump timing on engine: delivery start 9° ± 0.5° before TDC of cylinder 1 compression stroke.
Plunger pre-lift for timing on engine: 1 mm (0.0394 in.) from BDC (with tools **291754** - **291755**).
Cylinder No.1 delivery line union on pump: marked with letter A.

ASSEMBLY DIMENSIONS

SYMBOL	SVS	K	MS	ya	yb
mm (in.)	-	3.1 to 3.5 (0.1220 to 0.1378)	0.9 to 1.3 (0..0354 to 0.0512)	36.5 to 38.5 (1.437 to 1.5157)	38.8 to 44 (1.5276 to 1.7323)

CALIBRATION TEST CONDITIONS

Test bench conforming to ISO 4008/1 .../2
Injectors conforming to ISO 7440-A61 - (1.688.901.027 with calibrated pad ∅ 0.5 mm - 0.0197 in.).

Injector pressure setting 247 to 253 bar (3582 to 3669 psi).

Fuel 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 (0.2362 x 0.0787 x 17.716 in.).

Graduate drain time . . . . : 30".
Test liquid: ISO 4113 at a temperature of 45° ± 1°C (113° ± 33.8°F) at outlet.

1. START OF DELIVERY

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

2. ADVANCE REGULATOR STROKE

rpm: 800	Advance stroke: 0.7 to 1.1 mm (0.0276 to 0.0433 in.)

3. FUEL SUPPLY PUMP PRESSURE

rpm: 800	Internal pressure: 5.9 to 6.5 bar (85.6 to 94.3 psi)

4. FULL LOAD DELIVERY

rpm: 800	Delivery per 1000 shots: 65.1 to 66.1 cm^3 (0.0143 to 0.0145 gal.)	Spread:- 3.5 cm^3 (- 0.0008 gal.)

5. SPREAD GOVERNOR AT IDLE SPEED

rpm: 325	Delivery per 1000 shots: 7.5 to 8.5 cm^3 (0.0016 to 0.0019 gal.)	Spread: ≤ 3.5 cm^3 (0.0008 gal.)

6. SPREAD GOVERNOR AT MAXIMUM SPEED

rpm: 1270	Delivery per 1000 shots: 43.5 to 44.5 cm^3 (0.0096 to 0.0098 gal.)	Spread: - cm^3

7. DELIVERY AT STARTING SPEED

rpm: 100	Delivery per 1000 shots: 75 to 105 cm^3 (0.0165 to 0.0231 gal.)

8. TRANSFER PRESSURE PROGRESSION

rpm	800	400
Internal pressure bar (psi)	5.9 to 6.5 (85.6 to 94.3 psi)	3.8 to 4.4 (55.1 to 63.8 psi)

9. INJECTION ADVANCE PROGRESSION

rpm	800	
Advance stroke mm (in.)	0.7 to 1.1 (0.0276 to 0.0433)	

10. BACKFLOW

rpm	400	1200
Backflow cm^3 (gal.)	44.1 to 77.2 (0.0097 to 0.017)	60.7 to 104.8 (0.0134 to 0.0231)

(continued)

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

(continued)

11. DELIVERY PROGRESSION

rpm	Delivery per 1000 shots: cm^3 (gal.)
1340	0 to 3 (0 to 0.0007)
1270	43.5 to 44.5 (0.0096 to 0.0098)
1200	58.4 to 61.3 (0.0128 to 0.0135)
800	65.1 to 66.1 (0.0143 to 0.0145)
400	59.6 to 67.6 (0.0131 to 0.0149)

12. DELIVERY CHECK AT IDLE SPEED

rpm	325	290	370
Delivery per 1000 shots: cm^3 (gal.)	7.5 to 8.5 (0.0016 to 0.0019)	15.5 to 23.5 (0.00345 to 0.0052)	0 to 3 (0 to 0.0007)

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

13. ZERO CAPACITY (STOP)

rpm	Voltage (volts)	Delivery per 1000 shots: cm^3 (gal.)
325	0	0 to 3 (0 to 0.0007)

14. AUTOMATIC START SUPPLEMENT

rpm	Delivery per 1000 shots: cm^3 (gal.)
100	70 to 105 (0.0154 to 0.0231)
250	47.5 to 55.5 (0.0104 to 0.0122)

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 740 ± 5 mm (29.1339 ± 0.1968 in.) mercury.

