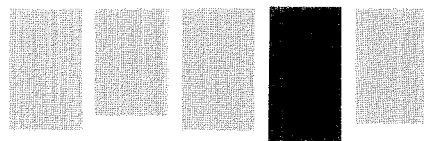


WORK SHOP MANUAL

6LD260
6LD260/C
6LD325
6LD325/C
6LD360
6LD360/V
6LD400
6LD400/V
6LD401/B1
6LD435
6LD435/V
6LD435/B1



 **LOMBARDINI**
SERVICE

This manual contains the most important information for the repair of LOMBARDINI air-cooled, direct injection Diesel engines type 6LD260, 6LD260/C, 6LD325, 6LD325/C, 6LD435/V, 6LD435/B1. This information is current as of October 1, 1990, and is subject to change without notice.

INDEX

I	MODEL NUMBER AND ENGINE IDENTIFICATION	page 5
II	CHARACTERISTICS	page 6
III	MAINTENANCE-RECOMMENDED OIL TYPE-REFILLING	page 9
IV	TROUBLE SHOOTING	page 10
V	OVERALL DIMENSIONS	page 11
VI	TORQUE SPECIFICATIONS	page 13
VII	DISASSEMBLY/REASSEMBLY	page 15
VIII	LUBRICATION SYSTEM	page 38
IX	FUEL/INJECTION SYSTEM	page 41
X	ELECTRIC EQUIPMENT	page 52
XI	SETTINGS	page 57
XII	STORAGE	page 59
	GENERAL ALPHABETIC INDEX	page 60

SIGLA ET IDENTIFICATION	Pag. 5
CARACTERISTIQUE	6-7
COURBES CARACTERISTIQUES DE PUISSANCE	8
ENTRETIEN-HUILE CONSEILLEE-CONTENANCES	9
ELIMINATION DES INCONVENIENTS	10
MESURES D'ENCOMBREMENT	11-12
COUPLES DES SERRAGE	13
COUPLES DES SERRAGE DES BOULLONS STANDARD	14
DISASSEMBLY/REASSEMBLY	15
Bringing fuel delivery limiter to its original position	36
Cam height	32
Cam timing	31
CAMSHAFT	31
Camshaft end play	33
Camshaft journals and bore	31
Camshaft timing	32
Choosing the head gasket thickness	25
Clearance between compression release cam and adjusting screw	17
CONNECTING ROD	26
Connecting rod alignment	27
Connecting rod dimensions	26
Conveyor plate for electric starting	18
CRANKSHAFT	29
Crankshaft end play	27
Crankshaft journal radius	29
Crankshaft lubrication ducts	29
CYLINDER	22
Cylinder characteristics in models 6LD260 and 6LD260/C	22
Cylinder classes	22
CYLINDER HEAD	19
Cylinder roughness	22
Dimensions and clearance between guides and valve stems (mm)	21
Dimensions of camshaft journal and bore	31
Dry air cleaner	16
Flywheel	18
Gear cover, timing side	28
Governor spring and leverage for small-size vehicles	35
Governor spring hooking position	34
Hand crank starting	37
Injector projection	19
Main bearing and connecting rod big end bearing inside diameter	30
Main bearing inside diameter	30
Main bearing support, flywheel side	27
Main journal and rod journal diameter	30
Manual droop adjustment	36
Muffler	16
Oil seal	28
Oil-bath air cleaner	15
Oil-bath air cleaner components	15
Oil-bath air cleaner components for de-noised engine	15
PISTON	23
Piston - Refitting	25
Piston classes and logo	23
Piston clearance	25
Piston pin	26
Piston rings - Clearance between grooves	24
Piston rings - End gaps	24

Piston rings - Fitting sequence	24
Pushrod tube	21
Re-coil starting	37
Rocker arm assembly	19
Rocker arm cover	16
Rocker arm cover with internal crankcase vapor recirculation system	17
Sound-insulating shroud with shroud plate and side plates	18
Speed governor	34
Speed governor and leverage for generating sets	35
Speed governor for engines meant for agricultural purposes	35
Speed governor setting	34
Speed governor with provision for external droop adjustment	36
Standard oil sump	25
Standard shroud and side plates	17
Tank	18
Thrust washer	30
Timing angles for checking purposes	33
Valve guide insertion	20
Valve guides and valve guide bores	20
Valve material	20
Valve seat lapping	21
Valve seats and valve seat bores	21
Valve spring	20
Valve timing check	33
Valve timing without considering timing marks	32
Valve/rocker arm clearance	17
Valves	19

LUBRICATION SYSTEM

38

Oil filter	39
Oil pressure check	40
Oil pressure curve at full speed	40
Oil pressure curve at idling speed	40
Oil pressure relief valve	40
Oil pump	39
Oil pump body and flange	39

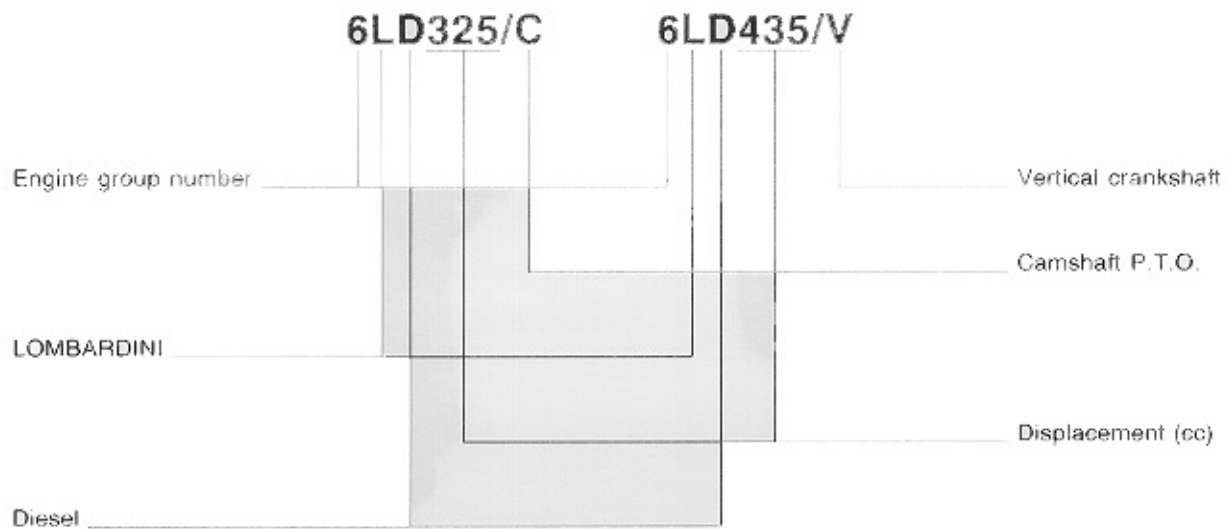
FUEL SYSTEM

41

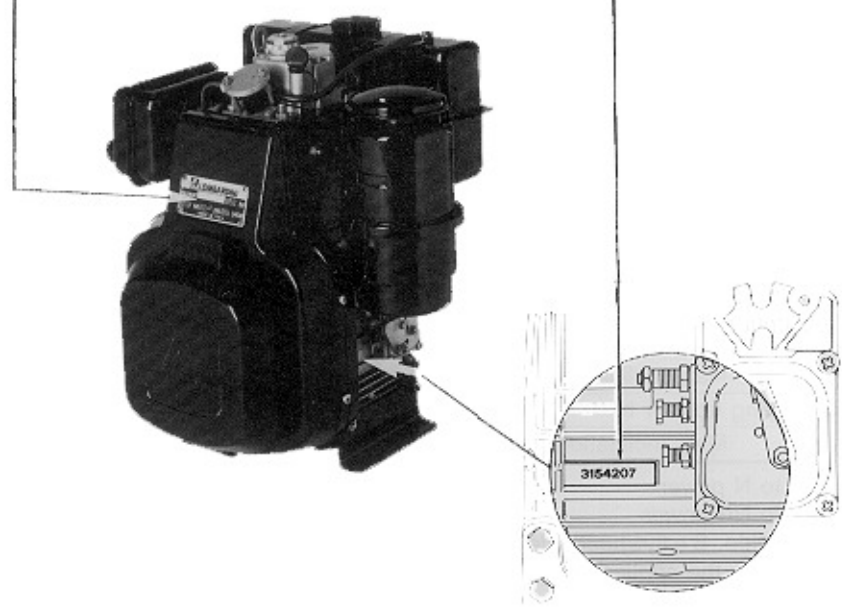
Fuel feeding pump drive rod protusion	42
Fuel feeding/injection system with feed pump and external fuel filter	41
Fuel filter inside tank	41
Fuel filter separate from the tank	42
Fuel transfer pump	42
Injec. pump type OLC for eng. fitted to small-size vehicles and agric. equip.	46
Injection pump	43
Injection pump delivery check at the test bed	48
Injection pump refitting	43
Injection timing checking device	48
Injection timing correction	50
Injection timing reference marks	49
INJECTOR	50
Injector type "P"	51
Nozzle	50
Nozzle for injector type "P"	51
OLC injection pump refitting	47
Plun. and deliv. valve for injec. pump type 6LD360, 6LD360N, 6LD400 and 6LD400/V	45
Plunger and deliv. valve for GDV for injec. pump type 6LD401/B1, 6LD435/B1	45
Plunger and deliv. valve for injec. pump type 6LD260 and 6LD260/C	44
Plunger and deliv. valve for injec. pump type 6LD325 and 6LD325/C	44
Plunger and deliv. valve for injec. pump type 6LD360 KAGR and 6LD400 KAGR	44
Plunger and deliv. valve for injec. pump type 6LD435 and 6LD435V	45
STATIC INJECTION TIMING	48

ELECTRIC SYSTEM	52
Alternator battery charger curve	53
Alternator, 12,5V 14A	53
Alternator, 12V 4A	53
Characteristic curves for starting motor type Valeo D6 RA 19	55
Check voltage regulator for proper operation	54
Electrical starting layout, 12V 4A	52
Injector setting	52
Key switch positions	56
Lighting system, 12V 14A	52
Starting motor type Bosch EF (L)	55
Voltage regulator	54
SETTINGS	57
Different types of injection pump delivery limiting device	58
Full speed setting in no-load conditions	57
Idle speed setting in no-load conditions	57
Injection pump delivery limiting device	57
Injection pump delivery setting	57
Injection pump delivery setting with engine on torque dynamometer	58
STORAGE	59
Permanent protection	59
Prepare the engine for operation	59
Temporary protection	59

MODEL NUMBER AND ENGINE IDENTIFICATION

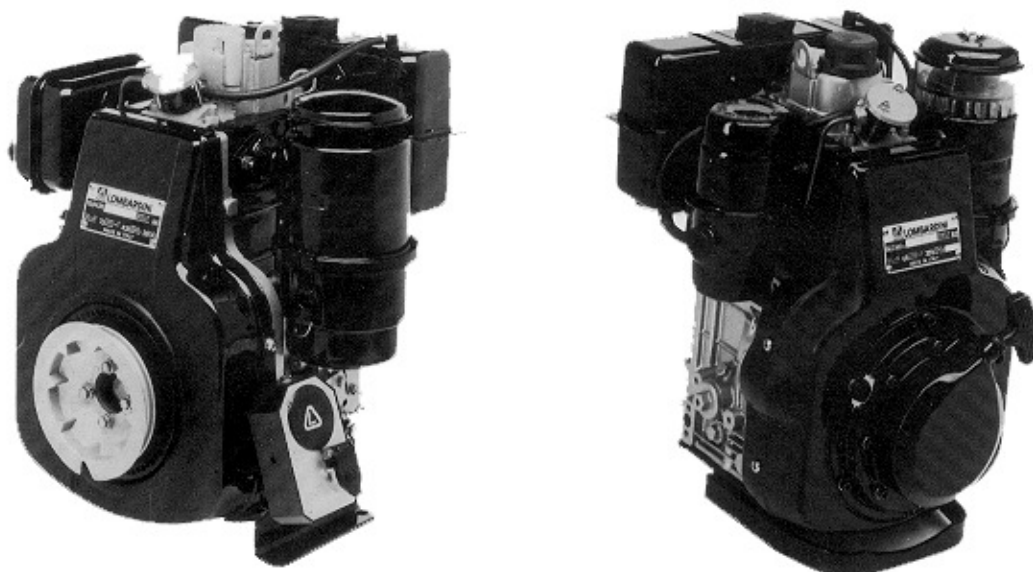


Once the model has been correctly interpreted, identify the engine through serial number indicated both on the data plate fitted to the shroud and on the crankcase.



II CHARACTERISTICS

CHARACTERISTICS OF MODELS 6LD260, 6LD260/C, 6LD325, 6LD325/C, 6LD360, 6LD360/V



ENGINE TYPE		6LD 260	6LD 260/C	6LD 325	6LD 325/C	6LD 360 6LD 360/V
Number of cylinders	N.	1	1	1	1	1
Bore	mm	70	70	78	78	82
Stroke	mm	68	68	68	68	68
Displacement	cm ³	262	262	325	325	359
Compression ratio		18:1	18:1	18:1	18:1	18:1
R.P.M.		3600	1800	3600	1800	3600
	N DIN 70020 - 80/1269/CEE - ISO 1585	3.7/5.0	3.7/5.0	5.0/6.8	5.0/6.8	5.5/7.5
Power kW/HP NB DIN 6270		3.3/4.5	3.3/4.5	4.4/6.0	4.4/6.0	5.1/7.0
	NA DIN 6270	3.0/4.0	3.0/4.0	4.0/5.4	4.0/5.4	4.7/6.4
Max. torque ★	Nm	10.5	21.0	14.0	28.0	16.7
	RPM	@ 2600	@ 1300	@ 2100	@ 1000	@ 2200
Fuel consumption ★★	l/h	1.2	1.2	1.6	1.6	1.8
Oil consumption	Kg/h	0.009	0.009	0.012	0.012	0.014
Dry weight	Kg.	40	40	40	40	44
Combustion air volume at 3600 r.p.m.	l./1'	380	380	470	470	520
Cooling air volume at 3600 r.p.m.	l./1'	5400	5400	5400	5400	6200
Max. allowable output shaft axial load	Kg.	180	180	180	180	180
	A	250	250	250	250	250
	B					
Max. inclination	α	35°	35°	35°	35°	35° Δ
Max. inclination lasting up to 1 h.	α	30°	30°	30°	30°	30° ΔΔ
Max. inclination permanent	α	★★★★	★★★★	★★★★	★★★★	★★★★

★ Referred to N power

★★ Referred to NB power

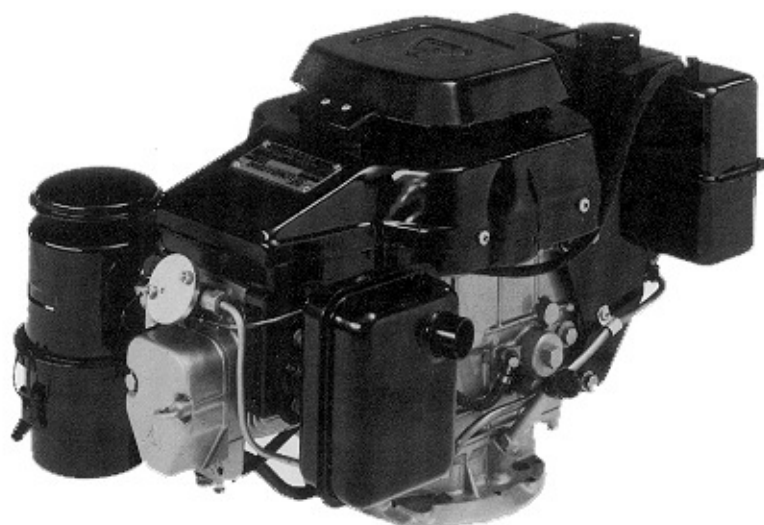
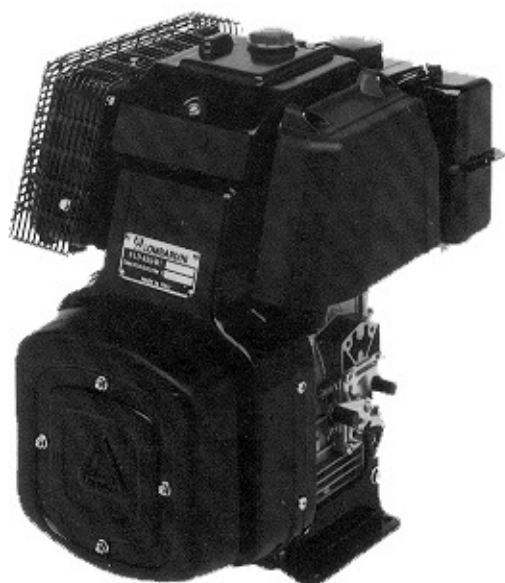
★★★ A = timing side, B = flywheel side

★★★★ Depending on the application

Δ For 6LD 360/V = 30°

ΔΔ For 6LD 360/V = 25°



CHARACTERISTICS OF MODELS 6LD401/B1, 6LD400, 6LD400/V, 6LD435, 6LD435/V, 6LD435/B1


ENGINE TYPE		6LD 401/B1	6LD 400 6LD 400/V	6LD 435 6LD 435/V	6LD 435/B1
Number of cylinders	N.	1	1	1	1
Bore	mm	82	86	86	86
Stroke	mm	75	68	75	75
Displacement	cm ³	396	395	436	436
Compression ratio		20:1	18:1	18:1	20:1
R.P.M.		3000	3600	3600	3000
	N DIN 70020 - 80/1269/CEE - ISO 1585	4.6/6.2	6.25/8.5	7.3/10	5.9/8.0
Power kW/HP	NB DIN 6270	4.3/5.8	5.9/8.0	6.8/9.2	5.5/7.5
	NA DIN 6270	3.9/5.3	5.4/7.3	6.2/8.3	5.0/6.8
Max. torque *	Nm	—	19.6	23.7	—
	RPM	—	@ 2200	@ 2200	—
Fuel consumption **	l/h	1.45	2.1	2.1	1.6
Oil consumption	Kg./h	0.011	0.013	0.013	0.013
Dry weight	Kg.	49	45	46	49.5
Combustion air volume at 3600 r.p.m.	l./l'	500 Δ	575	660	550 Δ
Cooling air volume at 3600 r.p.m.	l./l'	5100 Δ	6200	6200	5100 Δ
Max. allowable output shaft axial load	Kg.	180	180	180	180
		250	250	250	250
	momentary	α	35°	35° ΔΔ	35°
Max. inclination lasting up to 1 h.	α	30°	30° ΔΔΔ	30° ΔΔΔ	30°
	permanent	α	★★★★	★★★★	★★★★

* Referred to N power

** Referred to NB power

*** A = timing side, B = flywheel side

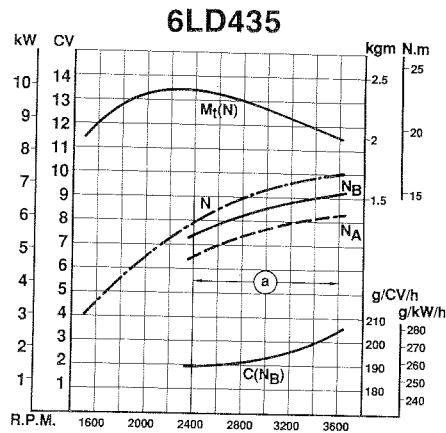
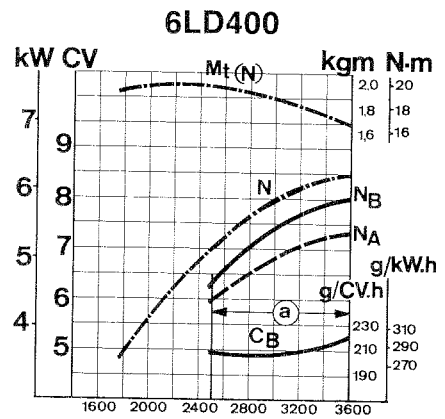
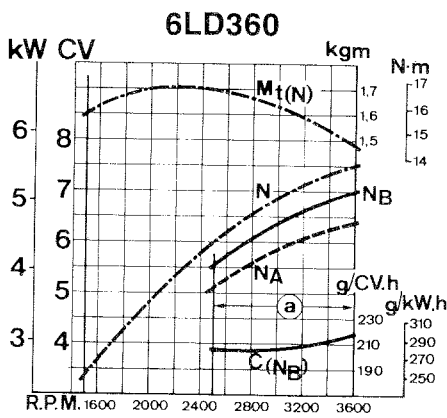
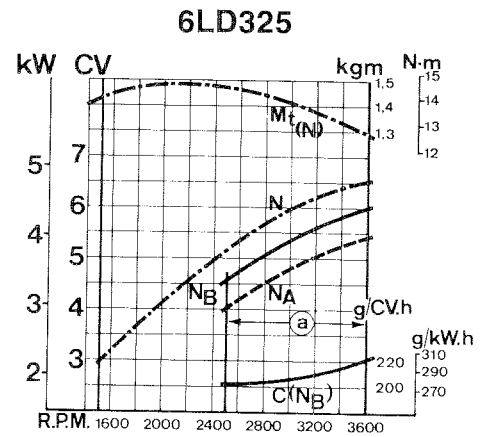
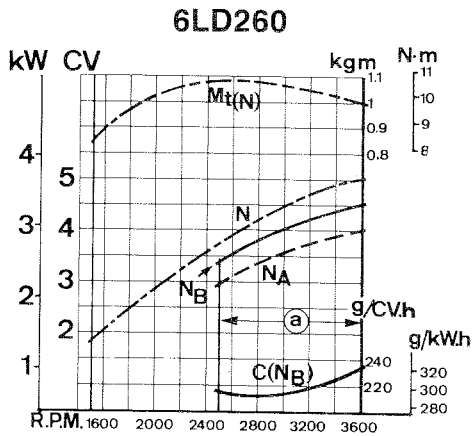
**** Depending on the application

Δ At 3000 r.p.m.

ΔΔ For 6LD400/V and 6LD435/V = 30°

ΔΔΔ For 6LD400/V and 6LD435/V = 25°

CHARACTERISTIC POWER, TORQUE AND SPECIFIC FUEL CONSUMPTION CURVES



N (DIN 70020 - 80/1269/CEE - ISO 1585) AUTOMOTIVE RATING: Intermittent operation with variable speed and variable load.
 N_B (DIN 6270) RATING WITH NO OVERLOAD CAPABILITY: Continuous light duty **N_A (DIN 6270) CONTINUOUS RATING WITH OVERLOAD CAPABILITY:** Continuous heavy duty with constant speed and constant load.

The above power values refer to an engine fitted with air cleaner and standard muffler, after run-in and at the environmental conditions of 20°C and 1 bar.

Max. power tolerance is 5%. Power decreases by approximately 1% every 100 m altitude and by 2% every 5°C above 20°C.

$C(N_B)$: Specific fuel consumption at N_B power

M_t : Torque at N power

ⓐ : Speed for continuous operation. In case of application outside this range please contact LOMBARDINI.



MAINTENANCE

OPERATION	COMPONENT	INTERVAL (HOURS)							
		10	50	125	250	500	1000	2500	5000
CLEANING	OIL-BATH AIR CLEANER (*)	●							
	FEED PUMP FILTER				●				
	HEAD AND CYLINDER FINS (*)				●				
	FUEL TANK						●		
	INJECTORS					●			
CHECK	AIR CLEANER OIL	●							
	LEVEL CRANKCASE OIL	●							
	BATTERY FLUID		●						
	VALVE/ROCKER ARM CLEARANCE				●				
	INJECTOR SETTING					●			
REPLACEMENT	AIR CLEANER (**)(***)	●							
	OIL CRANKCASE (***)		△		●				
	OIL FILTER CARTRIDGE		△		●				
	FUEL FILTER CARTRIDGE				●				
OVERHAUL INSPECTION	PARTIAL (****)						●		
	COMPLETE							●	

△ First replacement

(*) Under severe working conditions, clean daily

(**) Under extremely dusty conditions, change every 4-5 hours.

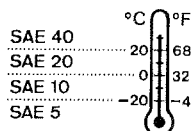
(***) See recommended oil type

(****) Includes checking cylinders, piston rings, guides, springs, grinding valve seats, de-carboning heads and cylinders as well as checking injection pump and injectors.

RECOMMENDED OIL TYPE

AGIP DIESEL SIGMA S SAE 30-40 specification MIL-L-2104 C
 ESSOLUBE D3, specification MIL-L-2104 D and UNIFARM specification MIL-L-2104 C.
 In countries where AGIP and ESSO products are not available use diesel engine oil API SERVICE CD or a similar type complying with the military specification MIL-L-2104 C and MIL-L-2104 D.

SUGGESTED OIL GRADES



CAPACITIES (LITERS)

Standard fuel tank	4.3
Air cleaner oil tank	0.3
Standard oil sump:	
6LD260, 6LD260/C, 6LD325, 6LD325/C, 6LD360	1.0
6LD400, 6LD 401/B1, 6LD435, 6LD435/B1	1.2
6LD360/V, 6LD400/V, 6LD435/V	1.1



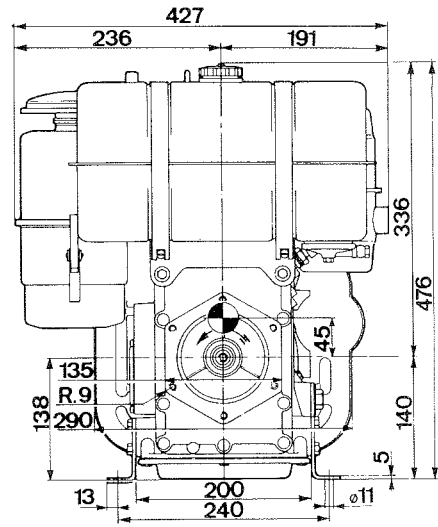
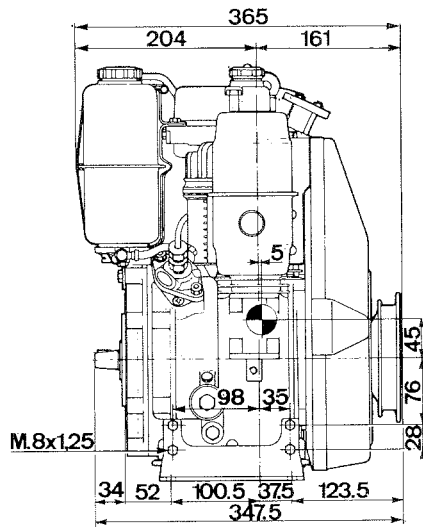
POSSIBLE CAUSES AND TROUBLE SHOOTING

The following table contains the possible cause of some symptoms which may occur during operation. Always perform the simplest checks before removing or replacing any part.

