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# **FIAT**

# **446**

# **446 DT**

## **WORKSHOP MANUAL**

**S E R V I Z I   T E C N I C I   D I   A S S I S T E N Z A**

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# FIAT

## 446

## 446 DT

### WORKSHOP MANUAL

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## FOREWORD

- The manual is divided into separately numbered sections.
- Two-digit sections contain:
  - tractor specification (00);
  - tractor sub-assembly specification and data (10 Engine, 20 Power Train, etc.).
- Three-digit sections deal with the overhaul of the sub-assemblies whose data are listed in the two-digit sections. The first two digits are the same as those of the associated data sections (e.g. 20 - Power Train; 201 - Clutch; 202 - Transmission, splitter etc.).
- An index is provided to facilitate retrieval of desired information.
- Each sheet carries the print number of the manual and the date of issue at the bottom of the page.
- Revised sheets will carry the same print number followed by a 2-digit number (e.g. first revision 603.54.235.01; second revision 603.54.235.02 etc.) and date of issue.  
Revised sheets will be accompanied by the updated index.
- All information herein is correct at the time of printing but is subject to alteration without prior notice.  
In case of discrepancies contact the nearest dealer, distributor or branch.

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The imperial weights and measures are given for operators' convenience and though the closest approximation is sought, they are normally rounded off for practical reasons. In case of discrepancies only the metric units should be considered.

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### SHIMS

When adjusting, measure each shim with a micrometer gauge and add the values obtained. Do not rely on overall shim thickness or the nominal value indicated for each shim.

### ROTARY SHAFT SEALS

To fit rotary shaft seals proceed as follows:

- prior to fitting, soak the seals for at least half an hour in the fluid to be retained;
- carefully clean the shaft and ensure that the contact surface is free from damage;
- turn the end of the sealing lip towards the fluid. If of the thrower lip type, turn the grooves so that during shaft rotation the fluid tends to be thrown back;
- smear the sealing lip with a very thin coat of lubricant (oil is better than grease) and pack the space between sealing lip and dust shield with grease (applicable to double-lip seals);
- fit the seals into their housing using a flat-ended tool or ram. Under no circumstances fit with a mallet or hammer;
- avoid entry of the seal into the recess in a tilted position. Exert a firm and uniform pressure squarely on it and ensure that the seal is pressed fully home;
- to prevent sealing lip damage during fitting, use a protection before sliding over the shaft.

### O-RINGS

Lubricate each ring prior to fitting and, on reassembly, slide over the part but do not twist, otherwise leakage will result.

### SEALING COMPOUNDS

On the mating surfaces indicated with X apply one of the following sealing compounds: RTV SILMATE, RHODORSIL CAF 1 or LOCTITE PLASTIC GASKET.

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

- using a wire brush, remove any deposits;
- thoroughly degrease using one of the following detergents: Solvent, kerosene or hot water/soda solution.

### BEARINGS

To fit bearings:

- before installing on shafts, heat to 80°C to 90°C;
- cool before pressing them into their seats.

### ROLL PINS

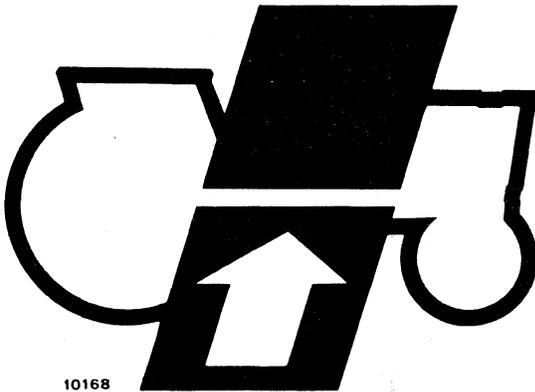
When fitting straight roll pins ensure that they face in direction of work to stress the pin.

Coil roll pins can be installed in any position.

# **GENERAL: General Instructions**

## **SPARE PARTS**

Use exclusively **FIAT spare parts**, bearing the trade mark below.



*ricambi  
originali*  
**Fiat Trattori**  
**FIAT**

These are the only parts that guarantee the quality, durability and safety of the original parts, being parts fitted in production.

Only **FIAT spare parts** can offer this guarantee.

When ordering spare parts please state:

- tractor model (marketing code) and frame number;
- engine type and number;
- part number (given on "Microfiches" or "Spare parts Catalogue").

## **SERVICE TOOLS**

The service tools indicated in this manual are:

- designed specifically for tractors of the FIAT range;
- essential for reliable repair work;
- manufactured and tested in such a way as to offer efficient and durable working instruments.

The mechanic is also reminded that being equipped means:

- operating in optimum working conditions;
- obtaining the best results;
- saving time and energy;
- working in greater safety.

## **NOTICE**

Wear limits recommended for some parts are not binding, being given for guidance only. "Front", "rear", "right" and "left" references are with operator facing normal direction of travel of tractor.

## WARNING



This symbol is your safety alert sign. It means  
"ATTENTION - BECOME ALERT - YOUR SAFETY IS INVOLVED"



### AVOID ACCIDENTS

Most accidents occurring in the workshop are caused by the failure of some individual to follow simple and fundamental safety rules or precautions. For this reason **MOST ACCIDENTS CAN BE PREVENTED** by recognizing the real cause and doing something about it before the accident occurs. Regardless of the care used in the design and production of any type of equipment, there are many conditions that cannot be completely safeguarded against without interfering with reasonable accessibility and efficient operation.

A careful operator is the best insurance against an accident. The complete observance of one simple rule would prevent many thousand serious injuries each year.

That rule is:

**ATTENTION.** Never attempt to clean, oil or adjust a machine while it is in motion.

### SAFETY PRECAUTIONS

#### GENERAL

- Strictly adhere to the maintenance and repair procedures indicated.
- Do not wear rings, wrist watches, jewelry or loose or hanging apparel, such as ties, torn clothing, scarves, unbuttoned or unzipped jackets that can catch on moving parts. Wear proper safety equipment as authorized for the job. Examples: hard hats, safety shoes, heavy gloves, safety glasses or goggles.
- Machine should not be serviced with anyone in the operator's seat unless they are qualified to operate the machine and are assisting in the service.

- Never attempt to operate the machine or its tools from any other position other than seated in the operator's seat.
- Never lubricate, service or adjust a machine with the engine running, except when specified.
- Shut off engine and check that the hydraulic circuits are no longer under pressure before removing camps and covers.
- Carry out all servicing operations with maximum care and attention.
- Shop or field service platforms and ladders used to maintain or service machinery should be constructed and maintained according to local or national requirements.
- Disconnect batteries and all controls to indicate operation in progress. Secure machine and any equipment to be lifted.
- Never check or fill fuel tanks, storage batteries or use starter fluid while smoking or near open flames, due to the presence of flammable fluid.
- Brakes are inoperative when manually released for servicing. Provision must be made to maintain control of the machine by chocking or other means.
- Ensure that the fuel gun is in contact with the filler when refuelling. To reduce the chance of static electricity sparking, maintain contact until after fuel flow is cut off.
- Use only designated towing or pulling attachment points. Use care in making attachment points. Be sure pins and locks as provided are secure before pulling. Stay clear of drawbars, cables or chains under load.

