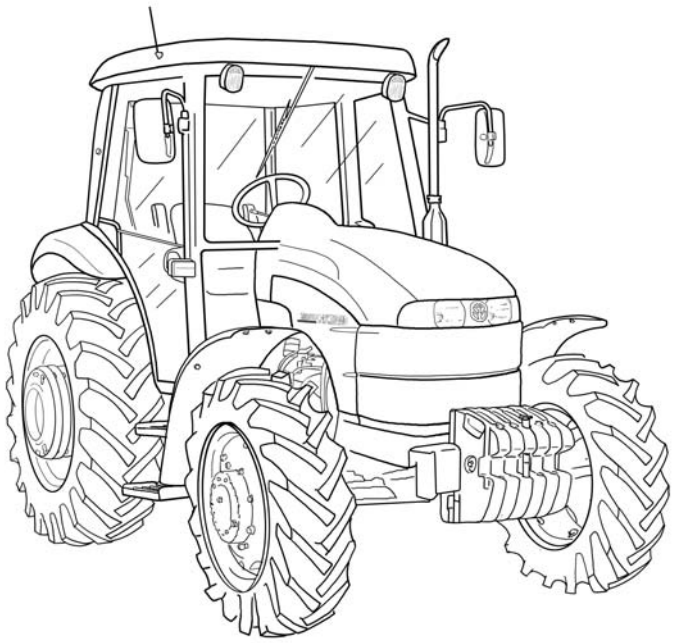
NEW HOLLAND



TD60 – TD70 – TD80 – TD90 – TD95 STRADDLE MOUNT MODEL TRACTORS SERVICE MANUAL

SECTIONS

S E R V I C E

INTRODUCTION

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

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

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

◊ *Pages updated in the future will be identified by the same document number followed by a two–figure update number (for example: 1st update 603.54.331.01; 2nd update 603.54.331.02; etc.) and 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 As NEW HOLLAND constantly improves its product range, some information may be out of date subsequent to modifications implemented for technical or commercial reasons or to meet legal requirements in different countries.*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 who performs the operations described herein without strictly following the instructions is personally responsible for resulting injury or damage to property.*

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

Repair Manual–TD Straddle Mount Series Tractors

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Bodywork And Driver Position — Chapter 1

GENERAL INSTRUCTIONS

IMPORTANT NOTICE

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

SHIMMING

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

ROTATING SHAFT SEALS

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

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

O RINGS

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

SEALERS

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

– remove possible scales using a metal brush;
– thoroughly degrease the surfaces using one of the following cleaning agent: trichlorethylene, petrol or a water and soda solution.

BEARINGS

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

ROLL PINS

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

NOTES FOR SPARE PARTS

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

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

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

NOTES FOR EQUIPMENT

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

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

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

– work in optimal technical conditions;
– obtain best results;
– save time and effort;
– work more safely.

NOTICES

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

HOW TO MOVE THE TRACTOR WITH THE BATTERY REMOVED

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

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SAFETY RULES

PAY ATTENTION TO THIS SYMBOL

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

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

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

TO PREVENT ACCIDENTS

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

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

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

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

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

SAFETY RULES

GENERALITIES

◊ Carefully follow specified repair and maintenance procedures.

◊ Do not wear rings, wristwatches, jewels, unbuttoned or flapping clothing such as ties, torn clothes, scarves, open jackets or shirts with open zips which could get hold into moving parts. We advise to use approved safety clothing such as anti–slipping footwear, gloves, safety goggles, helmets, etc.

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

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

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

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

◊ All repair and maintenance operations should be carried out with the greatest care and attention.

◊ Service stairs 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 warn that the tractor is being serviced. Block the machine and all equipment which should be raised.

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

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

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

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

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

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

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

◊ Always use lifting equipment and similar of appropriate capacity to lift or move heavy components.

◊ Pay special attention to bystanders.

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

◊ Never use gasoline, diesel oil or other flammable liquids as cleaning agents. Use non–flammable non–toxic proprietary solvents.

◊ Wear protection goggles with side guards when cleaning parts using compressed air.

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

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

◊ Do not smoke, use open flames, cause sparks in the nearby area when filling fuel or handling highly flammable liquids.

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

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

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

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

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

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

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

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

◊ Do not keep into your pockets any object which might fall unobserved into the tractor’s inner compartments.