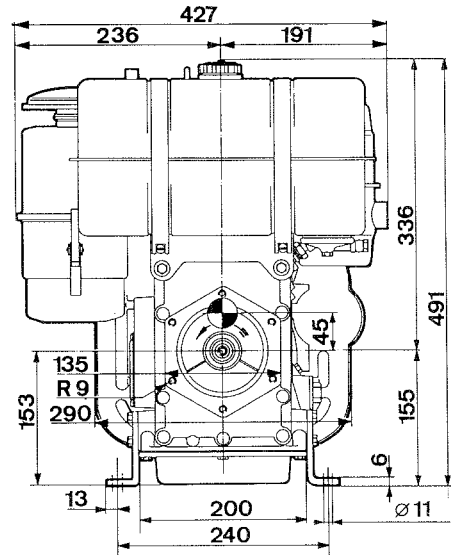
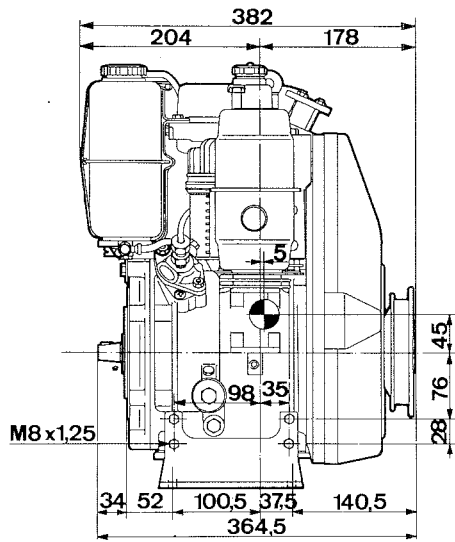
POSSIBLE CAUSE		SYMPTOM									
		Engine does not start	Engine starts but stops	No acceleration	Unsteady speed	Black smoke	White smoke	Low oil pressure	Oil level rising	Excessive oil consumption	Oil and fuel dripping from exhaust
FUEL CIRCUIT	Restriction in fuel	●									
	Clogged fuel filter	●	●	●							
	Air in fuel circuit	●	●	●							
	Clogged tank breather	●	●	●							
	Faulty feed pump	●	●								
	Stuck injector	●									
	Stuck injection pump delivery valve	●									
	Wrong injector setting					●					
	Excessive plunger blow-by								●		
	Stuck injection pump delivery control	●		●	●						
Wrong injection pump setting			●		●						
LUBRICATION	Oil level too high				●		●			●	
	Stuck pressure relief valve							●			
	Worn-oil pump							●			
	Air inside oil suction pipe							●			
	Faulty pressure gauge or switch							●			
	Clogged oil suction pipe							●			
ELECTRIC SYSTEM	Battery discharged	●									
	Bad or corroded connections	●									
	Defective key switch	●									
	Defective starter	●									
MAINTENANCE	Clogged air filter	●		●		●					
	Excessive idle operation						●			●	●
	Incomplete run-in						●				
	Engine overloaded			●		●					
SETTINGS/REPAIRS	Advanced injection timing	●									
	Retarded injection timing					●					
	Incorrect governor linkage adjustment	●			●						
	Broken or loose governor spring			●							
	Idle-speed set too low		●								
	Worn or stuck piston rings						●			●	●
	Worn cylinders						●			●	●
	Worn valve guides						●			●	●
	Sticking valves	●									
	Worn bearings							●			
	Governor linkage not freely operating	●	●		●						
	Crankshaft not turning freely					●					
Damaged cylinder head gasket	●										



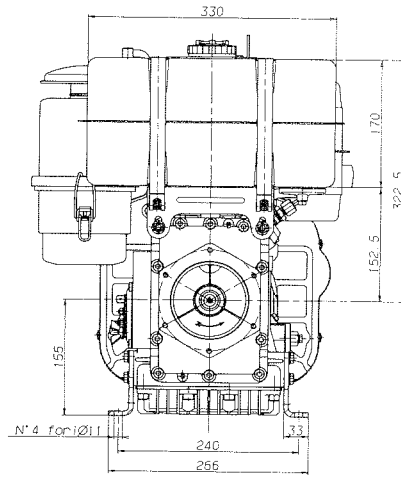
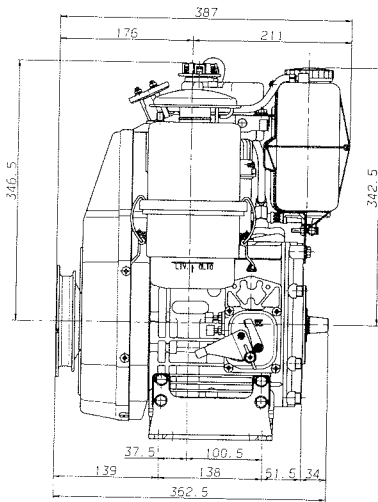
OVERALL DIMENSIONS 6LD260, 6LD325



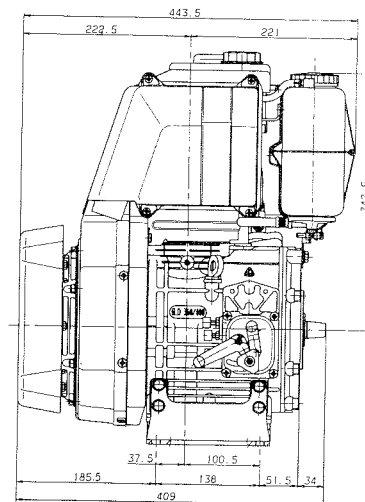
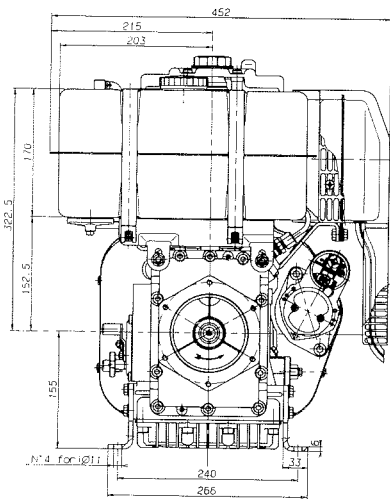
OVERALL DIMENSIONS 6LD360, 6LD400



OVERALL DIMENSIONS 6LD435



OVERALL DIMENSIONS 6LD401/B1 and 6LD435/B1



MAIN TORQUE SPECIFICATIONS




POSITION	Diameter x Pitch mm	Torque Nm
Injection pump delivery valve union	18x1,5	35 ÷ 40
Oil sump	8x1,25	23
Engine flanging bell	8x1,25	35
Rocker arm cover	8x1,25	20
Air cleaner	8x1,25	26
Oil filter	33x2	30
Oil pick-up	12x1,5	35
Clutch flange	8x1,25	40
Injector	6x1	9
Oil pump/speed governor gear	10x1,5	25
Injection pump delivery control lever (steel)	6x1	10
Injection pump delivery control lever (aluminium)	6x1	9
Muffler	8x1,25	25
Starter motor	8x1,25	23
Rocker arm control lever fulcrum pin	12x1,25	50
Engine foot	8x1,25	23
Injection pump	8x1,25	23
Oil pump	6x1	10
Gear cover, timing side	8x1,25	23
Pressure switch	12x1,5	40
Rope pulley	7x1	25 ÷ 27
High pressure injection line	12x1,5	20 ÷ 25
Main bearing support, flywheel side	8x1,25	23
Fuel tank mounting	8x1,25	25
Oil drain plug	12x1,5	50
Oil drain plug for 6LD435, 6LD435/B1 and 6LD401/B1	14x1,5	50
Connecting rod big end	8x1,25	35
Engine cylinder head	9x1,25	35
Engine (integral cylinder)	8x1,25	32
Oil pressure relief valve	18x1,5	25
Flywheel	14x1,5	167

USE OF SEALANTS

POSITION	Type of sealant
Air baffle/ (electric starting)	Loctite 270
Rocker arm shaft	Selon 334
Injection pump control lever pin (integral cylinder)	Loctite 270
Gear cover, timing side	Selon 334
Oil pick-up	Loctite 270
Alternator/stator retaining screws	Loctite 270
Alternator retaining screws	Loctite 270
(Studs in blind holes)	Selon 334
(Studs in through holes)	Loctite 270
(Bearing support)	Loctite 648 8.V.



STANDARD BOLT TORQUE SPECIFICATIONS

DESCRIPTION						
	High-carbon steel		Alloy steel		Special alloy steel	
Diameter and Pitch (mm)	Nm	Kgm	Nm	Kgm	Nm	Kgm
4x0,70	3,6	0,37	5,1	0,52	6	0,62
5x0,80	7	0,72	9,9	1,01	11,9	1,22
6x1,00	12	1,23	17	1,73	20,4	2,08
7x1,00	19,8	2,02	27,8	2,84	33	3,40
8x1,25	29,6	3,02	41,6	4,25	50	5,10
9x1,25	38	3,88	53,4	5,45	64,2	6,55
10x1,50	52,5	5,36	73,8	7,54	88,7	9,05
12x1,75	89	9,09	125	12,80	150	15,30
14x2,00	135	13,80	190	19,40	228	23,30
16x2,00	205	21,00	289	29,50	347	35,40
18x2,50	257	26,30	362	37,00	435	44,40
20x2,50	358	36,60	504	51,50	605	61,80
22x2,50	435	44,40	611	62,40	734	74,90
24x3,00	557	56,90	784	80,00	940	96,00



DISASSEMBLY AND REASSEMBLY

Besides disassembly and reassembly operations this chapter also includes checking and setting specifications, dimensions, repair and operating instructions.

Always use genuine LOMBARDINI spare parts for proper repair operations.

Oil-bath air cleaner (standard)

Oil-bath air cleaner with two filtering elements. The lower filtering element is made of metal while the upper is made of polyurethane.

Check gaskets and replace as necessary.

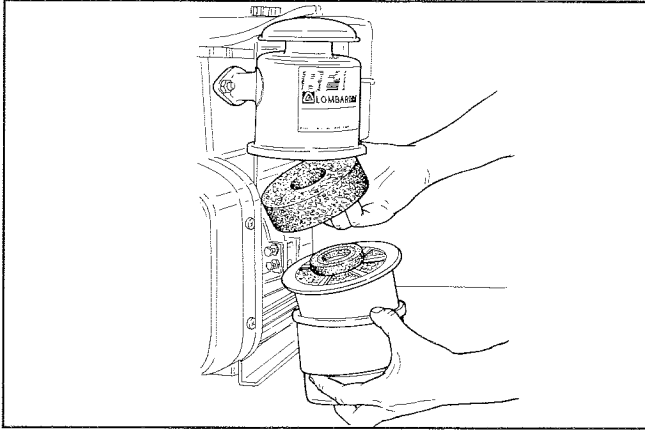
Check that flange welds are free of defects and porosity.

Carefully clean bowl and filtering elements with Diesel fuel and blow through the lower element with compressed air and dry the upper element with a cloth.

Fill with engine oil to the mark.

When refitting tighten nuts to 26 Nm.

See Page 9 for periodic maintenance details and oil replacement.



1

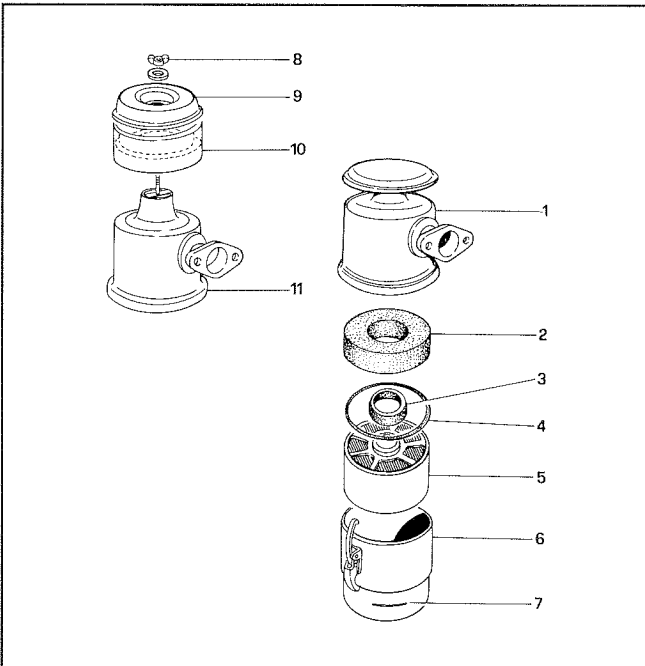
Oil-bath air cleaner components

- 1 Upper body
- 2 Upper filtering element (polyurethane)
- 3 Internal seal ring
- 4 External seal ring
- 5 Lower filtering element (steel mesh)
- 6 Lower body
- 7 Oil level mark

Centrifugal pre-filter components

- 8 Wing nut
- 9 Cover
- 10 Centrifugal pre-filter
- 11 Centrifugal pre-filter upper body

Daily check empty pre-filter cup 10 as necessary.



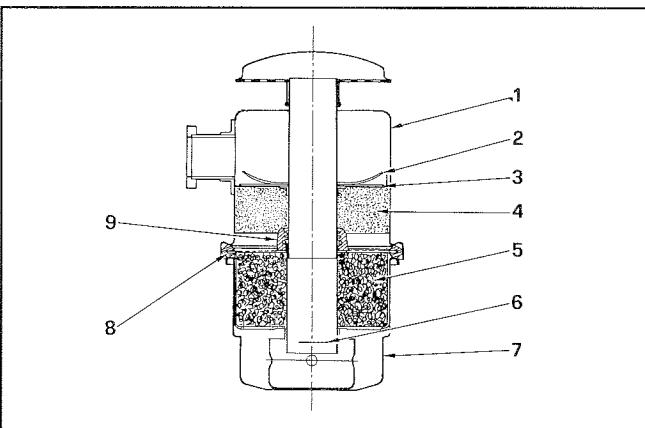
2

Oil-bath air cleaner for de-noised engines

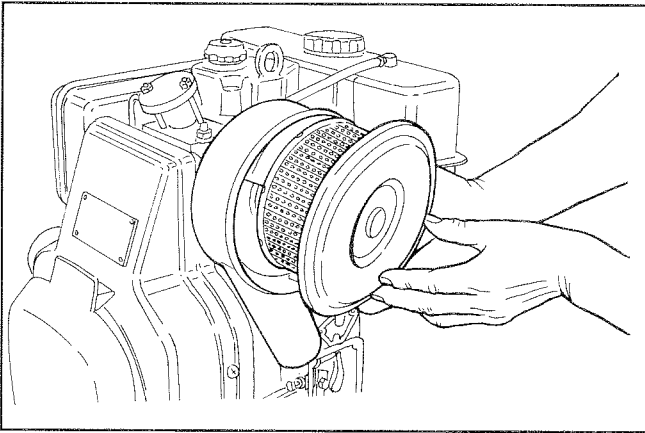
- 1 Cover
- 2 Diaphragm stop
- 3 Diaphragm
- 4 Upper filtering element (polyurethane)
- 5 Lower filtering element (steel mesh)
- 6 Oil level mark
- 7 Bowl
- 8 External seal ring
- 9 Internal seal ring

When refitting tighten nuts to 26 Nm.

See Page 9 for periodic maintenance details and oil replacement.



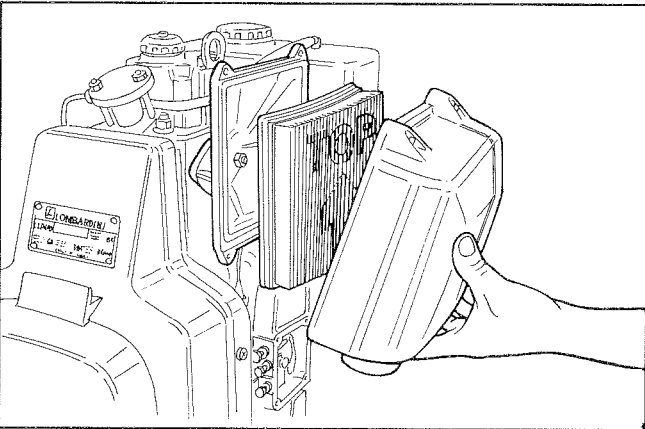
3



4

Dry air cleaner (optional)

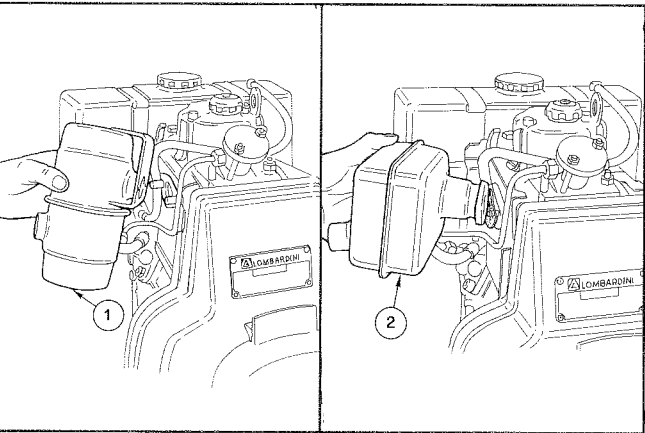
Circular shape with air inlet facing upwards or downwards.
 Cartridge characteristics:
 Filtering area = 2150 cm²
 Degree of filtration = 12 μ



5

Dry air cleaner (optional)

Features an aluminum mounting and a Moplen cover.
 The cartridge should always be fitted with the arrow facing upwards (TOP).
 Cartridge characteristics:
 Filtering area = 3650 cm²
 Type of paper = Bosso 20/66 PNCS, yellow
 Degree of filtration = 12 μ



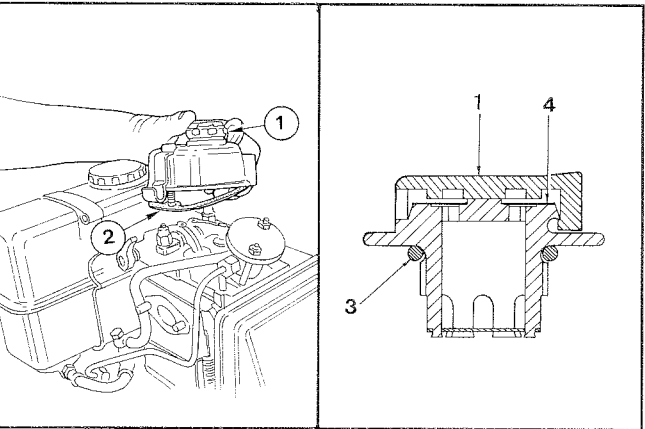
6

7

Muffler

- 1 Standard muffler
- 2 Optional muffler

Note: The optional muffler 2 is also available in the de-noised version.
 When refitting replace the gasket and tighten nuts to 25 Nm.



8

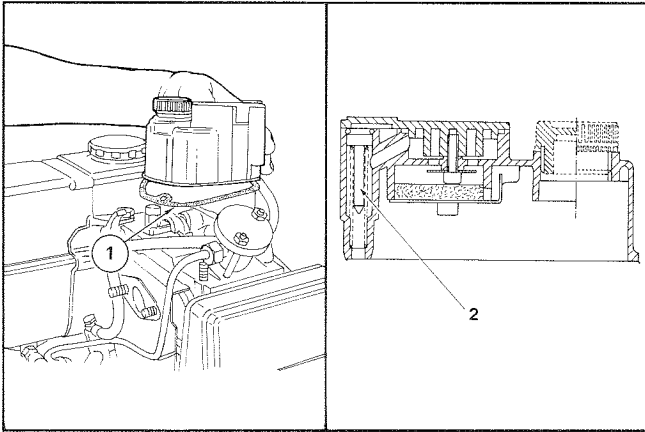
9

Rocker arm cover

- Components:
- 1 Breather and oil refill cap
 - 2 Gasket
 - 3 O-ring
 - 4 Diaphragm

The rocker arm cover houses the crankcase breather.
 The breathing system efficiency often depends upon diaphragm 5:
 regularly check for cleanliness.
 When refitting replace gasket 2. Tighten screws to 20 Nm.



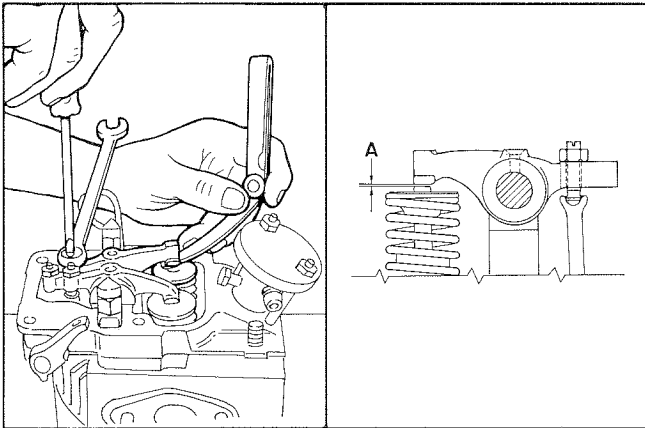


Rocker arm cover with internal crankcase vapor recirculation system

Can be fitted with both in case of oil-bath and dry air cleaner. The crankcase vapors are induced through the intake port. As the air filter clogs, valve 2 prevents excess oil vapors/condensate from entering the intake port. When refitting replace gasket 1 and tighten screws to 20 Nm.

10

11

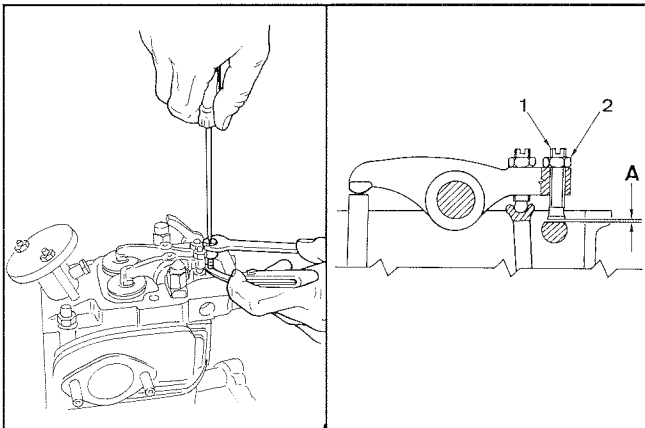


Valve/rocker arm clearance

Remove rocker arm cover and check gaskets for damage. Setting should be performed when the engine is cold: bring piston to top dead center on the compression stroke and set clearance A at $0,10 \div 0,15$ mm using a thickness gauge.

12

13

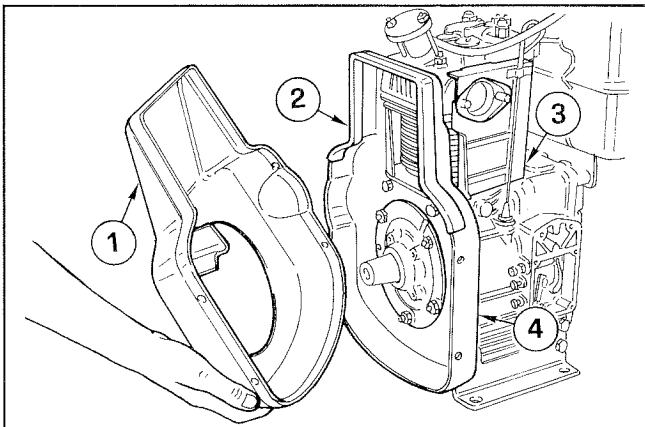


Clearance between compression release cam and adjusting screw

Bring piston to the top dead center on the compression stroke and loosen nut 2. By means of screw 1 set clearance A at $0,4 \div 0,5$ mm using a thickness gauge. Tighten nut 2.

14

15



Standard shroud and side plates

Components:

- | | |
|----------|----------------|
| 1 Shroud | 3 Side plate |
| 2 Gasket | 4 Shroud plate |

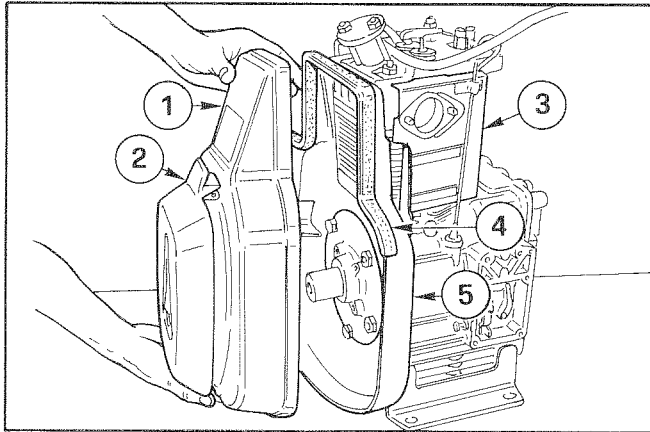
Together with plate 4 and both side plates 3 the shroud directs the air flow generated by flywheel rotation towards the head and cylinder. Gasket 2 seals the shroud to the plate and reduces vibration.

When refitting tighten the screws which fix it to the plate to 10 Nm.

16



17



17

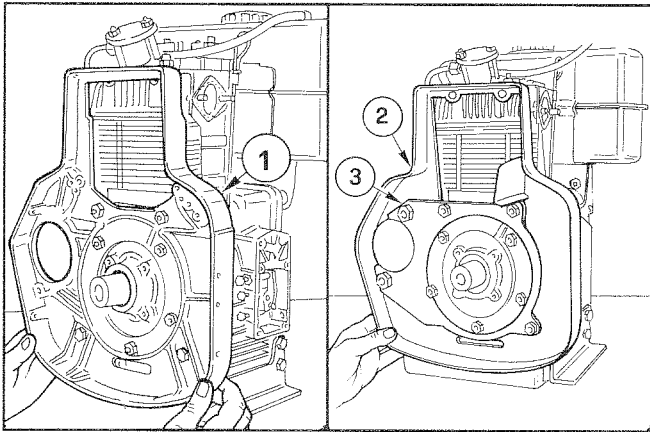
Sound-insulating shroud with shroud plate and side plates

- | | |
|----------------|----------------|
| 1 Shroud | 4 Gasket |
| 2 Pulley guard | 5 Shroud plate |
| 3 Side plate | |

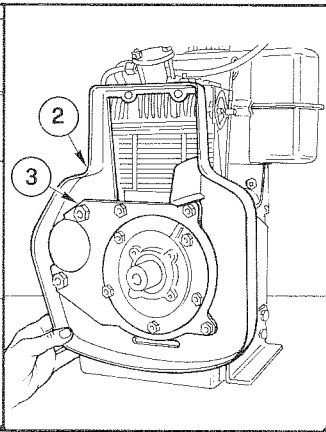
Similar to plate 5 and side plates 3 the sound-insulating shroud 1 is made of special material (ANTIPHON) which absorbs the noise generated by plate vibrations.

Pulley guard 2 is made of deadening material which reduces the noise the cooling fins produce.

When refitting tighten screws to 10 Nm.



18

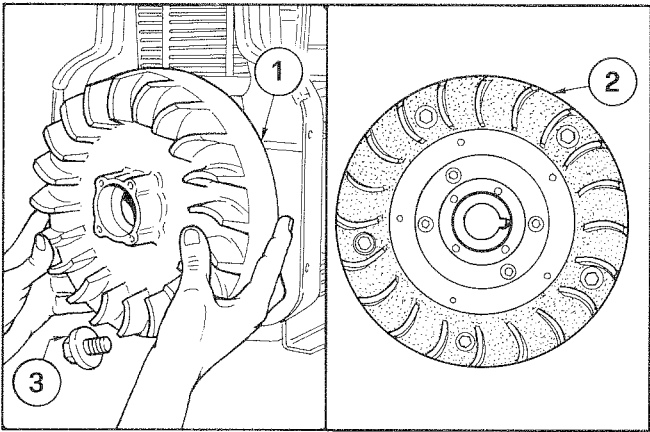


19

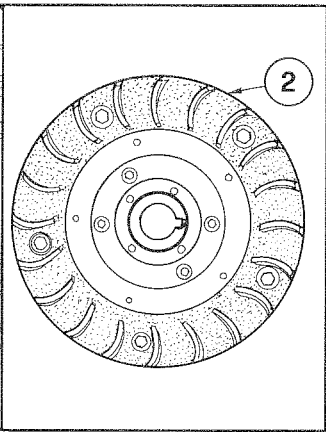
Shroud/starter plate

Three types of conveyor plates for electric starting are available: made of aluminium 1, of standard sheet metal 2 or ANTIPHON. Plates made of sheet metal and ANTIPHON require a mounting plate 3 to support the starting motor.

When refitting tighten screws to 23 Nm.



20

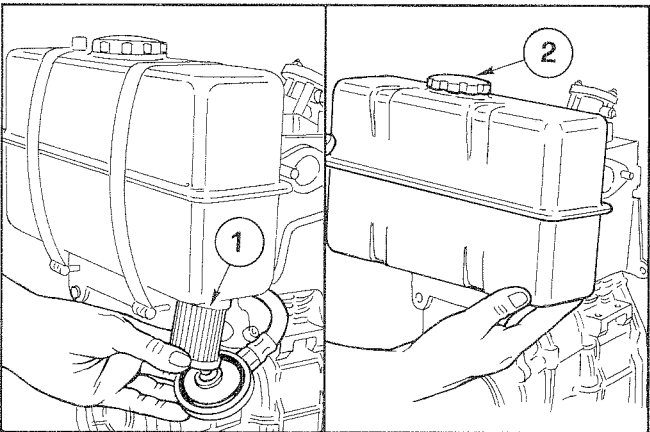


21

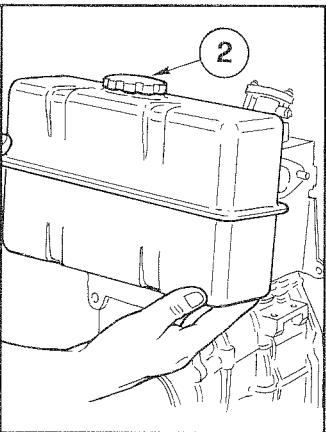
Flywheel

- 1 Standard flywheel
- 2 Flywheel with plastic blades for small vehicles.

Turn bolt 3 clockwise (in the case of models 6LD260/C and 6LD325/C turn the bolt counterclockwise) to loosen. When refitting tighten the bolt to 167 Nm.



22



23

Tank

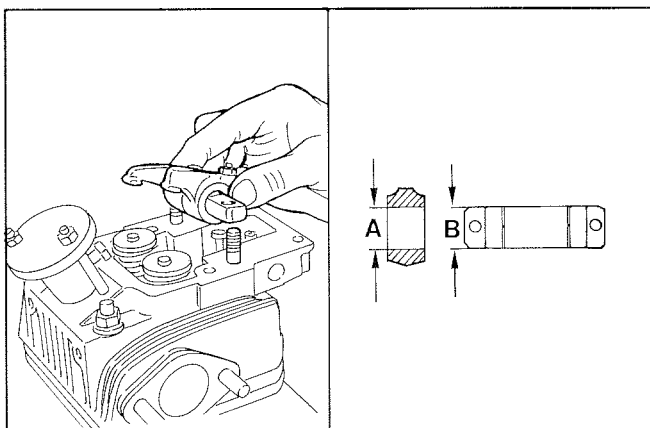
After removing fuel filter 1 remove tank and tank support. Completely empty the tank and check that no impurities are present within the tank.

Check that cap breather 2 is not clogged.

When refitting tighten support screws to 25 Nm.

See Fig. 131 for refitting fuel filter components.





24

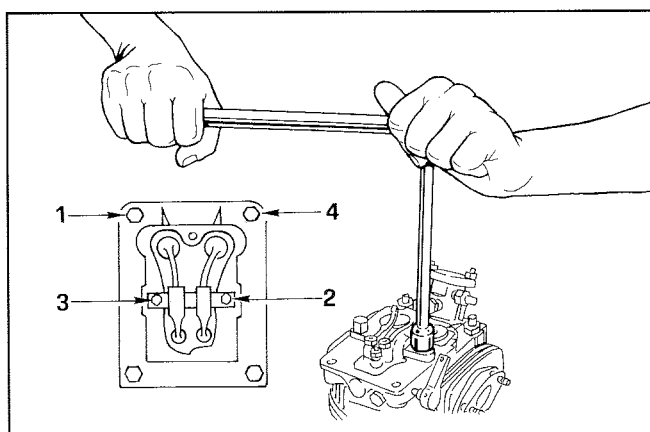
25

Rocker arm assembly

Dimensions (mm):

A = 15,032 ÷ 15,050**B** = 14,989 ÷ 15,000

Clearance (mm):

(A-B) = 0,032 ÷ 0,061**(A-B)** limit value = 0,120

26

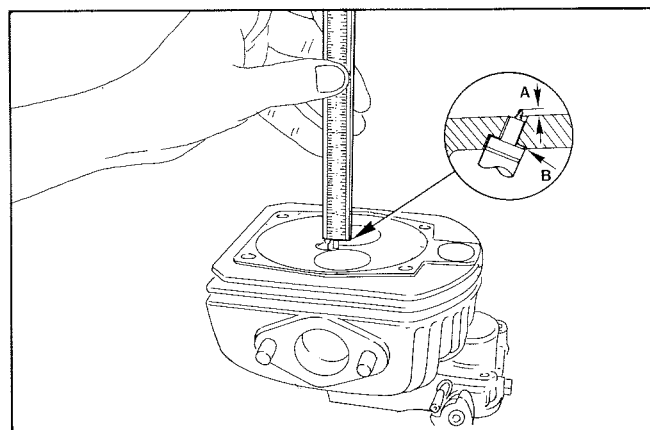
CYLINDER HEAD

Do not remove when hot to avoid warpage.

If cylinder head is warped, machine a maximum of 0.3 mm.

Always replace copper head gaskets; see Fig. 58 for choosing the right thickness.