## **GENERAL: Safety precautions**

- To move a disabled machine, use a trailer or low body truck if available.
- Load and unload on level ground giving full support to the trailer wheels. Anchor tractor to truck or trailer loading platform and chock wheels as requested by carrier.
- Use only grounded auxiliary power source for heaters, chargers, pumps and similar equipment to reduce the hazards of electrical shock.
- Lift and handle all heavy parts with a lifting device of proper capacity.
- Watch out for bystanders.
- Never place gasoline or diesel fuel in an open pan.
- Never use gasoline or solvent or other flammable fluid to clean parts. Use authorized commercial, non-flammable non-toxic solvents.
- When cleaning parts with compressed air use safety glasses with side shields or goggles.
- Limit the pressure to 2.1 bar (30 psi) according to local or national requirements.
- Do not run engine indoors without adequate ventilation.
- Do not smoke or permit any naked light or spark near when refuelling or handling highly flammable materials.
- Do not use a naked light as a light source to look for leaks or for inspection anywhere on the tractor.
- Move carefully when under, in or near machine or implements. Wear required protective equipment, such as hard hats, safety glasses, safety shoes.
- When checking equipment requiring the engine running, an operator should be in the operator's seat at all times with the mechanic in sight.
- For field service, move machine to level ground if possible and chock machine. If work is absolutely necessary on a gradient, chock machine and its attachments securely. Move the machine to level ground as soon as possible.
- Guard against kinking chains or cables. Do not lift or pull through a kinked chain or cable. Always wear heavy gloves when handling chain or cable.
- Be sure cables are anchored and the anchor point is strong enough to handle the expected load. Keep bystanders clear of anchor point and cable or chain.
- Keep maintenance area CLEAN and DRY. Remedy water or oil spillage immediately.
- Do not pile oily, greasy rags — they are a fire hazard. Store in a closed metal container. Before starting machine or moving attachment, check, adjust and lock operator's seat. Be sure all personnel in the area are clear before starting or moving machine and any of its attachments.
- Do not carry loose objects in pockets that might fall unnoticed into open compartments.
- Wear proper protective equipment such as safety goggles or safety glasses with side shields, hard hats, safety shoes, heavy gloves where metal or other particles are apt to fly or fall.
- Wear welder's protective equipment such as dark safety glasses, helmets, protective clothing, gloves and safety shoes when welding. Dark safety glasses must be worn by anyone standing by when welding is in progress. **DO NOT LOOK AT ARC WITHOUT PROPER EYE PROTECTION.**
- Wire rope develops steel slivers. Use authorized protective equipment such as heavy gloves and safety glasses when handling.
- Handle all parts with extreme care. Keep hands and fingers from between parts. Wear authorized protective equipment such as safety glasses, heavy gloves, safety shoes.

**START UP**

- Do not run the engine of this machine indoors without proper ventilation to remove deadly exhaust fumes.
- Do not place head, body, limbs, feet, fingers or hands near a rotating fan or belts.

**ENGINE**

- Turn radiator cap slowly to relieve pressure before removing. Add coolant only with engine stopped or idling if hot.
- Do not run engine when refuelling and use care if engine is hot due to the increased possibility of fire if fuel is spilled.
- Never attempt to check or adjust fan belts when engine is running. Do not adjust engine fuel pump when the machine is in motion.
- Never lubricate a machine with the engine running.

**ELECTRICAL SYSTEM**

- When auxiliary batteries are used, connect both cable ends to the terminals as specified: (+) with (+) and (-) with (-). Do not short circuit terminals. **BATTERY GAS IS HIGHLY INFLAMMABLE.** Leave battery box open to improve ventilation when charging batteries. Never check charge by placing metal objects across the terminals. Keep sparks or naked light away from batteries. Do not smoke near battery to guard against the possibility of accidental explosion.
- Check for fuel or battery electrolyte leaks before starting service or maintenance work. Eliminate leaks before proceeding.
- Do not charge batteries in a closed room. Provide proper ventilation to guard against an accidental explosion from an accumulation of explosive gases given off in the charging process.
- Disconnect batteries before working on electrical system, or starting repair work of any kind.

**HYDRAULIC SYSTEM**

- Fluid escaping under pressure from a very small hole can almost be invisible and can have sufficient force to penetrate the skin. Use a piece of carboard or wood to search for suspected pressure leaks. **DO NOT USE HANDS.** If injured by escaping fluid, see a doctor at once. Serious infection or reaction can develop if proper medical treatment is not administered immediately.
- When making pressure checks use the correct gauge for expected pressure.

**WHEELS AND TYRES**

- Be sure tyres are properly inflated to manufacturer's specified pressure. Inspect damage periodically.
- Stand to one side when correcting tyre pressure.
- Check tyres only when the machine is empty and tyres are cool to avoid overinflation. Do not use reworked wheel parts. Improper welding, heating or brazing weakens them and can cause failure.
- Never cut or weld on the rim of an inflated tyre.
- When servicing tyres, chock all wheels front and back. After jacking up, place stands under machine according to local or national requirements.
- Deflate tyres before removing objects from tread.
- Never inflate tyres with flammable gas. Explosion and personal injury could result.

**ATTACHMENTS**

- Lift and handle all heavy parts with a lift device of proper capacity. Be sure parts are supported by proper slings and hooks. Use lift eyes if provided. Watch out for bystanders.
- Handle all parts with extreme care. Keep hands and fingers from between parts. Wear authorized protective equipment such as safety glasses, heavy gloves, safety shoes.
- Guard against kinking chains or cables. Always wear heavy gloves when handling chains or cables.

**A**

**GENERAL**

**page 10**

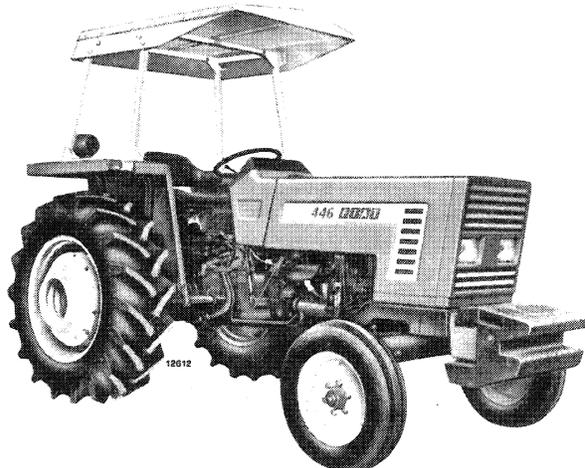
**SPECIFICATION**

|   |   |
|---|---|
| <b>Marketing code:</b>                      |   |
| - Two-wheel drive . . . . .                 | 446   |
| - All-wheel drive . . . . .                 | 446 DT  |
| <b>Engineering code:</b>                    |   |
| 8-speed, two-wheel drive . . . . .          | 673.100.000   |
| 12-speed, two-wheel drive . . . . .         | 673.100.000 - Var. 720.111                              |
| 8-speed, all-wheel drive . . . . .          | 673.127.000   |
| 12-speed, all-wheel drive . . . . .         | 673.127.000 - Var. 720.111                              |
| FIAT engine type, same on all four versions | { with BOSCH pump. . . . .<br>with C.A.V. pump. . . . . |
|   | 8035.02.276<br>8035.02.376                              |
| Clutch type . . . . .                       | LUK or O.M.G. 11/11"                                    |

**WEIGHTS**

|   | mod. 446 | mod. 446 DT |
|---|----------|-------------|
| Operating weight: Front tyres 6.00-16 (two-wheel drive) or 8.3/8-24 (all-wheel drive) and rear tyres 12.4/11-32, lift, implement attachment, front hook, swinging drawbar and ROPS frame . . . . . kg | 1950 (*) | 2160 (*)    |
| Same as above, with front ballasting (10 plates) and 6 ballast rings on rear wheels. . . . . kg   | 2690 (*) | 2900 (*)    |

(\*) Weight increases by 10 kg on models with 12-speed transmission.