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

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

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

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

START UP

◊ Never run the engine in confined spaces which 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 very slowly before removing it to allow pressure in the system to dissipate. Coolant should be topped up only when the engine is stopped or idle if hot.

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

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

◊ Never lubricate the tractor when the engine is running.

ELECTRICAL SYSTEMS

◊ If it is necessary to use auxiliary batteries, cables must be connected at both sides as follows: (+) to (+) and (–) to (–). Avoid short–circuiting the terminals. GAS RELEASED FROM BATTERIES IS HIGHLY FLAMMABLE. During charging, leave the battery compartment uncovered to improve ventilation. Avoid checking the battery charge by means of “jumpers” made by placing metallic objects across the terminals. Avoid sparks or flames near the battery area. Do no smoke to prevent explosion hazards.

◊ Prior to any service, check for fuel or current leaks. Remove these leaks before going on with the work.

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

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

HYDRAULIC SYSTEMS

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

◊ Always take system pressure readings using the appropriate gauges.

WHEELS AND TYRES

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

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

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

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

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

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

◊ Never inflate tyres using flammable gases as they may originate explosions and cause injuries to bystanders.

REMOVAL AND INSTALLATION

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

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

◊ Do not twine chains or metal cables. Always wear protection gloves to handle cables or chains.

CONSUMABLES

COMPONENT TO BE FILLED OR TOPPED UP	QUANTITY			NEW HOLLAND RECOMMENDED PRODUCTS	INTERNATIONAL SPECIFICATION
	litres/dm^3	US gal	IMP gal		
Cooling system: models TD60, TD70 . . . . . . models TD80, TD90, TD95	 12 14	 3.2 3.7	 2.64 3.08	Water & liquid **AMBRA AGRIFLU 50% + 50%** (NH 900 A)	–
Fuel tank.....	77	20.34	16.94	Decanted and filtered diesel fuel	–
Engine sump: without filter : TD60 and TD70..... TD80, TD90andTD95..... with filter : TD60 and TD70 HP models . . . . . . TD80, TD90 andTD95models.....	 7.6 10.5 8.3 11.2	 1.98 2.77 2.19 2.96	 1.67 2.31 1.83 2.46	**AMBRA Supergold SAE 15W – 40** (NH 330G) **AMBRA Supergold SAE 10W – 30**.. (NH 324G)	API CF–4/SG CCMC D4 MIL–L–2104E
Hydrostatic steering circuit	2.0	0.5	0.44	Oil **AMBRA MULTI G** (NH 410B)	API GL4 ISO 32/46 SAE 10W–30
Front axle: – axle housing: models TD60, TD70 . . . . . . models TD80, TD90, TD95 . . . . . – final drives (each): models TD60, TD70 . . . . . . models TD80, TD90, TD95	 4.5 7.0 0.8 1.25	 1.2 1.8 0.2 0.3	 0.99 1.54 0.18 0.28		
Rear transmission (bevel drive and brakes), gearbox, hydraulic lift and PTO models TD60,TD70, TD80, TD90, TD95 . . . . . . – with synchro–reverser: models TD60, TD70, TD80, TD90, TD95	 46 46	 12.15 12.15	 10.12 10.12		
Rear final drives (each) . . . . . . models TD60, TD70 . . . . . . models TD80, TD90 and TD95 . .	 3.9 5.3	 1.03 1.40	 0.86 1.17		
Front wheel hubs	–	–	–	Grease **AMBRA GR9** (NH 710A)	NLGI 2
Grease fittings	–	–	–		

WARNING

In order to correctly fill the oil and water tanks observe the existing level indications (e.g.: the level on the oil dipstick). Park the tractor on level ground and, where possible, ensure that all of the hydraulic cylinders are fully extended before checking oil levels.

