# WORKSHOP MANUAL

## FOCS Engine Series

cod. 1-5302-351




LOMBARDINI SERVICE
A KOHLER COMPANY

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This manual contains pertinent information regarding the repair of LOMBARDINI water-cooled, indirect injection Diesel engines type **LDW 502-602-903-1204-1204/T e LDW 702-1003-1404**: updated March 15th, 2006.

## CHAPTER INDEX


**1 GENERAL REMARKS AND SAFETY INFORMATION ..... Pag. 9 - 11**

GENERAL SAFETY DURING OPERATING PHASES ..... 11
GENERAL SERVICE MANUAL NOTES ..... 9
GLOSSARY AND TERMINOLOGY ..... 9
SAFETY AND ENVIRONMENTAL IMPACT ..... 11
SAFETY AND WARNING DECALS ..... 10
SAFETY REGULATIONS ..... 10-11
WARRANTY CERTIFICATE ..... 9

**2 TECHNICAL INFORMATION ..... 12-23**

MANUFACTURER AND ENGINE IDENTIFICATION ..... 14-15
OVERALL DIMENSION ..... 21-23
PERFORMANCE DIAGRAMS ..... 18-20
TECHINICAL SPECIFICATIONS ..... 16-17
TROUBLE SHOOTING ..... 12-13

**3 MAINTENANCE - RECOMMENDED OIL TYPE - REFILLING ..... 24-27**

ACEA Regualtions - ACEA Sequences ..... 25
API / MIL Sequence ..... 25
COOLANT ..... 27
FUEL SPECIFICATIONS ..... 27
International specifications ..... 25
LUBRICANT ..... 25
PRESCRIBED LUBRICANT ..... 26
ROUTINE ENGINE MAINTENANCE ..... 24
SAE Classification ..... 25

**4 DISASSEMBLY / REASSEMBLY ..... 28-65**

Air filter support ..... 30
Air restriction switch ..... 29
Alternator/Cooling fan belt drive ..... 33
Big end bearing ..... 58
Camshaft journals and housings - Dimensions ..... 47
Camshaft lobe measurement ..... 47
Camshaft timing - Belt Reassembly ..... 37
Camshaft timing - Belt Tightening and Fastening ..... 38
Camshaft timing - Belt tightening tool ..... 38
Camshaft timing pulley - Disassembly/Assembly ..... 37
Camshaft timing pulley - Reference marks ..... 37
Camshaft, disassembly ..... 46
Camshaft, journal and housing measurement ..... 46
Central main bearing caps ..... 60
Check the clearances between the bearings and the journal ..... 60
Clearances between the bearings and corresponding pins ..... 64
CONNECTING ROD ..... 58
Connecting rod alignment ..... 59
Connecting rod with bearings and pin ..... 58
Connecting tod, weight ..... 58
Cooling fan ..... 33
Crankcase breather LDW 502 ..... 44
Crankcase vacuum regulator valve ..... 43
Crankshaft axial clearance ..... 61
Crankshaft front and back oil seal rings ..... 62




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Crankshaft timing pulley ..... 36
Crankshaft, check journals and crank ..... 63
Crankshaft, lubrication lines ..... 63
Cylinder head assembly ..... 57
Cylinder head tightening procedure LDW 1204-1204/T-1404 ..... 57
Cylinder head tightening procedure LDW 502-602-702-903-1003 ..... 57
CYLINDER HEAD, removal ..... 48
Cylinder roughness ..... 59
Cylinder, class ..... 59
CYLINDERS ..... 59
Driving pulley ..... 34
Dry type air filter ..... 29
E.G.R. Circuit ..... 30-31
Exhaust maniflod ..... 32
Flywheel ..... 34
Fuel rail ..... 44
Fuel tank (optional) ..... 33
Governor springs ..... 40
Governor springs for Gensets ..... 40
Head gasket ..... 56
Hydraulic pump drive ..... 65
Injection pump control rod ..... 44
Intake / Exhaust / Injection camshaft lobe height - LDW 903 ..... 47
Intake manifold – Remote air filter ..... 30
Journal and connecting rod pins diameters ..... 63
Main bearings and connecting rod big ends diameters ..... 64
Oil bath air cleaner ( on request ) ..... 29
Oil pan, removal ..... 52
Oil pump - disassembly ..... 42
Oil pump - Reassembly ..... 42
PISTON ..... 52
Piston clearance ..... 55
Piston coolant nozzles ..... 61
Piston ring, Clearance between grooves ..... 54
Piston ring, mounting order ..... 55
Piston rings - End gaps ..... 54
Piston, assembly ..... 55
Piston, class ..... 53
Piston, disassembly and inspection ..... 53
Piston, weight ..... 54
Pre-combustion chamber ..... 51
Pre-combustion chamber ring nut removal ..... 51
Pre-combustion chamber, installation ..... 51
Pre-combustion chamber, removal ..... 51
Pump/injector unit - Disassembly ..... 45
Pump/injector unit - non-return valve ..... 45
Rear and forward main bearing caps ..... 60
RECOMMENDATIONS FOR DISASSEMBLING AND ASSEMBLING ..... 28
RECOMMENDATIONS FOR OVERHAULS AND TUNING ..... 28
Return pulley ..... 34
Ringfeder-type rings on LDW 1204-1204/T-1404 ..... 35
Ringfeder-type rings on LDW 1204-1204/T-1404 - Assembly ..... 35
Rocker arm assembly ..... 45
Rocker arm cover ..... 42
Rocker arm cover gasket ..... 43
Rocker arm pivot, dismounting and remounting ..... 46
Shoulder half rings ..... 61
Shoulder half rings, oversized elements ..... 62
Speed governor ..... 40
Speed governor - Limiting speed governor ..... 41
Speed governor - Reassembly ..... 41
Speed governor components ..... 40
Stop pin rings, dismounting and remounting ..... 52
Third drive, components ..... 65
Tightening pulley ..... 36
Timing belt / Timing pulley arrangement ..... 36
Timing belt cover ..... 35