## ENGINE

|  |  |
|--|--|
| <b>Fuel system</b>                             |  |
| Air cleaner . . . . .                          | Oil bath or dry, duplex cartridge, both with automatic drain centrifugal precleaner. |
| Fuel filters (on feed pump delivery) . . . . . | Two, in-line, cartridge type, water separator integral with first filter.            |
| Feed pump. . . . .                             | Double diaphragm   |
| — Operation . . . . .                          | Cam  |
| Injection pump. . . . .                        | Distributor  |
| Type { BOSCH . . . . .                         | EP/VA3/110 H 1300 CL: 134-8-770798   |
| { or   | DPA-3233 F420-770535   |
| { C.A.V. . . . .                               | Hydraulic centrifugal  |
| — Integral all speed . . . . . { BOSCH         | Hydraulic  |
| governor . . . . . { C.A.V.                    | 10° ± 1°   |
| — Integral advantage device . . . . .          | 17° ± 1°   |
| — Pump timing, BTDC. . . . . { BOSCH           | 3-orifice  |
| { C.A.V.                                       | See page 8, Section 10   |
| Injectors . . . . .                            | 221 to 230 bar (225 to 235 kg/cm <sup>2</sup> )                                      |
| — Type. . . . .                                | 1-2-3  |
| — Release pressure . . . . .                   |  |
| Firing order . . . . .                         |  |
| <b>Lubrication</b> . . . . .                   | Forced feed, gear pump   |
| Pump drive . . . . .                           | Camshaft   |
| Oil filters. . . . .                           | Strainer on pump inlet and full flow cartridge on outlet.                            |
| Relief valve . . . . .                         | In pump body   |
| — Oil pressure at governed speed . . . . .     | 2.9 to 3.9 bar (3 to 4 kg/cm <sup>2</sup> )  |
| <b>Cooling system</b> . . . . .                | Water, centrifugal pump  |
| Radiator . . . . .                             | 3 or 4 deep core vertical tube   |
| Fan, water pump-pulley mounted . . . . .       | Suction, steel, four-bladed  |
| Temperature control . . . . .                  | Wax thermostat   |
| <b>Tractor meter</b> . . . . .                 | On instrument panel  |
| — Drive . . . . .                              | Oil pump gear  |
| — Hourmeter activation speed . . . . .         | 1840 rpm   |
| — Meter drive ratio . . . . .                  | 1 to 2   |

**POWER TRAIN**

**Clutch**

Twin, dry single plate type LUK or O. M. G. 11 in. with separate controls: pedal for transmission and manual lever for PTO.

Plate material for both transmission and PTO plates is organic.

**Transmission**

Constant mesh, spur gear type.

Planetary gear splitter box for 8 forward speeds and 2 reverse speeds, with total of 12 forward speeds and 3 reverse speeds on version using crawler box (series with splitter box).

Gear box and splitter/crawler with separate control levers.

Bevel drive on differential with differing ratios depending on front-wheel or all-wheel traction.

Two pinion differential with pedal-control differential lock.

Final drives of single reduction planetary type.

**BRAKES**

**Service**

Drive brake bands acting on wheel drums fitted to halfshafts of differential with separate pedal control with pedals latched for simultaneous road speed braking.

Parking/emergency on transmission (on tractors with front-wheel drive).

Brake drums acting on corresponding synchronized PTO drive gear, mating bevel pinion shaft with manual lever control.

**Parking/emergency (on tractors with all-wheel drive)**

Same facilities as for the service brakes permitting blocking by manual lever.

**STEERING**

Steering wheel system with circulating ball steering box or with power steering optional.

Linkage joints sealed permanently.

Turning radius (without brake systems)

— mod. { 446 ..... 3400 mm  
          { 446 DT, with front axle in 4300 mm

**FRONT AXLE**

Inverted U, telescoping, center pivoting with track adjustment by sliding axle ends ..... 6 off.

**LIVE FRONT AXLE**

Fully floating, center pivoting unjointed drive shaft and articulations on tractor centerline.

Two-pinion differential with planetary final drives.

Five disc/rim/hub repositioning.

**REAR WHEELS**

Disc/rim/hub repositioning: ..... 7 off.

**POWER TAKE-OFF**

**Fully independent (540 rpm)**

Shaft. .... 13/8" — 6 splines

Control. .... mechanical by manual lever.

Engine speed with PTO at standard speed of 540 rpm ..... 2160 rpm.

Rotation: Clockwise (tractor seen from rear).

**Synchronized PTO**

Drive shaft and rotation same as for fully independent PTO.

Speed of spline shaft with 12/47 bevel drive on front-wheel traction models, or with 10/43 bevel drive on all-wheel traction models) per rear wheel turn :

— Front-wheel drive ..... 13.78 rpm

— All-wheel drive ..... 14.47 rpm

**HYDRAULIC LIFT**

Hydraulic, draught and position control with manual sensitivity adjustment. Draught control by three-point attachment.

Gear-type pump with engine valve gear drive.

Hydraulic fluid taken from gearbox.

Design lift capacity, max. lift capacity and max. lift stroke at end of arms (see Section 50, pages 1 and 4).

Three-point category I and II implement attachments, with normal arms or extra-long, reinforced arms optional.

**Remote control valves**

Single remote control valve (for right - or left - hand control) for remote single and double-acting cylinder control.

Trailer power braking remote control valve with extra remote control valve for double-acting remote control with left-hand control).

**TOWING ATTACHMENTS****Rear:**

- Swing over sector drawbar
- Cross member drilled for implement attachment
- Tow hook;
- Rockinger jaw hook: designed to rotate on its own longitudinal axis and equipped with an automatic device for tow pin coupling/locking.

**Front:**

- Fixed hook no applicable with front ballasting.

**BALLASTING****Front axle**

Comprising support of 80 kg (176 lb) for mounting total of 6 or 10 plates of 33 kg (73 lb) each for a total weight of 278 kg or 410 kg.

**Rear wheels**

Comprising 4 or 6 rings secured to the wheels rims, each weighing 55 kg (110 lb) to provide a total weight of 220 kg or 330 kg.

**BODY**

Forward-tilt hood for complete accessibility to

engine and other assys such as radiator, battery, air cleaner, engine oil filter, fuel filters, fuel pump, injection pump and power steering reservoir (optional).

Partial wrap-around rear fenders with ROPS frame mounts, with or without roof.

Sheet metal fuel tank located in front of seat. Operator's seat padded, with parallelogram suspension, adjustable for position and suspension.

**ELECTRICAL SYSTEM**

Voltage ..... 12 V  
33A alternator with integral electronic voltage regulator.

- Bosch: GI → 14V - 33A 27;
- Marelli: AA 108 - 14V - 33A - 1;
- ISKRA: AAG1104 - 14V - 33A;
- LUCAS: 18 A CR - 14V - 40A.

**Starter:**

- Marelli 2.5 kW (3.4 hp) MT 71AA;
- Bosch 1.8 kW (2.5 hp) JF → 12V;
- Lucas 2.5 kW (3.4 hp) M45G.

Battery located ahead of radiator, capacity 88/92 Ah or 110/120 Ah.

**Lighting**

Twin, high and asymmetric low beam headlamps, 45/40 W.

Two front lights comprising:

- parking (5 W bulb);
- turn signal (21 W bulb);

Two tail lights comprising:

- parking (5 W bulb);
- turn signal (21 W bulb);
- stop (21 W bulb);
- license plate (doubles as LH parking lights).

**Instruments and accessories**

13-function instrument panel (see Section 60, p. 9)

Dashboard (see Section 60, page 9).

Rear flood light (35 W bulb).

Rear power point, DIN, 7-pole.

Dash power point single-pole.

Horn.

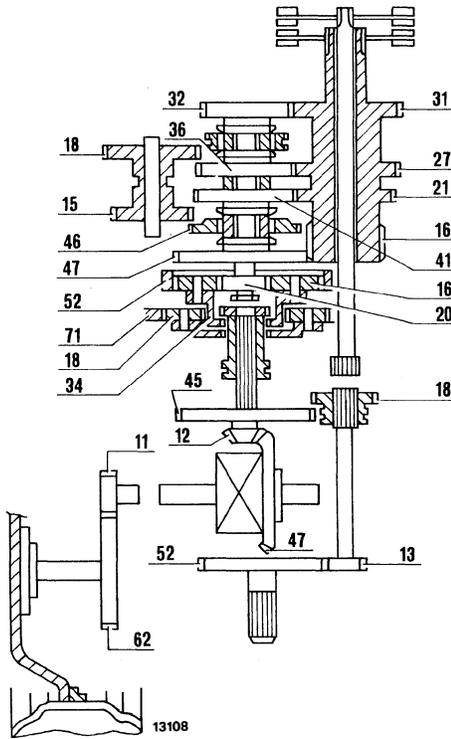
Thermostarter.

