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GENERAL FEATURES	3 cylinders	4 cylinders
Type of engine:		
– mod. TL60E, aspirated type 8035.05.214/215 (BOSCH pump)	See data on pg. 6–7	–
– mod. TL75E, aspirated type 8045.05R.214/215 (DELPHI pump).....	–	See data on pg. 8–9
– mod TL85E with turbo charger – type 8045.25.203/204/205 (DELPHI pump)	–	See data on pg. 8–9
– mod. TL95E with turbo charger – type 8045.25k.213/215 (DELPHI pump).....	–	See data on pg. 8–9
Cycle.....	Diesel, 4 stroke	Diesel, 4 stroke
Injection	Direct	Direct
N°. of in–line cylinders	3	4
Piston diameter		
– mod TL60E	104 mm	–
– mod TL75E	–	104 mm
– mod TL85E	–	104 mm
– mod TL95E	–	104 mm
Piston stroke.....	115 mm	115 mm
Total cylinder capacity:		
– mod TL60E	2931 cm^3	–
– mod TL75E	–	3613 cm^3
– mod TL85E	–	3613 cm^3
– mod TL95E	17:1 Aspirated	3613 cm^3
Compression ratio	16.5:1 Turbo	17:1 Aspirated
Maximum power		
– mod TL60E	44.5 Kw (65 cv)	16.5:1 Turbo
– mod TL75E	–	–
– mod TL85E	–	56 Kw (80 cv)
– mod TL95E	–	63 Kw (90 cv)
Maximum power rpm.....	2500 rpm	70 Kw (100 cv)
Max. torque rpm: mod TL60E.....	1500 rpm	2500 rpm
Max. torque rpm: mod TL75E.....	–	1400
Max. torque rpm: mod TL85E.....	–	1500
Max. torque rpm: mod TL95E.....	–	1500
Number of main bushings.....	4	5
Sump	Cast iron	Cast iron

GENERAL FEATURES	3 cylinders	4 cylinders
Lubrication	forced, with gear pump	
Pump control	from distribution shaft	
Engine rpm and oil pump ratio	2:1	
Oil filtering	through screen filter for aspiration and cartridge for output	
Normal oil pressure with engine hot and running at maximum rpm:	2.9 – 3.9 bar, (3 – 4 kg/cm^2)	
Pressure limiting valve	located on the pump body	
Initial valve opening pressure	3.5 bar (36 kg/cm^2)	
For more technical data on lubrication	See page 16	
Cooling	water circulation	
Radiator for mod. TL60E and TL75E	three rows of vertical tubes with copper fins	
Radiator for mod TL85E, TL95E	four rows of vertical, copper tubes	
Fan fastened to the water pump pulley	aspiration with 6 steel blades	
Water pump	centrifugal with blades	
Engine rpm and water pump ratio	1:1.403	
Temperature control	with thermostat	
Water thermometer	with color scale divided into 3 sections	
Corresponding temperatures for each section:		
– Initial blue range	30° : 65° C	
– Central green range	65° : 105° C	
– Final red range	105° : 115° C	
For more technical data about the cooling installation	See page 16	
Rev count	incorporated to the control panel	
Drive	originated from the distribution shaft gear	
Gauge calibrated for engine at	1800 rpm	
Distribution	with overhead valves controlled by cams, rods and rocker arms through the distribution control shaft located on the base and controlled by the crankshaft through helical gears.	
Aspiration:		
– start: before TDC	12°	
– finish: after BDC	31°	
Discharge:		
– start: before BDC	50°	
– finish: after TDC	16°	