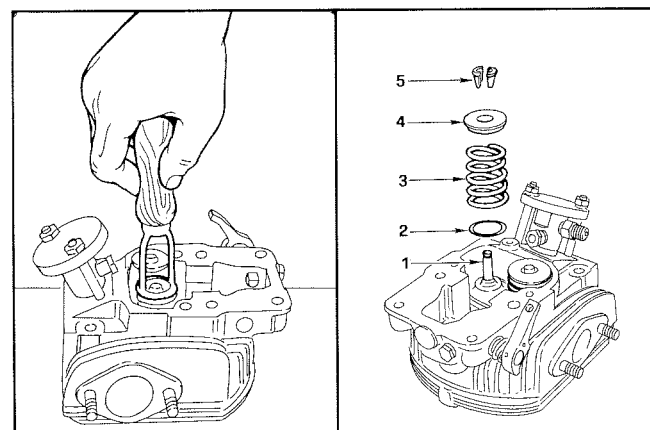
Progressively tighten nuts to 35 Nm in the 1, 2, 3, 4 sequence.



27

Injector projectionThe end of nozzle **A** should project 2,35 ÷ 3,30 mm from the cylinder head plane.

For 6LD401/B1 and 6LD435/B1 this value should be 2.85 ÷ 3.75 mm.

Adjust with copper gaskets **B** with thickness 0.5, 1.0 and 1.5 mm.

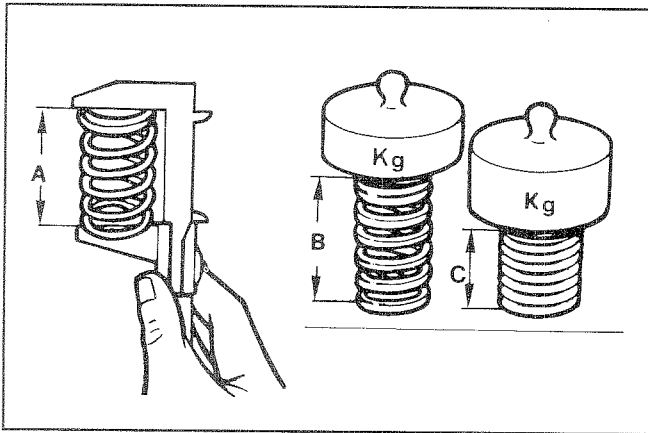
28

29

Valves

- 1 Valve stem
- 2 Spring disk/seat
- 3 Spring
- 4 Retainer
- 5 Half collets

Note: To remove half collets place a suitable spacer under the valve head and press down firmly as shown in the figure.



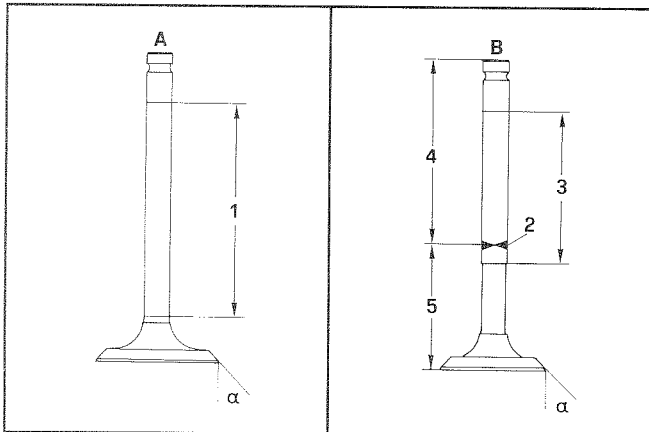
30

Valve spring

The same spring is fitted both to the exhaust and intake valve.
Measure the free length with a caliper.
Using a spring tester check that the spring length under two different loads corresponds to the values below:

Free length **A** = 42 mm
Length **B** compressed by a 23 Kg weight = 32 mm
Length **C** compressed by a 40 Kg weight = 25 mm

Replace the spring if the length is 1 mm less than specified.



31

32

Valve material

Intake valves A

Material: X 45 Cr Si 8 UNI 3992

1 Chromium-plated portion

α $45^{\circ}15' \div 45^{\circ}25'$

Exhaust valve B

Stem and head are made of two different materials.

2 Weld position

3 Chromium-plated portion

4 Portion made of X 45 Cr Si 8 UNI 3992

5 Portion made X 70 Cr Mn Ni N 216 UNI 3992

α $45^{\circ}15' \div 45^{\circ}25'$

Valve guides and valve guide bores

- 1 Intake valve guide
- 2 Exhaust valve guide

Dimensions (mm):

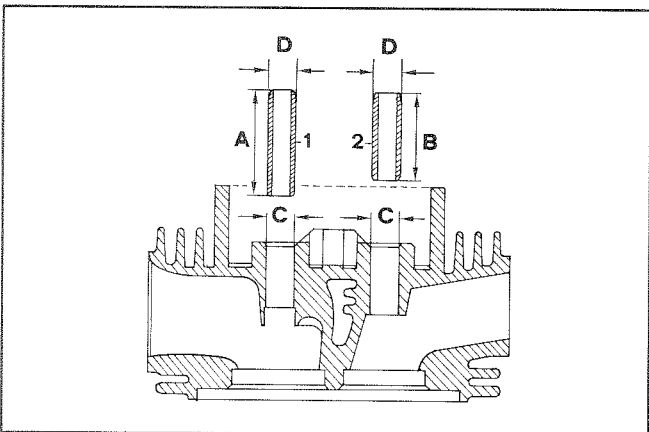
A = 40

B = 33

C = $11.00 \div 11.018$

D = $11.05 \div 11.06$

Note: Valve guides with oversized diameter of 0.5 mm are also available; in such cases valve guide bore **C** should also be increased by 0,5 mm.



33

Valve guide insertion

Heat cylinder head to $160 \div 180^{\circ}\text{C}$.

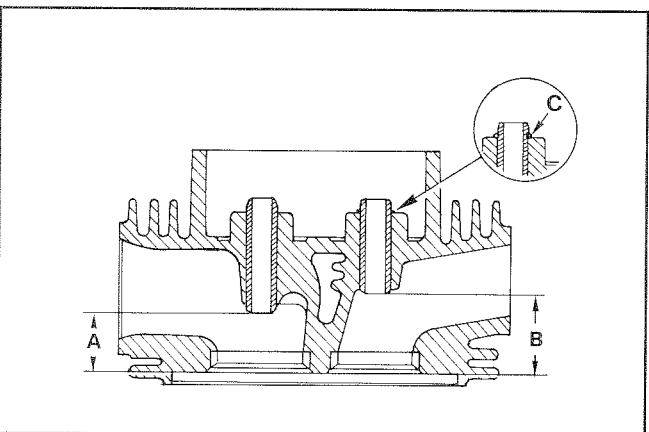
Press guides considering the **A** and **B** distances from the head plane.

Dimensions (mm):

A = $20,3 \div 20,7$

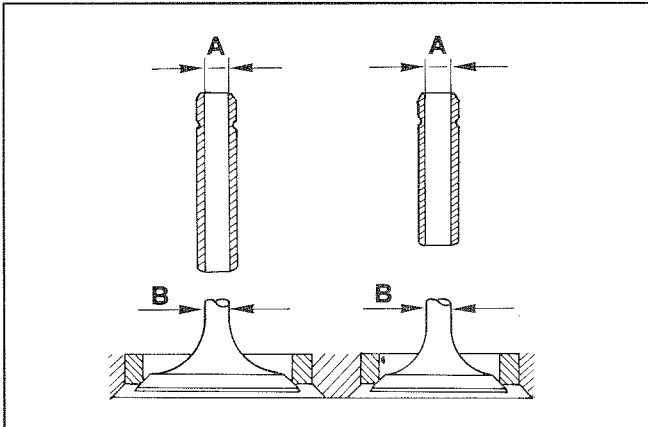
B = $27,3 \div 27,7$

Note: If guides are seated with stop ring **C**, first locate the ring in place on the guide and then install guides without considering **A** and **B**.



34





35

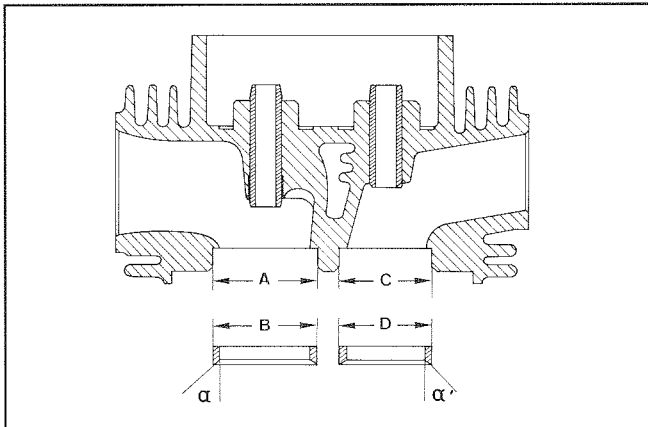
Dimensions and clearance between guides and valve stems (mm)

A = 7,030 ÷ 7,060

B = 6,985 ÷ 7,000

(A-B) = 0,030 ÷ 0,075

(A-B) limit value = 0,13



36

Valve seats and valve seat bores

Dimensions (mm):

A = 35.000 ÷ 35.010

B = 35.100 ÷ 35.120

C = 31.000 ÷ 31.010

D = 31.100 ÷ 31.120

For 6LD 401/B1 and 6LD435/B1

A = 37.000 ÷ 37.010

B = 37.100 ÷ 37.120

C = 33.000 ÷ 33.010

D = 33.100 ÷ 33.120

For 6LD260 and 6LD 260/C

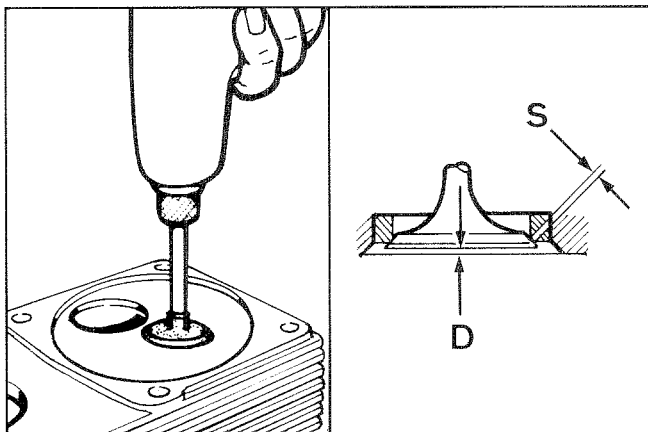
A = 31.000 ÷ 31.016

B = 31.100 ÷ 31.120

C = 27.000 ÷ 27.013

D = 27.085 ÷ 27.100

Press valve seats into the bores and cut α to 45°.



37

38

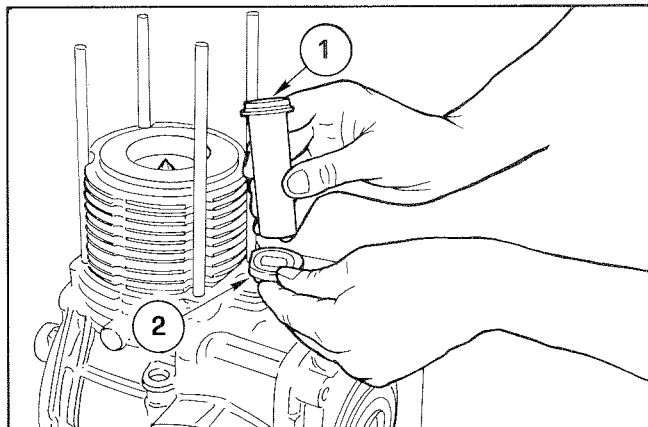
Valve seat lapping

After cutting lap valve seats with fine lapping compound.

The sealing surface **S** should not exceed 2 mm.

Valve recess **D** after grinding = 0.25 ÷ 0.55 mm; maximum worn limit 1.10; for 6LD260 = 0.25 ÷ 0.75 mm; worn limit 1.20.

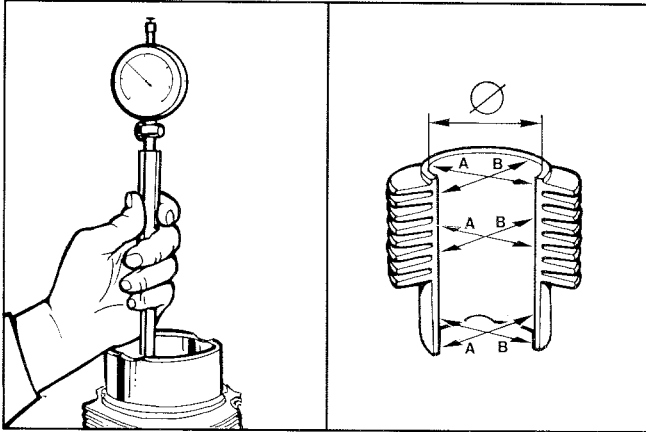
Note: In the case of heads with compression release the exhaust valve recess **D** should be 0.55 ÷ 0.85 mm; in case of models 6LD260 and 6LD260/C = 0.55 ÷ 0.95 mm.



39

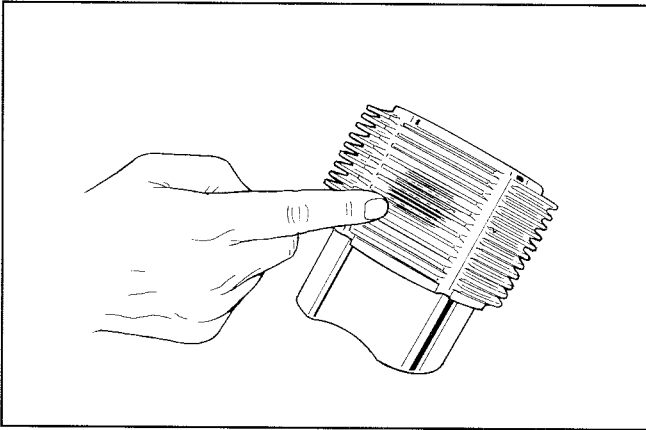
Pushrod tube

When refitting the head check before tightening that the upper (1) and lower (2) gaskets fit well onto the pushrod tube and their seats in the head and crankcase.

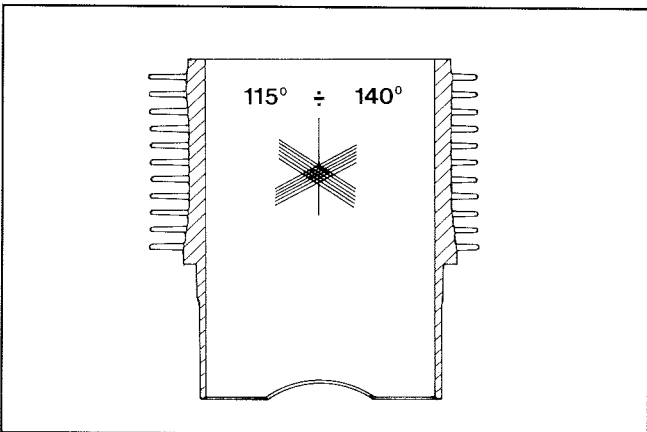


40

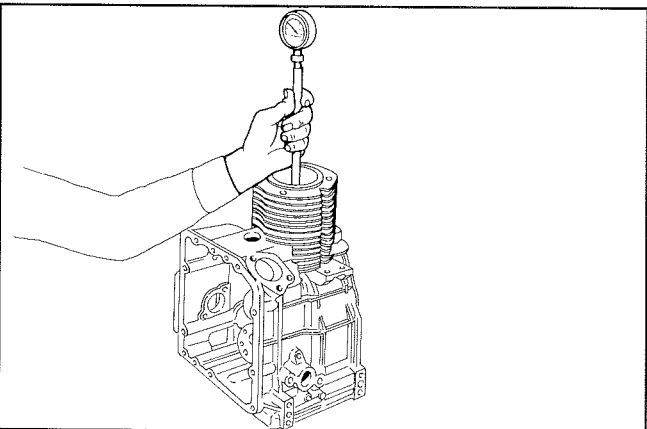
41



42



43



44

CYLINDER

Set the dial gauge to zero with a calibrated ring.

Check diameter \varnothing at **A** and **B** at three different heights as shown in the figure.

If wear exceeds the max. given value by 0.06 mm bore the cylinder and fit oversize piston and rings.

See Page 23 for diameter values.

Cylinder classes

According to diameter, cylinders are divided into class **A**, **B** and **C** which feature corresponding piston sizes (See Page 23).

Each class is identified by a specific color: white for class **A**, red for class **B** and green for class **C**.

These colors are visible on the cylinder outer surface as shown in the figure.

Note: No consideration is given to the above classes for cylinders supplied as spares.

Cylinder roughness

The cross-hatch pattern should be at an angle of $115^\circ \div 140^\circ$; lines should be uniform and clear in both directions.

Average roughness must range between 0.5 and 1 μm .

The cylinder surface which comes into contact with piston rings should be machined with the plateau method.

Warning: Do not manually hone the cylinder bore surfaces with emery cloth.

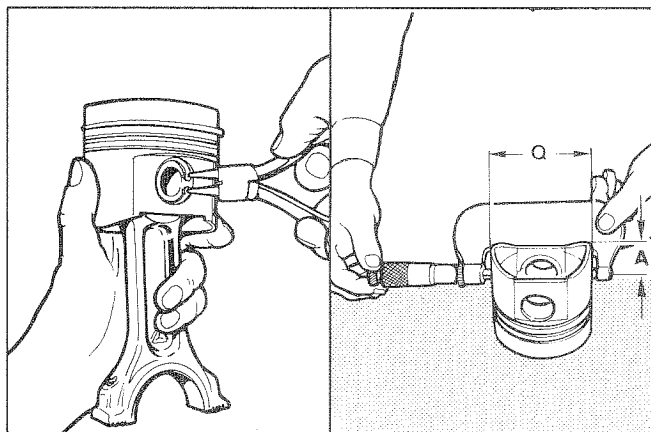
Cylinder characteristics in models 6LD260 and 6LD260/C

In models 6LD260 and 6LD260/C the cylinder forms an integral part of the crankcase.

In this case cylinders and pistons are not divided into classes.

Check as shown in Fig. 40 and 41.





45

46

PISTON

Being of low expansion type, the piston allows small clearances between piston and cylinder and, thus, oil consumption is reduced.

Low expansion pistons are fitted to all engines of this series except for 6LD260 and 6LD260/C.

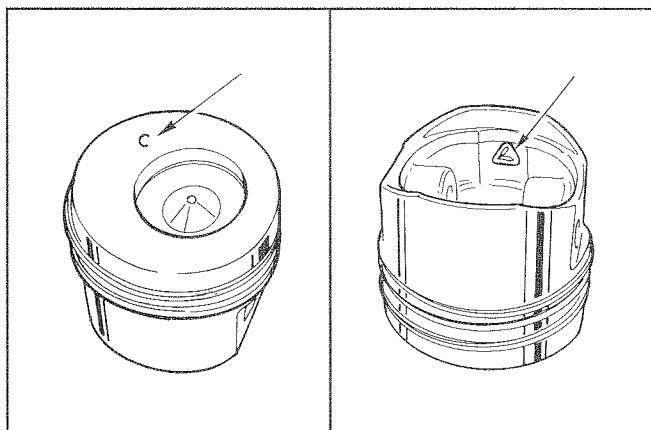
Remove circlips and remove piston pin.

Remove piston rings and clean grooves.

Measure diameter **Q** at the **A** distance from the bottom of skirt (**A** = 12 mm). In case of 6LD360 **A** should measure = 9,5 mm.

In case of diameter wear exceeding the minimum given value by 0.05 mm replace piston and rings.

Note: Oversize pistons of 0.5 and 1.0 mm are available.



47

48

Piston classes and logo

Depending on diameter, pistons are divided into class **A**, **B** or **C**; the class reference is stamped on the piston crown (Fig. 47) while the logo is stamped inside (Fig. 48).

Piston and cylinder dimensions (mm)

Engine	Class	Cylinder \varnothing	Piston \varnothing	Clearance
6LD325 6LD325/C	A	78.00 ÷ 78.01	77.95 ÷ 77.96	0.04 ÷ 0.06
	B	78.01 ÷ 78.02	77.96 ÷ 77.97	
	C	78.02 ÷ 78.03	77.97 ÷ 77.98	
6LD360 6LD360/V 6LD401/B1	A	82.00 ÷ 82.01	81.95 ÷ 81.96	
	B	82.01 ÷ 82.02	81.96 ÷ 81.97	
	C	82.02 ÷ 82.03	81.97 ÷ 81.98	
6LD400 6LD400/V 6LD435 6LD435/V 6LD435/B1	A	86.00 ÷ 86.01	85.95 ÷ 85.96	
	B	86.01 ÷ 86.02	85.96 ÷ 85.97	
	C	86.02 ÷ 86.03	85.97 ÷ 85.98	
	—	70.00 ÷ 70.02	69.91 ÷ 69.93	0.05 ÷ 0.11

Notes: In models 6LD360 and 6LD360/V, the piston has the same diameter as the 6LD401/B1 but a different combustion chamber. For the same reason the piston fitted to models 6LD400 and 6LD400/V differs from the one fitted to 6LD435, 6LD435/V and 6LD435/B1.

The 6LD360 and 6LD360/V cylinder has the same bore as the 6LD401/B1 but a different length. For the same reason the cylinder fitted to models 6LD400 and 6LD400/V differs from the one fitted to 6LD435, 6LD35/V and 6LD435/B1.

Piston availability:

Pistons with rated diameter are supplied only in class **A**.

Oversize pistons of 0.50 and 1.00 mm are supplied with oversize reference stamped on the crown.





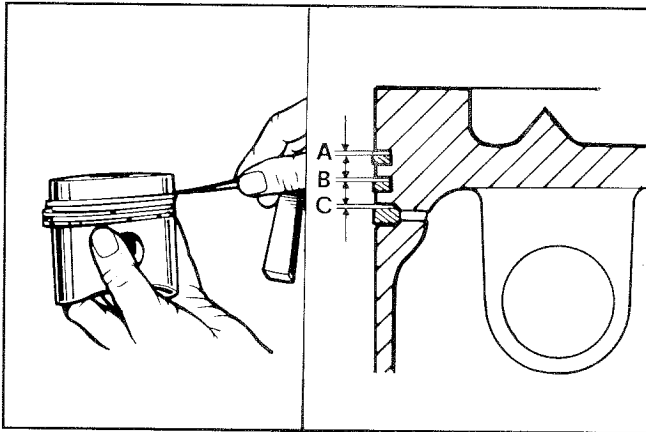
Piston rings - End gaps (mm)

Introduce piston rings into the lower part of cylinder and measure the end gap.

1st chromium-plated ring	A = 0.30 ÷ 0.45
2nd torsional ring	A = 0.30 ÷ 0.45
3rd oil control ring	A = 0.25 ÷ 0.40

Note: In models 6LD260 and 6LD260/C the piston features four rings (See Fig. 53).

49



Piston rings - Clearance between grooves (mm)

For 6LD400, 6LD400/V, 6LD435, 6LD435/B1, 6LD435/V

A	= 0.09 ÷ 0.12; limit value = 0.20
B	= 0.05 ÷ 0.08; limit value = 0.14
C	= 0.04 ÷ 0.08; limit value = 0.14

For 6LD325, 6LD325/C, 6LD360, 6LD360/V, 6LD401/B1

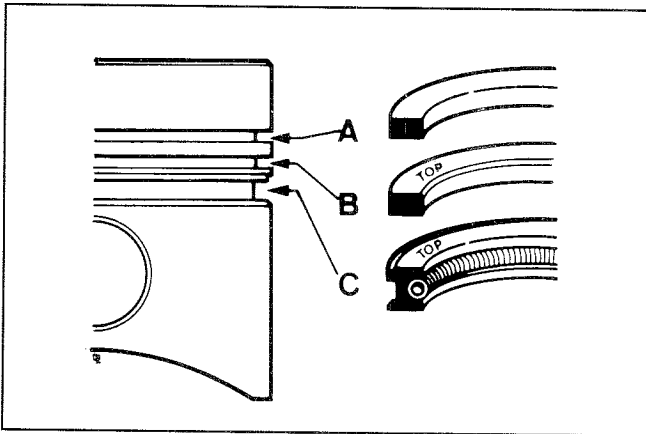
A	= 0.08 ÷ 0.10; limit value = 0.17
B	= 0.05 ÷ 0.08; limit value = 0.14
C	= 0.04 ÷ 0.07; limit value = 0.13

For 6LD260 and 6LD260/C also see fig. 53)

A	= 0.11 ÷ 0.15; limit value = 0.25
B	= 0.06 ÷ 0.10; limit value = 0.18
C	= 0.06 ÷ 0.10; limit value = 0.18
D	= 0.05 ÷ 0.09; limit value = 0.16

50

51

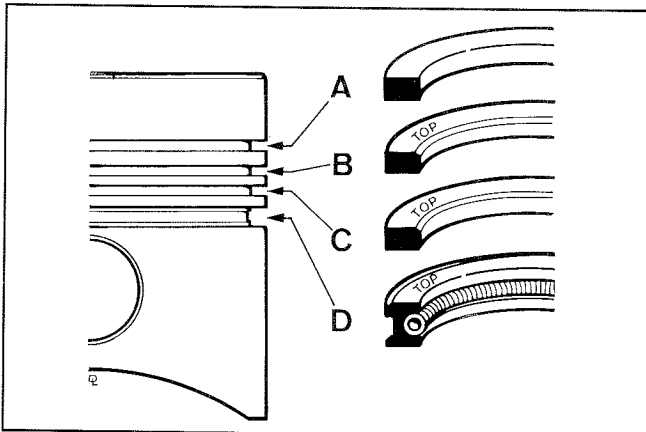


Piston rings - Fitting sequence

- A** = 1st chromium-plated ring
- B** = 2nd torsional ring
- C** = 3rd oil control ring

Note: Before fitting the piston into the cylinder turn the rings so that the ring gaps are staggered.

46



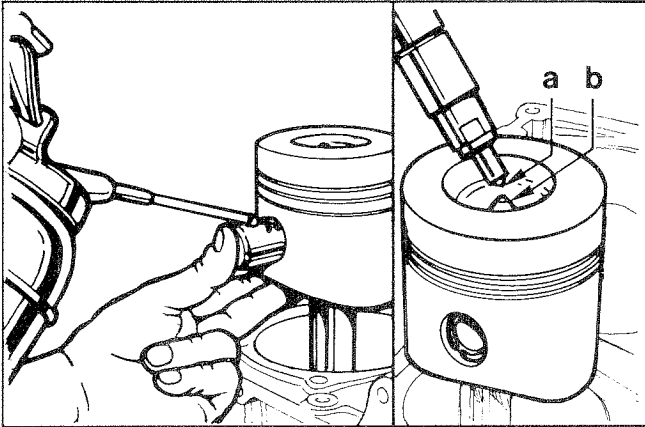
Piston rings - Fitting sequence for models 6LD260 and 6LD260/C

- A** = 1st chromium-plated ring
- B** = 2nd torsional ring
- C** = 3rd torsional ring
- D** = 4th oil control ring

Note: Install piston rings with inscription facing upwards. Piston rings without inscription may be installed in either direction.

53



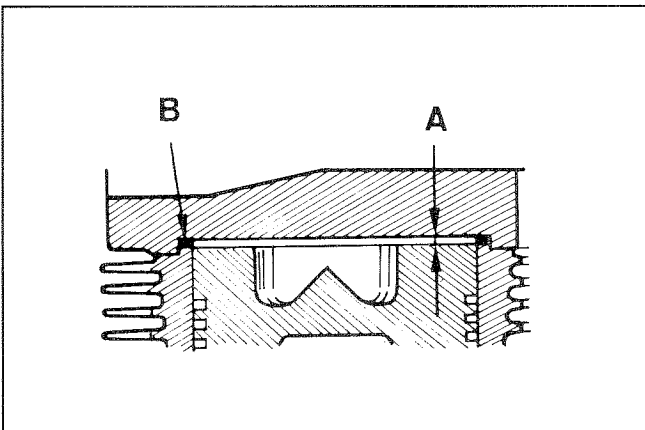


Piston - Refitting

Connect piston to connecting rod such that the combustion chamber center **b** is under nozzle tip **a**.
Lubricate piston pin and introduce into the piston by exerting pressure with your thumb.
Check that both circlips are well inside their seats.

54

55

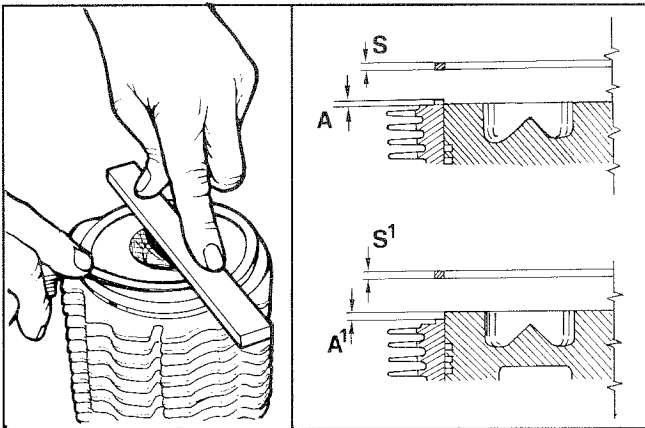


Piston clearance

A = Piston clearance
B = Head gasket

The thickness of head gasket **B** determines piston clearance **A** which should be $0.70 \div 0.75$ mm; it should be $0.60 \div 0.65$ mm in 6LD260 and 6LD260/C and $0.65 \div 0.70$ mm in 6LD401/B1 and 6LD435/B1.
Gaskets are available in the following thicknesses: 0.50; 0.55; 0.60; 0.65; 0.70; 0.75; 0.80; 0.85; 0.90; 0.95 mm. For 6LD260 and 6LD260/C = 0.45; 0.50; 0.55; 0.60; 0.65; 0.70; 0.75; 0.80 mm.

56



Choosing the head gasket thickness with piston clearance of $0.70 \div 0.75$ mm

A Distance between piston and cylinder plane (piston under cylinder plane)
S Gasket thickness referred to **A**.