Fuses: max. 8 off (see Section 60, page 9).

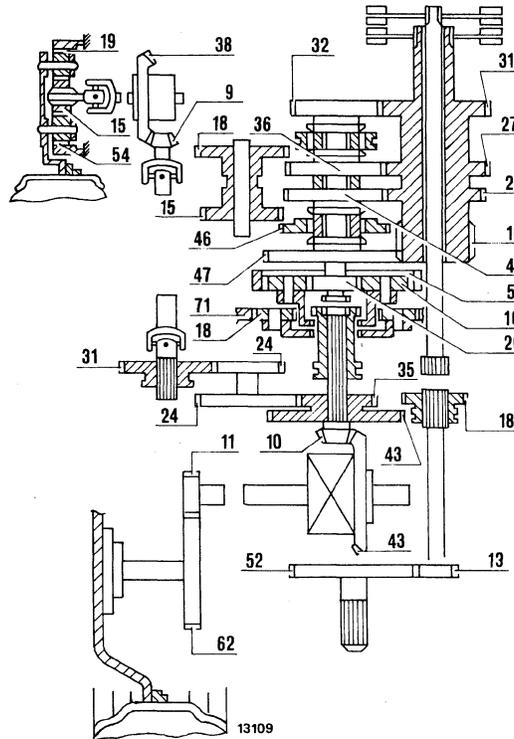
Tractor and trailer hazard warning lights.

**POWER TRAIN SCHEMATIC**

**Mod. 446**  
(8/12-speed version)



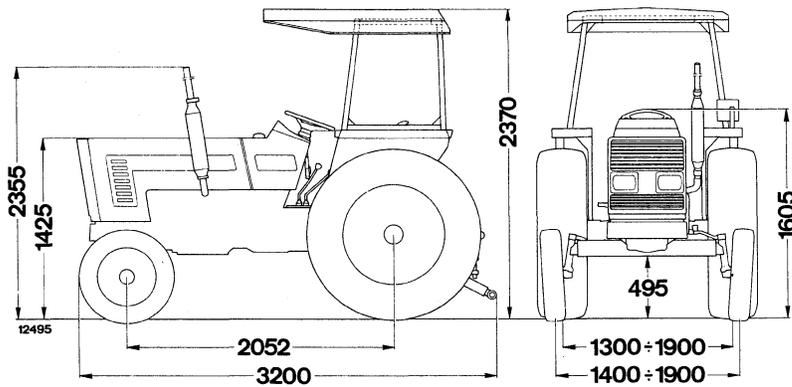
**Mod. 446 DT**  
(8/12-speed version)



| Tractor speed, at max. engine speed, with 8 and 12-speed transmission (km/h) |                           |            |            |                              |            |            |
|--|---------------------------|------------|------------|------------------------------|------------|------------|
| GEARS  | Mod. 446 with rear tyres: |            |            | Mod. 446 DT with rear tyres: |            |            |
|  | 13.6/12-28                | 14.9/13-28 | 12.4/11-32 | 13.6/12-28                   | 14.9/13-28 | 12.4/11-32 |
| Low (*)  | 1st.....                  | 0.9        | 0.9        | 0.9                          | 0.8        | 0.8        |
|  | 2nd.....                  | 1.2        | 1.3        | 1.3                          | 1.2        | 1.2        |
|  | 3rd.....                  | 1.9        | 2.0        | 2.0                          | 1.7        | 1.8        |
|  | 4th.....                  | 2.4        | 2.5        | 2.5                          | 2.2        | 2.3        |
|  | Reverse....               | 1.1        | 1.2        | 1.2                          | 1.0        | 1.1        |
| Normal   | 1st.....                  | 2.6        | 2.7        | 2.7                          | 2.4        | 2.5        |
|  | 2nd.....                  | 3.8        | 4.1        | 4.1                          | 3.5        | 3.7        |
|  | 3rd.....                  | 5.6        | 5.9        | 5.9                          | 5.1        | 5.4        |
|  | 4th.....                  | 7.4        | 7.7        | 7.7                          | 6.7        | 7.0        |
|  | Reverse....               | 3.6        | 3.8        | 3.8                          | 3.3        | 3.5        |
| High   | 1st.....                  | 9.3        | 9.8        | 9.8                          | 8.5        | 8.9        |
|  | 2nd.....                  | 14.0       | 14.7       | 14.7                         | 12.8       | 13.4       |
|  | 3rd.....                  | 20.5       | 21.5       | 21.5                         | 18.7       | 19.6       |
|  | 4th.....                  | 26.5       | 27.8       | 27.8                         | 24.1       | 25.3       |
|  | Reverse....               | 13.4       | 14.0       | 14.0                         | 12.2       | 12.8       |

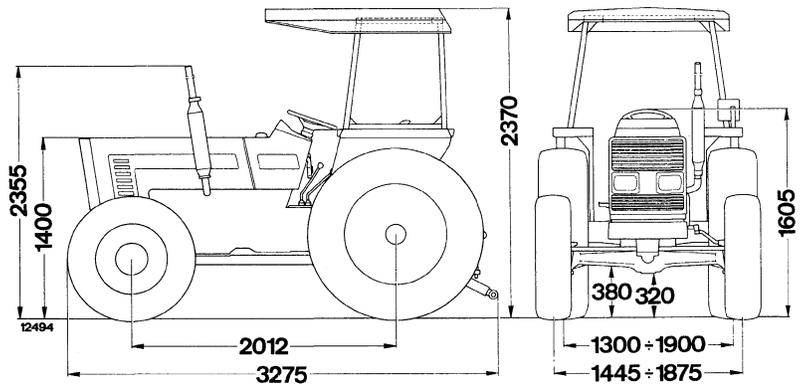
(\*) On 12-speed transmission only.

**MAIN DIMENSIONS (in mm)**



**Mod. 446**  
(6.00-16 front tyres  
and 12.4/11-32  
rear tyres)

**Mod. 446 DT**  
(8.3/8-24 front tyres  
and 12.4/11-32  
rear tyres)



**TYRE SIZES**

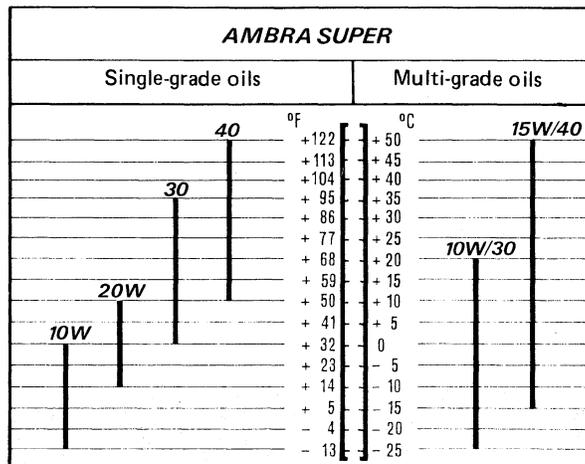
|             | <b>446</b>                             | <b>446 DT</b>   |
|-------------|--|---|
| Front. .... | 6.00-16<br>7.50-16                     | 8.00-20 (*)<br>9.5/9-20 (*)<br>11.2/10-20 (●)<br>8.3/8-24 (°) |
| Rear .....  | 13.6/12-28<br>14.9/13-28<br>12.4/11-32 | 13.6/12-28 (*)<br>14.9/13-28 (●)<br>12.4/11-32 (°)            |

(\*)(●)(°) Tyre marching references.