GENERAL FEATURES	3 cylinders	4 cylinders
Play between the rocker arms and valves to control the valve opening and closing diagram	0.45 mm	
Operating play between the valves and rocker arms with cold engine:		
– intake	0.30 ± 0.05 mm	
– exhaust	0.30 ± 0.05 mm	
For more technical data on distribution	See page 13	
Power Supply		
Air filtering	through dry air filter with dual cartridge, light indicator for clogged centrifugal pre–filter and automatic dust discharge.	
Feeding pump	with dual membrane	
Fuel filtering	through screen filter at the feeding pump, one filter with replaceable cartridge at the injection pump feed	
Minimum fuel capacity with rotary control shaft at 1600 rpm	100 liters/hour	
Cam controlled	driven by the engine distribution	
BOSCH injection pump	with rotary distributor	
DELPHI injection pump	with rotary distributor	
Speed regulator for all speeds incorporated in the pump:		
BOSCH	with centrifugal mass	
DELPHI	with centrifugal mass	
Automatic advance variator incorporated in the pump:		
BOSCH	hydraulic	
DELPHI	hydraulic	
For more technical data on power supply:		
Fixed anticipation (point of pump in the engine to start injection before TDC) – Calibrating pressure – Injection order and other information that complete the data on the BOSCH and DELPHI pumps.	Check based on engine type on the prospect indicated on page 2	

MAIN FEEDING DATA

Turbo charger (models TL85E, TL95E):	
– GARRET type	TA3118 – 0.82 A/R 57
Injection pump	with incorporated rotating distributor and automatic advance regulator
BOSCH pump:	
– mod. TL60E	VE 3/11F 1250 L 163 – 4794586
DELPHI pump:	
– mod. TL75E	DELPHI DP150
– mod. TL85E	DELPHI DP 150
– mod. TL95E	DELPHI DP 150
Direction of rotation	counterclockwise
Injection sequence	1 – 2 – 3 (TL60E) 1 – 3 – 4 – 2 (TL75E, TL85E, TL95E)

	TL60E	TL75E	TL85E	TL95E
Injectors				
BOSCH type	4800029	-	-	-
– Injection holder type	4791124	-	-	-
– Injector type	4800030	-	-	-
DELPHI TYPE	–			
– Injection holder type	–	KBEL83S35	KBEL83S35	KBEL83S35
– Injector type	–			
Number of holes	3	-	-	-
Diameter of injector holes	0,35	-	-	-
Calibration pressure (bar)	230–242	-	-	-
BOSCH pump injection piping				
– type	4797506	-	-	-
– pipe dimension mm	6x1.5x475	-	-	-

MOD. TL60E – CALIBRATION DATA FOR BOSCH INJECTION PUMP TYPE VE 3/11 F 1250 L 163

ASSEMBLY DATA

Pump point in engine: start of injection 6°± 1° before TDC on cylinder 1 in the compression stroke.

Pre-displacement of pumping element to set at the pump point in the engine: 1 mm from BDC (with tool **380000228 – 380000229**)

Pump outlet connection relative to cylinder # 1 marked with letter A.

ASSEMBLY SIZES

SYMBOL	SUS (max.)	KF	MS	ya	yb
mm	4.30	5.1-5.3	1.5-1.7	37.9-39.9	44.5-49.5

CALIBRATION TEST CONDITIONS

Test bench according to norm ISO 4008/1.../2

Injectors according to norm ISO 7440-A61 – (1688901020 and pad with calibrated orifice Ø 0.6 mm)

Injector calibration: 172 – 175 bar (175 – 178 kg/cm^2).

Feed pressure: 0.35 ± 0.05 bar (kg/cm^2).

Piping (according to norm ISO 4093.2): 6 x 2 x 840 mm

Burette emptying time: 30"

Test fluid: ISO 4113 at a temperature of 45° ± 1°C.

1. BEGINNING OF INJECTION		
Pre-displacement of pumping element for BDC mm 0.2 ± 0.02 (0.04)	Pump rotation (control side): counterclockwise	Injection sequence: 1 – 2 – 3

2. ADVANCE VARIATOR DISPLACEMENT	
Rpm: 800	Advance displacement: 2.7 ± 0.2 mm

3. FEED PUMP PRESSURE	
Rpm: 800	Internal feed pressure: 4.1 ± 0.3 bar

4. VOLUME AT FULL LOAD		
Rpm: 750	Volumes for 1000 injections 69 ± 0.5 cm^3	Deviation: < 3.5 (3.5) cm^3

5. DEVIATION CURVE WITH REGULATOR ON MINIMUM		
Rpm: 350	Volumes for 1000 injections 23 ± 2 cm^3	Deviation: < 3.5 (3.5) cm^3