Relative humidity 70°/o ± 5.

Ambient temperature 25 °C (77 °F).

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

Throttle lever position	Braking load applied	Engine speed rpm	Power output with engine run-in for a total of: Production speed kW (Hp)	Power output with engine run-in for a total of: 50 hours (total) kW (Hp)	Fuel consumption kg (lbs.)/h
Maximum	For maximum power output	2500	≥ 50 (68)	51.1 to 54 (69.5 to 73.4)	11.8 to 12.4 (26.01 to 27.34)
Maximum	For maximum torque	1500	≥ 36 (48.9)	36.8 to 39 (51.1 to 54.2)	8.0 to 8.4 (17.66 to 18.52)
Maximum	None (no-load)	2700 to 2750	-	-	-
Minimum	None (no-load)	625 to 675	-	-	-

MODELTK 85 - CALIBRATION DATA FOR BOSCH INJECTION PUMP TYPE VE 4/11 F 1250 L 773 - 99472102 / VE 4/11 F 1250 L 787 - 500324962

ASSEMBLY DATA

Pump timing on engine: delivery start 9° ± 0.5° before TDC of cylinder 1 compression stroke.
Plunger pre-lift for timing on engine: 1 mm (0.0394 in.) from BDC (with tools **291754** - **291755**).
Cylinder No.1 delivery line union on pump: marked with letter A.

ASSEMBLY DIMENSIONS

SYMBOL	K	KF	r	ya	yb
mm (in.)	-	-	30.1 (1.185)	36.5 to 38.5 (1.437 to 1.5157)	37.4 to 42.6 (1.4724 to 1.6772)

CALIBRATION TEST CONDITIONS

Test bench conforming to ISO 4008/1 .../2
Injectors conforming to ISO 7440-A61 - (1.688.901.027 with calibrated pad ∅ 0.5 mm - 0.0197 in.).

Injector pressure setting 250 to 253 bar (3626 to 3669 psi).

Fuel 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 (0.2362 x 0.0787 x 17.716 in.).

Graduate drain time . . . . . : 30".

Test liquid: ISO 4113 at a temperature of 45° ± 1°C (113° ± 33.8°F) at outlet.

1. START OF DELIVERY

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

2. ADVANCE REGULATOR STROKE

rpm: 900	Advance stroke: 0.7 to 1.1 mm (0.0276 to 0.0433 in.)

3. FUEL SUPPLY PUMP PRESSURE

rpm: 900	Internal pressure: 6.7 to 7.3 bar (97.2 to 105.9 psi)

4. FULL LOAD DELIVERY

rpm: 800	Delivery per 1000 shots: 61.2 to 62.2 cm^3 (0.0135 to 0.0137 gal.)	Spread: ≤ 3.5 cm^3 (0.0008 gal.)

5. SPREAD GOVERNOR AT IDLE SPEED

rpm: 300	Delivery per 1000 shots: 9.2 to 10.2 cm^3 (0.002 to 0.0022 gal.)	Spread: ≤ - cm^3

6. SPREAD GOVERNOR AT MAXIMUM SPEED

rpm: 1300	Delivery per 1000 shots: 41.1 to 42.1 cm^3 (0.0090 to 0.0092 gal.)	Spread: ≤ 3.5 cm^3 (0.0008 gal.)

7. DELIVERY AT STARTING SPEED

rpm: 100	Delivery per 1000 shots: 33 to 73 cm^3 (0.0073 to 0.0161 gal.)