**CAPACITIES**

| DESCRIPTION  | LIQUIDS AND LUBRICANTS               |                          |             |   |
|--|--------------------------------------|--------------------------|-------------|---|
|  | FIAT RECOMMENDED PRODUCTS            | QUANTITY                 |             | International designation   |
|  |                                      | 446 and 446 DT           |             |   |
|  |                                      | dm <sup>3</sup> (liters) | pints       |   |
| Sump and filter oil . . . . .  | oil Fiat<br>AMBRA SUPER              | 7.5                      | 13          | Diesel engine oil<br>to MIL-L-2104C<br>and service API CD   |
| Sump oil . . . . .   |                                      | 6.7                      | 11.5        |   |
| Air cleaner oil (1) . . . . .  |                                      | 0.95                     | 1.85        |   |
| Transmission system, rear axle<br>and lift:<br>– 2-wheel drive. . . . .<br>– All-wheel drive . . . . . | TUTELA<br>MULTIF                     | 13.3                     | 23          | Transmission, oil<br>bath brakes and<br>lift oil corresponds<br>to Massey Ferguson<br>MF 1135 and Ford<br>M2C 86A |
| Steering unit . . . . .  |                                      | 18.5                     | 32.5        |   |
| Power steering. . . . .  |                                      | 0.50                     | 1           |   |
| Final drives (each). . . . .   |                                      | 1.8                      | 3           |   |
| Front axle:<br>– Axle cases<br>– Planetary drives (each). . . . .                                      |                                      | 1.7                      | 3           |   |
|  |                                      | 4.3                      | 7.5         |   |
| Front wheel hubs . . . . .   | grease Fiat                          | –                        | –           | Lithium-calcium<br>grease to NLG12  |
| Pressure lubricator . . . . .  | TUTELA G 9                           | –                        | –           |   |
| Coolant  | Water and FIAT<br>'PARAFU 11'<br>(2) | dm <sup>3</sup> (liters) |             |   |
|  |                                      | 10.5                     | 18.5 galls. |   |
| Fuel tank  | Diesel fuel                          | 61                       | 13.5 galls. |   |

Oil viscosity to be chosen in relation to ambient temperature



(1) Change filter oil when dirt level is approx. 1 cm thick.  
(2) See page 1, Section 106.

**Attention**

Note on models using above OLIO FIAT products that AMBRA SUPER and AMBRA oils are interchangeable.

## ENGINE BLOCK - CYLINDER HEAD

|   |  |  |             |  |  |                    |  |  |            |  |
|---|--|--|-------------|--|--|--------------------|--|--|------------|--|
| <b>Engine Block</b>                             |  |  |             |  |  |                    |  |  |            |  |
| Cylinder bore diameter in engine block .....    | 102.890 to 102.940 mm<br>(4.051 to 4.053 in)   |  |             |  |  |                    |  |  |            |  |
| Sleeve OD .....                                 | 103.020 to 103.050 mm<br>(4.056 to 4.057 in)   |  |             |  |  |                    |  |  |            |  |
| Sleeve interference fit in block .....          | 0.08 to 0.160 mm (0.003 to 0.006 in)   |  |             |  |  |                    |  |  |            |  |
| Sleeve diameter oversize .....                  | 0.2 mm (0.008 in)  |  |             |  |  |                    |  |  |            |  |
| Sleeve bore diameter .....                      | 100.000 to 100.018 mm<br>(3.937 to 3.938 in)   |  |             |  |  |                    |  |  |            |  |
| Maximum ovality and taper due to wear (2) ..... | 0.12 mm (0.005 in)   |  |             |  |  |                    |  |  |            |  |
| Sleeve bore oversize .....                      | 0.2-0.4-0.6-0.8 mm<br>(0.008-0.016-0.024-0.031 in)   |  |             |  |  |                    |  |  |            |  |
| Housing bore diameter:                          |  |  |             |  |  |                    |  |  |            |  |
| – camshaft bushings                             | <table style="border: none;"> <tr> <td style="font-size: 3em; vertical-align: middle;">{</td> <td>front .....</td> <td>54.780 to 54.805 mm<br/>(2.1567 to 2.1577 in)</td> </tr> <tr> <td></td> <td>intermediate .....</td> <td>54.280 to 54.305 mm<br/>(2.1370 to 2.1379 in)</td> </tr> <tr> <td></td> <td>rear .....</td> <td>53.780 to 53.805 mm<br/>(2.1173 to 2.1183 in)</td> </tr> </table> | {  | front ..... | 54.780 to 54.805 mm<br>(2.1567 to 2.1577 in) |  | intermediate ..... | 54.280 to 54.305 mm<br>(2.1370 to 2.1379 in) |  | rear ..... | 53.780 to 53.805 mm<br>(2.1173 to 2.1183 in) |
| {   | front .....  | 54.780 to 54.805 mm<br>(2.1567 to 2.1577 in) |             |  |  |                    |  |  |            |  |
|   | intermediate .....   | 54.280 to 54.305 mm<br>(2.1370 to 2.1379 in) |             |  |  |                    |  |  |            |  |
|   | rear .....   | 53.780 to 53.805 mm<br>(2.1173 to 2.1183 in) |             |  |  |                    |  |  |            |  |
| Tappet housing bore diameter .....              | 15.000 to 15.018 mm (1)<br>(0.590 to 0.591 in)   |  |             |  |  |                    |  |  |            |  |
| Tappet oversize .....                           | 0.1-0.2-0.3 mm (0.004-0.008-0.012 in)  |  |             |  |  |                    |  |  |            |  |
| Main bearing housing bore diameter .....        | 80.587 to 80.607 mm<br>(3.1727 to 3.1734 in)   |  |             |  |  |                    |  |  |            |  |

## CYLINDER HEAD

|   |  |
|---|--|
| Valve guide housing bore diameter in head ..... | 13.966 to 13.983 mm<br>(0.5498 to 0.5505 in) |
| Valve guide oversize .....                      | 0.2 mm (0.0079 in)                           |
| Valve seat dimensions .....                     | Section 101, page 2                          |
| Valve stand-in .....                            | 0.7 to 1.1 mm (0.027 to 0.043 in)            |
| – maximum seating allowed .....                 | 1.4 mm (0.055 in)                            |
| Injector projection .....                       | 1 to 1.5 mm (0.039 to 0.059 in)              |
| – maximum stand-out allowed .....               | 1.8 mm (0.071 in)                            |
| Cylinder head height .....                      | 92 mm (3.622 in)                             |
| Maximum head skimming depth .....               | 0.5 mm (0.020 in)                            |

## CRANKSHAFT

|  |  |
|--|--|
| <b>Crankshaft - Bearings</b>             |  |
| Main journal diameter .....              | 76.187 to 76.200 (1)   |
| Main journal undersize .....             | 0.254-0.508-0.762-1.016 mm<br>(0.0099-0.0199-0.0299-0.0399 in) |
| Main bearing wall thickness .....        | 2.162 to 2.172 mm (0.0851 to 0.0855 in)                        |
| Main bearing undersize .....             | 0.254-0.508-0.762-1.016 mm<br>(0.0099-0.0199-0.0299-0.0399 in) |
| Main journal clearance in bearings ..... | 0.042 to 0.096 mm (0.0025 to 0.0038 in)                        |
| – maximum wear clearance .....           | 0.180 mm (0.0071 in)   |

(1) After reaming 0.1 mm oversize tappets may be fitted in production coupled to corresponding oversize housing bores.

(2) After reaming 0.1 mm oversize sleeves may be fitted in production coupled to corresponding oversize pistons.

(cont.)