6. DEVIATION CURVE WITH REGULATOR ON MAXIMUM		
Rpm: 1400	Volumes for 1000 injections 20 ± 2 cm^3	Deviation: – cm^3

7. VOLUME AT STARTING RPM	
Rpm: 100	Volume for 1000 injections: 80 to 130 cm^3

8. EVOLUTION OF TRANSFER PRESSURE			
Rpm	800	500	1200
Internal feed pressure bar	3.8 – 4.4	2.5 – 3.1	5.5 – 6.1

9. EVOLUTION OF INJECTION ADVANCE			
Rpm	800	600	1200
Advance displacement mm	2.5 -2.9 (2 – 3.4)	0.8 – 1.6 (0.5 – 1.9)	5.6 – 6.4 (5.3 – 6.7)

10. RETURN FLOW		
Rpm	0	1250
Return flow cm^3/10 sec.	41,7 – 83,4 (26,7 – 98,4)	55,6 – 139 (40,6- 153)

NOTE: The volumes indicated above in parenthesis are to be used solely as check values.

11. EVOLUTION OF FLOWS	
Rpm	Volumes for 1000 injections cm^3
1460	1.5 (± 1.5)
1400	18 – 22 (15.5 ± 24.5)
1350	42 – 58
1250	68.5 – 71.5 (66.5 – 73.5)
750	68.5 – 69.5 (66 – 72)
500	59 – 62 (57 – 64)

12. FLOW CHECK AT MINIMUM RPM			
Rpm		350	475
Volumes for 1000 injections	cm^3	21 – 25 (19 – 27)	0 – 3.0

OBS: The volumes indicated above in parenthesis are to be used solely as check values

13. MECHANICAL ZERO (STOPPAGE) FLOW		
Rpm	Voltage	Volumes for 1000 injections cm^3
1250	12	0-3

14. ELECTRICAL ZERO (STOPPAGE) FLOW		
Rpm	Voltage	Volumes for 1000 injections cm^3
350	–	0-3

15. AUTOMATIC STARTING FLOW EVOLUTION	
Rpm	Volumes for 1000 injections cm^3
100	80 – 130
250	25 – 65
350	90 – 140

BENCH TEST DATA					
Test conditions Fixed tdc injection advance for cylinder # 1 in the compression stroke (see previous page). Engine without fan, air filter and exhaust muffler. Atmospheric pressure: 740 ± 5 mm Hg (Turim altitude).			Relative humidity 70% ± 5 Ambient temperature 20 ± 3 °C Diesel fuel specific weight 830 ± 10 g/liter		
Throttle lever position	Load applied on brake	Engine revolution (rpm)	Corresponding power with the engine running for:		Fuel consumption kg/h
			2 hours Kw (cv)	50 hours Kw (cv)	
Maximum	To develop maximum power	2500	> 40.4 (55)	> 41.9 – 44.1 (57 – 60)	9.7 – 10.2
Maximum	To develop maximum torque	1500	> 28.3 (38.5)	29.4 – 31.25 (40 – 42.5)	6.4 – 6.8
Maximum	Null (on empty)	2750 – 2790	–	–	–
Minimum	Null (on empty)	625 – 675	–	–	–

MOD. TL75E, TL85E – CALIBRATION DATA FOR DELPHI INJECTION PUMP TYPE DP 150

ASSEMBLY DATA

Pump point in engine: start of injection (degrees of engine flywheel) 12°± 1° before TDC on cylinder 1 in the compression stroke.

Injection pump pumping element at start of strike (BDC) obtained with tool **380000215** (manual pump to test injection nozzles), applying Diesel fuel pressure at injection pump output **U**.

Pump outlet connection relative to cylinder # 1 marked with letter **U**.

CALIBRATION TEST CONDITIONS

Test bench according to norm ISO 4008/1.../2

Injectors according to norm ISO 7440-A61 – (1688901020 and pad with calibrated orifice Ø 0.6 mm)

Injector calibration: 172 – 175 bar (175 – 178 kg/cm^2).

Feed pressure: 0.35 ± 0.05 bar (kg/cm^2).

Piping (according to norm ISO 4093.2): 6 x 2 x 840 mm

Burette emptying time: 30"

Test fluid: ISO 4113 at a temperature of 45° ± 1°C.