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Timing belt removal ..... 36
Vacuum pump and vacuum pump flange ..... 33
Valve / Rocker arm clearance ..... 44
Valve guide insertion ..... 49
Valve guides and valve guide housings ..... 49
Valve recess and seat sealing width ..... 50
Valve seats and housings - Dimensions ..... 50
Valve springs ..... 48
Valve stem sealing rings - Reassembly ..... 48
Valve timing - Angles ..... 39
Valve timing check ..... 38
Valve, specifications ..... 49
Valves ..... 48

**5 TURBOCHARGER ..... 66-67**

TURBO CHARGER ..... 66
Turbocharger components ..... 66
Turbocharger pressure testing ..... 66
Turbocharger west gate adjustment - Regolazione corsa asta comando valvola " Waste gate " ..... 67

**6 LUBRIFICATION CIRCUIT ..... 68-71**

Internal oil filter and oil sump return pipe ..... 69
LUBRIFICATION CIRCUIT ..... 68
Oil filter cartridge ..... 70
Oil pressure check ..... 70
Oil pressure regulating valve ..... 70
Oil pump ..... 69
Oil pump, clearance between rotors ..... 69

**7 COOLANT CIRCUIT ..... 72-73**

COOLANT CIRCUIT ..... 72
Coolant circulation pump, components ..... 73
Radiator and compensation, check and seal tank cap. ..... 73
Thermostatic valve ..... 73

**8 FUEL SYSTEM ..... 74-83**

Closing the oilhole ..... 82
Fuel feeding / injection circuit ..... 74
Fuel filter detached from the tank (on request) ..... 74
Fuel lift pump ..... 74
Fuel pump drive rod projection ..... 74
Injection advance control and regulation ..... 80
Injection advance for currently used pump/injector unit ..... 80
Injection advance references on timing belt protector ..... 81
Injection pump assembly/disassembly ..... 76
Injection pumps delivery balancing ..... 83
Injector, nozzle projection ..... 79
Injector, setting (old type) ..... 79
Injector, spark arrester ..... 79
Instrument connection ..... 83
Plunger barrel ring nut assembly/disassembly ..... 76
Plunger injection pump reassembly ..... 76
Preliminary steps to pump/injector unit delivery balancing test ..... 82
Pump/injector unit ..... 75
Pump/injector unit se.no. 6590.285 control data. ..... 77-78
Pump/injector unit, components ..... 75
Pumping element ..... 77
Pumping element (old-type injection pump) ..... 77



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## TROUBLE SHOOTING

**THE ENGINE MUST BE STOPPED IMMEDIATELY WHEN:**

**1)** - The engine rpms suddenly increase and decrease;
**2)** - A sudden and unusual noise is heard;
**3)** - The colour of the exhaust fumes suddenly darkens;
**4)** - The oil pressure indicator light turns on while running.