8. TRANSFER PRESSURE PROGRESSION

rpm	900	450
Internal pressure supply: bar (psi)	6.7 to 7.3 (97.2 to 105.9 psi)	4.3 to 5.3 (62.4 to 76.9 psi)

9. INJECTION ADVANCE PROGRESSION

rpm	900	1020
Advance stroke mm (in.)	0.7 to 1.1 mm (0.0276 to 0.0433)	1.3 to 1.9 (0.0512 to 0.0748)

10. BACKFLOW

rpm	450	1250
Backflow for 10 s cm^3 (gal.)	18 to 30 (0.0040 to 0.0066)	24 to 40 (0.0053 to 0.0088)

(continued)

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

(continued)

11. DELIVERY PROGRESSION

rpm	Delivery per 1000 shots: cm^3 (gal.)
1400	0 to 3 (0 to 0.0007)
1300	41.1 to 42.1 (0.0090 to 0.0092)
1250	52.5 to 57.5 (0.0115 to 0.0126)
1200	53.5 to 58.5 (0.0118 to 0.0129)
800	61.2 to 62.2 (0.0135 to 0.0137)

12. DELIVERY CHECK AT IDLE SPEED

rpm	300
Delivery per 1000 shots: cm^3 (gal.)	9.2 to 10.2 (0.0020 to 0.0022)

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

13. ZERO CAPACITY (STOP)

rpm	Voltage (volts)	Delivery per 1000 shots: cm^3 (gal.)
300	0	0 to 3 (0 to 0.0007)

14. AUTOMATIC START SUPPLEMENT

rpm	Delivery per 1000 shots: cm^3 (gal.)
100	33 to 73 (0.0073 to 0.0161)
250	34 to 44 (0.0075 to 0.0097)
140	40 to 70 (0.0088 to 0.0154)

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 740 ± 5 mm (29.1339 ± 0.1968 in.) mercury.

Relative humidity 70°/o ± 5.

Ambient temperature 25 °C (77 °F).

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

Throttle lever position	Braking load applied	Engine speed rpm	Power output with engine run-in for a total of: Production speed kW (Hp)	Power output with engine run-in for a total of: 50 hours (total) kW (Hp)	Fuel consumption kg (lbs.)/h
Maximum	For maximum power output	2500	≥ 55 (74.8)	56.2 to 59.6 (76.4 to 81)	12.9 to 13.7 (28.44 to 30.2)
Maximum	For maximum torque	1500	≥ 39.3 (53.4)	40.2 to 42.7 (54.7 to 58.1)	8.8 to 9.4 (19.4 to 20.72)
Maximum	None (no-load)	2700 to 2750	-	-	-
Minimum	None (no-load)	625 to 675	-	-	-

MODELTK 95 - CALIBRATION DATA FOR BOSCH INJECTION PUMP TYPE VE 4/11 F 1250 L 850 - 500358111

ASSEMBLY DATA

Pump timing on engine: delivery start 5° ± 0.5° before TDC of cylinder 1 compression stroke.
Plunger pre-lift for timing on engine: 1 mm (0.0394 in.) from BDC (with tools **291754** - **291755**).
Cylinder No.1 delivery line union on pump: marked with letter A.

ASSEMBLY DIMENSIONS

SYMBOL	K	r	ya	yb
mm (in.)	-	30.1 (1.185)	36.5 to 38.5 (1.437 to 1.5157)	40 to 46

CALIBRATION TEST CONDITIONS

Test bench conforming to ISO 4008/1 .../2
Injectors conforming to ISO 7440-A61 - (1.688.901.027 with calibrated pad ∅ 0.5 mm - 0.0197 in.).

Injector pressure setting 250 to 253 bar (3626 to 3669 psi).

Fuel 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 (0.2362 x 0.0787 x 17.716 in.).

Graduate drain time . . . . . : 30".

Test liquid: ISO 4113 at a temperature of 45° ± 1°C (113° ± 33.8°F) at outlet.

1. START OF DELIVERY

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

2. ADVANCE REGULATOR STROKE

rpm: 900	Advance stroke: 0.8 to 1.2 mm (0.0315 to 0.0472 in.)