1. BEGINNING OF INJECTION		
Pumping element at BDC	Pump rotation (control side): counterclockwise	Injection sequence: 1 – 3 – 4 – 2

FEED PUMP MAIN DATA	mm
Control shaft eccentricity	3
Control shaft diameter corresponding to the bushes	31.975 – 32.000
Internal diameter of bushes installed and finished in the housing	32.050 – 32.075
Interference between bushes and the housings	0.063 – 0.140
Assembly play between the shaft and bushings	0.050 – 0.100
Internal washer thickness	1.45 – 1.50
External washer thickness	2.93 – 3.00

BLOCK MAIN DATA	mm (cylinder) 104 mm
Block	cast iron monoblock, incorporates the housings for the distribution /tappet assembly shaft
Cylinder hole diameter	106.850 – 106.900
Grinding	0.4 – 0.8
External diameter oversize	0.2
Diameter of housing for the main bushings covers	84.200 – 84.230
Diameter of housings for control shaft bushings:	
– front	54.780 – 54.805
– intermediate	54.280 – 54.305
– rear	53.780 – 53.805
Diameter of tappet housings	15.000 – 15.018
Tappet oversize	0.1 – 0.2 – 0.3

([1]) Value to be obtained after installation through grinding

([2]) Take measurements on the ring working areas parallel and perpendicular to the crankshaft.

MAIN DATA FOR CRANKSHAFT AND BUSHINGS	**mm** (cylinder 104 mm)
Crankshaft (balancing)	with integral counterweights
Standard diameter of main seats	79.791 – 79.810 ([1])
Main seat diameter undersizes	0.254-0.508 – 0.762-1.016
Main bushings bushes standard thickness	2.168 – 2.178
Main bushings bushes undersizes (internal diameter)	0.254-0.508 – 0.762-1.016
Play between the seats and the main bushings	0.034 – 0.103
Maximum acceptable play from wear (main bushings)	0.180
Link conrod seat standard diameter	63.725 – 63.744 ([1])
Link conrod seat diameter undersizes	0.254-0.508 – 0.762-1.016
Link conrod standard thickness	1.805 – 1.815
Link conrod internal diameter undersizes	0.254-0.508 – 0.762-1.016
Play between the seats and the link conrod bushings	0.033 – 0.087
Maximum acceptable play from wear (link conrod bushings)	0.180
Crankshaft thrust link conrod standard thickness	3.378 – 3.429
Thrust link conrod additional thicknesses	0.127-0.254 – 0.381-0.508
Total width of thrust link conrods	31.766 – 31.918
Crankshaft main link conrods width	32.000 – 32.100
Assembled crankshaft longitudinal play	0.082 – 0.334
Maximum longitudinal play from wear (crankshaft)	0.40
Maximum ovalization and conicity of main seats and link conrod after grinding	0.01
Maximum ovalization and conicity from wear of main seats and link conrod	0.05
Maximum tolerance for warping supporting the crankshaft on the end seats	0.10
Maximum acceptable tolerance, both directions, in the link conrod seat alignment (3 cylinder engine), or each pair of link conrod seats (4 cylinder engine) relative to the main seats.	0.25
Maximum tolerance of eccentricity between the external surface of the main seats and the crankshaft center (imaginary line)	± 0.10

([1]) At production in the factory, there is an allowance in crankshaft assembly with main seats and link conrods reduced by 0.1 mm, and consequent relative reduction of bushes.

MAIN DATA FOR CRANKSHAFT AND BUSHINGS	**mm** (cylinder 104 mm)
Maximum acceptable tolerance for the flywheel support flange surface perpendicularity relative to the center of the crankshaft with centesimal gauge supported frontally (A, pg. 73) in a diameter of 108 mm (gauge reading)	0.025
Maximum acceptable tolerance for the flywheel centering flange coaxiality (B, pg. 73) relative to the main seats (total gauge reading).....	0.04

MAIN DATA FOR THE LINK CONRODS	**mm** (cylinder 104 mm)
Link conrods	cast iron with lubrication orifice
Diameter of the link conrod bush seat.....	41.846 – 41.884
External diameter of link conrod bush	41.979 – 42.017
Interference between the bush and link conrod seat.....	0.095 – 0.171
Internal diameter of the link conrod bush (measure after installing).....	38.004 – 38.014
Diameter of bush seat on the link conrod.....	67.407 – 67.422
Maximum tolerance for parallelism between the two controlled link conrod shafts at 25 mm	± 0.07
Maximum difference in link conrod weight in the same engine ...	25 grams