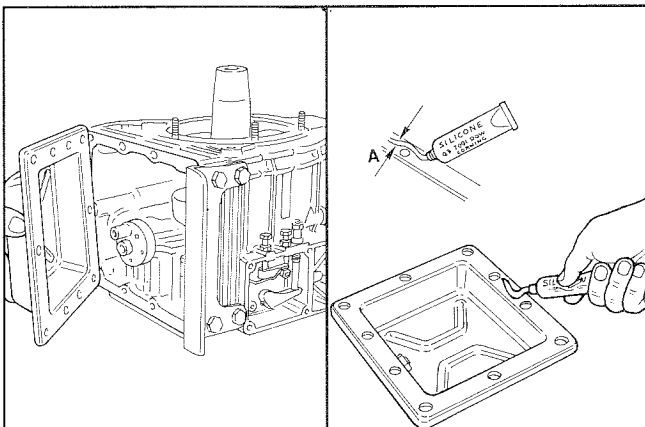
A (mm) =	0.25	0.20	0.15	0.10	0.05	0
S (mm) =	0.50	0.55	0.60	0.65	0.70	

A₁ Distance between cylinder plane and piston (piston on cylinder plane)
S₁ Gasket thickness referred to **A₁**.

A₁ (mm) =	0	0.05	0.10	0.15	0.20	0.25
S₁ (mm) =	0.75	0.80	0.85	0.90	0.95	

57

58



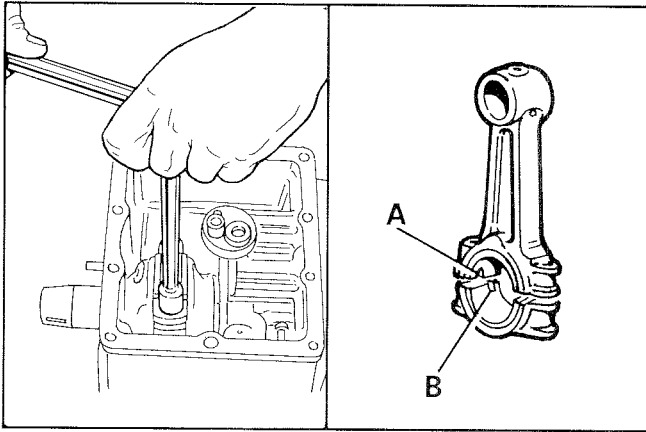
Standard oil sump (sheet metal)

Sealing between oil sump and crankcase is obtained by silicone paste sealant.
Carefully clean all parts and apply a double continuous strip of silicone type "Q37091 Dow Corning" in thickness **A** ($2 \div 4$ mm). Wait three minutes before installing on the crankcase.
Tighten screws to 23 Nm. Wait two hours before starting the engine.

Note: Aluminium oil sumps, including those fitted to engines 6LD401/B1 and 6LD435/B1 feature a gasket made of G3820.

59

60

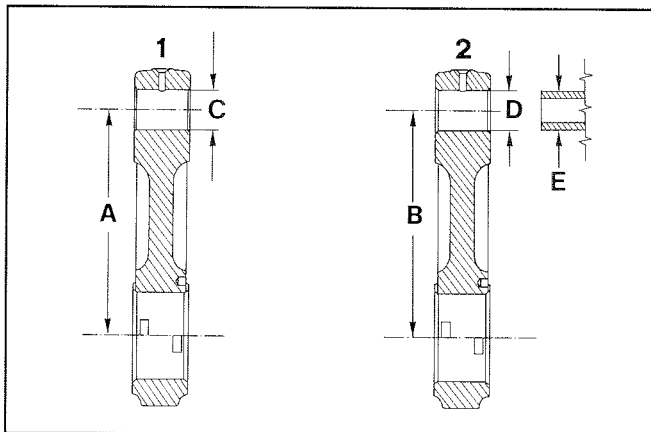


61

62

CONNECTING ROD

Remove the connecting rod and perform the following checks.
When refitting both index notches **A** and **B** should be on the same side.
Tighten screws to 35 Nm.



63

Connecting rod dimensions (mm)

- 1 Connecting rod without piston pin bearing
- 2 Connecting rod with piston pin bearing fitted to 6LD435, 6LD435/V, 6LD435/B1 and 6LD401/B1.

$$A = 111.95 \div 112.05$$

$$B = 117.95 \div 118.05$$

$$C = 20.010 \div 20.020$$

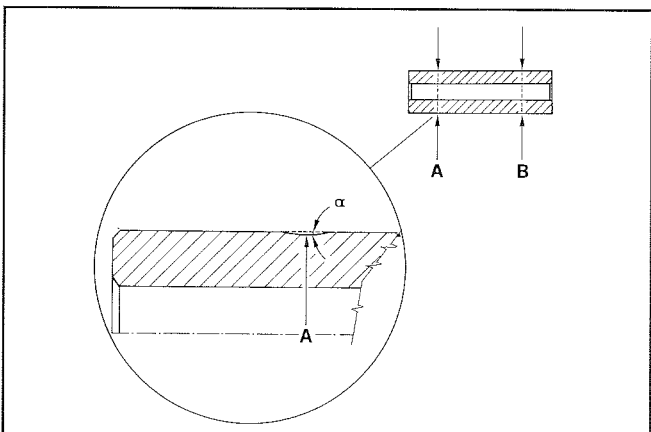
$$D = 20.010 \div 20.020 \text{ (with machined bearing in place)}$$

$$E = 19.995 \div 20.000 \text{ (pin diameter)}$$

$$(C-E), (D-E) = 0.010 \div 0.025$$

$$(C-E), (D-E) \text{ limite} = 0.040$$

See Fig. 81 for connecting rod big end bearings.



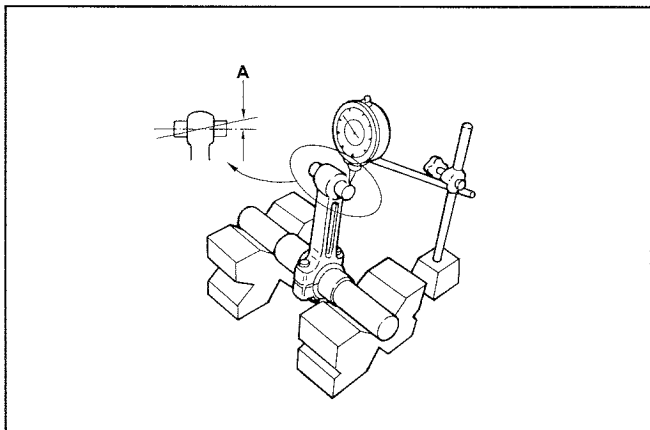
64

Piston pin

The new low expansion pistons fitted to all engines of this series except for 6LD260 and 6LD260/C require special piston pins. At **A** and **B** their profile follows an α angle of 10° .

This special profile prevents both the connecting rod and the piston from fatigue failure.





65

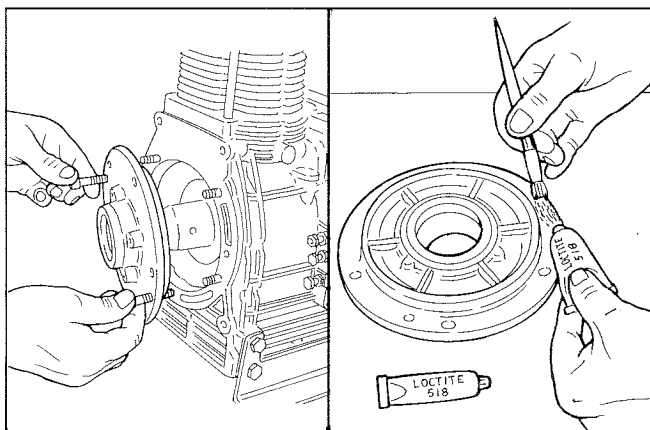
Connecting rod alignment

Use a gauge as shown in the figure.

Check that axes are aligned using the piston pin; axial mis-alignment

A = 0.015; max. limit 0.03 mm.

Moderate warpage may be corrected by gradually working with a press.



66

67

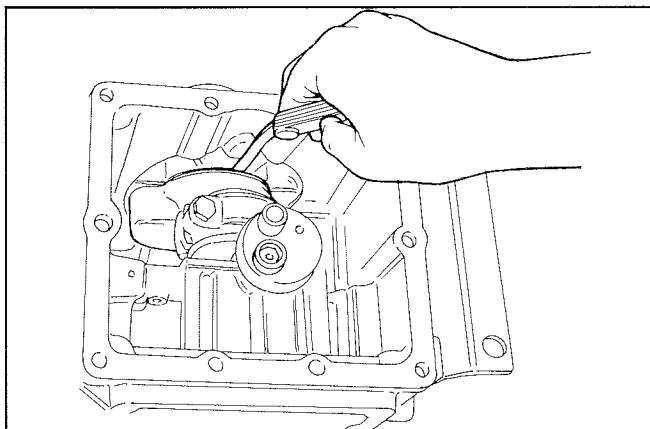
Main bearing support, flywheel side

Remove main bearing support using two M8x1.25 screws.

Sealing between main bearing support and crankcase is ensured by a layer of fluid sealant type "Loctite 518"; carefully clean both sealing surfaces and spread the sealant in a uniform fashion.

Tighten nuts to 23 Nm.

In case Loctite 518 is not available a 0.20 mm gasket can be used if allowed by the crankshaft end play (max. 0.17 mm). If not replace the support.



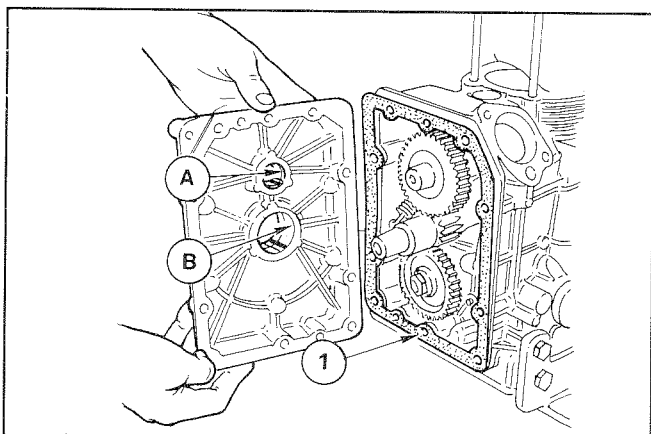
68

Crankshaft end play

Check crankshaft end play after tightening the main bearing support on the flywheel side to 23 Nm; the value should be 0.12 ÷ 0.37 mm.

Since a sealant is used there is no adjustment.

If end play is outside values given, the support must be replaced.



69

Gear cover, timing side

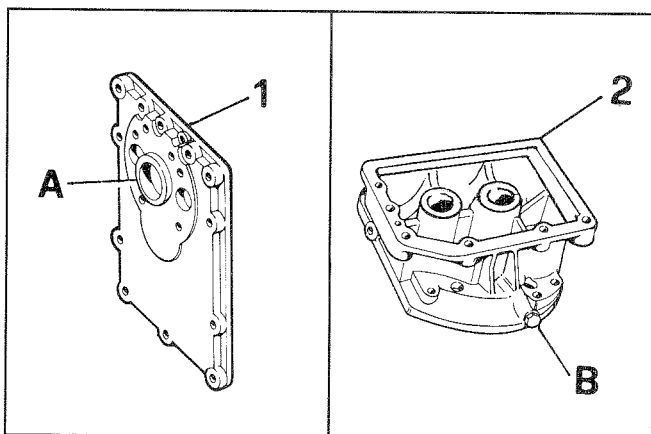
Gasket 1 is made of Betaflex with 0.2 mm thickness. Replace when refitting.

At **B**: oil seal bore outside and crankshaft roller bearing inside.

At **A**: camshaft journal bore with lubrication hole.

Note: The roller bearing is not fitted to engines meant for agricultural use identified by "K AGR" on the nameplate.

When refitting tighten screws to 23 Nm.



70

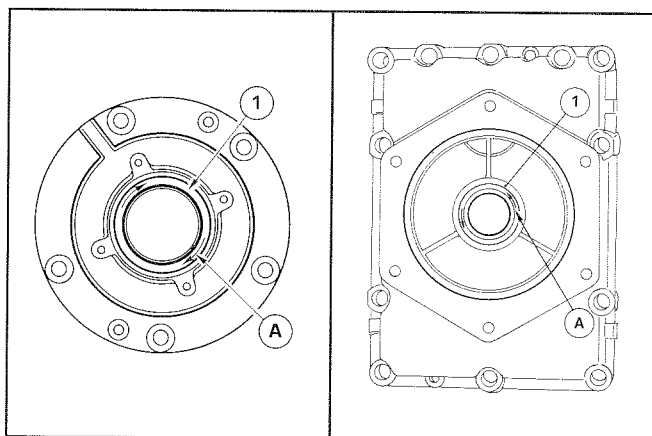
71

Gear cover, timing side, for 6LD260/C, 6LD325/C and 6LD360/V, 6LD400/V and 6LD435/V

Gear cover 1 is fitted to engines with camshaft p.t.o.

When replacing the oil seal check that knurls at **A** follow the same direction as the camshaft direction of rotation (counterclockwise).

Gear cover 2 fitted to engines with vertical crankshaft and also acts as an oil sump; plug **B** is used to drain oil.



72

73

Oil seal

Oil seal 1 is located in the support on the flywheel side while oil seal 2 is located in the gear cover on the timing side.

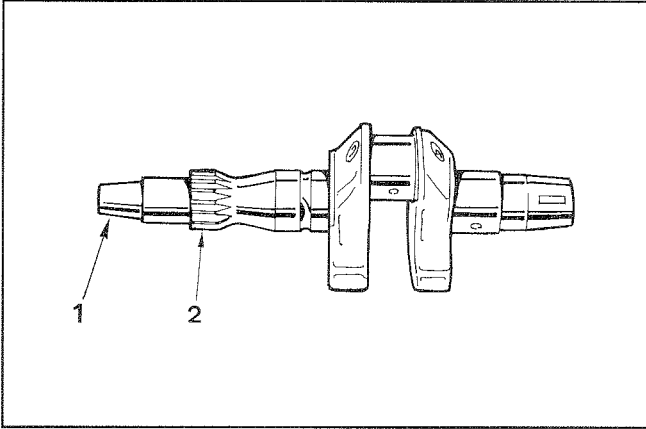
Arrows **A** point to the crankshaft direction of rotation which is clockwise if the engine is viewed from the flywheel side and counterclockwise if the engine is viewed from the timing side.

Press them into their seats exerting uniform pressure throughout their front surface.

CRANKSHAFT

Without considering p.t.o. types **1** essentially there are two types of crankshaft: with 68 mm stroke (6LD260, 6LD260/C, 6LD325, 6LD325/C, 6LD360, 6LD360/V, 6LD400, 6LD400/V) and 75 mm stroke (6LD401/B1, 6LD435, 6LD435/V, 6LD435/B1).

Toothing **2** of the timing control gear is straight in all engines except for 6LD401/B1 and 6LD435/B1 which are helical.

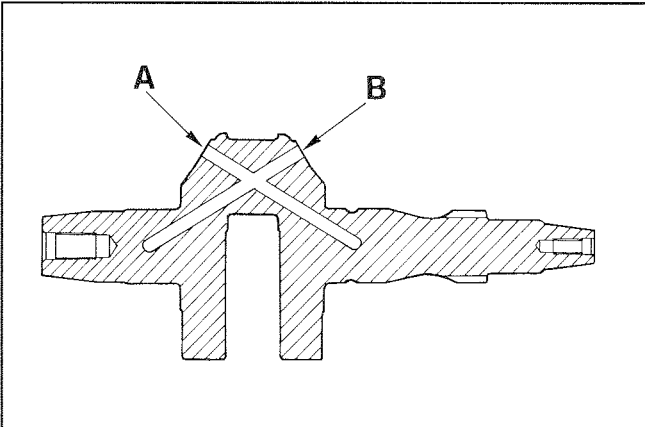


74

Crankshaft lubrication ducts

Remove plugs, clean ducts **A** and **B** with a pointed tool and compressed air.

After cleaning screw plugs back in place and check for sealing.

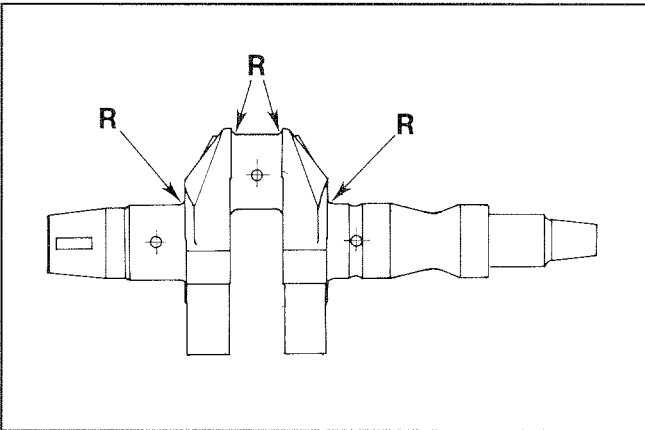


75

Crankshaft journal radius

The radius **R** connecting journals to shoulders is $2.8 \div 3.2$ mm.

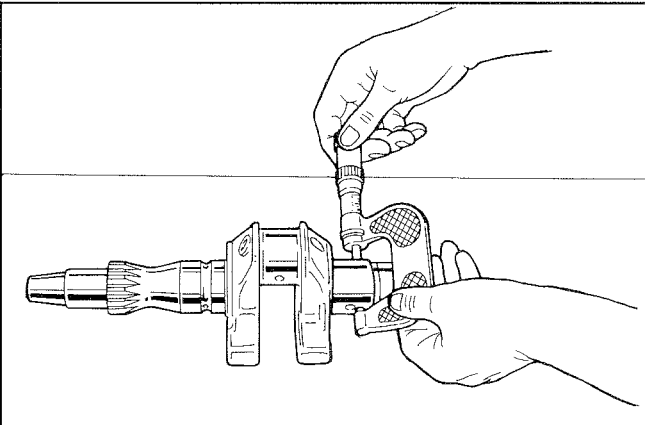
Note: When grinding main or rod journals restore the **R** value to original specification to avoid crankshaft breakage.



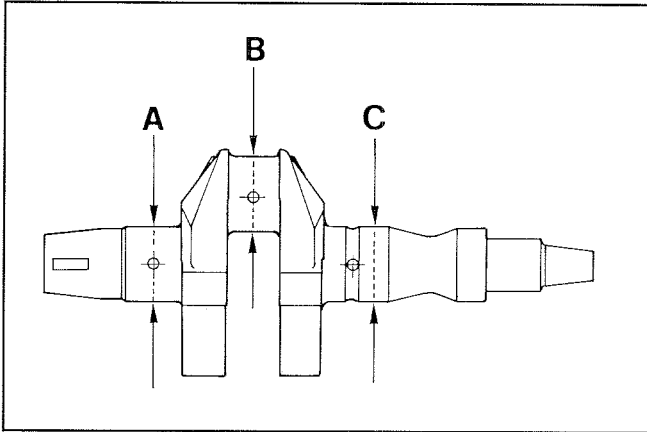
76

Checking main journal diameter

Use an outside micrometer.



77

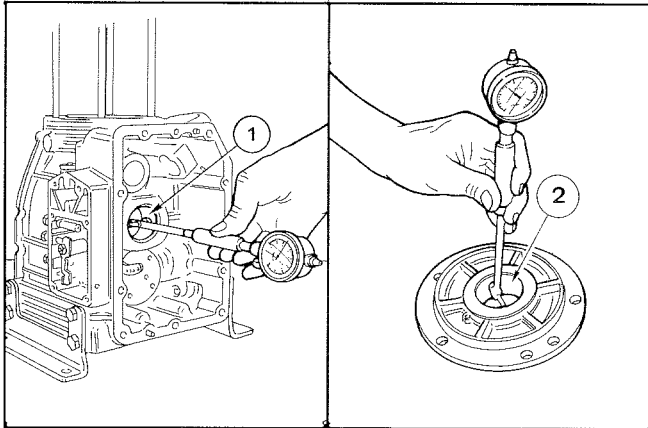


78

Main journal and rod journal diameter (mm)

$$A = C = 39.990 \div 40.000$$

$$B = 39.984 \div 40.000$$



79

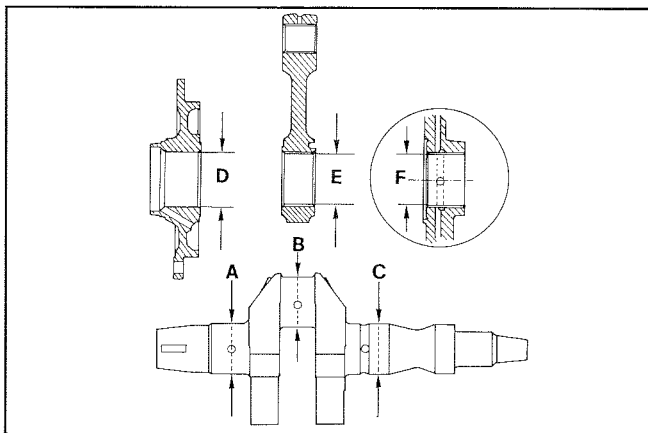
80

Main bearing inside diameter

1 Main bearing in crankcase

2 Main bearing in the support on the flywheel side

Use inside micrometer or bore gauge to measure the diameter of main bearings 1 and 2.



81

Main bearing and connecting rod big end bearing inside diameter and clearance between the corresponding journals (mm)

$$D = F = 40.040 \div 40.060$$

$$E = 40.020 \div 40.065$$

See Fig. 78 for A, B and C.

$$(D-A) = 0.050 \div 0.070$$

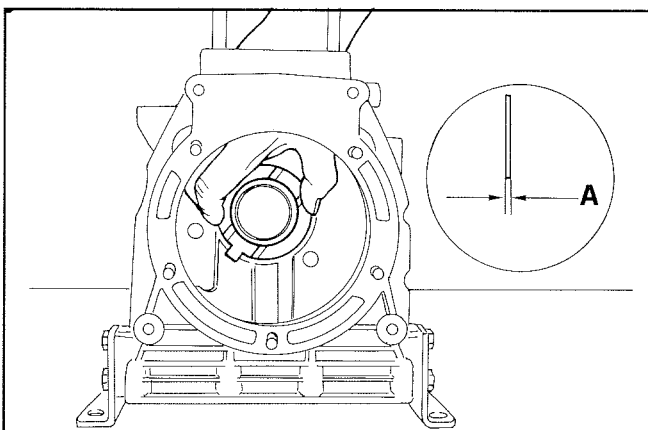
$$(D-A) \text{ limit value} = 0.13$$

$$(E-B) = 0.020 \div 0.081$$

$$(E-B) \text{ limit value} = 0.14$$

$$(F-C) = 0.050 \div 0.070$$

$$(F-C) \text{ limit value} = 0.13$$



82

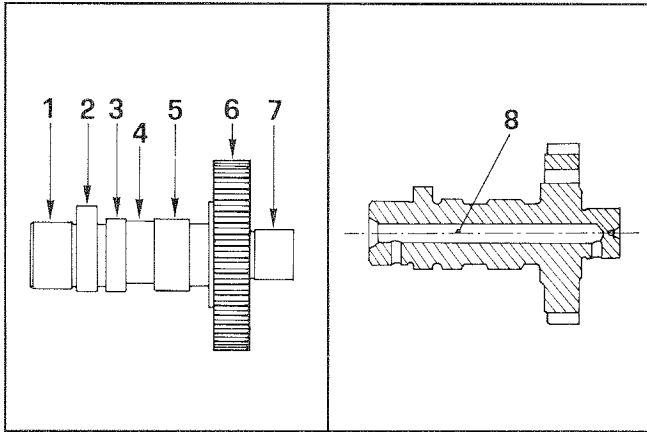
Thrust washer

Apply grease to the steel side of the thrust washer to aid in limiting washer movement during assembly of the crankshaft position thrust washer as shown.

Dimensions (mm):

$$A = 2.310 \div 2.360 \quad \text{limit value} = 2.200$$





CAMSHAFT

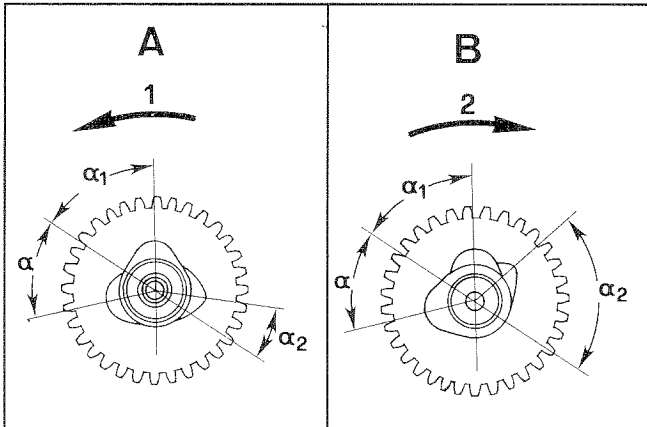
Components:

- 1 Journal, crankcase side
- 2 Intake lobe
- 3 Exhaust lobe
- 4 Fuel pump eccentric
- 5 Injection lobe
- 6 Gear
- 7 Journal, gear cover side
- 8 Lubrication hole (only for 6LD360/V, 6LD400/V, 6LD435/V).

Gear 6 features a straight tothing except for engines type 6LD401/B1 and 6LD435/B1 where it is helical-toothed.

83

84



Cam timing with straight-toothed gear

- 1 Counterclockwise rotation
- 2 Clockwise rotation only for 6LD260/C and 6LD325/C

A

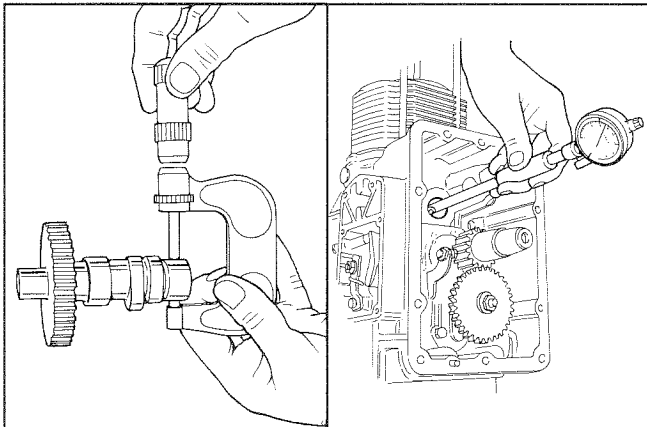
B

$\alpha = 51^\circ$
 $\alpha_1 = 53^\circ 15'$
 $\alpha_2 = 25^\circ 30'$

$\alpha = 53^\circ 15'$
 $\alpha_1 = 51^\circ$
 $\alpha_2 = 84^\circ 39'$

85

86

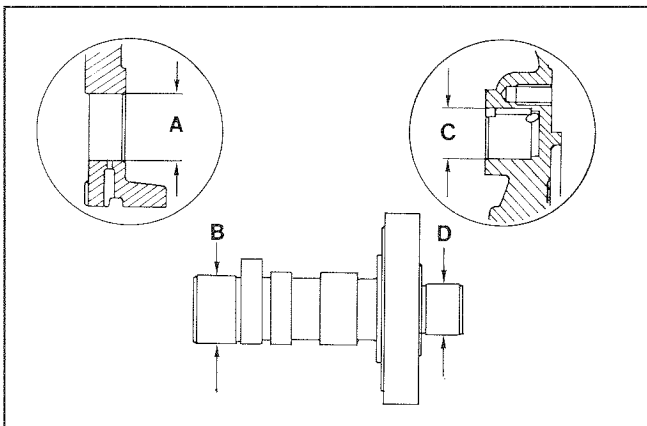


Camshaft journals and bore

Measure with an outside micrometer gauge and an inside bore gauge.

87

88



Dimensions of camshaft journal and bore (mm)

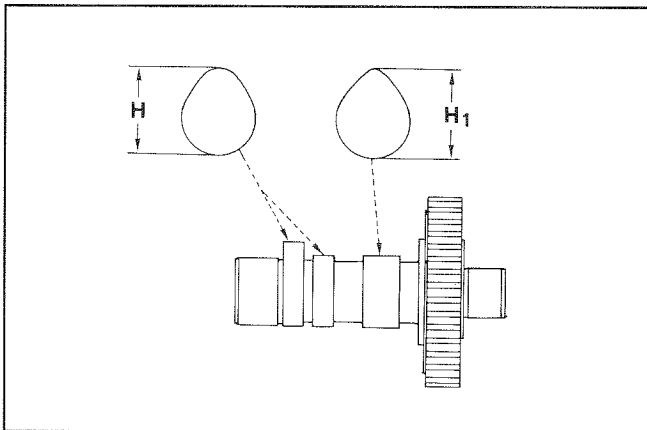
- A = 25.976 ÷ 25.989 (crankcase housing)
- B = 25.937 ÷ 25.950
- C = 20.000 ÷ 20.021 (gear cover housing)
- D = 19.957 ÷ 19.970

(A-B) = 0.026 ÷ 0.052
 (C-D) = 0.030 ÷ 0.064

(A-B) limit value = 0.095
 (A-B) limit value = 0.110

89





90

Cam height

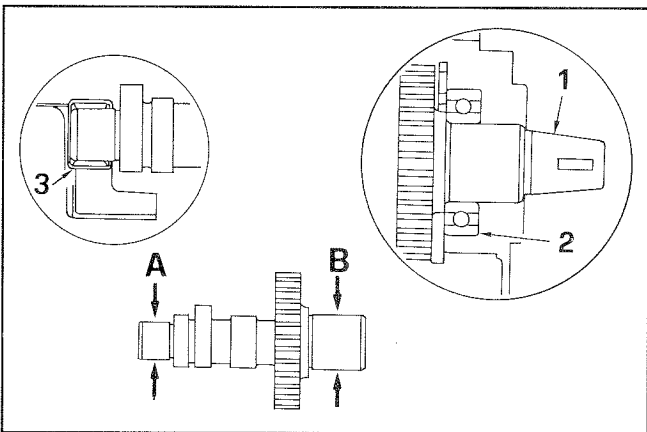
Exhaust and intake lobes feature the same height.

Dimensions (mm):

$H = 33.05 \div 33.15$ (intake and exhaust)

$H_1 = 34.90 \div 35.00$ (Injection)

Replace camshaft if cam wear exceeds the minimum given value of H and H_1 by 0.1 mm.