SECTION 10 – ENGINE

Chapter 1 – Engine

CONTENTS

GENERAL SPECIFICATION	3–cylinder	4–cylinder
Engine type:		
– TD 60 model normally aspirated – type 8035.05D.639/939 (BOSCH pump)	–	–
– TD 70 model turbocharged – type 8035.25C.639/939 (BOSCH pump)	–	–
– TD 80 model normally aspirated – type 8045.05R.639/939 (BOSCH pump)	–	–
– TD 90 model turbocharged – type 8045.25.639/939 (BOSCH pump)	–	–
– TD 95 model turbocharged – type 8045.25L.639/939 (BOSCH pump)	–	–
Cycle	Diesel, 4–stroke	
Fuel injection	Direct	
Number of cylinders in line	3	4
Cylinder liners	dry force–fitted in cylinder block	dry force–fitted in cylinder block
Piston diameter		
– TD 60 model	104 mm	–
– TD 70 model	104 mm	–
– TD 80 model	–	104 mm
– TD 90 model	–	104 mm
– TD 95 model	–	104 mm
Piston stroke	115 mm	
Total displacement:		
– TD 60 model	2931 cm^3	–
– TD 70 model	2931 cm^3	–
– TD 80 model	–	3908 cm^3
– TD 90 model	–	3908 cm^3
– TD 95 model	–	3908 cm^3
Compression ratio	17 to 1 normally aspirated 16.5 to 1 turbocharged	
Maximum power 2000/25 EC at 2500 rpm:		
– TD 60 model	43.4 kW (59 HP)	–
– TD 70 model	50.7 kW (69 HP)	–
– TD 80 model	–	58.8 kW (80 HP)
– TD 90 model	–	65.5 kW (89 HP)
– TD 95 model	–	69.1 kW (94 HP)
Maximum power ECE R 24 at 2500 rpm:		
– TD 60 model	41.2 kW (56 HP)	–
– TD 70 model	47.8 kW (65 HP)	–
– TD 80 model	–	55.9 kW (76 HP)
– TD 90 model	–	63.3 kW (86 HP)
– TD 95 model	–	66.9 kW (91 HP)
Fast idling speed	2500 rev/min	
Maximum torque (daNm) at 1500 rpm: TD 60 model	20.7	–
Maximum torque (daNm) at 1500 rpm: TD 70 model	25.0	–
Maximum torque (daNm) at 1500 rpm: TD 80 model	–	27.9
Maximum torque (daNm) at 1500 rpm: TD 90 model	–	32.0
Maximum torque (daNm) at 1500 rpm: TD 95 model	–	33.7
Number of main bearings	4	5
Sump	Structural, cast iron	

(continued)

GENERAL SPECIFICATION	3–cylinder	4–cylinder
Lubrication	forced, with gear pump	
Pump drive	camshaft	
Engine speed/oil pump speed ratio	2:1	
Oil cleaning	mesh filter on oil intake and cartridge filter on delivery line	
Normal oil pressure, with engine hot and at fast idling speed:	2.9 to 3.9 bar (3 to 4 kg/cm^2)	
Lube pressure relief valve	built into pump housing	
Valve opening pressure	3.5 bar (3.6 kg/cm^2)	
For further lubrication data	See page 23	
Cooling system	coolant circulation	
Radiator on TD60, TD70, TD80 and TD90 models	3–row vertical pipes with copper fins	
Radiator on TD95 models	four–row vertical pipes with copper fins	
Fan, attached to coolant pump pulley	4–blade steel exhauster fan	
	6–blade steel exhauster fan (TD95)	
Coolant pump	centrifugal vane–type	
Engine speed/coolant pump speed ratio	1:1,403	
Temperature control	Thermostat	
Coolant temperature gauge	coloured scale divided into 3 sections	
Temperature ranges corresponding to each section:		
– initial white section	from 30° to 65° C	
– middle green section	from 65° to 105° C	
– final red section	from 105° to 115° C	
For further cooling system data	See page 23	
Rev counter	incorporated in control panel	
Rev counter drive	from gear on camshaft	
Hour counter calibrated for engine speed of	1800 rev/min	

(continued)

(continued)

GENERAL SPECIFICATIONS	3–cylinder	4–cylinder
Timing	overhead valves operated by a camshaft located in the engine block through tappets, pushrods and rockers. Camshaft is driven by the crankshaft through helical gears.	
Intake:		
– start: before T.D.C	12°	
– end: after B.D.C	31°	
Exhaust:		
– start: before B.D.C	50°	
– end: after T.D.C	16°	
Valve clearance for timing check	0.45 mm	
Valve clearance for normal running (engine cold):		
– intake	0.30 ± 0.05 mm	
– exhaust	0.30 ± 0.05 mm	
For further timing data	See page 20	
Fuel System		
Air cleaning	dual cartridge dry air filter with clogged filter indicator, centrifugal pre–filter and automatic dust ejector	
Fuel pump	double diaphragm	
Fuel Filter	mesh filter in fuel supply pump and replaceable cartridge on delivery line to injection pump.	
Minimum fuel flow rate with pump shaft rotating at 1600 rev/min.	100 litres/hour	
Operated by eccentric cam	on camshaft	
BOSCH injection pump	distributor type	
All–speed governor, incorporated in pump: BOSCH	centrifugal counterweights	
Automatic advance regulator, incorporated in pump: BOSCH	hydraulic	
For further fuel system data:	see pages 5 to 15	
For 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 pages 5 to 15	