MAIN DATA FOR PISTONS	**mm** (cylinder 104 mm)
Pistons	Light alloy with three rings, two being sealants and one oil scraper
Standard diameter of pistons with 587 mm skirting base measured perpendicularly to the piston pin shaft	103.812 – 103.826
Maximum play from wear	0.30
Pistons oversize	0.4 – 0.8
Piston lug from TDC relative to the block	0.355 – 0.761
Diameter from pin to piston	37.983 – 37.990
Piston pin housing diameter	37.993 – 37.990
Play between the pin and piston housings	0.003 – 0.017
Play between the piston pin and bush	0.014 – 0.031
Maximum acceptable play from wear	0.06
Maximum difference in piston weight in the same engine	20 grams
Play between the rings and piston channels (vertically):	
– 1st ring	0.090 – 0.122
– 2nd ring	0.060 – 0.092
– 3rd ring	0.040 – 0.075
Maximum acceptable play from wear: (between rings and channels):	
– 1st ring	0.50
– 2nd and 3rd ring	0.20
Play between ring ends (installed):	
– 1st ring	0.40 – 0.65
– 2nd ring	0.30 – 0.55
– 3rd ring	0.30 – 0.60
Maximum acceptable play between ends from wear	1.20

MAIN DISTRIBUTION DATA	mm (cylinder 104 mm)
Play between distribution gear teeth	0.160
Internal diameter of distribution gear bushes (installed and finished in the seat)	37.050 – 37.075
Diameter of transmission gear bushing seat	36.975 – 37.000
Play between bushing seat and relative bushes	0.050 – 0.100
Maximum acceptable play from wear	0.15
Interference between the bush and seat on transmission gear	0.063 – 0.140
External diameter of bushings on the control shaft:	
– front	54.875 – 54.930
– intermediate	54.375 – 54.430
– rear	53.875 – 53.930
Interference between the bushes (control shaft) and the housings in the block	0.070 – 0.150
Internal diameter of the bushes on the control shaft (installed and finished in the block):	
– front	51.080 – 51.130
– intermediate	50.580 – 50.630
– rear	50.080 – 50.130
External diameter of seats on the control shaft:	
– front	50.970 – 51.000
– intermediate	50.470 – 50.500
– rear	49.970 – 50.000
Play between the seats and bushes	0.080 – 0.160
Maximum acceptable play from wear	0.20
Longitudinal play of control shaft	0.070 – 0.220

MAIN DATA FOR TAPPETS	mm (cylinder 104 mm)
Diameter of housing in the block	15.000 – 15.018
Standard tappet external diameter	14.950 – 14.970
Play between the tappet and block	0.030 – 0.068
Maximum acceptable play from wear	0.15
Tappet oversize	0.1 – 0.2 – 0.3

MAIN DATA FOR ROCKER ARMS – VALVES	mm (cylinder 104 mm)
Rocker arm hole diameters	18.016 – 18.034
Rocker arm holder shaft diameters	17.982 – 18.000
Play between the rocker arm holder and the rocker arms	0.016 – 0.052
Maximum acceptable play from wear	0.15
Characteristics of rocker arm separation spring:	
– Rated length of free spring	59.5
– spring length under a load of 46 – 52 N (4.7 – 53. kg)	44
Valve play for synchronization (diagram)	0.45
Valve play for engine operation (cold):	
– intake valve	0.30 ± 0.05
– exhaust valve	0.30 ± 0.05
Eccentric working travel: (of control shaft):	
– intake valve	5.67
– exhaust valve	5.95