91

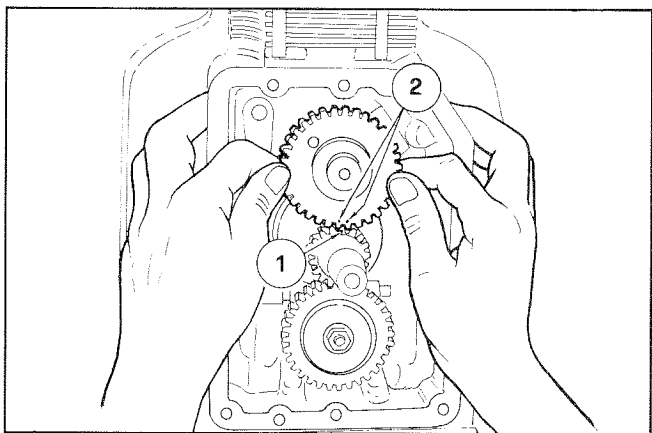
Camshaft for models 6LD260/C and 6LD325/C

The engine p.t.o. 1 is located in the camshaft and not on the crankshaft. On the p.t.o. side the camshaft is mounted on ball bearing 2 while on the crankcase side it is mounted on roller bearing 3. Cams are staggered as shown in Fig. 86. Cam heights are as shown in Fig. 90.

Journal dimensions (mm):

$A = 19.991 \div 20.000$

$B = 30.008 \div 30.021$

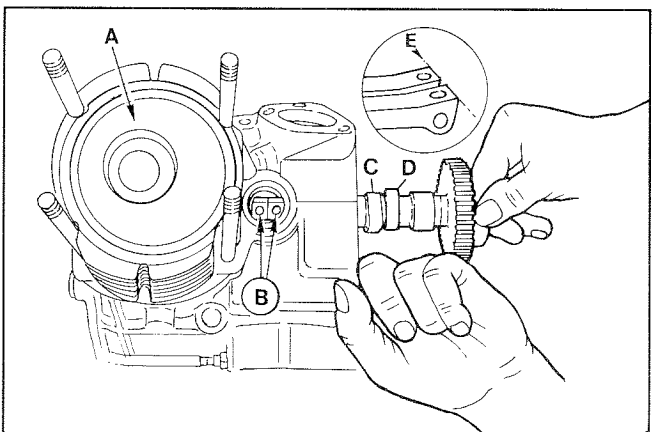


92

Camshaft timing

Fit camshaft gear by making timing mark 2 coincide with timing marks 1 on the crankshaft.

If timing marks are not present, position the piston at top dead center and install camshaft as shown. See also below.



93

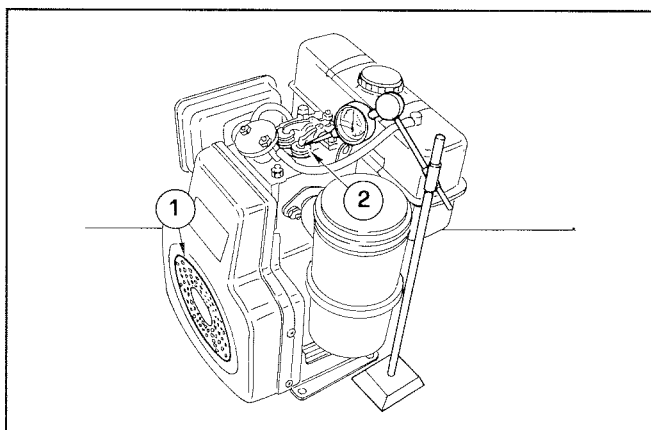
Valve timing without considering timing marks

Locate piston A at the top dead center.

Lift tappets B and introduce camshaft so that intake cam C and exhaust cam D are balanced (intake cam opens, exhaust closes).

Perform the final check: intake and exhaust tappets B should be at the same E level when resting on the corresponding cams.





94

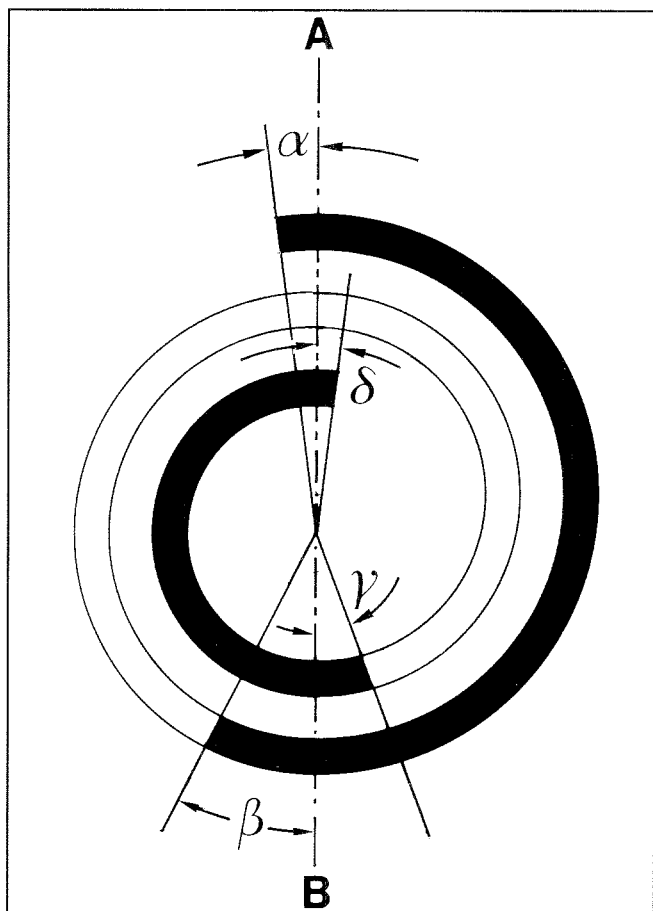
Valve timing check

Check valve timing at the crankshaft. The values shown are checked at the circumference of disk guard 1 with 168 mm diameter.

Set valve clearance at 0.65 ÷ 0.70 mm (after checking restore the value at 0.10 ÷ 0.15 mm).

Set dial gauge on intake valve 2 to a zero value; by rotating the driving shaft according to its direction of rotation you can measure α (intake valve opening before top dead center **A**) and β (intake valve closing after top dead center **B**), see Fig. 95.

Follow the same procedure for exhaust valve checking γ (exhaust valve opening) and δ (exhaust valve closing).



95

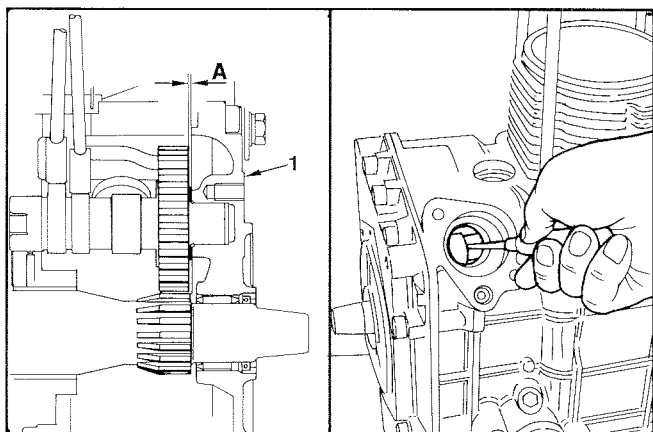
Timing angles for checking purposes

$\alpha = 7.5^\circ$ before top dead center corresponding to 11 mm on disk guard 1, Fig. 94.

$\beta = 25.5^\circ$ after bottom dead center corresponding to 37 mm on disk guard 1.

$\gamma = 21^\circ$ before bottom dead center corresponding to 30.5 mm in disk guard 1.

$\delta = 3^\circ$ after top dead center corresponding to 4.5 mm on disk guard 1.



96

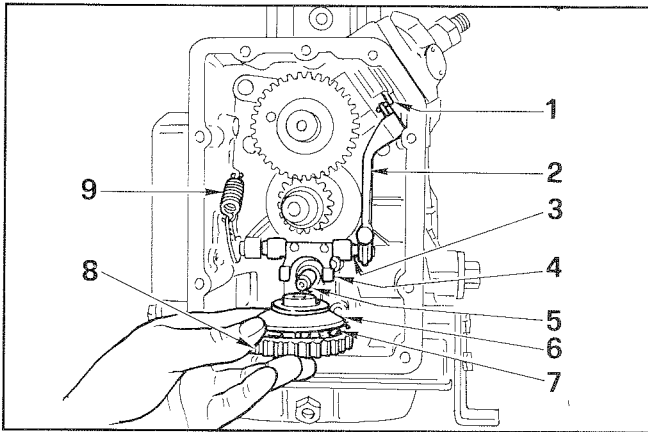
97

Camshaft end play

Check end play **A** (0.20 ÷ 0.60 mm) after tightening gear cover 1 on the timing side.

Perform this check before fitting cylinder head and injection pump. Remove injection pump tappets and axially move camshaft backwards and forwards with a small bar (See Fig. 97).

Note: Care should be taken not to damage tappet bore.



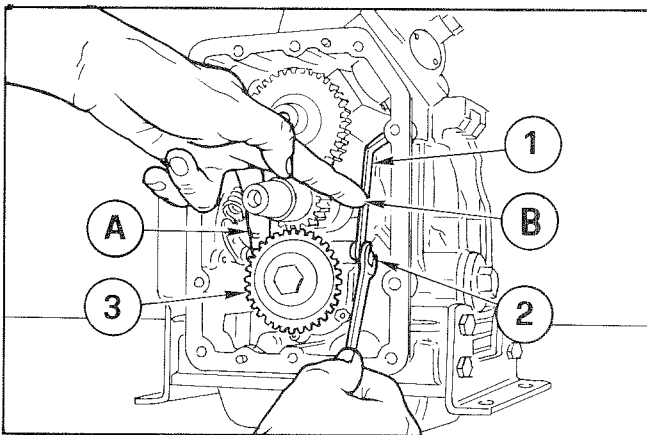
98

Speed governor

Ball type (with weights for generating sets) and is fitted to the oil pump gear 8.

Operation: Gear 8 is driven by the crankshaft. Balls 7 are pushed to the periphery by the centrifugal force and thus axially move mobile bell 6 connected to injection pump delivery control 1 by means of fork 4, journal 3 and lever 2. Spring 9 is tensioned by the throttle control and offsets the ball centrifugal force.

Balance between the two forces keeps the crankshaft speed almost constant as the load changes.



99

Speed governor setting

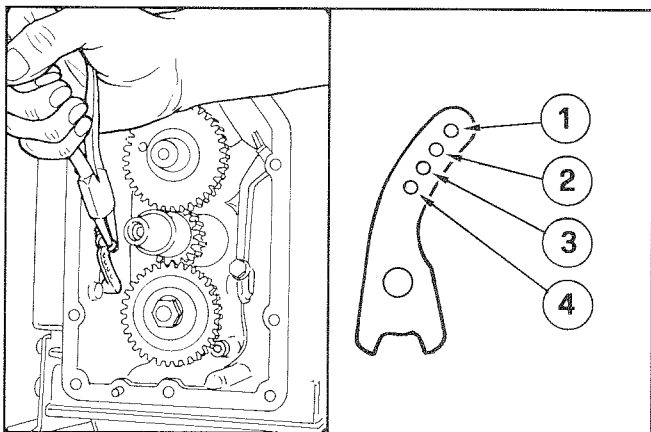
Loosen nut 2 (a screw if 1 is an aluminium rod).

With the finger **A** push the mobile bell towards the outside of the engine (governor 3 closes).

With the finger **B** push lever 1 towards the inside of the engine (injection pump maximum delivery).

Tighten nut to 19 Nm (or 9 Nm if rod 1 is made of aluminium).

Note: Injection pump must be installed



100

101

Governor spring hooking position

1 = Standard adjustment, 3600 r.p.m., with ball-type governor (power hoe, etc.)

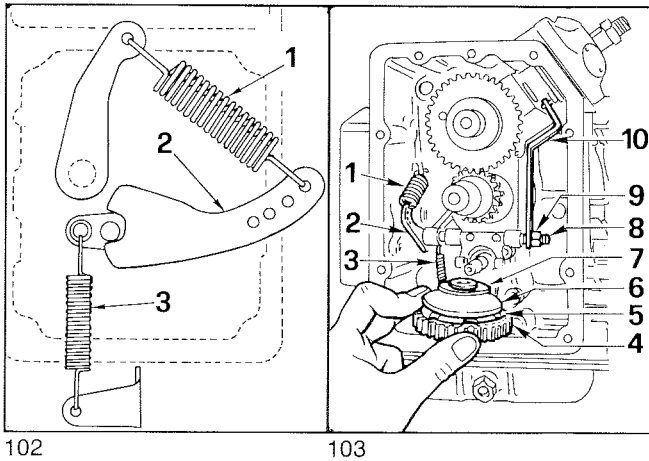
2 = Adjustment at 3600 r.p.m. with weight-type governor (generating set).

3 = Adjustment at 3000 r.p.m. with weight-type governor (generating set).

4 = Adjustment at 2700 ÷ 3200 r.p.m. with ball-type governor (grass mower, etc.)

Warning: The governor and extra fuel springs should not be modified (shortened, lengthened or deformed); if springs require replacement use only genuine Lombardini components.





Speed governor for engines meant for agricultural purposes

This type of governor is fitted to those engines characterized by the letters K AGR on the nameplate (agricultural use). Governor gear 5 and bell 7 are made of plastic material. Nut 9 is of the self-locking type. The injection pump control lever 10 is made of sheet metal.

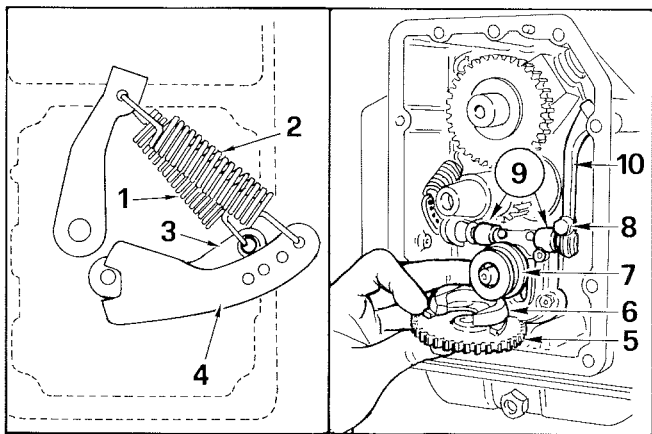
Components:

- | | |
|---------------------|----------------------------|
| 1 Governor spring | 6 Mobile bell |
| 2 Lever | 7 Washer |
| 3 Extra fuel spring | 8 Journal |
| 4 Gear | 9 Adjusting nut |
| 5 Ball | 10 Inj. pump control lever |

When refitting tighten nut 9 to 10 Nm. Also see Fig. 99, 100 and 101 for spring placement.

102

103



Speed governor and leverage for generating sets

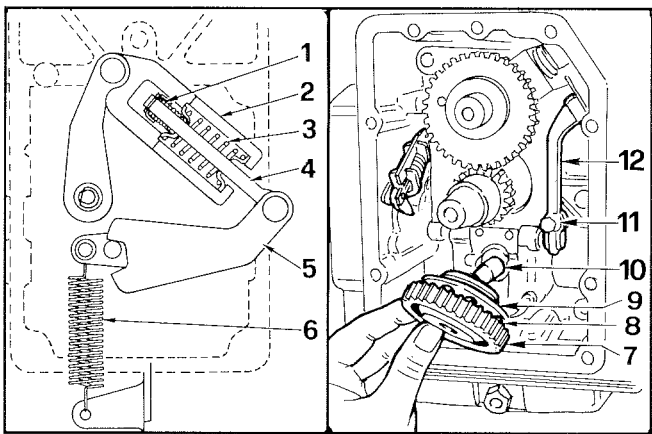
The bearings inside oil pump mountings 9, the double roller bearing inside mobile bell 7 and weights 6 ensure that the performance is suitable for generating sets.

Components:

- | | |
|---------------------------|--|
| 1 Extra fuel spring | 6 Weight |
| 2 Governor spring | 7 Mobile bell |
| 3 Extra fuel spring lever | 8 Screw |
| 4 Governor spring lever | 9 Oil pump mountings |
| 5 Governor gear | 10 Injection pump control lever (in aluminium) |

104

105



Governor spring and leverage for small-size vehicles

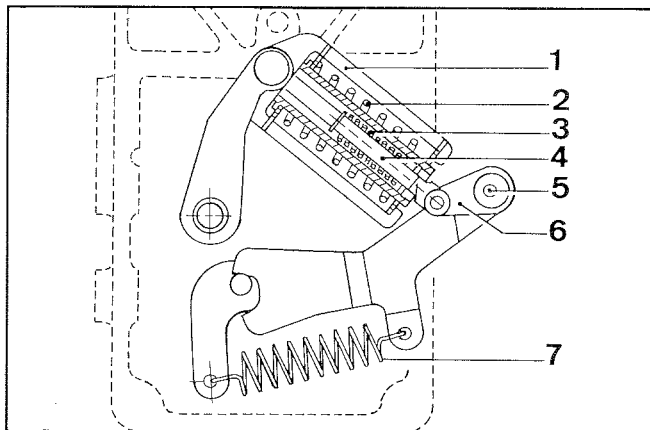
The system made up of two co-axial springs featuring different diameter making it possible to obtain a limited speed change with respect to throttle movement especially at low speeds.

Components:

- | | |
|---------------------|---|
| 1 Low speed spring | 8 Ball |
| 2 Frame | 9 Mobile bell |
| 3 High speed spring | 10 Oil pump shaft |
| 4 Link | 11 Adjusting screw |
| 5 Lever | 12 Injection pump control lever (in aluminum) |
| 6 Extra fuel spring | |
| 7 Governor gear | |

106

107



108

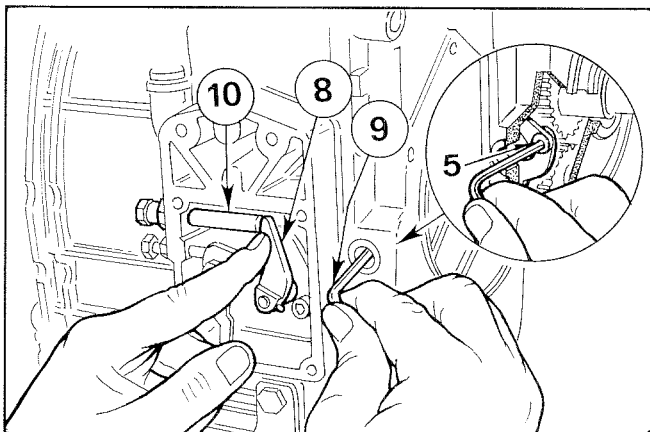
Speed governor with provision for external droop adjustment

The governor is of the ball type. The operating features are similar to those shown in Fig. 106 and 107.

The main feature of this speed governor is the possibility to modify droop externally.

Components:

- | | |
|-------------------------|--------------------------|
| 1 Frame | 6 Connecting rod |
| 2 Full speed spring | 7 Extra fuel spring |
| 3 Idling speed spring | 8 Fuel lever |
| 4 Journal | 9 3 mm Allen wrench |
| 5 Hole for Allen wrench | 10 Fuel delivery limiter |



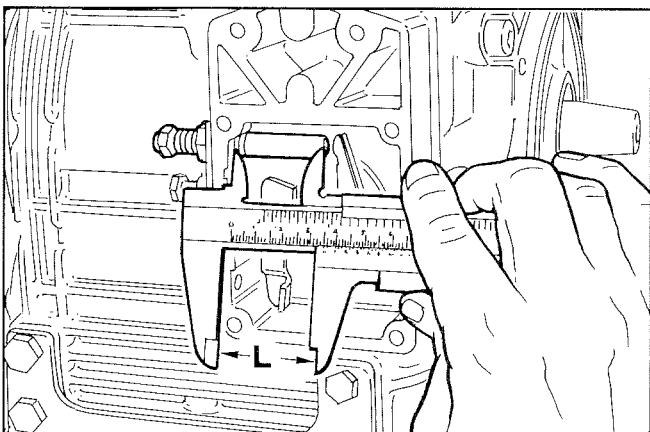
109

Manual droop adjustment

Introduce Allen wrench 9 into hex 5. To center the wrench inside hex 5 move lever 8 to the left or the right as required.

Slowly turn the wrench: decreases when turning the wrench counter-clockwise and increases when turning it clockwise.

There is no direct link between the degrees of rotation and the droop. On average, 20° of rotation cause a droop of 15 ÷ 20 r.p.m.

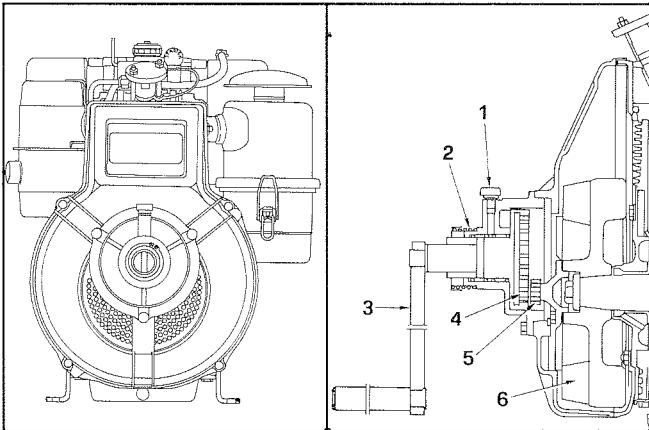


110

Bringing fuel delivery limiter to its original position after droop adjustment

If this operation is unavoidable (See Fig. 109) it is recommended, before loosening the fuel delivery limiter, to carefully measure distance L in order to re-position it exactly as before once the operation is completed.





111

112

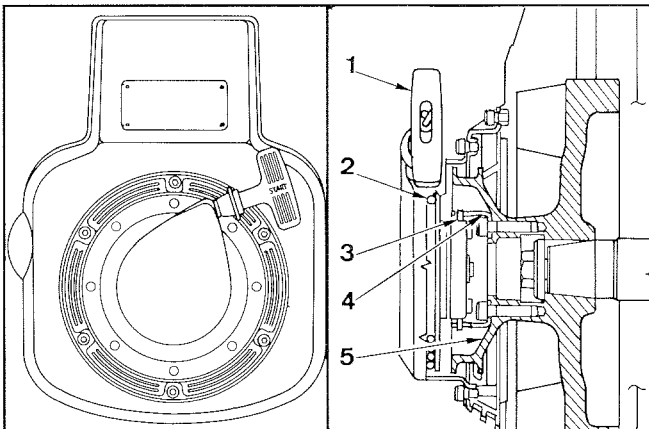
Hand crank starting

Remove plug 1 and introduce bearing grease through the hole. When crank 3 is pushed towards the engine, the teeth of gear 4 become engaged with those of pinion 5 which is integral with flywheel 6 and the crankshaft.

After engaging the compression release, rotate the crank clockwise until the crankshaft turns at the required starting speed.

Finally disengage the compression release. Once starting is achieved, spring 2 engages gear 4 and pinion 5 becomes disconnected.

The reduction ratio is 1:4.



113

114

Re-coil starting

Compression release is semi-automatic and should be engaged before starting; once the engine is started the decompression system automatically disengages.

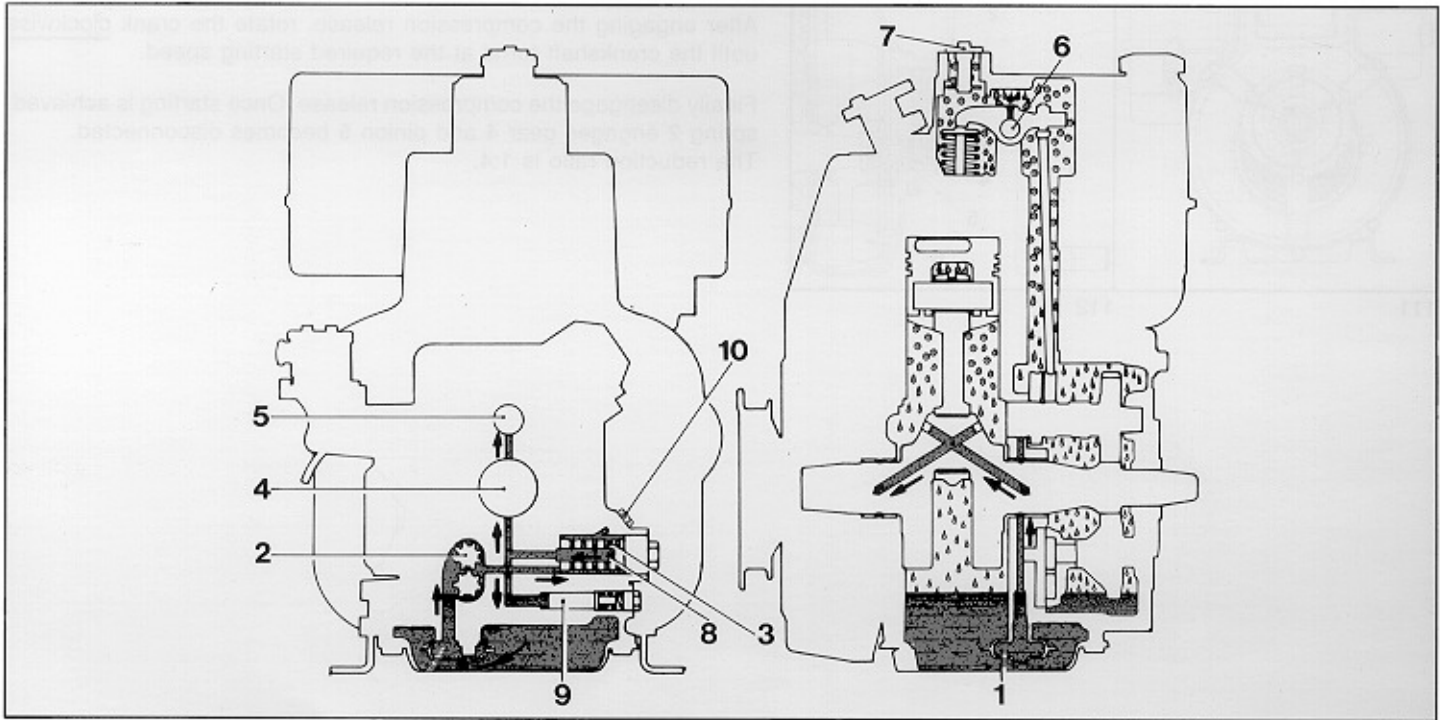
When handle 1 is pulled, teeth 3 move wider apart because of the centrifugal force and engage with cup 4. When starting is completed the teeth return to their initial position because of the cup rotation.

Rope 2 is re-wound into its housing by a spring located inside.

Note: For engine lubrication and also to make starting with self-winding rope easier it is recommended to use oil grade 15W/40.

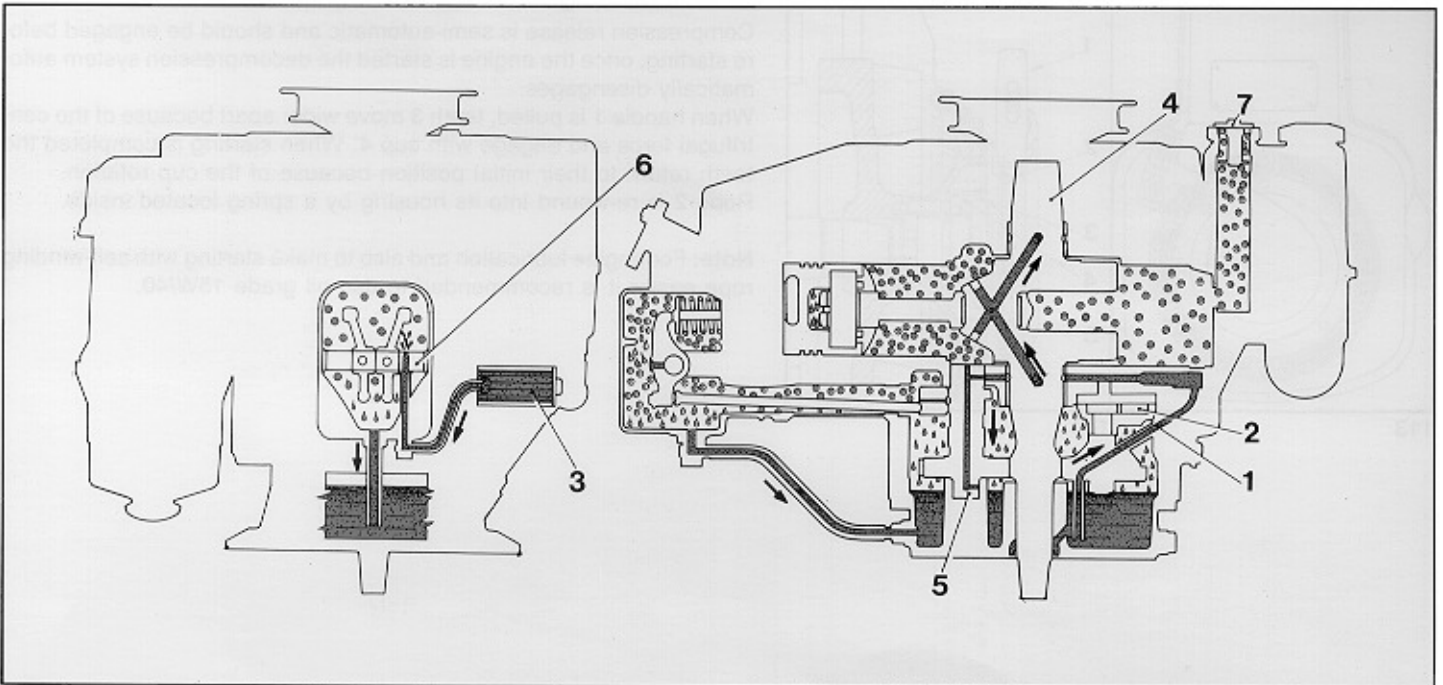
LUBRICATION SYSTEM LAYOUT

6LD260, 6LD260/C, 6LD325, 6LD325/C, 6LD360, 6LD400, 6LD401/B1, 6LD435, 6LD435/B1



115

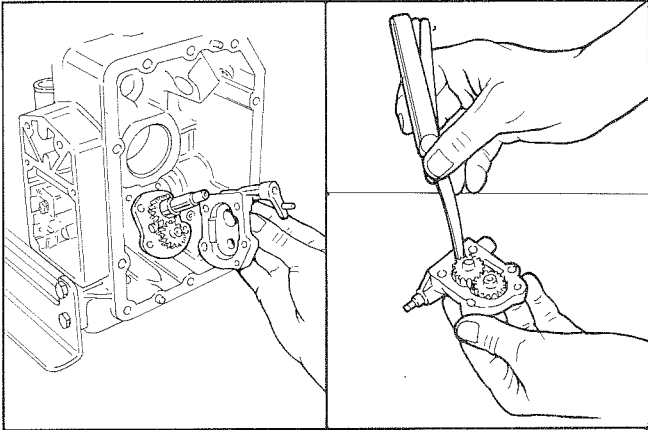
6LD360/V, 6LD400/V, 6LD435/V



116

Components:

1) Pick-up - 2) Oil pump - 3) Filter cartridge - 4) Crankshaft - 5) Camshaft - 6) Rocker arm journal - 7) Breather plug - 8) Cartridge by-pass - 9) Pressure relief valve - 10) Plug.