DATA

Turbocharger (TD95 Model): – . . . . . GARRETT type	T25
Fuel injection pump	distributor type with incorporated speed governor and automatic advance regulator
BOSCH pump:	
– . . . . . TD 60 model	VE 3/12 F 1250 L 976
– . . . . . TD 70 model	VE 3/12 F 1150 L 977
– . . . . . TD 80 model	VE 4/12 F 1250 L 980
– . . . . . TD 90 model	VE 4/12 F 1250 L 982
– . . . . . TD 95 model	VE 4/12 F 1150 L 972
Direction of rotation	anti–clockwise
Injection order	1–2–3 (TD60 and TD70 Models) 1–3–4–2 (TD80, TD90 and TD95 Models)

Fuel Injectors: BOSCH					
– Nozzle holder type					
– Nozzle type					
Number of nozzles	5		6		
Diameter of nozzle orifices					
Pressure setting	248–272 bar		248–272 bar		
	TD70	TD95	TD60	TD80	TD90
Fuel delivery lines – BOSCH pump					
– Type					
– Dimensions . . . . . mm	–	–	–	–	–

TD60 MODEL – CALIBRATION DATA FOR BOSCH INJECTION PUMP TYPE VE 3/12 F 1250 L 976

ASSEMBLY DATA

Pump timing on engine: delivery start 4° ± 0.5 before TDC of cylinder 1 compression stroke.
Plunger pre–lift for timing on engine: 1 mm from BDC (with tools **291754 – 291755**)
Cylinder no. 1 delivery line union on pump: marked with letter A.

ASSEMBLY DIMENSIONS

SYMBOL	SVS (max)	KF	MS	ya	yb
mm		–	–	36,9–40,9	41,5–46,5

CALIBRATION TEST CONDITIONS

Test bench conforming to ISO 4008/1.../2
Injectors conforming to ISO 7440–A61 – (1688901027 with pad ∅ 0.5 mm)
Injector setting pressure: 250 bar (254 kg/cm^2).

Fuel supply pressure: 0.35 ±0.05 bar (kg/cm^2).
Delivery pipes (conforming to ISO 4093.2):
6 x 2 x 450 mm
Graduate drain time: 30 seconds
Test liquid: ISO 4113 at a temperature of 40° ± 2°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

Rev/min: 1250	Setting: mm 2.3 ± 0.2

3. FUEL SUPPLY PUMP PRESSURE

Rev/min: 800	Internal pressure: 6.3 ÷ 6.9 bar

4. FULL–LOAD DELIVERY WITHOUT BOOSTER PRESSURE

Rev/min: 750	Delivery: 78.5 – 79.5 mm^3 per crank cycle	Spread: – mm^3

5. ADJUSTMENT AT IDLING SPEED

Rev/min: 325	Delivery: 13 – 17 mm^3 per crank cycle	Spread: – mm^3

6. ADJUSTMENT AT FAST IDLING SPEED

Rev/min: 1300	Delivery: 41 – 45 mm^3 per crank cycle	Spread: – mm^3

7. DELIVERY AT STARTING

Rev/min: 100	Delivery: 80 – 110 mm^3/per crank cycle

8. TRANSFER PRESSURE PROGRESSION

Rev/min.		800	500	1250
Transfer pump pressure	bar	6,3 – 6,9	4,8 – 5,4	8,2 – 8,8

9. INJECTION ADVANCE PROGRESSION

Rev/min		–	–	–
Advance stroke	mm	–	–	–

10. BACKFLOW

Rev/min		–	–
Backflow	cm^3 /10 sec	–	–

(continued)

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

(cont)

11. DELIVERY PROGRESSION

Rev/min.	Delivery: mm^3 per crank cycle
1365	<3
1300	41 – 45
1000	69,5 – 73,5
750	78,5 – 79,5
500	69,5 – 73,5

12. DELIVERY CHECK AT IDLE SPEED

Rev/min.		250	325
Delivery:	mm^3 per crank cycle	43 – 47	13 – 17

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

BENCH TEST PERFORMANCE DATA	
Test Conditions	
Fixed advance before TDC with cylinder No.1 on compression stroke: (see previous page).	Relative humidity 70% ± 5.
Engine without fan, air filter and exhaust silencer.	Ambient temperature 25° C.
Atmospheric pressure: 990 mbar	Specific gravity of diesel fuel 830 ± 10 g/litre.