MAIN DATA OF DYNAMIC BALANCER WITH ROTARY COUNTERWEIGHT (fig. 111)	mm (Only 4 cylinder engines)
Interference between the bushes (28) and the seat on the gear (26)	0.063 – 0.140
Play between the transmission gear bearing seat (27) and bushes (28)	0.050 – 0.100
Interference of installation between the bushes and support seat (20)	0.063 – 0.140
Play between the gear shaft (22) and the relative bushes	0.050 – 0.100
Play between the sleeve teeth (17) that interlinks the gear (22) and the gear counter weight (13)	0.038 – 0.106
Interference between the front bush (16) and seat on the casing (12)	0.063 – 0.140
Play between the control shaft (13) and the front bush (16)	0.050 – 0.100
Interference between the gear counterweight rear bush (13) and the support seat (6)	0.037 – 0.101
Play between the control shaft (13) and the relative rear bush	0.013 – 0.061
Interference between the bushes and the relative casing on the counterweights (8)	0.040 – 0.100
Play between the counterweight revolution shaft (4) and the relative bushes	0.020 – 0.073
Interference between the transmission gear bush (9) and relative seat in the casing (12)	0.037 – 0.101
Play between the transmission gear shaft (10) and the relative bush	0.013 – 0.061
Play between the gear teeth (of counterweights)	0.080

HEAD MAIN DATA	**mm** (cylinder 104 mm)
Head	with valve seats machined directly on the cast and pressed valve guides (steel).
Original head height	92
Maximum thickness that can be removed	0.5
Diameter of standard valve guide holes in the head	13.950 – 13.983
External diameter of standard valve guide	13.993 – 14.016
Interference between the casings and valve guides on the head	0.010 – 0.066
Internal diameter of valve guides (installed in the head)	8.032 – 8.043
Diameter of valve rods	7.985 – 8.000
Assembly play between the valve rod and valve guides	0.023 – 0.058
Maximum acceptable play from wear	0.13
Maximum decentralization of guided valve on the rod measured at 360° from the indicator contact point supported on the valve head contact surface	0.03
Valve guide oversize	0.2
Valve housing angle in the head:	
– for the intake valve	60° ± 5'
– for the exhaust valve	45° ± 5'
Valve face angle:	
– for the intake valve	60° 30' ± 7'
– for the exhaust valve	45° 30' ± 7'
Diameter of valve head:	
– for the intake valve	45.300 – 45.500
– for the exhaust valve	37.500 – 37.750
Distance from the valve face relative to the head plane	0.7 – 1.0
Maximum acceptable distance	1.3
Characteristics of springs for intake and exhaust valves:	
– rated length of free spring	44.6
– spring length with valve closed, under a load of 256 – 284N (26.1 – 28.9 kg)	34
– spring length with valve open, under a load of 502 – 544N (51.2 – 56.6 kg)	23.8
Injector lug in relation to the head plane:	
• BOSCH injector part # 4792442, 4800029, 4824170, 99451588	0.3 – 1.1
• STANADYNE injector part # 4802394, 4802391, 99439239	0.25 – 1.05
• OMAP injector part # 4800031 e 4800032	0.15 – 0.95

MAIN DATA FOR LUBRICATION	mm	
	ASPIRATED	TURBO
Play between the drive shaft and the oil pump bush	0.016 – 0.055	–
Play between the shaft and the relative driven gear	0.033 – 0.066	–
Play between the drive and driven gear teeth	0.100	–
Radial play between the drive and driven gears and the pump body	0.060 – 0.170	–
Drive and driven gear thickness	40.961 – 41.000	–
Height of gears in the valve body	41.025 – 41.087	–
Longitudinal play between the pump body and the gears	0.025 – 0.126	–
Characteristics of the pressure limiting valve spring:		
– length of free spring	45	35.9
– Length of spring under a load of 45 – 49 N (4.6 – 5 kg)	37.5	–
– Length of spring under a load of 88 – 94 N (9 – 9.6 kg)	30.5	–
– Length of spring under a load of 127.8 – 141.2 N (13.0 – 14.4 kg)	–	29
– Length of spring under a load of 233.4 – 258 N (23.8 – 26.3 kg)	–	23.2

MAIN DATA FOR THE COOLING SYSTEM	mm (cylinder 104 mm)
Interference between the shaft and water pump turbine	0.017 – 0.059
Interference between the shaft and fan hub	0.024 – 0.058
Interference between the bush with front sealant and the turbine	0.012 – 0.058
For more technical data about the cooling system	see page 3