# ENGINE: Specification and Data

## CRANK GEAR

(continued)

|   |  |
|---|--|
| Crankpin diameter .....   | 58.730 to 58.743 mm (1)<br>(2.3122 to 2.3127 in)               |
| Crankpin undersize .....  | 0.254-0.508-0.762-1.016 mm<br>(0.0099-0.0199-0.0299-0.0399 in) |
| Big end bearing wall thickness .....  | 1.805 to 1.815 mm<br>0.0710 to 0.0715 in)                      |
| Big end bearing undersize .....   | 0.254-0.508-0.762-1.016 mm<br>(0.0099-0.0199-0.0299-0.0399 in) |
| Crankpin clearance in big end bearing .....   | 0.035 to 0.080 mm<br>(0.0014 to 0.0032 in)                     |
| — maximum wear clearance .....  | 0.180 mm (0.0071 in)   |
| Crankshaft thrust washer thickness .....  | 3.378 to 3.429 mm<br>(0.1329 to 0.1349 in)                     |
| Thrust washer oversize .....  | 0.127 mm (0.0049 in)   |
| Width of main bearing housing over thrust washers .....   | 31.766 to 31.918 mm<br>(1.2506 to 1.2566 in)                   |
| Length of corresponding main journal .....  | 32.000 to 32.100 mm<br>(1.2598 to 1.2638 in)                   |
| Crankshaft end float .....  | 0.082 to 0.334 mm<br>(0.0032 to 0.0131 in)                     |
| — maximum wear end float .....  | 0.40 mm (0.016 in)   |
| Maximum main journal and crankpin ovality or taper after grinding .....   | 0.01 mm (0.0004 in)  |
| Maximum main journal and crankpin ovality or taper due to wear .....  | 0.05 mm (0.0019 in)  |
| Maximum main journal misalignment with crankshaft resting on end journals .....                                       | 0.10 mm (0.0039 in)  |
| Maximum misalignment of crankpins relative to main journals (in either direction) .....                               | 0.25 mm (0.0098 in)  |
| Maximum tolerance on distance from outer crankpin edge ..   | ± 0.10 mm (± 0.0039 in)  |
| Maximum crankshaft flange run-out with stylus in A, (Section 103, page 2) over 108 mm (4.25 in) diameter, T.I.R. .... | 0.02 mm (0.0008 in)  |
| Maximum flywheel seat eccentricity relative to main journals (See B, section 103, page 2) T.I.R. ....                 | 0.04 mm (0.0016 in)  |
| <b>Connecting Rods</b>  |  |
| Small end bore diameter .....   | 35.861 to 35.899 mm<br>(1.4118 to 1.4133 in)                   |
| Small end bushing OD .....  | 35.979 to 36.017 mm<br>(1.4165 to 1.4179 in)                   |
| Bushing interference fit in small end .....   | 0.080 to 0.156 mm<br>(0.0031 to 0.0061 in)                     |
| Small end bushing fitted ID .....   | 32.005 to 32.012 mm<br>(1.2600 to 1.2603 in)                   |

(1) 0.1 mm undersize crankpin and main journal crankshafts may be fitted in production coupled to corresponding undersize bearings.

(follows)

## PISTONS

(continued)

|  |  |
|--|--|
| Big end bore diameter .....  | 62.408 to 62.420 mm<br>(2.4570 to 2.4575 in)       |
| Maximum connecting rod axis misalignment at 125 mm<br>(5 in) .....                       | ± 0.07 mm (± 0.003 in)                             |
| Maximum connecting rod weight difference over a<br>complete set of the same engine ..... | 25 grams (0.88 oz.)                                |
| <b>Pistons</b>   |  |
| Piston diameter 50 mm (2 in) from base of skirt, at right<br>angles to pin .....         | 99.828 to 99.840 mm<br>(3.9302 to 3.9307 in)       |
| Piston clearance in sleeve .....   | 0.160 to 0.190 mm<br>(0.0063 to 0.0075 in)         |
| — maximum wear clearance .....   | 0.30 mm (0.012 in)                                 |
| Piston oversize range .....  | 0.2-0.4-0.6-0.8 mm<br>(0.008-0.016-0.024-0.032 in) |
| Piston stand-out .....   | 0.462 to 0.787 mm<br>(0.0184 to 0.0314 in)         |
| Piston pin diameter .....  | 31.983 to 31.990 mm<br>(1.2592 to 1.2594 in)       |
| Piston pin housing bore in piston .....  | 31.993 to 32.000 mm<br>(1.2596 to 1.2598 in)       |
| Piston pin clearance in piston .....   | 0.003 to 0.017 mm<br>(0.0001 to 0.0007 in)         |
| Piston pin oversize .....  | 0.2-0.5 mm (0.008-0.019 in)                        |
| Piston pin clearance in small end bushing .....  | 0.015 to 0.029 mm<br>(0.0006 to 0.0011 in)         |
| — maximum wear clearance .....   | 0.06 mm (0.0024 in)                                |
| Maximum weight difference over a complete set of<br>pistons .....                        | 20 grams (2/3 oz.)                                 |
| Piston ring clearance in groove:   |  |
| — Top .....  | 0.090 to 0.122 mm<br>(0.0035 to 0.0048 in)         |
| — 2nd .....  | 0.050 to 0.082 mm<br>(0.0019 to 0.0032 in)         |
| — 3rd .....  | 0.040 to 0.072 mm<br>(0.0016 to 0.0028 in)         |
| Maximum wear clearance:  |  |
| — Top .....  | 0.50 mm (0.008 in)                                 |
| — 2nd and 3rd .....  | 0.20 mm (0.019 in)                                 |
| Piston ring gap:   |  |
| — Top .....  | 0.35 to 0.55 mm (0.0138 to 0.0216 in)              |
| — 2nd .....  | 0.30 to 0.45 mm (0.0118 to 0.0177 in)              |
| — 3rd .....  | 0.25 to 0.40 mm (0.0098 to 0.157 in)               |
| Maximum wear gap .....   | 1.20 mm (0.047 in)                                 |

(follows)

# ENGINE: Specification and Data

## VALVE ASSEMBLY

|  |   |
|--|---|
| <b>Camshaft</b><br><br>Camshaft bushing O.D.:<br>– front .....<br>– intermediate .....<br>– rear .....<br>Bushing interference fit in housing .....  | 54.875 to 54.930 mm<br>(2.1604 to 2.1626 in)<br>54.375 to 54.430 mm<br>(2.1407 to 2.1429 in)<br>53.875 to 53.930 mm<br>(2.1210 to 2.1232 in)<br>0.070 to 0.150 mm<br>(0.0028 to 0.0059 in)  |
| Camshaft bushing fitted I.D. after reaming:<br>– front .....<br>– intermediate .....<br>– rear .....<br><br>Camshaft journal diameter:<br>– front .....<br>– intermediate .....<br>– rear .....<br>Camshaft journal clearance in bushing .....<br>Maximum wear clearance ..... | 51.080 to 51.130 mm<br>(2.011 to 2.013 in)<br>50.580 to 50.630 mm<br>(1.9913 to 1.9933 in)<br>50.080 to 50.130 mm<br>(1.9716 to 1.9736 in)<br><br>50.970 to 51.000 mm<br>(2.0067 to 2.0079 in)<br>50.470 to 50.500 mm<br>(1.9870 to 1.9882 in)<br>49.970 to 50.000 mm<br>(1.9673 to 1.9685 in)<br>0.080 to 0.160 mm<br>(0.0031 to 0.0063 in)<br>0.20 mm (0.0079 in) |
| Camshaft end float (thrust plate to associated seat<br>in camshaft) .....  | 0.070 to 0.220 mm<br>(0.0028 to 0.0087 in)  |
| <b>Tappets</b><br><br>Tappet O.D. ....<br>Tappet clearance in housing on engine block .....<br>– maximum wear clearance .....<br>Tappet oversize .....   | 14.950 to 14.970 mm<br>(0.5886 to 0.5894 in)<br>0.030 to 0.068 mm<br>(0.0012 to 0.0027 in)<br>0.15 mm (0.0059 in)<br>0.1-0.2-0.3 mm<br>(0.004-0.008-0.012 in)   |

(cont.)