Throttle lever position	Braking load applied	Engine speed rev/min	Power output with engine run–in for a total of: 2 hours kW)	Power output with engine run–in for a total of: 50 hours kW	Fuel consumption kg/h
Maximum	For maximum torque	2500	–	39,5 – 42,0	9,1 – 9,7
Maximum	For maximum torque	1500	–	31,5 – 33,5	6,8 – 7,2
Maximum	None (no–load)	2770 ± 25	–	–	–
Minimum	None (no–load)	650 ± 25	–	–	–

TD70 MODEL – CALIBRATION DATA FOR BOSCH INJECTION PUMP TYPE VE 3/12 F 1150 L 977

ASSEMBLY DATA

Pump timing on engine: delivery start 0° ± 0.5 before TDC of cylinder 1 compression stroke.
Plunger pre–lift for pump timing on engine: 1 mm from BDC (with tools **291754 – 291755**).
Cylinder no. 1 delivery line union on pump: marked with letter A.

ASSEMBLY DIMENSIONS

SYMBOL	SVS (max)	KF	MS	ya	yb
mm		–	–	–	35,5–39,5

CALIBRATION TEST CONDITIONS

Test bench conforming to ISO 4008/1.../2
Injectors conforming to ISO 7440–A61 – (1688901027 with pad ∅ 0.5 mm)
Injector setting pressure: 250 bar (254 kg/cm^2).
Fuel supply pressure: 0.35 ±0.05 bar (kg/cm^2).
Delivery pipes (conforming to ISO 4093.2):
6 x 2 x 450 mm
Graduate drain time: 30 seconds
Test liquid: ISO 4113 at a temperature of 40° ± 2°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

Rev/min: 1250	Advance stroke: mm 2.8 – 3.2

3. FUEL SUPPLY PUMP PRESSURE

Rev/min: 800	Internal pressure: 6.2 – 6.8 bar

4. FULL–LOAD DELIVERY WITHOUT BOOSTER PRESSURE

Rev/min: 600	Delivery: 61.5 – 62.5 mm^3 per crank cycle	Spread: –mm^3

5. ADJUSTMENT AT IDLING SPEED

Rev/min: 325	Delivery: 11 – 15 mm^3 per crank cycle	Spread: – mm^3

6. ADJUSTMENT AT FAST IDLING SPEED

Rev/min: 1350	Delivery: 25 – 29 cm^3 per crank cycle	Spread: – mm^3

7. DELIVERY AT STARTING

Rev/min: 100	Delivery: 80 – 110 mm^3 per crank cycle

8. TRANSFER PRESSURE PROGRESSION

Rev/min.		800	500	1250
Transfer pump pressure	bar	6,2 – 6,8	4,7 – 5,3	8,2 – 8,8

9. INJECTION ADVANCE PROGRESSION

Rev/min.		1000	1250	
Advance stroke	mm	1,0 – 1,4	2,8 – 3,2	

10. BACKFLOW

Rev/min.		–	–
Backflow	cm^3 /10 sec	–	–

(continued)

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

(continued)

11. DELIVERY PROGRESSION

Rev/min.	Delivery mm^3 per crank cycle	Booster pressure kPa
1380	<3	100
1300	55–59	100
1250	58–62	100
1000	66–70	100
750	73–74	100
500	80–84	100
600	68–72	30
600	60–64	0

12. DELIVERY CHECK AT IDLE SPEED

Rev/min.	325	250
Delivery: mm^3 per crank cycle	11 – 15	40 – 42

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

BENCH TEST PERFORMANCE DATA

Test Conditions

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

Engine without fan, air filter and exhaust silencer.

Atmospheric pressure: 990 mbar

Relative humidity 70% ± 5.

Ambient temperature 25° C.

Specific gravity of diesel fuel 830 ± 10 g/litre.