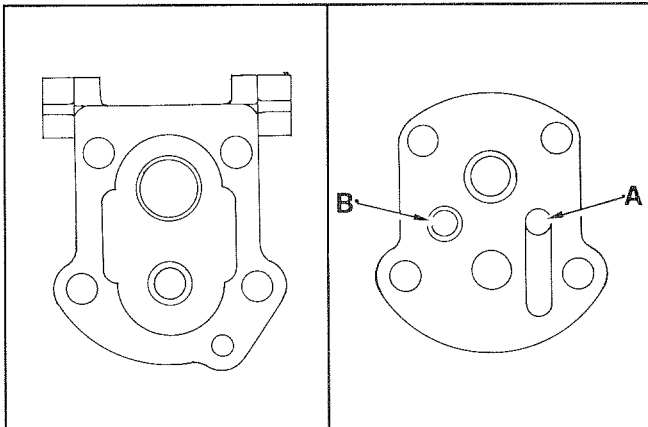


117

118

Oil pump

Check that gear teeth are not damaged and that clearance between gear edge and pump body does not exceed 0.15 mm. Also check that the control shaft is free to rotate with end play not exceeding 0.15 mm. Oil pump delivery at 3600 r.p.m. is 4.8 l/min.



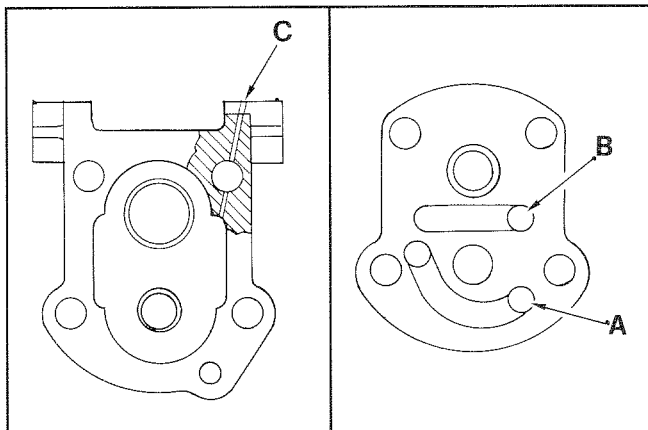
119

120

Oil pump body and flange

- A = intake
- B = Delivery

When refitting check that crankcase and flange mounting planes are not damaged. Tighten screws to 10 Nm.



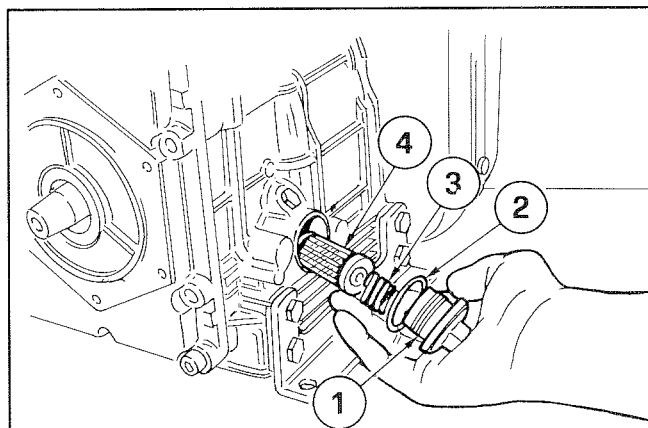
121

122

Oil pump body and flange for 6LD260/C, 6LD325/C

- A = Intake
- B = Delivery
- C = Camshaft lubrication hole

In 6LD260/C and 6LD325/C the crankshaft turns in a direction which is opposite to that of the other engines of the series. As a result of this, in order for lubrication to occur normally, the pump flange has been designed differently. Pump body hole C has the purpose of lubricating the camshaft.



123

Oil filter

Components:

- 1 Cap
- 2 Seal ring
- 3 Spring
- 4 Cartridge

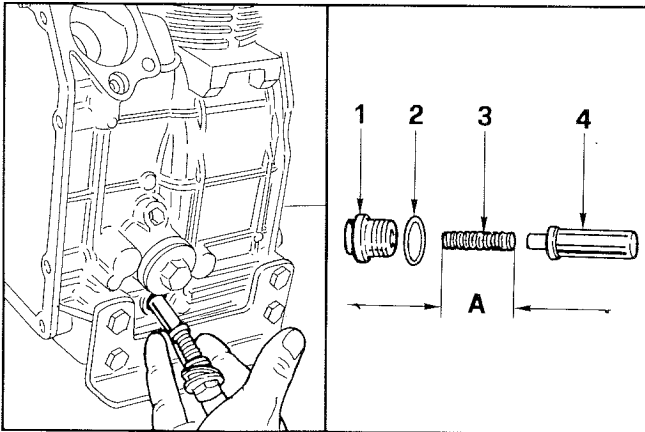
Cartridge characteristics:

Filtering area = 75 cm²

Degree of filtration = 70 μm

By-pass valve opening pressure = 0.60 ÷ 0.75 bar

Max. operating pressure = 4.5 bar.



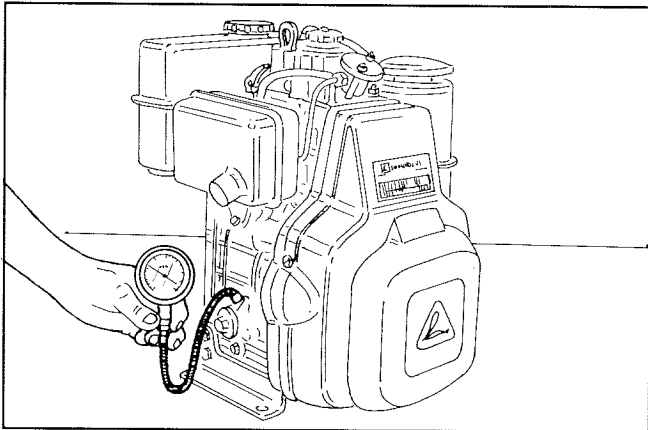
124

125

Oil pressure relief valve

- 1 Plug
- 2 Gasket
- 3 Spring
- 4 Valve

Dimensions (mm):

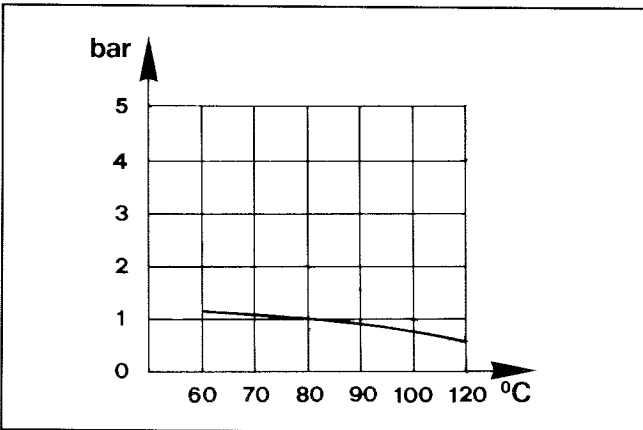
A = 37Carefully clean all components and check spring **A** length.

126

Oil pressure check

Fill engine with oil and fuel.

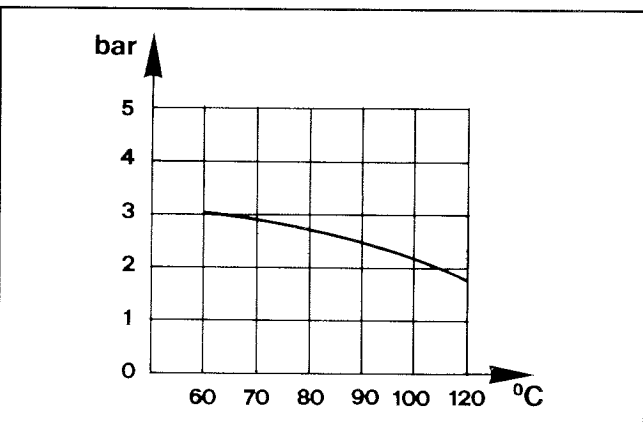
Connect a 10 bar pressure gauge to the oil filter fitting as shown. Start the engine and check pressure as a function of the oil temperature.



127

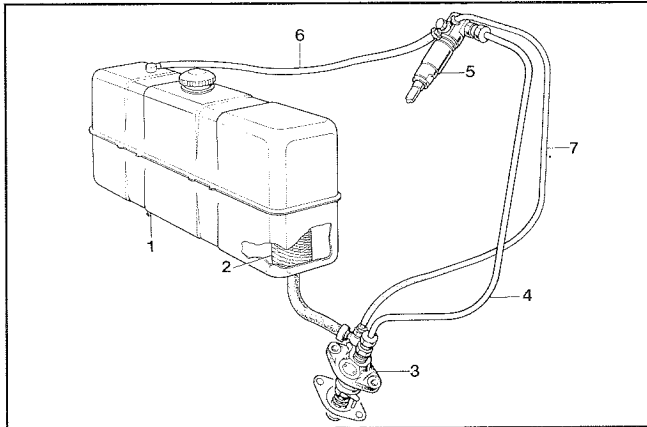
Oil pressure curve at full speed

The curve is obtained at the oil filter port with constant engine speed of 1200 r.p.m. in no-load conditions; pressure is given in bar and temperature in centigrades.



128

Oil pressure curve at full speedThe curve is obtained at the oil filter port with engine working at 3000 r.p.m. at the **N** power; pressure is given in bar and temperature in centigrades.**Note:** After the running-in period the lube max. temperature should be less than the room temperature plus 95°C.

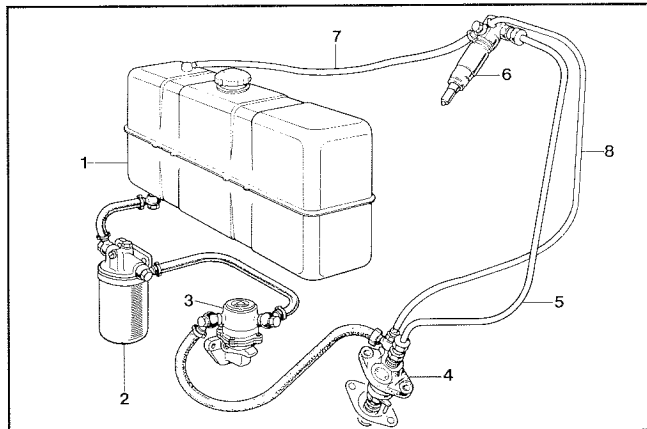


129

Fuel feeding/injection system (standard)

Components:

- 1 Tank
- 2 Fuel filter inside the tank
- 3 Injection pump
- 4 High pressure line
- 5 Injector
- 6 Injector leak-off line
- 7 Bleeding tube

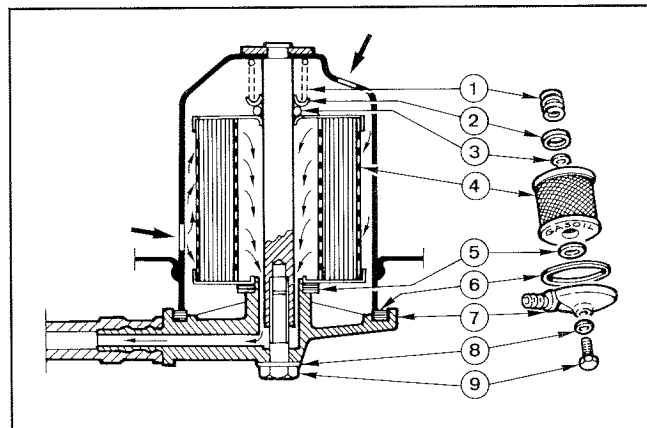


125

Fuel feeding/injection system with feed pump and external fuel filter (optional)

Components:

- 1 Tank
- 2 Fuel filter outside the tank
- 3 Fuel transfer pump
- 4 Injection pump
- 5 High pressure line
- 6 Injector
- 7 Injector leak-off line
- 8 Bleeding tube



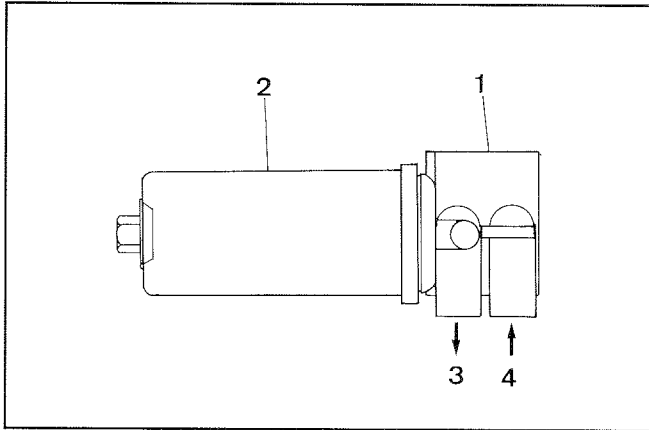
131

Fuel filter inside tank (standard)

Components:

- 1 Spring
- 2 Disk
- 3 Ring
- 4 Cartridge
- 5 Gasket
- 6 Gasket
- 7 Cover
- 8 Ring
- 9 Bolt

Cartridge characteristics:
 Degree of filtration = 5 μm
 Filtering area = 235 cm^2



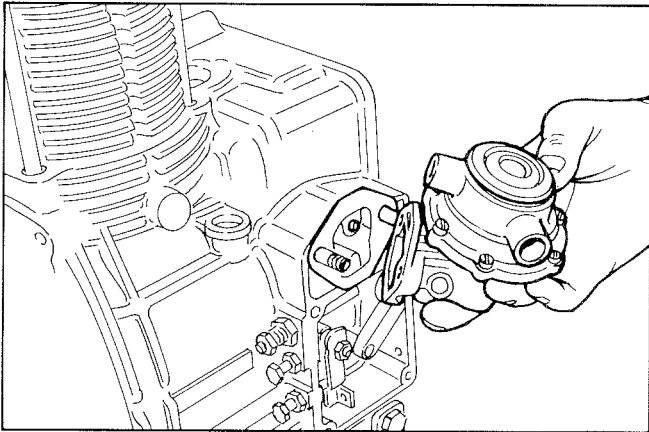
132

Fuel filter separate from the tank (optional)

- 1 Mounting
- 2 Cartridge
- 3 Fuel outlet from the filter
- 4 Fuel inlet into the filter

Cartridge characteristics:

Filtering area = 720 cm²
 Degree of filtration: 5 ÷ 8 μm
 Max. working pressure: 7 bar
 Working temperature: -25° ÷ 150°C
 See Page 9 for maintenance details.

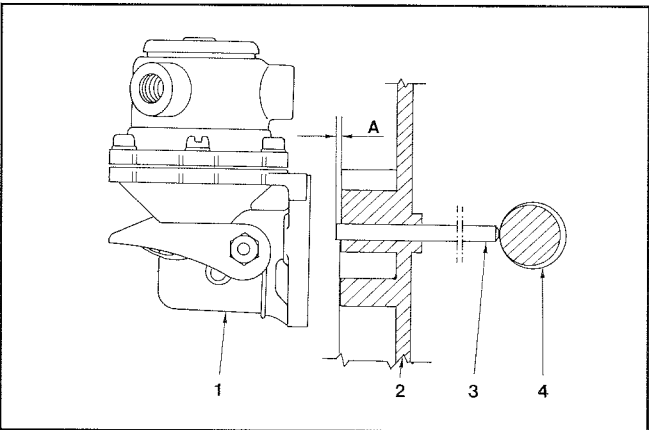


133

Fuel transfer pump (optional)

When the tank is supplied separate from the engine it usually requires also the shipment of the fuel feeding pump and the camshaft suitable for driving the pump. The pump is of the diaphragm type and is operated by a camshaft eccentric via a drive rod.

Characteristics: when the control eccentric rotates at 1500 r.p.m. minimum delivery is 60 l/h and self-regulation pressure is 4 ÷ 5 mm water column.



134

Fuel feeding pump drive rod protrusion

Components:

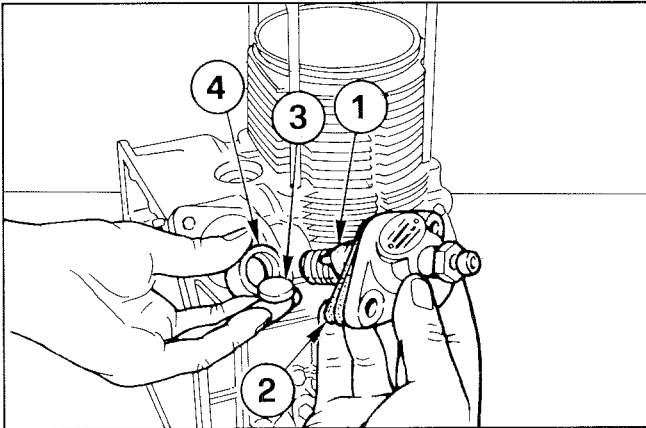
- 1 Fuel transfer pump
- 2 Crankcase
- 3 Drive rod
- 4 Camshaft eccentric

This check should be performed when eccentric 4 is at rest (rod at lowest level).

Protrusion **A** of drive rod 3 is 0.8 ÷ 1.2 mm; protrusion can be adjusted by means of gaskets available in the following thicknesses: 0.50; 0.80 and 1.0 mm.

Drive rod length = 93.0 ÷ 93.2 mm.





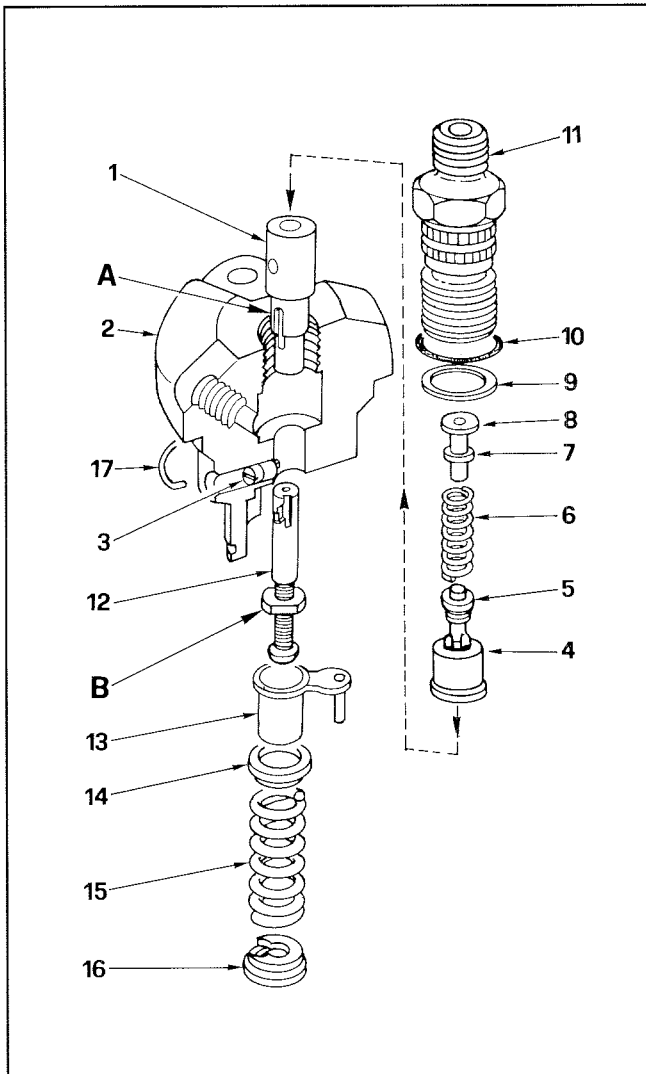
135

Injection pump

- Components:
- 1 Delivery control
 - 2 Shims for injection advance
 - 3 Spacer
 - 4 Tappet

The injection pump is mounted on the crankcase and is operated by the camshaft via tappet 4.

Note: When removing the injection pump from its seat make sure that spacer 3 is not dropped into the oil sump; injection pump operation will be impaired if the spacer is not installed.

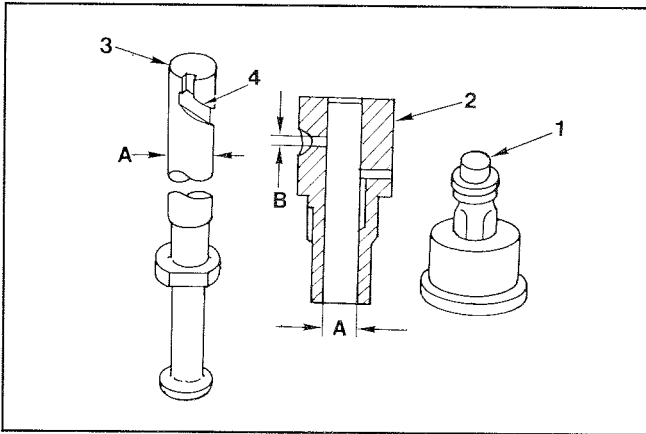


136

Injection pump refitting

- Components:
- 1 Barrel
 - 2 Pump body
 - 3 Pin
 - 4 Delivery valve seat
 - 5 Delivery valve
 - 6 Spring
 - 7 Shim
 - 8 Filler
 - 9 Washer
 - 10 O-ring
 - 11 Delivery union
 - 12 Plunger
 - 13 Rack
 - 14 Spring plate
 - 15 Spring
 - 16 Spring retainer

Fit barrel 1 into pump body 2 making sure that groove A matches with pin 3.
 Follow the above fitting sequence remembering that plunger 12 should be introduced into cylinder 1 with mark B (can be any mark or writing) on the same side as pin 3.
 Tighten union 11 to 35 ÷ 40 Nm.



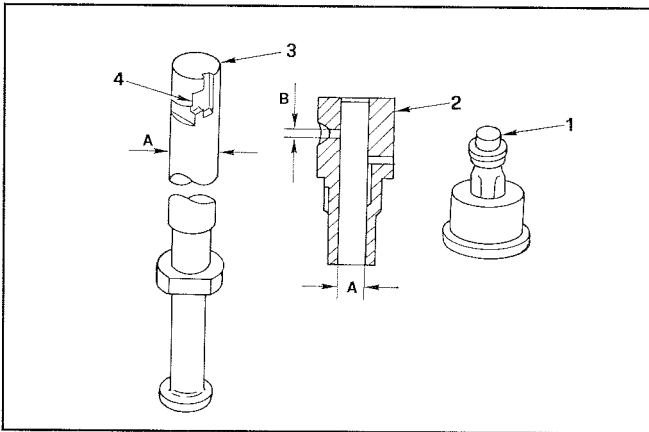
137

Plunger and delivery valve for injection pump type 6LD260 and 6LD260/C

- 1 Delivery valve
- 2 Barrel
- 3 Plunger
- 4 LH helix

A = 5.5 mm (nominal diameter)
B = 2.5 mm

The volume displaced by delivery valve 1 is 25 mm³.



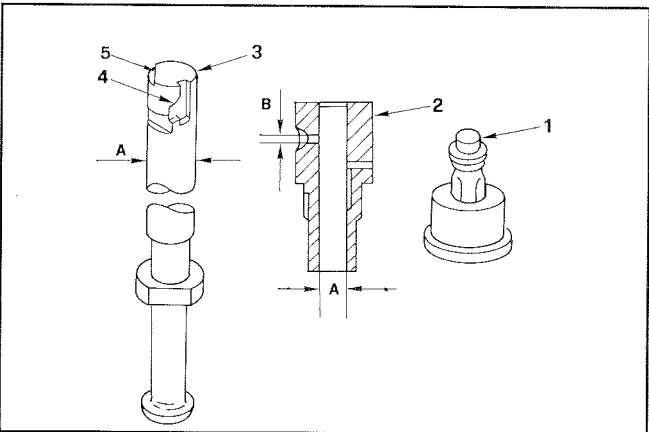
138

Plunger and delivery valve for injection pump type 6LD325 and 6LD325/C

- 1 Delivery valve
- 2 Barrel
- 3 Plunger
- 4 RH helix

A = 5.5 mm (nominal diameter)
B = 2 mm

The volume displaced by delivery valve 1 is 15 mm³.



139

Plunger and delivery valve for injection pump type 6LD360, K AGR and 6LD400, K AGR

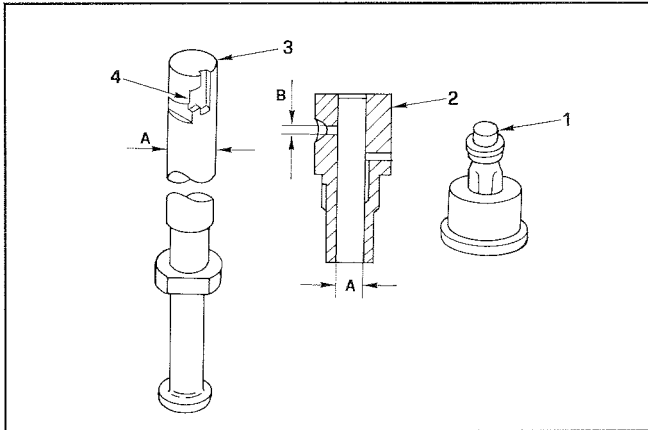
- 1 Delivery valve
- 2 Barrel
- 3 Plunger
- 4 RH helix
- 5 Retardation notch

A = 6 mm (nominal diameter)
B = 2 mm

The volume displaced by delivery valve 1 is 25 mm³.

Note: In engines for agricultural use pump type QLC (See Fig. 143) can be fitted as an alternative to this pump.





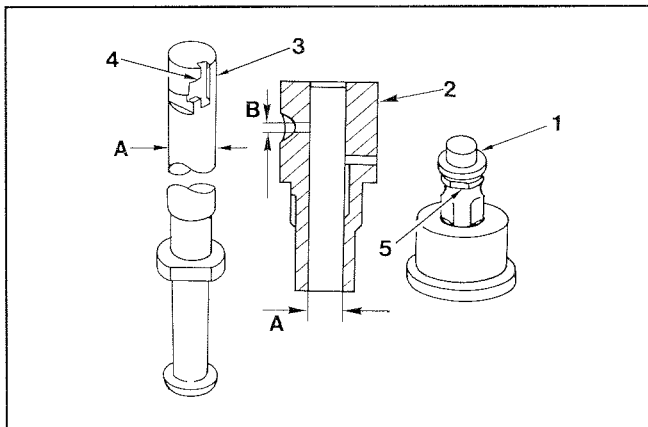
Plunger and delivery valve for injection pump type 6LD360, 6LD360/V, 6LD400 and 6LD400/V

- 1 Delivery valve
- 2 Barrel
- 3 Plunger
- 4 RH helix

A = 6 mm (nominal diameter)
 B = 2 mm

The volume displaced by delivery valve 1 is 15 mm³.

140



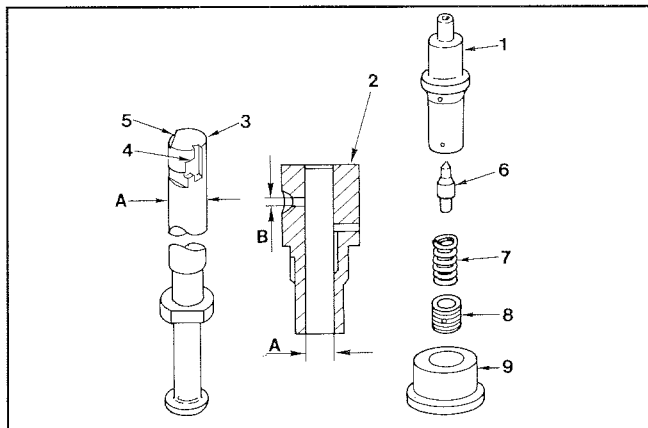
Plunger and delivery valve for injection pump type 6LD435 and 6LD435/V

- 1 Delivery valve
- 2 Barrel
- 3 Plunger
- 4 RH helix
- 5 Wrench flat

A = 7 mm (nominal diameter)
 B = 2 mm

This valve differs from the others because of the flat 5; the volume displaced is 15 mm³.

141



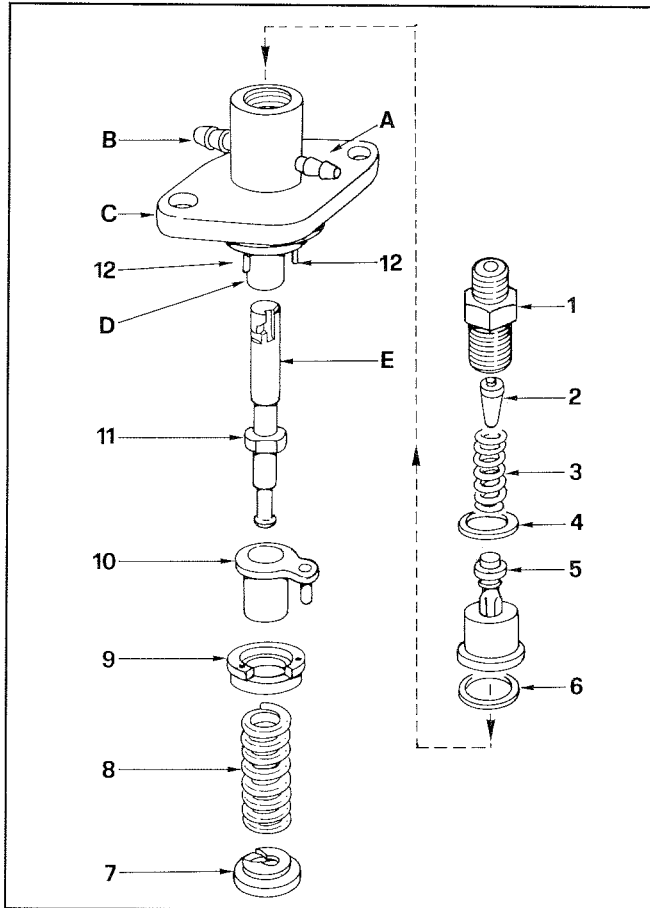
Plunger and delivery valve GDV for injection pump type 6LD401/B1, 6LD435/B1

- 1 Main delivery valve
- 2 Barrel
- 3 Plunger
- 4 RH helix
- 5 Retardation notch
- 6 By-pass
- 7 Spring
- 8 Ring nut
- 9 Valve seat

A = 7 mm (nominal diameter)
 B = 2 mm

The injection pump features a valve type GDV whose task is to keep a constant pressure of 65 ÷ 70 bar inside the delivery tube between injections.