## VALVE GEAR

(continued)

|   |                                 |  |
|---|---------------------------------|--|
| <b>Rockers</b>  |                                 |  |
| Rocker bushing O.D. ....  |                                 | 21.006 to 21.031 mm<br>(0.8270 to 0.8280 in) |
| Rocker bore diameter .....  |                                 | 20.939 to 20.972 mm<br>(0.8244 to 0.7902 in) |
| Bushing interference fit in rocker .....  |                                 | 0.030 to 0.090 mm<br>(0.0012 to 0.0036 in)   |
| Rocker bracket bore diameter .....  |                                 | 18.016 to 18.034 mm<br>(0.7093 to 0.7100 in) |
| Rocker shaft diameter .....   |                                 | 17.982 to 18.000 mm<br>(0.7079 to 0.7087 in) |
| Rocker shaft clearance in bracket .....   |                                 | 0.016 to 0.052 mm (0.0006 to 0.0020 in)      |
| — maximum wear clearance .....  |                                 | 0.15 mm (0.006 in)                           |
| Rocker spacer spring length:  |                                 |  |
| — free .....  |                                 | 59.5 mm (2.3425 in)                          |
| — under 46 to 52 N (4.7 to 5.3 kg, 10.4 to 11.7 lb) .....                       |                                 | 44 mm (1.7323 in)                            |
| <b>Valves, Guides and Springs</b>   |                                 |  |
| Valve dimensions .....  |                                 | see page 2, Section 102                      |
| Valve face angle .....  |                                 | 45° 30' ± 7'                                 |
| Valve clearance   | } Timing check .....            | 0.45 mm (0.0177 in)                          |
|   | } Normal (cold or warm) { inlet | 0.25 mm (0.0010 in)                          |
|   | } exhaust                       | 0.35 mm (0.0138 in)                          |
| Cam lift  | { Inlet .....                   | 5.250 mm (0.2067 in)                         |
|   | { Exhaust .....                 | 5.777 mm (0.2274 in)                         |
| Valve lift  | { Inlet .....                   | 9.3 mm (0.3661 in)                           |
|   | { Exhaust .....                 | 10.2 mm (0.4016 in)                          |
| Valve guide O.D. ....   |                                 | 13.988 to 14.016 mm<br>(0.5507 to 0.5518 in) |
| Valve guide oversize .....  |                                 | 0.2 mm (0.0079 in)                           |
| Valve guide interference fit in housing on cylinder head .....                  |                                 | 0.005 to 0.050 mm<br>(0.0002 to 0.0020 in)   |
| Valve guide fitted I.D. after reaming .....                                     |                                 | 8.023 to 8.038 mm<br>(0.3159 to 0.3165 in)   |
| Valve stem clearance in guide .....   |                                 | 0.023 to 0.053 mm<br>(0.0009 to 0.0021 in)   |
| — maximum wear clearance .....  |                                 | 0.13 mm (0.0051 in)                          |
| Maximum valve stem eccentricity over one revolution with stylus on sealing face | { inlet .....                   | 0.03 mm (0.0012 in)                          |
|   | { exhaust value .....           | 0.04 mm (0.0016 in)                          |

(cont.)

## ENGINE: Specification and Data

### VALVE ASSEMBLY

(cont.)

|  |  |
|--|--|
| Inlet and exhaust valve spring length:<br>— free .....                         | 65.5 mm (2.579 in)                           |
| — valve closed, under 295 to 332 N (30.1 to 33.9 kg,<br>66.4 to 74.7 lb) ..... | 41 mm (1.614 in)                             |
| — valve open, under 472 to 511 N (48.1 to 52.1 kg,<br>106 to 115 lb) .....     | 30.8 mm (1.213 in)                           |
| <b>Valve Timing Gears</b>  |  |
| Timing gear backlash .....   | 0.08 mm (0.0031 in)                          |
| Idler gear jack shaft diameter .....   | 31.975 to 32.000 mm<br>(1.2589 to 1.2598 in) |
| Idler gear bushing fitted I.D. after reaming .....                             | 32.050 to 32.075 mm<br>(1.2618 to 1.2628 in) |
| Jack shaft journal clearance in bushing .....                                  | 0.050 to 0.100 mm<br>(0.0019 to 0.0039 in)   |
| — maximum wear clearance .....   | 0.15 mm (0.0059 in)                          |
| Bushing interference fit in idler gear .....                                   | 0.063 to 0.140 mm<br>(0.0025 to 0.0055 in)   |
| Lift and power steering pump drive gear shaft diameter .....                   | 36.975 to 37.000 mm<br>(1.4557 to 1.4567 in) |
| Bushing fitted I.D. after reaming .....  | 37.050 to 37.075 mm<br>(1.4586 to 1.4596 in) |
| Shaft clearance in bushing .....   | 0.050 to 0.100 mm<br>(0.0019 to 0.0039 in)   |
| Bushing interference fit in housing .....                                      | 0.063 to 0.140 mm<br>(0.0025 to 0.0055 in)   |
| Pump drive gear thrust washer thickness .....                                  | 1.45 to 1.50 mm<br>(0.0571 to 0.0591 in)     |

### LUBRICATION SYSTEM

|   |  |
|---|--|
| Oil Pump .....                              | gear, camshaft driven  |
| Oil pump drive ratio .....                  | 2 to 1   |
| Oil pressure, warm, at governed speed ..... | 2.9 to 3.9 bar (3 to 4 kg/cm <sup>2</sup> ,<br>42.6 to 56.9 psi) |
| Relief valve crack-off setting .....        | 3.5 bar (3.6 kg/cm <sup>2</sup> , 51.2 psi)                      |
| Shaft clearance in bushing .....            | 0.016 to 0.055 mm<br>(0.0006 to 0.0022 in)                       |
| Shaft clearance in driven gear .....        | 0.033 to 0.066 mm<br>(0.0013 to 0.0026 in)                       |
| Gear backlash .....                         | 0.100 mm (0.0039 in)   |
| Gear clearance in pump body .....           | 0.060 to 0.170 mm<br>(0.0024 to 0.0067 in)                       |

(cont.)

## LUBRICATION SYSTEM

(continued)

|   |  |
|---|--|
| Drive and driven gear width .....                           | 40.961 to 41.000 mm<br>(1.6126 to 1.6142 in)       |
| Gear housing depth in pump body .....                       | 41.025 to 41.087 mm<br>(1.6152 to 1.6176 in)       |
| Drive and driven gear end float .....                       | 0.025 to 0.126 mm<br>(0.0009 to 0.0049 in)         |
| Pressure relief valve spring length:                        |  |
| — free .....  | 45 mm (1.77 in)                                    |
| — closed, under 88 to 94 N (9 to 9.6 kg, 19.8 to 21 lb.) .. | 30.5 mm (1.20 in)                                  |
| Oil Filters .....   | gauze on suction and main cartridge<br>on delivery |

## COOLING SYSTEM

|   |  |
|---|--|
| <b>Water Pump</b> .....                                 | centrifugal, vane                          |
| Water pump drive ratio .....                            | 1.407 to 1                                 |
| Shaft interference fit in impeller .....                | 0.027 to 0.060 mm<br>(0.0011 to 0.0024 in) |
| Shaft interference fit in fan hub .....                 | 0.020 to 0.054 mm<br>(0.0008 to 0.002 in)  |
| Face sealing bushing interference fit in impeller ..... | 0.012 to 0.058 mm<br>(0.0005 to 0.0023 in) |
| <b>Thermostat</b>                                       |  |
| Type .....  | FLEXIDER or SAVARA<br>or BEHR-THOMSON      |
| Opening temperature .....                               | 79 ± 2°C                                   |
| Fully open at   | { FLEXIDER or SAVARA .....                 |
|   | { BEHR-THOMSON .....                       |
| Valve travel when fully open .....                      | 94°C<br>95°C<br>7.5 mm (0.295 in)          |
| <b>Radiator</b> .....                                   | vertical tube and steel fins, 3            |
| <b>Expansion tank</b> .....                             | transparent plastic                        |
| <b>Fan</b> .....  | suction, steel, 4-bladed                   |
| <b>Water Temperature Gauge</b> .....                    | three coloured sectors                     |
| Temperature range:                                      |  |
| — white sector .....                                    | 30° to 65°C                                |
| — green sector .....                                    | 65° to 105°C                               |
| — red sector .....                                      | 105° to 115°C                              |