Throttle lever position	Braking load applied	Engine speed rev/min	Power output with engine run–in for a total of: 2 hours kW	Power output with engine run–in for a total of: 50 hours kW	Fuel consumption kg/h
Maximum	For maximum torque	2500	–	47.5 – 50.5	11.1 – 11.8
Maximum	For maximum torque	1500	–	37.0 – 39,5	8.2 – 8.7
Maximum	None (no–load)	2770 ± 25	–	–	–
Minimum	None (no–load)	650 ± 25	–	–	–

TD80 MODEL – CALIBRATION DATA FOR BOSCH INJECTION PUMP TYPE VE 4/12 F 1150 L 980

ASSEMBLY DATA

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

ASSEMBLY DIMENSIONS

SYMBOL	SVS (max)	KF	MS	ya	yb
mm		–	–	36,9–40,9	40,1–45,5

CALIBRATION TEST CONDITIONS

Test bench conforming to ISO 4008/1.../2.
Injectors conforming to ISO 7440–A61 – (1688901027 with pad ∅ 0.5 mm).
Injector setting pressure: 250 bar (254 kg/cm^2).
Fuel supply pressure: 0.35 ±0.05 bar (kg/cm^2).
Delivery pipes (conforming to ISO 4093.2):
6 x 2 x 450 mm.
Graduate drain time: 30 seconds.

Test liquid: ISO 4113 at a temperature of 40° ± 2°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

Rev/min: 1150	Advance stroke: mm 2.4 – 2.8

3. FUEL SUPPLY PUMP PRESSURE

Rev/min: 800	Internal pressure: from 5.7 to 6.3 bar

4. FULL–LOAD DELIVERY WITHOUT BOOSTER PRESSURE

Rev/min: 700	Delivery: 94.0 – 95.0 mm^3 per crank cycle	Spread: – mm^3

5. ADJUSTMENT AT IDLING SPEED

Rev/min: 325	Delivery: 10 – 14 mm^3 per crank cycle	Spread:– mm^3

6. ADJUSTMENT AT FAST IDLING SPEED

Rev/min: 1225	Delivery: 50 – 54 mm^3 per crank cycle	Spread: – mm^3

7. DELIVERY AT STARTING

Rev/min: 100	Delivery: 80 – 110 mm^3 per crank cycle

8. TRANSFER PRESSURE PROGRESSION

Rev/min.		800	500	1150
Transfer pump pressure	bar	from 5.7 to 6.3	from 4.9 to 5.5	6.7 – 7.3

9. INJECTION ADVANCE PROGRESSION

Rev/min.		1000	1150	
Advance stroke	mm	1.3 – 1.7	2.4 – 2.6	

10. BACKFLOW

Rev/min.		–	–
Backflow	cm^3	–	–

(continued)

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

(continued)

11. DELIVERY PROGRESSION

Rev/min.	Delivery: mm^3 per crank cycle
1290	<3
1200	72 – 76
1150	75 – 79
1000	81 – 85
700	94 –95
500	87 – 91

12. DELIVERY CHECK AT IDLE SPEED

Rev/min.	350	250	
Delivery: mm^3 per crank cycle	13 – 17	63 – 67	

BENCH TEST PERFORMANCE DATA

Test Conditions

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

Engine without fan, air filter and exhaust silencer.

Atmospheric pressure: 990 mbar

Relative humidity 70% ± 5.

Ambient temperature 25°C.

Specific gravity of diesel fuel 830 ± 10 g/litre.

Throttle lever position	Braking load applied	Engine speed rev/min	Power output with engine run–in for a total of: 2 hours kW	Power output with engine run–in for a total of: 50 hours kW	Fuel consumption kg/h
Maximum	For maximum torque	2500	–	54.0 – 57.5	12.3 – 13.1
Maximum	For maximum torque	1500	–	39.5 – 42	8.5 – 9.0
Maximum	None (no–load)	2725 ± 25	–	–	–
Minimum	None (no–load)	650 ± 25	–	–	–