142



143

Injection pump type QLC for engines fitted to small-size vehicles and agricultural equipment (K AGR)

Components:

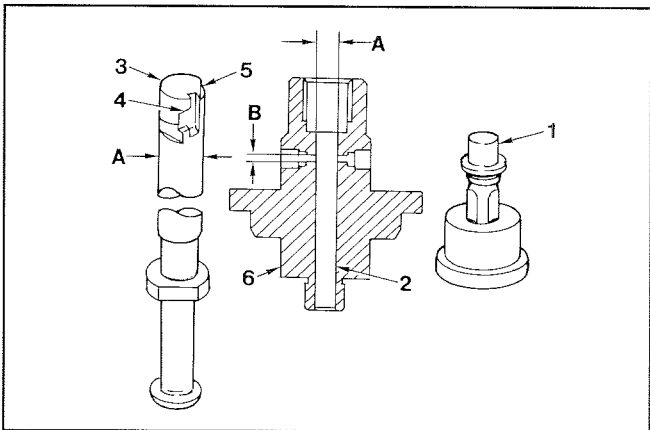
- 1 Delivery union
- 2 Filler
- 3 Spring
- 4 Washer
- 5 Delivery valve
- 6 Washer
- 7 Spring retainer
- 8 Spring
- 9 Upper retainer
- 10 Delivery control
- 11 Plunger
- 12 Stop pin

- A Fuel inlet union
 B Fuel outlet union
 C Body
 D Barrel
 E Helix

Disassembly following the number sequence.

Retainer 9 is held in place by pins 12.

Pry with a tool placed between retainer and pump body.



144

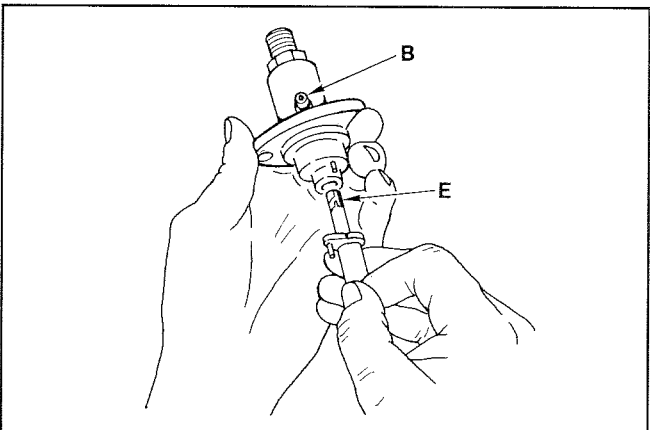
Plunger and delivery valve for injection pump type QLC

- 1 Delivery valve
- 2 Barrel integral with the pump body
- 3 Plunger
- 4 RH helix
- 5 Retardation notch
- 6 Pump body

A = 6 mm (nominal diameter)

B = 2 mm

The volume displaced by delivery valve 1 is 15 mm³.



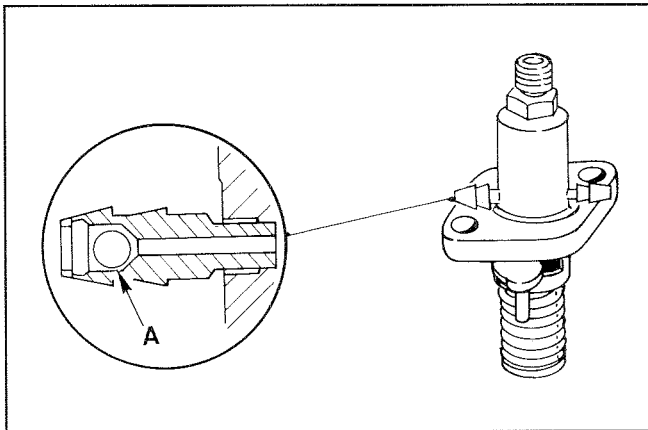
145

QLC injection pump refitting

The piston must be fitted with helix E facing the inlet union B; if it is accidentally fitted with propeller facing the outlet union, the injection pump will not work (there is, however, no danger that the engine will overspeed; complete assembly as shown in Fig. 143.

Tighten delivery union to 35 Nm.

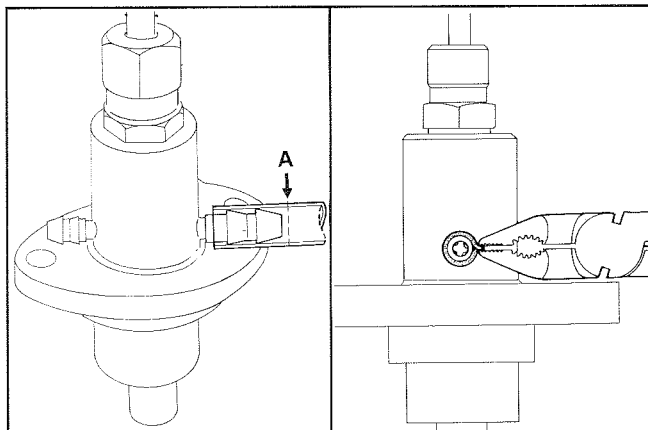




Non-return valve for QLC injection pump

A non-return valve **A** is fitted to the outlet union; this valve has the purpose of improving injection by releasing entrained air from the injection pump. The valve also allows quick shut-offs via a fuel solenoid.

146



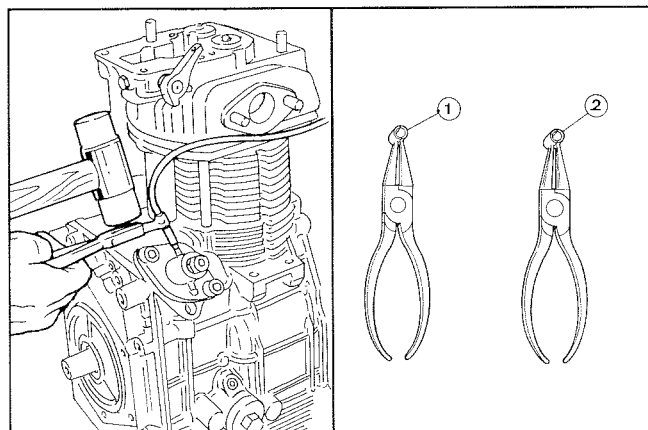
Fuel feeding tube removal from injection pump type QLC

Cut nylon tube at **A**.
Remove the tube portion remaining on the union with standard pliers. Deform the nylon tube without damaging union tightness as shown in the Figure.

Use the same fuel feeding tubes if allowed by the remaining lengths; replace if not.

147

148



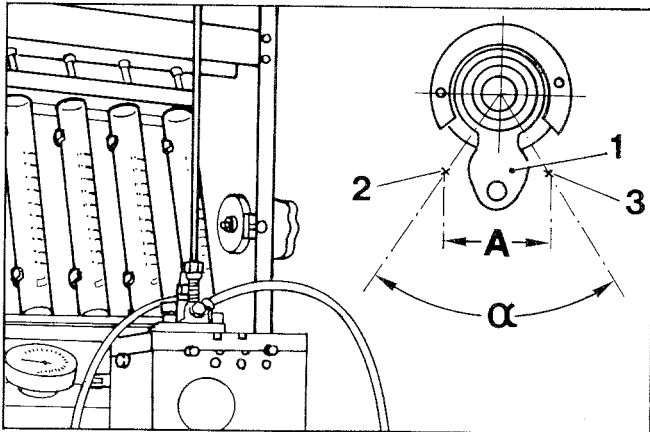
Refitting fuel feeding tubes in injection pump type QLC

- 1 Pliers for tubes with dia. 5.5 mm part No. 7104-1460-022
- 2 Pliers for tubes with dia. 7.5 mm part No. 7104-1460-023

The inlet and outlet tubes are made of nylon and pressed into the injection pump unions with special pliers and a plastic-headed hammer.

149

150



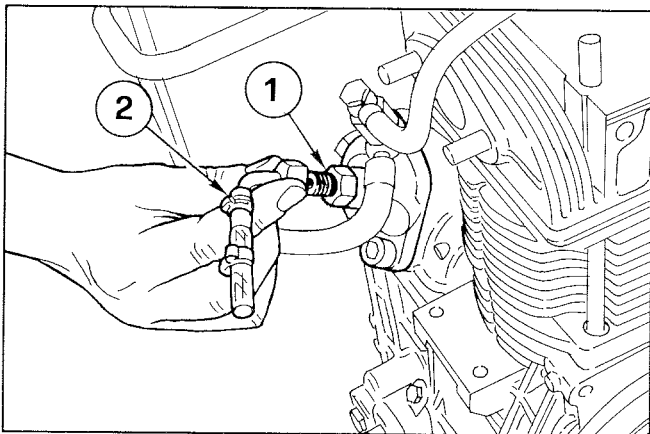
151

Injection pump delivery check on test bench

- 1 Delivery control rack
 - 2 Rack 1 in stop position (corresponding to max. delivery in models 6LD260, 6LD260/C)
 - 3 Rack 1 in max. delivery position (corresponding to stop position models 6LD260, 6LD260/C)
- A = 18,5 ÷ 19,5 mm (max. rack rod stroke in injection pump type QLC)
 $\alpha = 66^\circ$

Test data

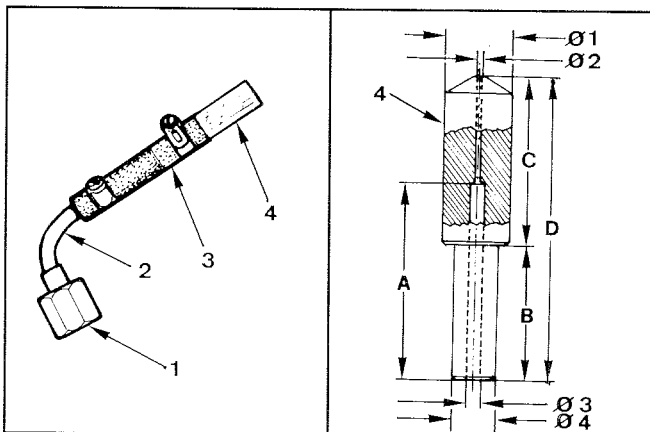
Injection pump for engine type	Control rod max. force	Rod stroke during max. delivery	Camshaft r.p.m.	Delivery
	Newtons	mm	R.P.M	mm ³ /stroke
6LD260 6LD260/C	0,35	9	1800	15 ÷ 25
		0	150	32 ÷ 45
6LD325 6LD325/C	0,35	9	1800	30 ÷ 40
		0	150	49 ÷ 61
6LD360 AGR 6LD400 AGR	0,35	9	1800	18 ÷ 32
		0	150	48 ÷ 60
6LD360 6LD360/V 6LD400 6LD400/V	0,35	9	1800	18 ÷ 32
		0	150	58 ÷ 68
6LD435 6LD435/V	0,35	9	1800	38 ÷ 44
		0	150	53 ÷ 63
6LD401/B1 6LD435/B1	0,35	9	1800	18 ÷ 32
		0	150	50 ÷ 60
6LD325 for small-size vehicles 6LD360 for small-size vehicles	0,35	12	1500	16 ÷ 24
		0	150	52 ÷ 62



152

(STATIC) INJECTION TIMING

Disconnect high pressure line making sure that during this operation the delivery union of pump 1 is not loosened. Install injection timing tool 2.



153

154

**Injection timing checking device
Ser. No. 7271-1460-024**

Components:

- 1 Union
- 2 Tube
- 3 Sleeve
- 4 Transparent body

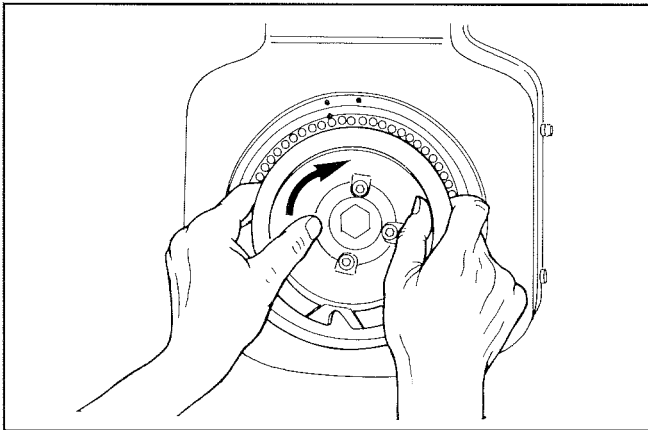
Device allows for immediate monitoring of the fuel flow through the small transparent hole.

Dimensions (mm):

 $\varnothing_1 = 10.00$; $\varnothing_2 = 0.60$; $\varnothing_3 = 2.00$; $\varnothing_4 = 6.50$.

A = 29.00; B = 20.00; C = 25.00; D = 45.00.





155

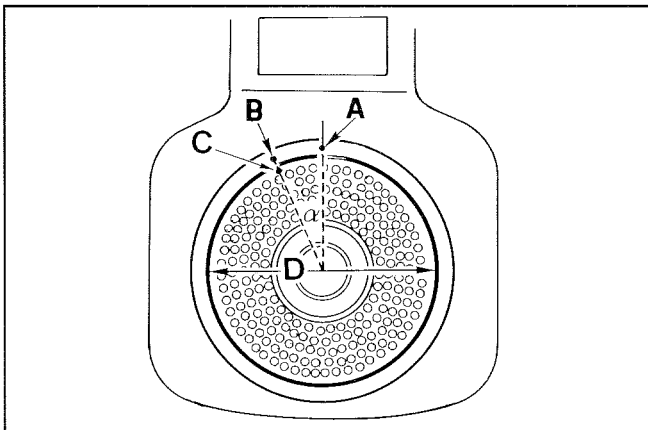
Injection timing check

Top up the tank checking that fuel level is at least 10 cm above checking device.

Adjust injection pump rack rod at half-stroke so that the plunger delay notch (if any) does not coincide with the fuel feed hole.

Turn the flywheel in normal engine direction of rotation and check that fuel reaches the checking device fitted on the injection pump delivery union.

Repeat this last operation; during compression proceed slowly and stop immediately when the fuel is seen pass through the checking device hole; bring flywheel back by 3 mm: this is the static injection timing.



156

Injection timing reference marks on blower housing and flywheel disk guard

A Piston reference mark at the top dead center

B Injection timing reference mark compared to **A**

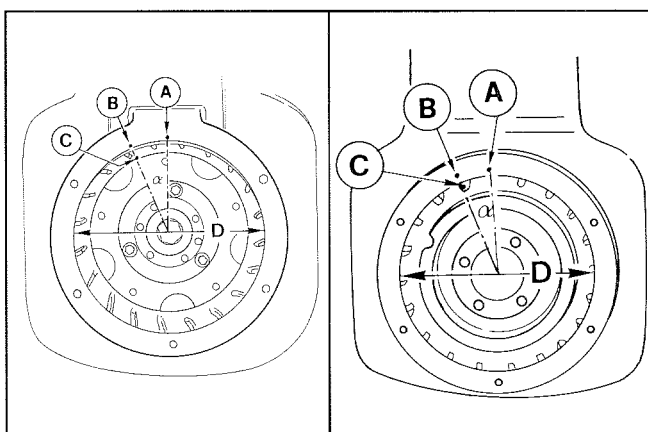
A ÷ B Distance in mm

C Piston reference mark at injection timing position

α Reference angle in degrees

D Flywheel disk guard diameter

Engine type	(A ÷ B) mm	α	D
6LD260 6LD260/C 6LD325 6LD325/C 6LD360 6LD360/V 6LD400 6LD400/V	35 ÷ 38	24° ÷ 26°	168
6LD360 AGR 6LD400 AGR	38 ÷ 41	26° ÷ 28°	
6LD435 6LD435/V	23 ÷ 26	16° ÷ 18°	



157

158

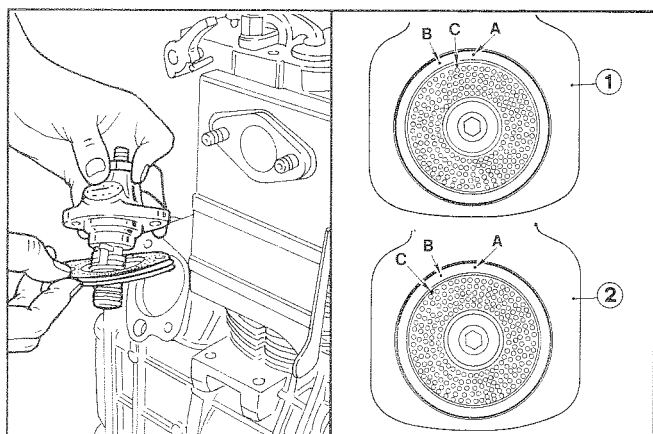
Injection timing reference marks on blower housing and flywheel

Engines type 6LD325, 6LD360 for small-size vehicles (Fig. 157), 6LD401/B1 and 6LD435/B1 for generating sets (in compliance with EEC standards) (Fig. 158) do not feature the flywheel disk guard with dia. 168 mm.

Injection timing is thus measured along the blower housing circumference whose diameter **D** = 180 mm.

The **A**, **B**, **C** and α references are the same as Fig. 156.

Engine type	(A ÷ B) mm	α	D
6LD325 for small-size vehicles 6LD360 for small-size vehicles	39 ÷ 42	25° ÷ 27°	180
6LD401/B1 for generating sets. (EEC standards)	33 ÷ 34,5	21° ÷ 22°	
6LD435/B1 for generating sets. (EEC standards)	30 ÷ 31,5	19° ÷ 20°	



159

160

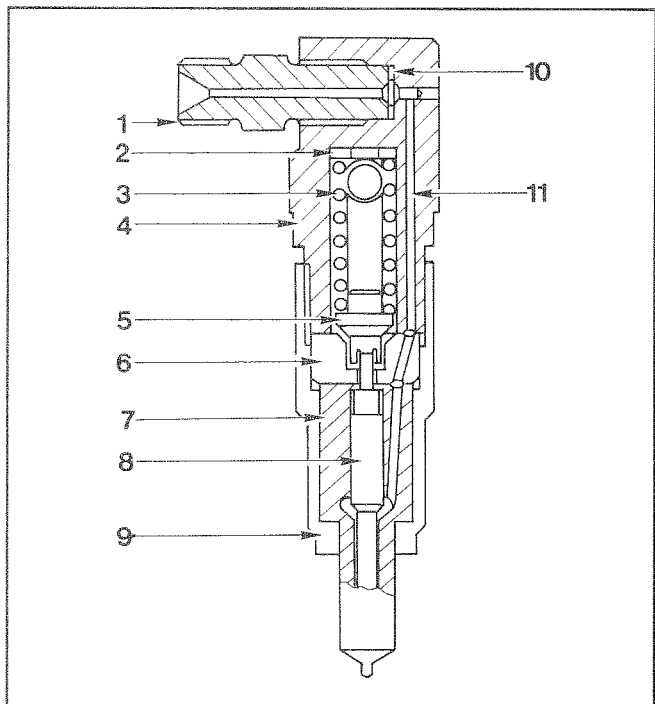
Injection timing correction

If reference mark **C** does not match with **B** follow examples 1 and 2.
 1 Example of late injection timing: remove shims under the pump to make **C** match with **B**.

2 Example of early injection timing: add shims under the pump to make **C** match with **B**.

Note: By adding or removing a 0.1 mm shim under the pump, **C** is delayed or advanced by approximately 2.5 mm.

Shims available as spares have a thickness of 0.1, 0.3, 0.5 mm.

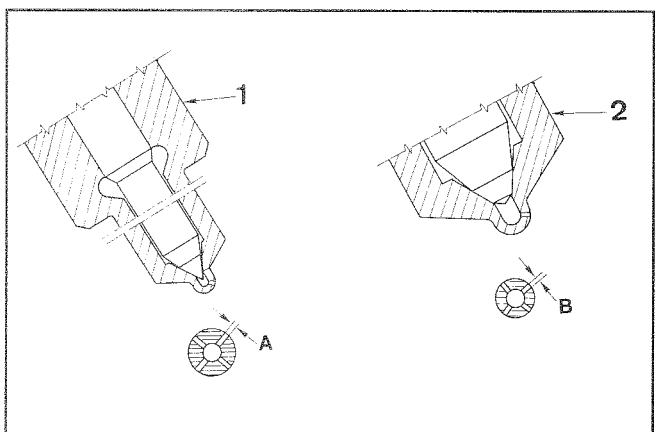


161

INJECTOR

- 1 High pressure fitting
- 2 Adjusting shim
- 3 Spring
- 4 Nozzle holder
- 5 Pressure rod
- 6 Intermediate flange
- 7 Nozzle
- 8 Needle valve
- 9 Nozzle cup
- 10 Gasket
- 11 Drilling

When refitting tighten nozzle cup **9** to 68 Nm.



162

Nozzle

1 For engines type 6LD260, 6LD260/C

Features:

A = 4x0.25 mm (hole number and diameter)

Hole length = 0.8 mm

Spray angle = 155°.

2 For engines type 6LD325, 6LD325/C, 6LD360, 6LD360/V, 6LD400, 6LD400/V, 6LD435, 6LD435/V

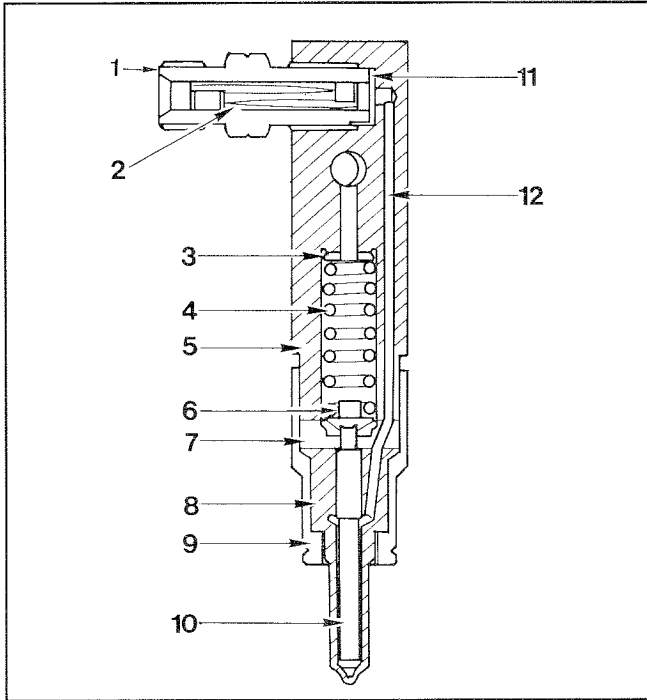
Features:

B = 4x0.24 mm (hole number and diameter)

Hole length = 0.6 mm

Spray angle = 160°.





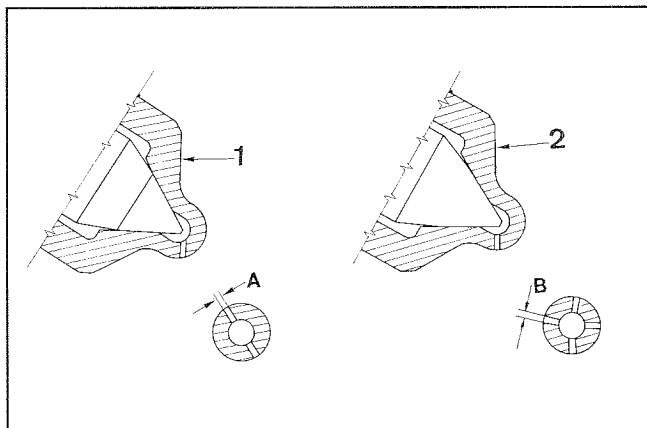
Injector type "P"

- 1 High pressure fitting
- 2 Filter
- 3 Adjusting shim
- 4 Spring
- 5 Nozzle holder
- 6 Pressure rod
- 7 Intermediate flange
- 8 Nozzle
- 9 Nozzle cup
- 10 Needle valve
- 11 Gasket
- 12 Duct

Injector type "P" is fitted to engine type 6LD401/B1 and 6LD435/B1 whose noise level is in compliance with the EEC regulations. The injector body is smaller than in the other engines of the same series. A filter is located inside intake fitting 1. When refitting tighten cup 9 to 50 Nm.

Note: Filter 2 cannot be removed. It is normally maintenance-free. If filter clogs, replace fitting.

163



Nozzle for injector type "P"

- 1 For 6LD401/B1

Features:

A = 2x0,20 mm (hole number and diameter)

Hole length = 0,6 mm

Spray angle = 140°

- 2 For 6LD435/B1

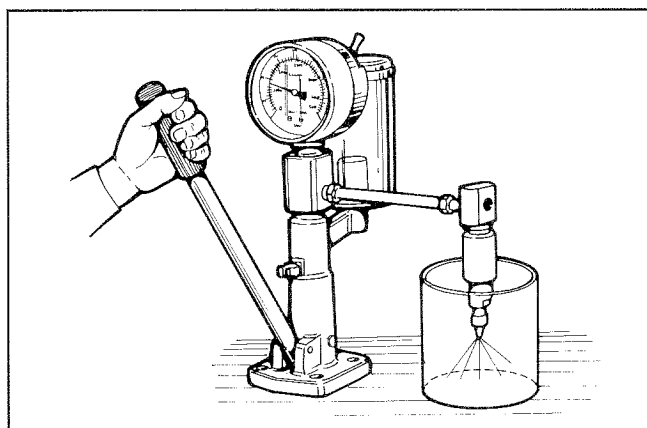
Features:

B = 4x0,20 mm (hole number and diameter)

Hole length = 0,6 mm

Spray angle = 150°.

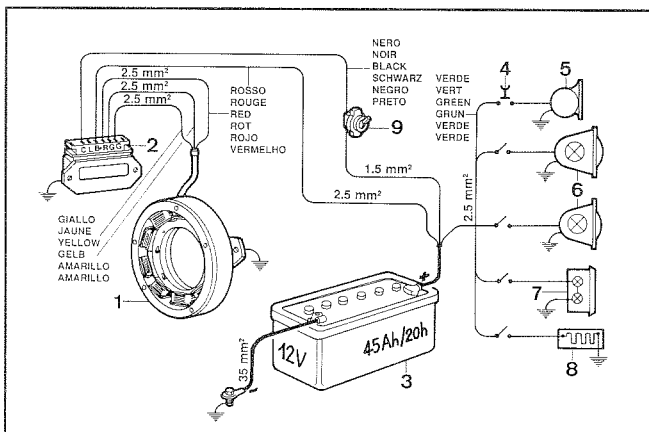
164



Injector setting

Connect the injector to an injector tester and check that setting pressure is 190 ÷ 200 bar (for injector type "P" = 200 ÷ 210 bar); make the required adjustments, if any, by changing the shim over the spring. When replacing the spring, set should be at 10 bar greater pressure than nominal (200 ÷ 210 bar) to allow for bedding during operation. Check needle valve sealing by slowly moving hand pump until approximately 180 bar. Replace nozzle in case of dripping.

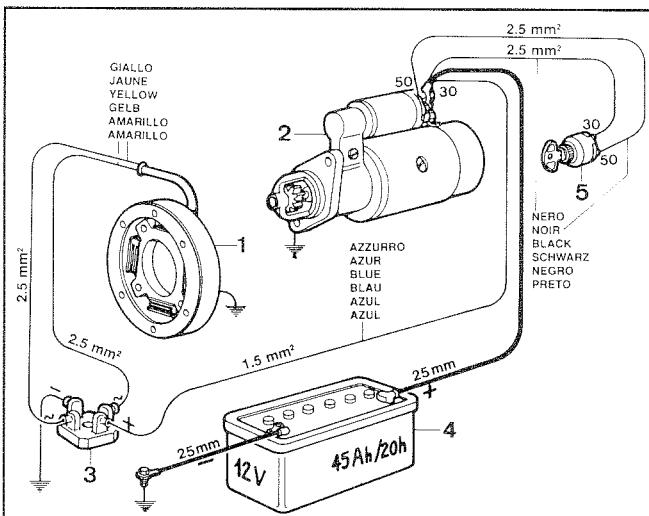
165



Lighting system, 12V 14A, with battery charger voltage regulator

- Components:
- 1 Alternator
 - 2 Voltage regulator
 - 3 Battery
 - 4 Push-button
 - 5 Horn
 - 6 Front lights
 - 7 Rear lights
 - 8 Heating system
 - 9 Switch

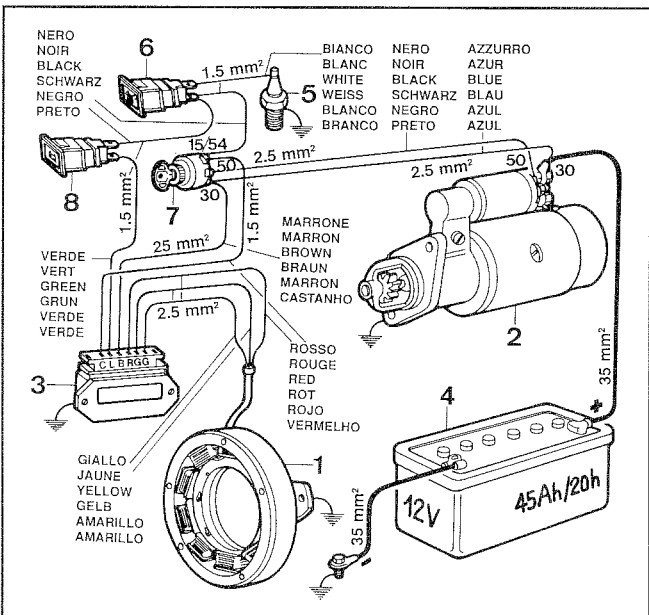
166



Electrical schematic 12V, 4A, with battery charger rectifying bridge

- Components:
- 1 Alternator
 - 2 Starter motor
 - 3 Rectifying bridge
 - 4 Battery
 - 5 Key switch

167



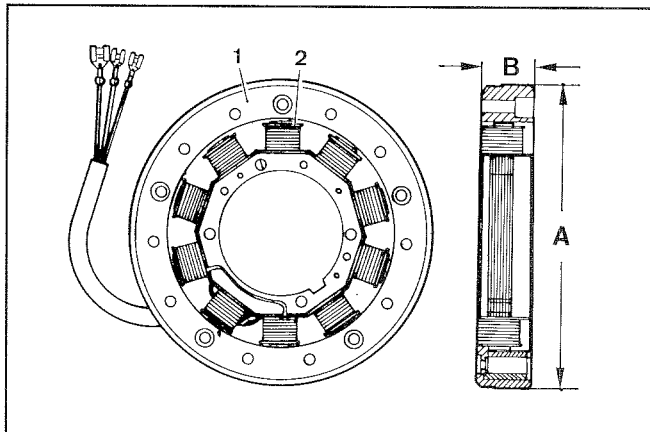
Electrical schematic 12V, 14A, with voltage regulator, battery charging light and pressure switch

- Components:
- 1 Alternator
 - 2 Starter motor
 - 3 Voltage regulator
 - 4 Battery
 - 5 Pressure switch
 - 6 Oil pressure light
 - 7 Key switch
 - 8 Battery charging light

Note: Battery, which is not supplied by Lombardini, should be a 12V nominal and a capacity of not less than 45 Ah.