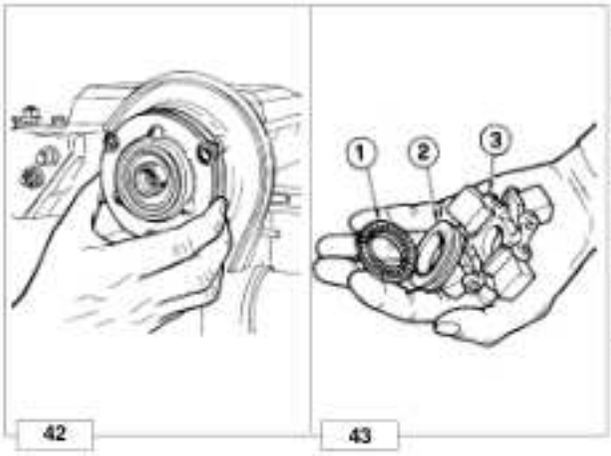
***TABLE OF LIKELY ANOMALIES AND THEIR SYMPTOMS***

The following table contains the possible causes of some failures which may occur during operation.
Always perform these simple checks before removing or replacing any part.

| | POSSIBLE CAUSE | TROUBLE | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Engine does not start | Engine starts but stops | No acceleration | Non-uniform speed | Black smoke | White smoke | Oil preassure too low | Oil level increase | Excessive oil consumption | Oil and fuel dripping from the exhaust | Engine overheats | Inadequate performance | High noise level |
| FUEL CIRCUIT | Clogged fuel pipes | ■ | ■ | ■ | ■ | | | | | | | | ■ | |
| | Clogged fuel filter | ■ | ■ | ■ | ■ | | | | | | | | ■ | |
| | Air or water in the fuel circuit | ■ | ■ | ■ | ■ | | ■ | | | | | | ■ | |
| | Tank cap breather blocked | ■ | ■ | ■ | ■ | | | | | | | | ■ | |
| | Faulty fuel pump | ■ | ■ | ■ | ■ | | | | ■ | | | | ■ | |
| | Lack of fuel | ■ | ■ | | | | | | | | | | | |
| ELECTRIC SYSTEM | Glow plug fuse burned | ■ | | | | | | | | | | | | |
| | Faulty glow plug control relay | ■ | | | | | | | | | | | | |
| | Flat battery | ■ | | | | | | | | | | | | |
| | Unclear or mistaken cable connection | ■ | | | | | | | | | | | | |
| | Faulty starter switch | ■ | | | | | | | | | | | | |
| | Faulty starting motor | ■ | | | | | | | | | | | | |
| | Faulty glow plugs | ■ | | | | | ■ | | | | | | | |
| MAINTENANCE | Clogged air filter | ■ | ■ | ■ | ■ | ■ | | | | ■ | | | ■ | |
| | Prolonged operation at idle | | | | | | ■ | | | ■ | ■ | | | |
| | Incomplete run-in | | | | | | ■ | | | ■ | | | ■ | |
| | Overloaded engine | ■ | ■ | ■ | | ■ | | | | ■ | | ■ | | |
| SETTINGS REPAIRS | Excessive valve clearances | | | | | | | | | | | | ■ | ■ |
| | Absence of valve clearances | ■ | | | | | | | | | | | | |
| | Incorrect speed governor leverages | ■ | | | ■ | | | | | | | | ■ | |
| | Speed governor spring broken or disengaged | | ■ | ■ | | | | | | | | | | |
| | Idle low | | ■ | | ■ | ■ | | | | ■ | ■ | | | |
| | Worn out or stuck rings | ■ | | | | | ■ | | | ■ | ■ | ■ | ■ | |
| | Worn out cylinders | ■ | | | | | ■ | | | ■ | ■ | ■ | ■ | |
| | Worn out valve guides | | | | | | ■ | | | ■ | ■ | ■ | ■ | |
| | Bad valve seal | ■ | | | | ■ | | | | ■ | ■ | ■ | ■ | |
| | Bearing shells of bearing cap - piston rod - rocker worn out | | | | | | | ■ | | ■ | | ■ | ■ | ■ |
| | E.G.R. valve blocked open | | | | | ■ | | | | | | | | |
| | Governor leverages not running | ■ | ■ | ■ | ■ | | | | | | | | | |
| | Cylinder head gasket damaged | ■ | | | | | | | ■ | ■ | | ■ | ■ | ■ |
| | Faulty timing system | ■ | | | | | | | | | | | | ■ |
| | Supplementary starter spring broken or disengaged | ■ | | | | | | | | | | | | |



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42 43

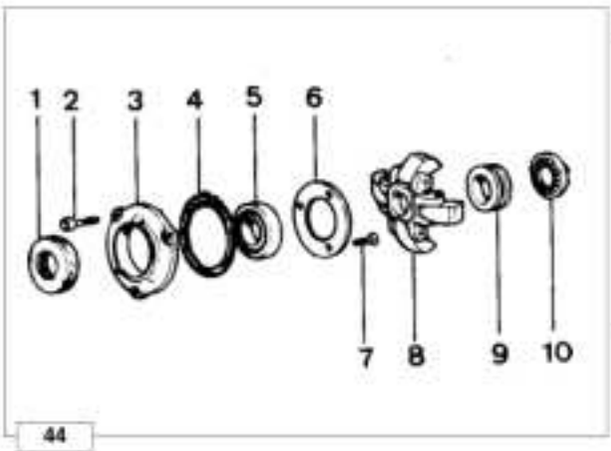
## SPEED GOVERNOR

The weight-type mechanical governor, is driven directly by the camshaft and is housed with the cylinder head.