TD90 MODEL – CALIBRATION DATA FOR BOSCH INJECTION PUMP TYPE VE 4/12 F 1250 L 982

ASSEMBLY DATA

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

ASSEMBLY DIMENSIONS

SYMBOL	K	KF	MS	SVS (max)	ya	yb
mm	–	–	–		37.9–40.9	39.7–44.7

CALIBRATION TEST CONDITIONS

Test bench conforming to ISO 4008/1.../2
Injectors conforming to ISO 7440–A61 – (1688901027 with pad ∅ 0.5 mm)
Injector setting pressure: from 250 to 253 bar (from 255 to 258 kg/cm^2).
Fuel supply pressure: 0.35 ±0.05 bar (kg/cm^2).
Delivery pipes (conforming to ISO 4093.2):
6 x 2 x 450 mm
Graduate drain time: 30 seconds
Test liquid: ISO 4113 at a temperature of 40° ± 2°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

Rev/min: 1250	Advance stroke: mm 2.8 – 3.2

3. FUEL SUPPLY PUMP PRESSURE

Rev/min: 800	Internal pressure: 6.7 to 7.3 bar

4. FULL–LOAD DELIVERY WITHOUT BOOSTER PRESSURE

Rev/min: 800	Delivery: 88 – 89 mm^3 per crank cycle	Spread: – mm^3

5. ADJUSTMENT AT IDLING SPEED

Rev/min: 300	Delivery: 6.2 – 6.8 mm^3 per crank cycle	Spread: – mm^3

6. ADJUSTMENT AT FAST IDLING SPEED

Rev/min: 1300	Delivery: 50 – 54 mm^3 per crank cycle	Spread: – mm^3

7. DELIVERY AT STARTING

Rev/min: 100	Delivery: 80 – 110 mm^3 per crank cycle

8. TRANSFER PRESSURE PROGRESSION

Rev/min.		800	500	1250
Transfer pump pressure	bar	6.2 – 6.8	4.9 – 5.5	8.2 – 8.8

9. INJECTION ADVANCE PROGRESSION

Rev/min.		1100	1250	
Advance stroke	mm	1.1 – 1.9	2.7 – 3.2	

10. BACKFLOW

Rev/min.		–	–
Backflow	cm^3	–	–

(continued)

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

(continued)

11. DELIVERY PROGRESSION

Rev/min.	Delivery: mm^3 per crank cycle
1375	<3
1300	58 – 62
1250	71 – 75
1000	78 – 82
750	88 – 89
500	81 – 85

12. DELIVERY CHECK AT IDLE SPEED

Rev/min.		350	250	
Delivery	mm^3 per crank cycle	13 – 17	63 – 67	

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

BENCH TEST PERFORMANCE DATA	
Test Conditions	
Fixed advance before TDC with cylinder No.1 on compression stroke: (see previous page).	Relative humidity 70% ± 5.
Engine without fan, air filter and exhaust silencer.	Ambient temperature 25°C.
Atmospheric pressure: 990 mbar	Specific gravity of diesel fuel 830 ± 10 g/litre.

Throttle lever position	Braking load applied	Engine speed rev/min	Power output with engine run–in for a total of: 2 hours kW	Power output with engine run–in for a total of: 50 hours kW	Fuel consumption kg/h
Maximum	For maximum torque	2500	–	60.0 – 64.0	13.7 – 14.6
Maximum	For maximum torque	1500	–	46.0 – 48.8	9.8 – 10.4
Maximum	None (no–load)	2725 ± 25	–	–	–
Minimum	None (no–load)	650 ± 25	–	–	–

TD95 MODEL – CALIBRATION DATA FOR BOSCH INJECTION PUMP TYPE VE 4/12 F 1250 L 972

ASSEMBLY DATA

Pump timing on engine: delivery start 0° ± 0.5° before TDC of cylinder 1 compression stroke.
Plunger pre–lift for pump timing on engine: 1 mm 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	–	–	35.5–39.5	39.7–46.7

CALIBRATION TEST CONDITIONS

Test bench conforming to ISO 4008/1.../2
Injectors conforming to ISO 7440–A61 – (1688901027 with pad ∅ 0.5 mm)
Injector setting pressure: from 250 to 253 bar (from 255 to 258 kg/cm^2).
Fuel supply pressure: 0.35 ±0.05 bar (kg/cm^2).
Delivery pipes (conforming to ISO 4093.2):
6 x 2 x 450 mm
Graduate drain time: 30 seconds
Test liquid: ISO 4113 at a temperature of 40° ± 2°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