## ENGINE: Specification and Data

### FUEL SYSTEM

|   |   |
|---|---|
| <b>Feed Pump</b> .....<br>Operation .....<br>Minimum fuel flow at 1.600 rpm shaft .....<br>Drive shaft eccentricity .....   | double diaphragm<br>engine driven<br>100 litre/hour (22 Gall/hour)<br>3 mm (0.118 in)   |
| <b>Feed Pump Drive</b><br>Shaft journal diameter .....<br>Bushing fitted I.D. after reaming .....<br>Shaft clearance in bushing .....<br>Bushing interference fit in housing .....<br>Inner washer thickness .....<br>Outer washer thickness .....  | 31.975 to 32.000 mm<br>(1.2588 to 1.2598 in)<br>32.050 to 32.075 mm<br>(1.2618 to 1.2628 in)<br>0.050 to 0.100 mm<br>(0.0020 to 0.0040 in)<br>0.063 to 0.140 mm<br>(0.0025 to 0.0055 in)<br>1.450 to 1.500 mm<br>(0.0025 to 0.0055 in)<br>2.930 to 3.000 mm<br>(0.1153 to 0.1181 in)  |
| <b>Injection pump</b> .....<br>Type { BOSCH .....<br>C.A.V. ....<br>Direction of rotation .....<br>Firing order .....   | distributor, integral governor<br>and advance device<br>EP/VA3/110H1300<br>CL: 134-8-770798<br>DPA3233 F420-770535<br>anticlockwise<br>1-2-3  |
| <b>Fuel injectors:</b><br>– type { FIAT .....<br>BOSCH .....<br>C.A.V. ....<br>O.M.A.P. ....<br>– FIAT { nozzle holder .....<br>spray nozzle .....<br>– BOSCH { nozzle holder .....<br>spray nozzle .....<br>– C.A.V. { nozzle holder .....<br>spray nozzle .....<br>– O.M.A.P. { nozzle holder .....<br>spray nozzle .....<br>Number of spray orifices .....<br>Spray orifice diameter .....<br>Release pressure .....<br>Delivery pipes:<br>– type { with pump BOSCH .....<br>with pump C.A.V. ....<br>– pipe size { with pump BOSCH .....<br>with pump C.A.V. .... | EPPZ10F1 - 770577<br>EPPZ50F3 - 771064<br>EPPZ60F3 - 770897<br>EPPZ70F3 - 770957<br>KB70S1F10 - 767107<br>DLL140S64F - 770578<br>KBL70S177/4 - 771065<br>DLLA141S662 - 771066<br>BKBL69S5376 - 770899<br>BDLL140S6655 - 770902<br>OKLL70S2974 - 770958<br>OLL140S64F - 770959<br>3<br>0.35 mm (0.0140 in)<br>221 to 230 bar (225 to 235 kg/cm <sup>2</sup> )<br>PRR25F15Z - 767452<br>PRR11F15Z - 768356<br>1.5 x 6 x 427 mm<br>(0.006x0.24x17.0800 in)<br>2 x 6 x 427 mm<br>(0.08x0.24x17.0800 in) |



# ENGINE: Specification and Data

## MODEL 446-446 DT - CALIBRATION DATA - BOSCH INJECTION PUMP TYPE EP/VA3/110 H 1300 CL - 134 - 8 - 770798

### ASSEMBLY DATA

Direction of rotation (drive end) . . . Anti-clockwise  
 Firing order . . . . . 1-2-3  
 Rotor stroke to spill cut-off . . . . . 0.7±0.02 mm  
 Pump timing: 10° ± 1° B.T.D.C., cylinder No. 1  
 in compression stroke.  
 Preloaded shuttle spring length. —  
 Delivery connection to cylinder No. 1: marked with  
 letter A.

### TEST PLAN

#### Procedure A

Bosch test machine with WSF 2044/4X injector  
 springs and EFEP 182 spray nozzles.

RABOTTI test machine with FIAT 656829 injector  
 springs and EFEP 182 spray nozzles —  
 Release pressure 147.1 bar (150 kg/cm<sup>2</sup>, 2133 psi)  
 Pipes . . . . . 2x6x840 mm

#### Procedure B

Test machine with injector bodies and nozzles as  
 fitted to engine.  
 Release pressure . . . . . 221 to 230 bar  
 (225 to 235 kg/cm<sup>2</sup>, 3200 to 3343 psi)  
 Pipes: . . . . . 1.5x6x700 mm  
 Calibration fluid . . . . . FIAT CFB at 40°+5°C  
 (for lower test temperatures  
 add 0.25 cm<sup>3</sup>/1000 shots  
 to each degree)  
 Fuel pressure . . . . . 0.2 bar (0.2 kg/cm<sup>2</sup>, 2.8 psi)

| Test No. | Lever position<br>L <sub>1</sub> = shuttle<br>L <sub>2</sub> = throttle | Speed<br><br>rpm                  | Transfer pressure<br><br>bar (kg/cm <sup>2</sup> ) | Advance piston stroke (*)<br><br>mm | PROCEDURE A   |   | PROCEDURE B   |   |
|----------|---|-----------------------------------|--|-------------------------------------|---|---|---|---|
|          |   |                                   |  |                                     | Injector delivery<br>cm <sup>3</sup> /1000<br>shots | Back leakage<br>cm <sup>3</sup> /100<br>shots | Injector delivery<br>cm <sup>3</sup> /1000<br>shots | Back leakage<br>cm <sup>3</sup> /100<br>shots |
| 1        | L <sub>1</sub> = shut-off<br>L <sub>2</sub> = full                      | 700±5                             | —  | —                                   | 0   | —   | 0   | —   |
| 2        | L <sub>1</sub> -L <sub>2</sub> = full                                   | 700±5                             | —  | —                                   | 58 to 60  | —   | 51 to 53  | —   |
| 3        | L <sub>1</sub> -L <sub>2</sub> = full                                   | 1370                              | —  | —                                   | 32 to 40  | —   | 25 to 33  | —   |
| 4        | —   | 100                               | 0.6 to 1.1   | —                                   | —   | —   | —   | —   |
| 5        |   | 700±5                             | 4.5 to 5   | —                                   | —   | —   | —   | —   |
| 6        |   | 1300                              | 6.7 to 7.2   | —                                   | —   | —   | —   | —   |
| 7        | L <sub>1</sub> -L <sub>2</sub> = full                                   | 250                               | —  | —                                   | 57 max.   | —   | 54 max.   | —   |
| 8        | L <sub>1</sub> -L <sub>2</sub> = full                                   | 100                               | —  | —                                   | 130 min.  | —   | 130 min.  | —   |
| 9        | —   | 250 to 400                        | —  | 0 (start)                           | —   | —   | —   | —   |
| 10       |   | 700 ± 5                           | —  | 3.5 to 4.5                          | —   | —   | —   | —   |
| 11       |   | 1050 to 1100                      | —  | 6.8 (end)                           | —   | —   | —   | —   |
| 12       | L <sub>1</sub> = full   | 1450 to 1500                      | —  | —                                   | 0   | —   | 0   | —   |
| 13       | L <sub>2</sub> = full (1)   | 1370                              | —  | —                                   | 32 to 40  | —   | 25 to 33  | —   |
| 14       | L <sub>1</sub> = full (2)<br>L <sub>2</sub> = full                      | 1300 ± <sub>20</sub> <sup>0</sup> | —  | —                                   | 53 to 55 (°)  | —   | 49 to 51 (°)  | —   |
| 15       |   | 1000                              | —  | —                                   | —   | 30 to 55                                      | —   | 30 to 55                                      |
| 16       |   | 700 ± 5                           | —  | —                                   | 58 to 60  | —   | 51 to 53  | —   |
| 17       |   | 500 ± 5                           | —  | —                                   | 55 to 57  | 60 to 90                                      | 51 to 53  | 60 to 90                                      |
| 18       | L <sub>1</sub> = full   | 400 to 500                        | —  | —                                   | 0   | —   | 0   | —   |
| 19       | L <sub>2</sub> = idle (3)   | 350                               | —  | —                                   | 12 to 22  | —   | 10 to 18  | —   |

(\*) Using tool 292817.  
 (°) Max. spread 2.5 cm<sup>3</sup>/1000 shots  
 (1) Adjust max. speed screw  
 (2) Adjust max. fuel screw  
 (3) Adjust idling speed screw