3. FUEL SUPPLY PUMP PRESSURE

rpm: 900	Internal pressure: 6.2 to 6.8 bar (89.9 to 98.6 psi)

4. FULL-LOAD DELIVERY WITH BOOSTER PRESSURE

rpm: 750	LDA pressure: kPa 100	Delivery per 1000 shots: 76 to 77 cm^3 (0.0167 to 0.0169 gal.)	Spread: ≤ 3.5 cm^3 (0.0008 gal.)

5. FULL-LOAD DELIVERY WITHOUT BOOSTER PRESSURE

rpm: 600	Delivery per 1000 shots: 54.2 to 55.2 cm^3 (0.0119 to 0.0121 gal.)

6. SPREAD GOVERNOR AT IDLE SPEED

rpm: 325	Delivery per 1000 shots: 11.5 to 12.5 cm^3 (0.0025 to 0.0027 gal.)	Spread: ≤ 4.0 cm^3 (0.0009 gal.)

7. SPREAD GOVERNOR AT MAXIMUM SPEED

rpm: 1300	LDA pressure: kPa 100	Delivery per 1000 shots: 42.7 to 43.7 cm^3 (0.0094 to 0.0096 gal.)

8. DELIVERY AT STARTING SPEED

rpm: 100	Delivery per 1000 shots: 85 to 125 cm^3 (0.0187 to 0.0275 gal.)

9. TRANSFER PRESSURE PROGRESSION

LDA pressure:	kPa	100	
rpm		400	900
Internal pressure supply:	bar (psi)	2.9 to 3.9 (42.1 to 56.6)	6.2 to 6.8 (89.9 to 98.6)

10. INJECTION ADVANCE PROGRESSION

LDA pressure	kPa	100	
rpm		900	1050
Advance stroke	mm (in.)	0.8 to 1.2 (0.0315 to 0.0472)	1.4 to 2.0 (0.0551 to 0.0787)

11. BACKFLOW

rpm		600	1250
LDA pressure	kPa	0	100
Backflow	cm^3 (gal.)	18 to 30 (0.0039 to 0.0066)	22 to 38 (0.0048 to 0.0083)

(continued)

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

(continued)

12. DELIVERY PROGRESSION

rpm	Pressure LDA kPa	Delivery per 1000 shots: cm^3 (gal.)
600	25	70.5 to 71.5 (0.0155 to 0.0157)
1380	100	0 to 3 (0 to 0.0007)
1300	100	42.7 to 43.7 (0.0094 to 0.0096)
1250	100	66.1 to 70.1 (0.0145 to 0.0154)
750	100	76 to 77 (0.0167 to 0.0169)
600	0	54.2 to 55.2 (0.0119 to 0.0121)

13. DELIVERY CHECK AT IDLE SPEED

rpm	325	275
Delivery per 1000 shots cm^3 (gal.)	11.5 to 12.5 (0.0025 to 0.0027)	28.4 to 40.4 (0.0062 to 0.0089)

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

14. ZERO CAPACITY (STOP)

rpm	Voltage (volts)	Delivery per 1000 shots: cm^3 (gal.)
325	0	0 to 3 (0 to 0.0007)

15. AUTOMATIC START SUPPLEMENT

rpm	Pressure LDA kPa	Delivery per 1000 shots: cm^3 (gal.)
100	-	85 to 125 (0.0187 to 0.0275)
250	-	60 to 70 (0.0132 to 0.0154)
150	-	100 to 130 (0.0220 to 0.0286)

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 740 ± 5 mm (29.1339 ± 0.1968 in.) mercury.

Relative humidity 70°/o ± 5.

Ambient temperature 25 °C (77 °F).