Rev/min: 1150	Advance stroke: mm 2.3 – 2.7

3. FUEL SUPPLY PUMP PRESSURE

Rev/min: 800	Internal pressure: from 7.2 to 7.8 bar

4. FULL–LOAD DELIVERY WITHOUT BOOSTER PRESSURE

Rev/min: 600	Delivery: 71 – 72 mm^3 per crank cycle	Spread: – mm^3

5. FULL–LOAD DELIVERY WITH BOOSTER PRESSURE

Rev/min.: 700 (100 kPa)	Delivery: 90.5 – 91.5 mm^3 per crank cycle

6. ADJUSTMENT AT IDLING SPEED

Rev/min: 325	Delivery: 10 – 14 mm^3 per crank cycle	Spread: – mm^3

7. ADJUSTMENT AT FAST IDLING SPEED

Rev/min: 1225	Delivery: 28 – 32 mm^3 per crank cycle

8. DELIVERY AT STARTING

Rev/min: 100	Delivery: 80 – 110 mm^3 per crank cycle

9. TRANSFER PRESSURE PROGRESSION

Rev/min.		800	500	1150
Transfer pump pressure	bar	from 7.2 to 7.8	from 6.2 to 6.8	8,2 – 8,8

10. INJECTION ADVANCE PROGRESSION

Rev/min.		1000	1150	
Advance stroke	mm	from 0.9 to 1.3	from 2.3 to 2.7	

11. BACKFLOW

Rev/min.			
Backflow	cm^3		

(continued)

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

(continued)

12. DELIVERY PROGRESSION

Rev/min.	Delivery mm^3 per crank cycle	Booster pressure kPa
1250	<3	100
1200	38 – 42	100
1150	73 – 77	100
1000	78 – 82	100
700	90.5 – 91.5	100
500	97 – 101	100
600	78 – 82	35
600	69.5 – 73.5	0

13. DELIVERY CHECK AT IDLE SPEED

Rev/min.		275	325	430
Delivery per 1000 shots:	cm^3	27.4 to 33.4	5.8 to 9.8	0 to 3

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

BENCH TEST PERFORMANCE DATA

Test Conditions

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

Engine without fan, air filter and exhaust silencer.

Atmospheric pressure: 990 mbar

Relative humidity 70% ± 5.

Ambient temperature 25°C.

Specific gravity of diesel fuel 830 ± 10 g/litre.

Throttle lever position	Braking load applied	Engine speed rev/min	Power output with engine run–in for a total of: 2 hours kW	Power output with engine run–in for a total of: 50 hours kW	Fuel consumption kg/h
Maximum	For maximum torque	2500	–	66 – 70	15.5 – 15.9
Maximum	For maximum torque	1500	–	51 – 54	11 – 11.7
Maximum	None (no–load)	2700 ± 25	–	–	–
Minimum	None (no–load)	650 ± 25	–	–	–

FUEL SUPPLY PUMP DATA	mm
Eccentricity of drive shaft	3
Diameter of drive shaft at bushings	31.975 to 32.000
Internal diameter of installed and reamed bushings	32.050 to 32.075
Interference between bushings and seats	0.063 to 0.140
Assembly clearance between shaft and bushings	0.050 to 0.100
Thickness of internal washer	1.45 to 1.50
Thickness of external washer	2.93 to 3.00

CRANKCASE/CYLINDER BLOCK DATA	mm
Cylinder block (4–cylinder engines)	cast–iron monobloc with replaceable dry–fitted cylinder liners, incorporating seatings for crankshaft bearings, camshaft and pushrod/tappet assemblies
Internal diameter of cylinder liners (4–cylinder engines)	104.000 to 104.024 (1)
External diameter of cylinder liners (4–cylinder engines)	107.020 to 107.050
Diameter of cylinder bores (4–cylinder engines)	106.850 to 106.900
Interference fit between cylinder liners and bores (4–cylinder engines)	0.120 to 0.200
Liner internal diameter oversizes (4–cylinder engines)	0.4 to 0.8
Liner external diameter oversizes (4–cylinder engines)	0.2
Maximum permissible liner ovality or taper due to wear (2) (4–cylinder engines)	0.12
Diameter of main shell bearing seats	84.200 to 84.230
Diameter of camshaft bearing seats:	
– front	54.780 to 54.805
– middle	54.280 to 54.305
– rear	53.780 to 53.805
Diameter of standard tappet bores in crankcase	15.000 to 15.018
Spare tappet oversizes	0.1 – 0.2 – 0.3

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