*Components:*

**1** Thrust washer
**2** Spool
**3** Flyweight assembly

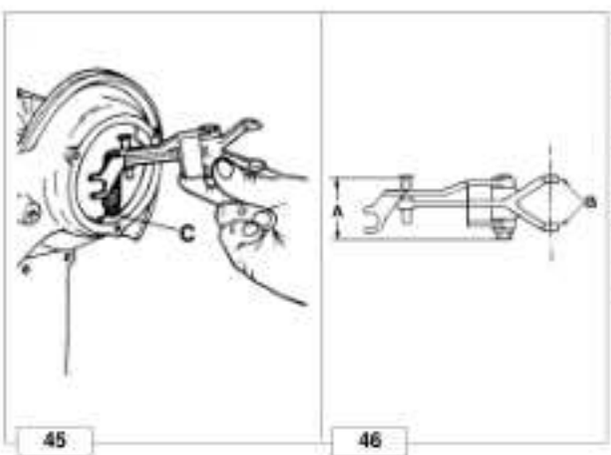
***Note:*** In engines with the minimum/maximum (see fig. 49) the weights are lightened by 25%.




44

## Speed governor components

**1** Oil seal
**2** Screw
**3** Support
**4** O-Ring
**5** Bearing
**6** Retainer
**7** Screw
**8** Flyweight assembly
**9** Spool
**10** Thrust washer

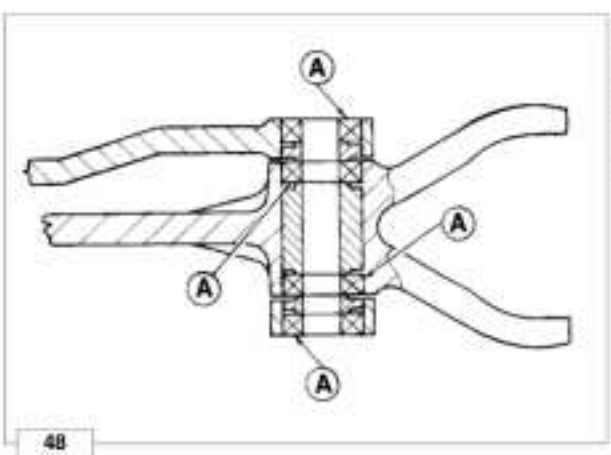



45 46

## Governor springs

Unscrew the pin that attaches it to the cylinder head.
To remove it as shown in the figure it is necessary to dismount the camshaft. It could also be removed from the accelerator box side by unscrewing the torque gearing device.
Before reassembling it, check value **A** (45 to 46 mm) and the parallelism of the two levels **B** that must not exceed 0.05 mm.

***Note:*** There are 5 different types of regulator springs **C**. These change according to the engine adjustment: standard spring for 3,600 rpm, for 3,000 rpm, for 2,400 to 2,600 rpm, for 1,800 rpm and for 1,500 rpm.



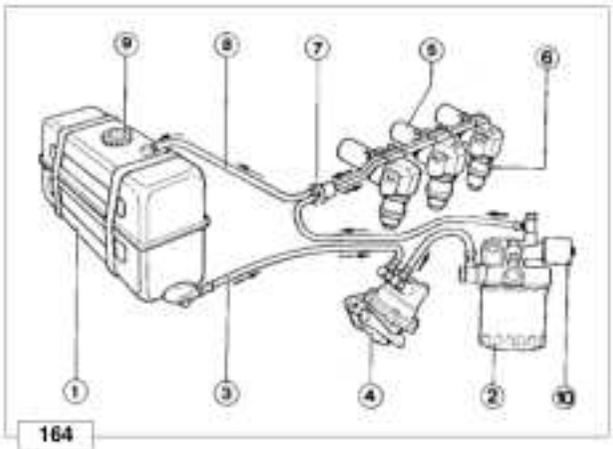

48

## Governor springs for Gensets

In the section view of the leverages the 4 ball bearings **A** are highlighted.
They are mounted on engines for generator sets adjusted at 1,500÷1,800 rpm and on other particular applications on request.