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

Throttle lever position	Braking load applied	Engine speed rpm	Power output with engine run-in for a total of: Production speed kW (Hp)	50 hours (total) kW (Hp)	Fuel consumption kg (lbs.)/h
Maximum	For maximum power output	2500	≥ 63.2 (85.9)	64.5 to 68.5 (87.7 to 93.1)	15.2 to 16.2 (33.51 to 35.71)
Maximum	For maximum torque	1500	≥ 49.5 (67.3)	50.5 to 53.5 (68.7 to 72.8)	10.8 to 11.4 (23.81 to 25.13)
Maximum	None (no-load)	2700 to 2750	-	-	-
Minimum	None (no-load)	625 to 675	-	-	-

FUEL SUPPLY PUMP DATA	mm (in.)
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)
Clearance between axle shafts and bushes	0.050 to 0.100 (0.0020 to 0.0039)
Thickness of internal washer	1.45 to 1.50 (0.0571 to 0.0591)
Thickness of external washer	2.93 to 3.00 (0.1154 to 0.1181)

CRANKCASE/CYLINDER BLOCK DATA	mm (in.)	
	Bore 100	Bore 104
Cylinder block	cast-iron monobloc with replaceable dry-fitted cylinder liners, incorporating seatings for crankshaft bearings, cam-shaft and tappet assemblies	
Internal diameter of cylinder liners	100 to 100.024 (1) (3.937 to 3.9379)	104 to 104.024 (1) (4.0945 to 4.0954)
External diameter of cylinder liners	103.02 to 103.05 (4.0559 to 4.0571)	107.02 to 107.05 (4.2134 to 4.2146)
Diameter of cylinder liner bores on block	102.85 to 102.9 (4.0492 to 4.0512)	106.85 to 106.9 (4.2067 to 4.2087)
Interference fit between cylinder liners and bores on the cylinder block	0.120 to 0.200 (0.0047 to 0.0079)	
Cylinder liners 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)	
Main journal half bearing seat diameter	84.200 to 84.230 (3.3150 to 3.3161)	
Camshaft bushing seat diameter:		
- front	54.780 to 54.805 (2.1567 to 2.1577)	
- intermediate	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 (0.5905 to 0.5912)	
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 (in.)	
	Bore 100	Bore 104
Crankshaft	balanced with integral counterweights	
Standard journal diameter	79.791 to 79.810 (1) (3.1414 to 3.1421)	
Journal undersizes	0.254 - 0.508 - 0.762 - 1.016 (0.01 - 0.02 - 0.03 - 0.04)	
Main journal half bearing thickness	2.168 to 2.178 (0.0853 to 0.0857)	
Main half bearing 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 0.0040)	
Maximum permitted wear clearance	0.180 (0.0071)	
Standard crankpin diameter	63.725 to 63.744 (1) (2.5086 to 2.5096)	
Crankpin undersizes	0.254 - 0.508 - 0.762 - 1.016 (0.01 - 0.02 - 0.03 - 0.04)	
Standard connecting rod half bearing thickness	1.805 to 1.815 (0.0711 to 0.0714)	
Connecting rod half bearing undersizes (internal diameter)	0.254 - 0.508 - 0.762 - 1.016 (0.01 - 0.02 - 0.03 - 0.04)	
Bearing to crankpin clearance	0.033 to 0.087 (0.0013 to 0.0034)	
Maximum permitted wear clearance	0.180 (0.0071)	
Standard crankshaft thrust washer thickness	3.378 to 3.429 (0.1330 to 0.135)	
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 1.2602)	
Crankshaft assembly endfloat	0.082 to 0.334 (0.0032 to 0.0131)	
Maximum permitted axial wear clearance	0.40 (0.0157)	
Maximum ovality or taper of journals and crankpin after regrinding	0.01 (0.0039)	
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	0.1 (0.0039)	
Maximum permitted tolerance, in both directions, on crankpin alignment (3-cylinder engine), or of each pair of crankpins relative to crankshaft journals (4-cylinder engine)	0.25 (0.0098)	
Maximum tolerance for run-out between the outer surfaces of the crankshaft journals and the crankshaft centreline	± 0.1 (0.0039)	