168





169

Alternator 12,5V, 14A

Features a fixed stator winding, housed on the bearing support on the flywheel side.

The rotating permanent magnet inductor is located in the flywheel.

1 Inductor

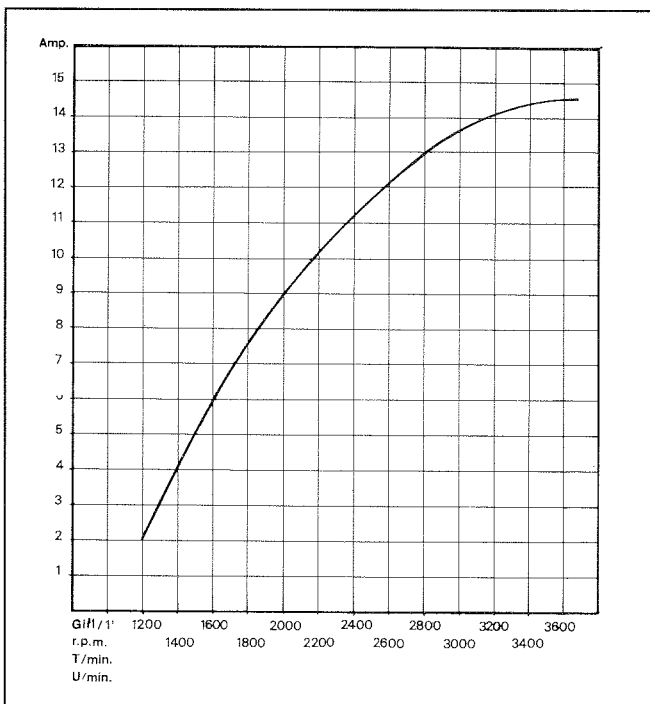
2 Stator winding

Dimensions (mm):

A = 158,80 ÷ 159,20

B = 27,50 ÷ 27,90

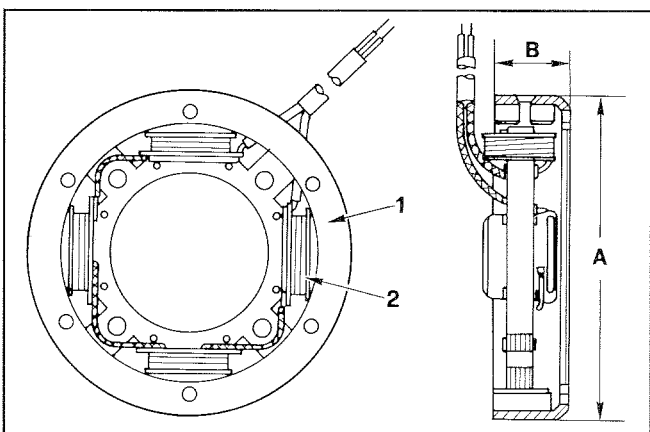
Clearance between armature winding and inductor (air gap) should be 0,48 ÷ 0,60 mm.



170

Alternator battery charger curve (12.5V, 14A)

(+ 25°C ambient with 12.5V battery voltage).



171

Alternator, 12V 4A

1 Inductor

2 Stator winding

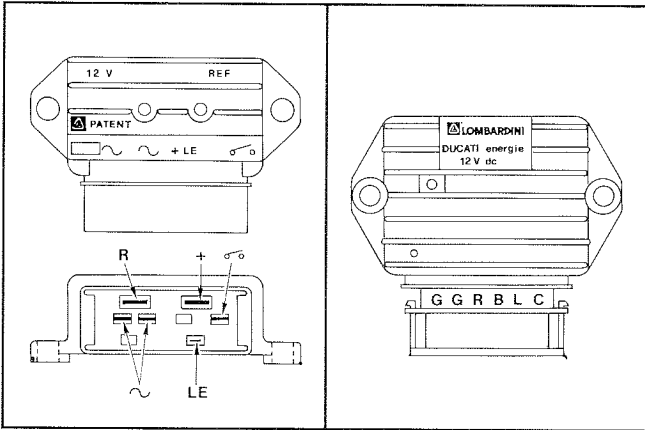
Dimensions (mm):

A = 122,8 ÷ 124

B = 28,3 ÷ 29,6

Clearance between stator winding and inductor (air gap) should be 0.40 ÷ 0.60 mm.

Note: For direct current battery charging systems with bridge rectifier and 12V battery, power at 2000 r.p.m. is 50W (fig. 167).



172

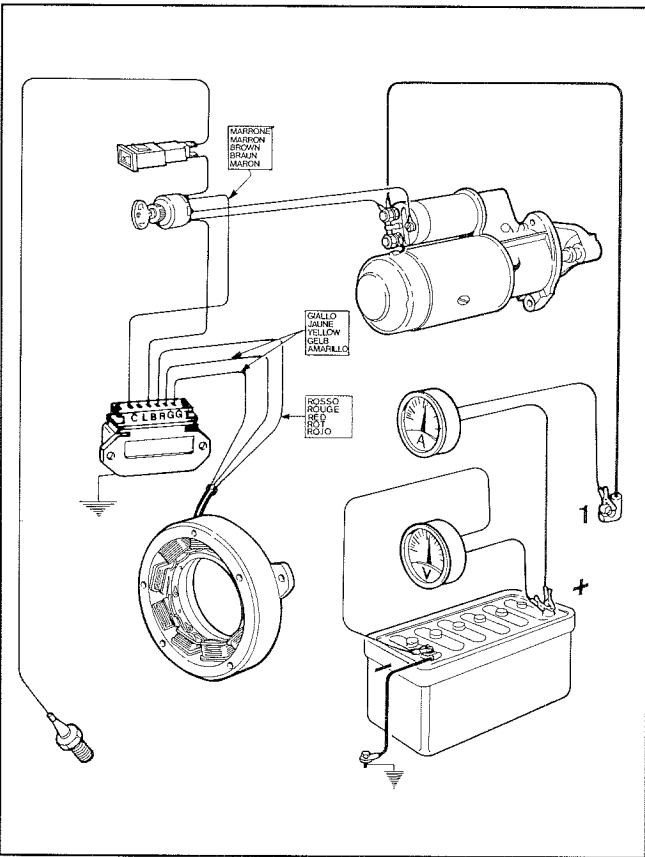
173

Voltage regulator

Type LOMBARDINI, supplied by AETSA SAPRISA, NICSA and DUCATI: voltage 12V, max. current 26 A.

To avoid wrong connections 3 different tab sizes are provided.

AETSA, SAPRISA NICSA	DUCATI	TAB DIMENSIONS mm	
		WIDTH	THICKNESS
~	G	6,35	0,8
R	R	9,50	1,2
+	B	9,50	1,2
LE	L	4,75	0,5
	C	6,35	0,8



174

Testing voltage regulator for proper operation

Check that connections correspond to the schematic.

Disconnect the terminal from the battery positive pole.

Connect a d.c. voltmeter between the two battery poles.

Fit an ammeter between the positive pole and the corresponding cable 1 terminal.

The ammeter should be suitable for reading the required value (14A) and for withstanding the starting motor peak absorption (400 ÷ 450A). Start and stop the engine a several times until battery voltage drops below 13V.

When battery voltage reaches 14.5V the ammeter current should suddenly drop down to almost zero.

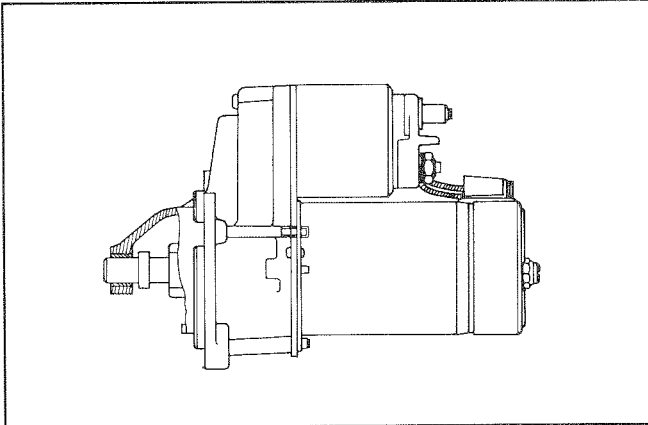
Replace regulator if recharge current is zero with voltage below 14V.

Warning: When the engine is running do not disconnect battery cables or switch key to "off" position.

Keep regulator away from heat sources above 75°C.

Do no electric weld on engine or application.



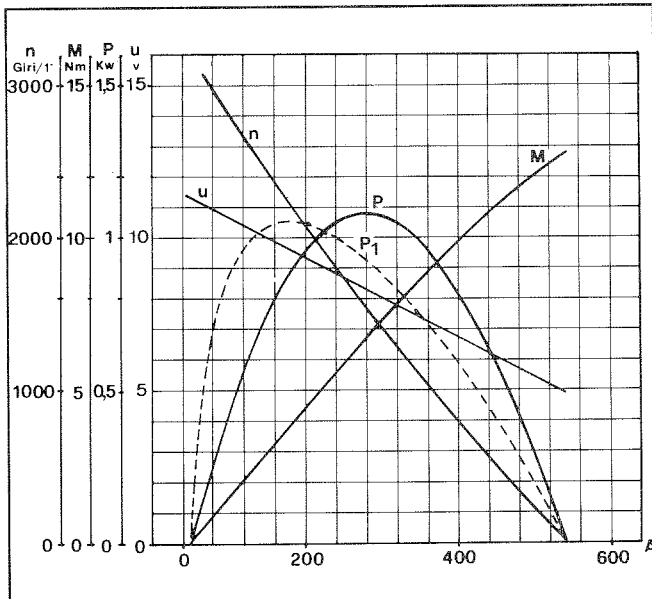


175

STARTING MOTOR (standard)

Type: Valeo D6 RA19 1 kW 12V

Counterclockwise direction of rotation (viewed from pinion side).

Note: Apply to Valeo Service Centers for any type of repair.

176

Characteristic curves for starting motor type Valeo D6 RA19 1 kW 12 V

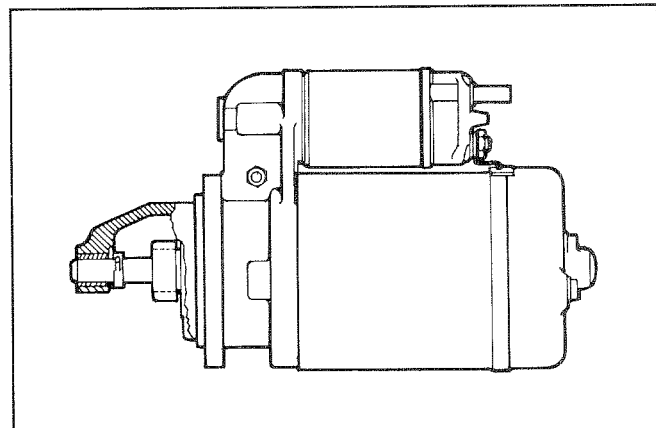
The continuous line curves were obtained at a temperature of +23°C.
 The dotted line curve P₁ was obtained at a temperature of -20°C.

U = Motor terminal voltage in Volts**n** = Motor speed in r.p.m.**A** = Absorbed current in Ampere**P** = Power in kW**M** = Torque in N/m

Reduction ratio = 5,54:1

Max. permissible battery ≤ 67 Ah - 400 A

Commonly used battery = 54 Ah - 265 A

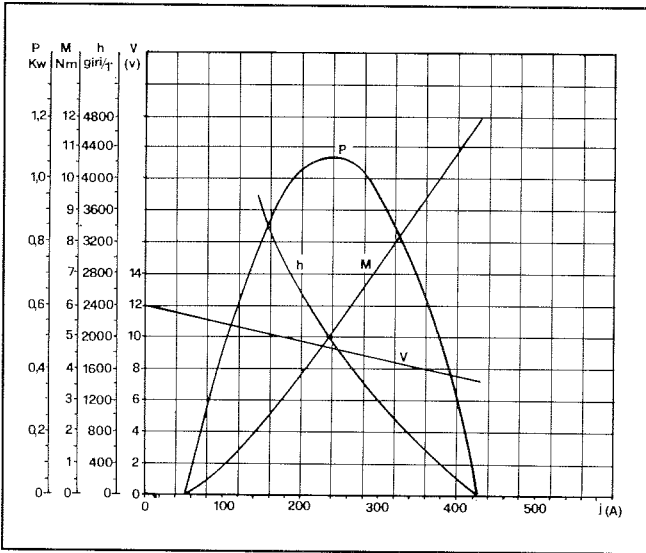


177

Starting motor type Bosch EF (L) - 12V, class 1 (optional)

Counterclockwise direction of rotation (viewed from pinion side).

Note: Apply to Bosch Service Centers for any type of repair.



178

Characteristic curves for starting motor type Bosch EF (L) - 12V, Class 1

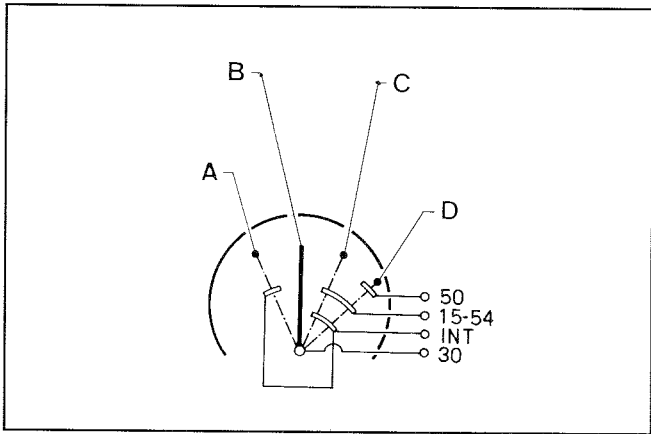
Curves were obtained at a temperature of +20°C with 56Ah battery at half charge.

V = Motor terminal voltage in Volts
n = Motor speed in r.p.m.

M = Torque in Nm

P = Power in kW

J (A) = Absorbed current in Ampere.

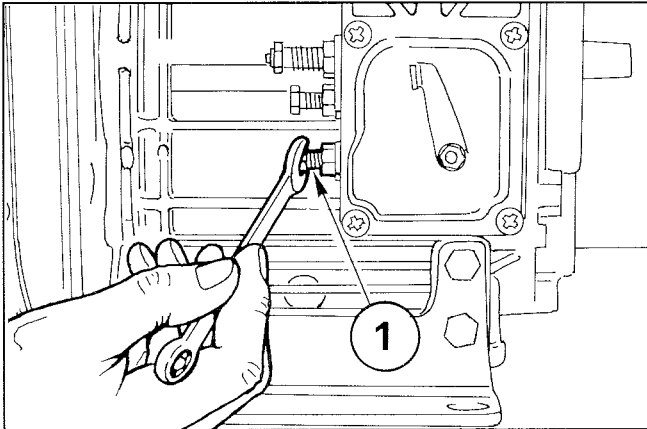


179

Key switch positions

- A** = Accessory
- B** = Off
- C** = On
- D** = Start



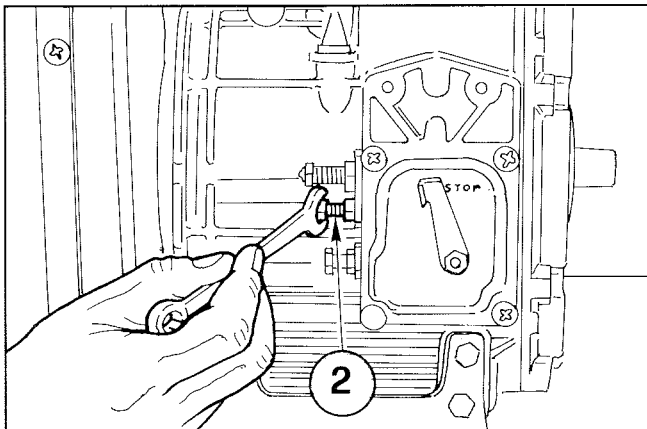


180

1) Idle speed setting in no-load conditions (standard)

After filling with oil and fuel, start the engine and warm up for 10 minutes. Adjust idling speed at 1000 ÷ 1200 r.p.m. by turning setscrew 1; then tighten lock nut.

Note: Idling speed setting in no-load conditions for engines type 6LD401/B1 and 6LD435/B1 is 2200 r.p.m. Idling speed setting for engines fitted to small-size vehicles is 950 ÷ 1000 r.p.m.

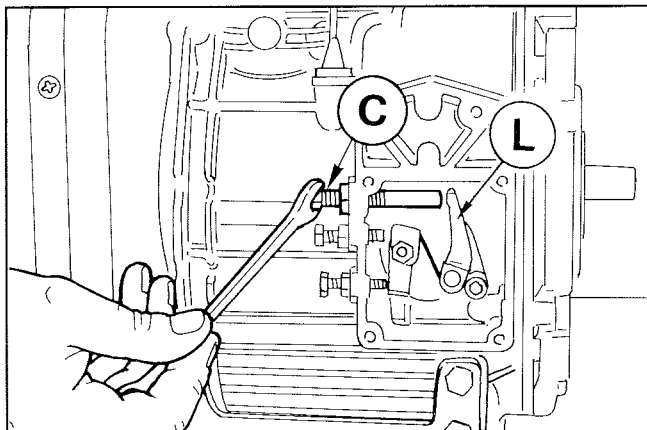


181

Full speed setting in no-load conditions (standard)

After setting idle speed turn screw 2 and set full speed in no load conditions at 3800 r.p.m.; then tighten lock nut.

Note: Full speed setting for engines type 6LD400/B1 and 6LD435/B1 is 3150 r.p.m.



182

Injection pump delivery setting

Setting should be performed with engine on a torque dynamometer. If not, setting is only approximate.

The following steps are required:

Loosen delivery limiting device **C** by 5 turns.

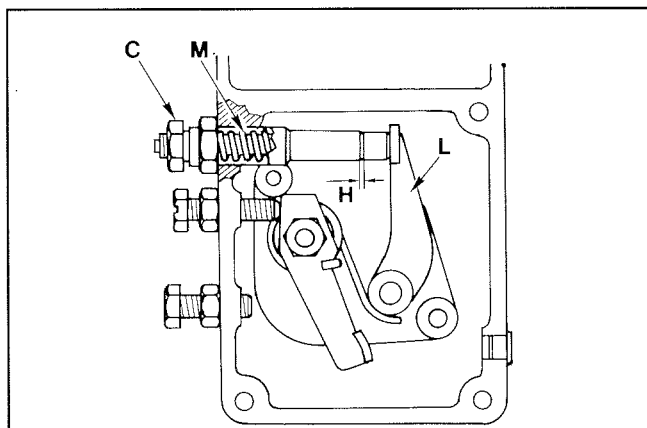
Bring engine to full speed in no-load conditions, i.e. 3800 r.p.m.

Tighten delivery limiting device **C** until it touches lever **L**.

Unscrew delivery limiting device **C** by 1 1/2 turns.

Tighten lock nut.

Note: If the engine, under full load, generates too much smoke tighten **C**; if no smoke is observed at the exhaust and the engine cannot reach full power unscrew **C**.



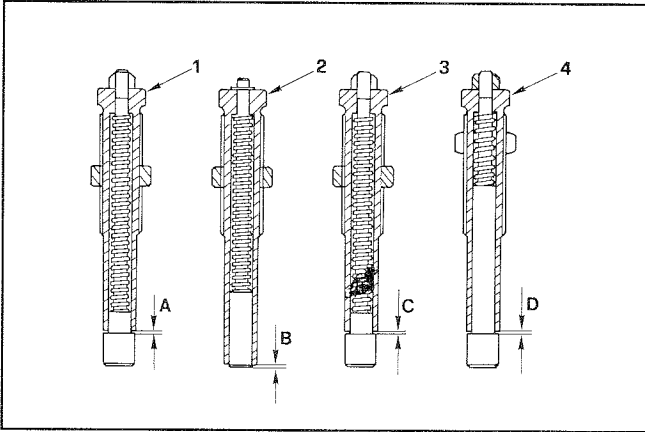
183

Injection pump delivery limiting and torque device (standard)

Delivery limiting device **C** has the function of limiting the injection pump max. delivery.

The same device also acts as torque device. The speed governor spring (Pos. 9 fig. 98) acts on lever **L** withstanding the resistance opposed by spring **M** inside the cylinder.

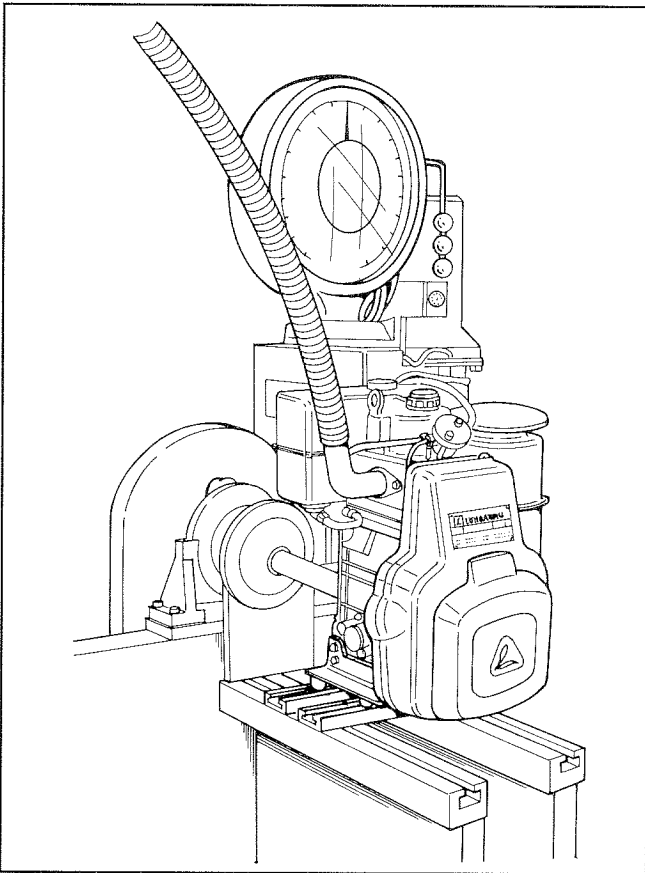
The stroke **H** allowed by the torque device to lever **L** is 0,3 ÷ 0,4 mm. As a result of this pump delivery increases and torque reaches its peak value.



184

Different types of injection pump delivery limiting and torque adjusting device

- | | |
|---|---------------------------|
| 1 Standard; | A = 0,3 ÷ 0,4 mm |
| 2 Engines for generating sets with weight-type governor | B = 0,2 ÷ 0,4 mm |
| 3 For 6LD360 (small-size vehicles); | C = 0,55 ÷ 0,65 mm |
| 4 For 6LD325 (small-size vehicles); | D = 0,65 ÷ 0,75 mm |



185

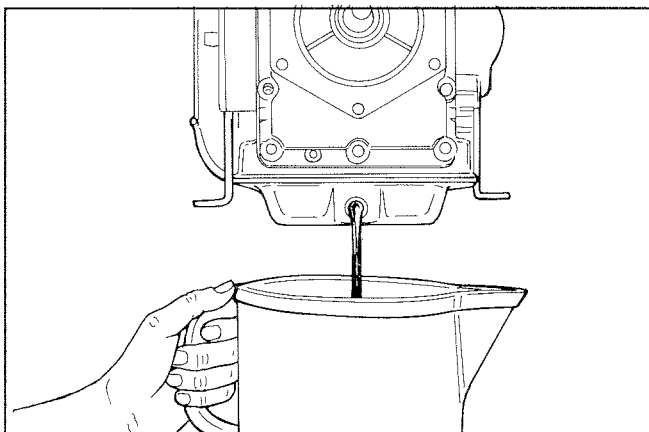
Injection pump delivery setting with engine on torque dynamometer

- 1) Bring engine to idling speed, warm-up.
- 2) Unscrew delivery limiting device **C** (See page 182).
- 3) Bring the engine to the power and r.p.m. required by the customer of the device.
- 4) Check that fuel consumption falls within the table specifications (see below). If consumption is not as indicated, change balance conditions at the torque dynamometer by varying the load and adjusting the governor.
Under stable engine conditions check consumption again.
- 5) Tighten limiting device **C** until the engine r.p.m. decreases. Lock the limiting device by means of lock nut.
- 6) Release brake completely and check at what speed the engine becomes stable.
Speed governor should comply with the requirements of the class indicated by the customer.
- 7) Stop the engine.
- 8) Check valve clearance when the engine has cooled down.

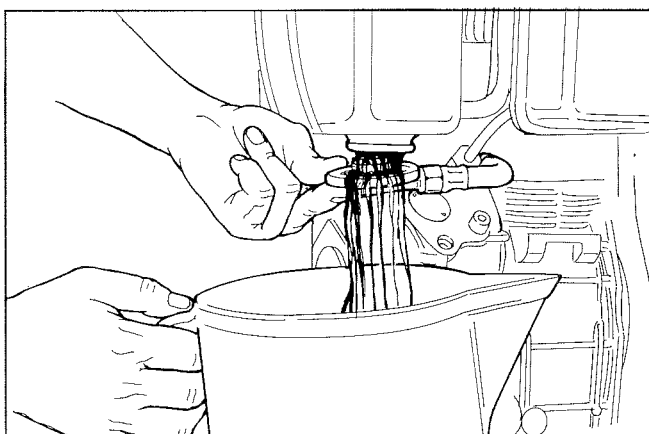
Required settings (as most commonly applies)

Engine	r.p.m.	Power kW	Specific fuel consumption	
			Time (sec.) per 100 cm ³	g/kW h
6LD260	3600	3,7	235 ÷ 255	316 ÷ 343
6LD325		5,0	182 ÷ 198	301 ÷ 327
6LD360		6,0	161 ÷ 177	282 ÷ 310
6LD400		6,25	154 ÷ 169	282 ÷ 310

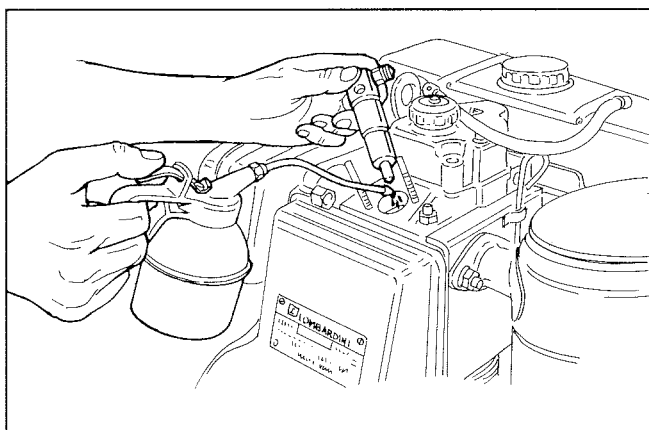




186



187



188

STORAGE

Prepare engines as follows for storage over 30 days.

Temporary protection (1 ÷ 6 months)

- Let engine run at low idle speed in no-load conditions for 15 minutes.
- Fill crankcase with protection oil MIL-1-644-P9 and let engine run at 3/4 speed for 5 ÷ 10 minutes.
- When engine is warm empty oil sump and fill with standard new oil.
- Remove fuel filter cover and empty the tank.
- Remove fuel filter, replace cartridge.
- Carefully clean cylinder fins, cylinder and head.
- Seal all openings with tape.
- Remove the injector, pour a spoonful of oil type SAE 30 into the cylinder and rotate manually to distribute the oil. Refit the injector.
- Spray oil type SAE 10W into exhaust and intake manifolds, rocker arms, valves, tappet, etc., Grease all unpainted parts.
- Wrap the engine in a plastic film.
- Store in a dry place, if possible not directly on the soil and far from high voltage electric lines.

Permanent protection (over 6 months)

The following is recommended apart from the above instructions:

- For the lubrication and injection system as well as for moving parts use rustproof oil type MIL-L-21260 P10 grade 2, SAE 30 (Ex.: ESSO RUST - BAN 623 - AGIP, RUSTIA C. SAE 30). Let the engine run with rustproof oil and drain any excess.
- Coat external unpainted surfaces with antirust type MIL-C-16173D - grade 3 (ex.: ESSO RUST BAN 398 - AGIP, RUSTIA 100/F).

How to prepare the engine for operation

- Clean engine outside.
- Remove protections and covers.
- Remove antirust by an appropriate solvent or degreaser.
- Remove injector, fill with standard oil, turn crankshaft by a few revolutions, remove oil pan plug and drain the protective oil.
- Check injector setting, valve clearance, head tightening, oil filter and air cleaner. If the engine is stored over a long period of time (over 6 months) check one of the crankshaft bearings for corrosion.