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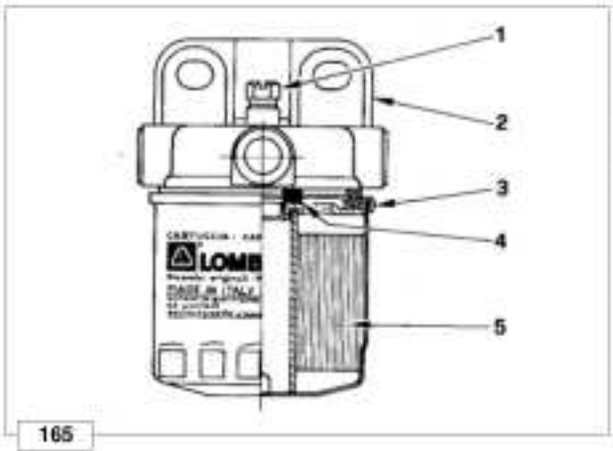
164

## Fuel feeding / injection circuit

*Components:*

**1** Fuel Tank
**2** Fuel filter
**3** Fuel feeding tube
**4** Fuel lift pump
**5** Injection pump
**6** Injector
**7** Fuel rail passage rubber joint
**8** Injector exhaust pipe
**9** Fuel tank cap
**10** Solenoid valve

***Note:*** The tank complete with filter is supplied on request.



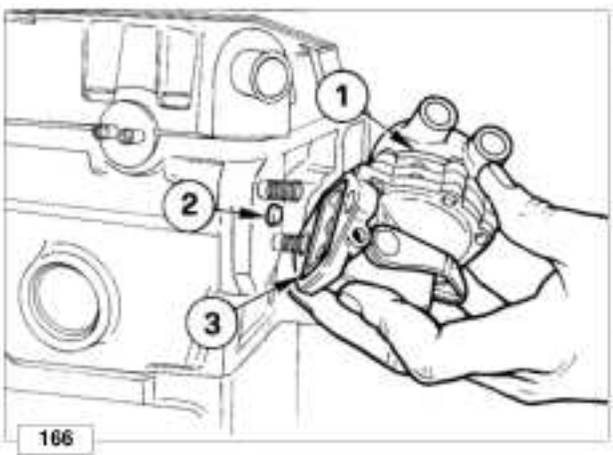
165

## Fuel filter detached from the tank (on request)

**1** Air relief valve
**2** Bearing
**3** Cartridge
**4** Rubber element
**5** Filtering element

*Cartridge characteristics:*
Filtering paper: ..... PF 905
Filtering surface: ..... 2400 $cm^2$
Degree of filtration: ..... 2÷3 **µ**
Maximum operating pressure: ..... 4 bar

➲ See page 24 for periodic maintenance details.



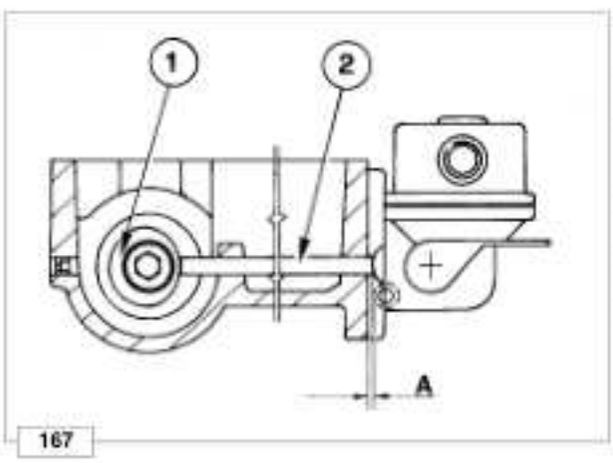
166

## Fuel lift pump

*Components:*
**1** Fuel lift pump
**2** Push rod
**3** Seal ring

The fuel pump is membrane type. It is driven by camshaft cam via a drive rod.
It is equipped with an external manual fuel lever.

*Characteristics:*
With the control cam at 1500 rpm the delivery rate is 75 l/hours and the self-adjusting pressure is at 0.55 to 0.65 bar.



167

## Fuel pump drive rod projection

The protrusion **A** of drive rod **2** from the cylinder head surface is 1.66÷2.18 mm.
The check must be carried out with cam **1** idle as in the figure.

❍ Block the two fuel pump fastening nuts simultaneously at 24 Nm.

Check the length of the drive rod and if it is not the right size, replace it.
Drive rod length = 153.15÷153.35 mm.



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