(continued)

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

(continued)

CRANKSHAFT AND BEARINGS DATA	mm (in.)	
	Bore 100	Bore 104
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, fig. 96) on a 108 mm (4.252 in.) diameter (total dial gauge reading)	0.025 (0.001)	
Maximum permitted tolerance on co-axial alignment of flywheel centering (B, fig. 96) in relation to crankshaft journals (total dial gauge reading)	0.04 (0.0016)	

CONNECTING ROD DATA	mm (in.)	
	Bore 100	Bore 104
Connecting rods	cast-iron with oil way	
Diameter of small end bushing seat	41.846 to 41.884 (1.6475 to 1.649)	
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 (4.9213 in.)	± 0.07 (0.0027)	
Maximum weight difference between con rods in same engine . .	25 g. (0.055 lbs.)	

PISTON DATA	mm (in.)	
	Bore 100	Bore 104
Pistons	light alloy with three compression rings, including two seal rings and one scraper ring	
Standard piston diameter, measured at 57 mm from skirt base and perpendicularly to the gudgeon pin axis	99.827 to 99.841 (3.9302 to 3.9307)	103.812 to 103.826 (4.0871 to 4.0876)
Piston clearance in cylinder liner	0.159 to 0.197 (0.0062 to 0.0077)	0.174 to 0.212 (0.0068 to 0.0083)
Maximum permitted wear clearance	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 (0.014 to 0.03)	
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 (0.0005 to 0.0012)	
Maximum permitted wear clearance	0.06 (0.0024)	
Maximum weight difference between pistons in same engine	20 g. (0.0001 lbs.)	
Piston ring groove clearance (measured vertically):		
- 1st ring	0.090 to 0.122 (0.0035 to 0.0048)	
- 2nd ring	0.060 to 0.092 (0.0024 to 0.0036)	
- 3rd ring	0.040 to 0.075 (0.0016 to 0.0029)	
Maximum permitted wear clearance:		
- 1st ring	0.50 (0.0197)	
- 2nd and 3rd ring	0.20 (0.0079)	
Assembly clearance between piston ring ends in cylinder sleeves:		
- 1st ring	0.35 to 0.55 (0.0138 to 0.0216)	0.40 to 0.65 (0.0157 to 0.0256)
- 2nd ring	0.30 to 0.45 (0.0118 to 0.0177)	0.30 to 0.55 (0.0118 to 0.0216)
- 3rd ring	0.30 to 0.60 (0.0118 to 0.0024)	
Maximum permissible gap (wear limit)	1.20 (0.0472)	

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VALVE TIMING GEAR DATA	mm (in.)	
	Bore 100	Bore 104
Clearance between sides of timing gear pair teeth	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)	
Clearance between pin and relative bushings	0.050 to 0.100 (0.002 to 0.0039)	
Maximum permitted wear clearance	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)	
- intermediate	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 (0.0027 to 0.0059)	
Inside diameter of camshaft bearings (fitted and reamed):		
- front	51.080 to 51.130 (2.011 to 2.013)	
- intermediate	50.580 to 50.630 (1.9913 to 1.9933)	
- rear	50.080 to 50.130 (1.9716 to 1.9736)	
Diameter of camshaft journals:		
- front	50.970 to 51.000 (2.0067 to 2.0079)	
- intermediate	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 bushings	0.080 to 0.160 (0.0031 to 0.0063)	
Maximum permitted wear clearance	0.20 (0.0079)	
Camshaft endfloat between thrust plate and seat on camshaft	0.070 to 0.220 (0.0027 to 0.0087)	
For further timing system technical data	see page 4	

TAPPET DATA	mm (in.)	
	Bore 100	Bore 104
Tappet bore in crankcase	15.000 to 15.018 (0.5905 to 0.5912)	
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)	
Maximum permitted wear clearance	0.15 (0.0059)	
Tappet oversizes	0.1 - 0.2 - 0.3 (0.0039 - 0.0079 - 0.0118)	

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