MAIN DATA FOR THE ANGULAR TIGHTENING TORQUE

PART TO TIGHTEN	Thread	Tightening torque		Angle
		Nm	Kgm	
Head fixing bolt (2, pg. 21 or pg. 23)	M 12 x 1.25	70	7.1	90° + 90°
Crankshaft main bushes (4) fixing bolts	M 14 x 1.5	80	8.2	90°
Link conrod bushes bolts (5)	M 11 x 1.5	40	4	60°
Engine flywheel fixing bolt (3).....	M 12 x 1.25	40	4	60°

TIGHTENING TORQUES

PARTS	SIZE	TORQUE VALUE	
		Nm	Kgm
Rocker arms supports fixing bolts	M 8	25	2.5
Hub to crankshaft fixing nut	M 30 x 1.5	294	30
Fan and alternator drive pulley fixing bolts (6).....	M 10 x 1.25	55	5.6
Dynamic balancer fixing bolts for 4 cylinder models	M 12 x 1.25	110	11.2
Intake manifold fixing bolts.....	M 8	25	2.5
Alternator and belt tensioner fixing nut	M 10 x 1.2	55	5.6
Water pump to engine fixing bolt	M 10 x 1.25	55	5.6
Nuts for injector fixing stud	M 8	25 (*)	2.5 (*)
Valve cover fixing nuts	M 8	15	1.5
Rocker arms supports fixing bolts	M 8	25	2.5
Oil pump and respective cover fixing bolts	M 8	25	2.5
Distribution cover and box fixing bolts	M 8	25	2.5
Flanged intermediate pin fixing bolts	M 10 x 1.25	55	5.6
Control shaft retention plate bolts	M 8	35	3.5
Nuts for valve play adjustment bolts	M 8	22	2.2
Exhaust manifold fixing bolts	M 8	25	2.5
Injection pump fixing bolts.....	M 8	25	2.5
Engine sump fixing bolts to:			
– front and rear distribution cover	M 10 x 1.25	39 – 49	4 – 5
– engine flywheel and cylinder block cover:			
• TL60E, TL75E models	M 10 x 1.25	49 – 59	5 – 6
• TL85E, TL95E models	M 10 x 1.25	49 – 59	5 – 6

(*) Tighten the nuts in two phases

SPECIAL TOOLS

Important – The operations described in this section should only be performed using the **ESSENTIAL** tools that appear below with the symbol (X). However, for greater safety and to obtain the best results as well as saving time and effort, it is recommended that these essential tools be used together with the specific tools listed below and certain tools that should be made according to the construction designs supplied in this manual.

List of specific tools required for the various operations contained in this section.

X **292320** Tractor splitting kit.

290740 Hook to lift the engine.

X **380000301** Rotary trestle to service the engine.

X **380000804** Set of supports to service the engine on rotary trestle 380000301.

X **380000303** Kit to control cylinder compression with adapter 380000617.

380001301 Digital thermometer for temperature control.

292870 Universal manometers, seals and tubes for lubricating pressure control kit.

293240 Kit to control engines with turbo charger.

293679 Wrench to disassemble oil filters.

X **296118** Device to control engine belt tension.

X **291160** Pliers to assemble the piston rings.

X **380000994** Belt to assemble pistons on the cylinders.

X **380000304** Device for angular tightening of engine bolts.

X **380000226** Extractor for the crankshaft pulley hub.

X **291883** Wrench to adjust valve play.

X **291046** Mandrill to assemble and disassemble the valve guides.

X **380000222** Valve guide countersinker.

X **294028** The 8° enlarger to make the lower opening on the exhaust valve guides.

X **293231** Bush to assemble the valve guides (with **291046**).

X **292177** Set of enlargers for the valve guide.

X **380003037** Valve spring compressor.

X **380003042** Kit to assemble and grind the injector holder sleeve in the head.

X **380000223** Extractor for the water pump turbine.

X **293280** Punch to assemble the cooling water pump turbine seal (repair).

X **293761** Kit of wrenches to disassemble the injectors.

X **380000549** Sliding hammer.

X **380000292** Transmission clutch and PTO centralizer.

Testing the injection pump on the bench

X **380000228** Comparing gauge (1/100 mm scale, 5 mm travel, 40 mm with 380000229).

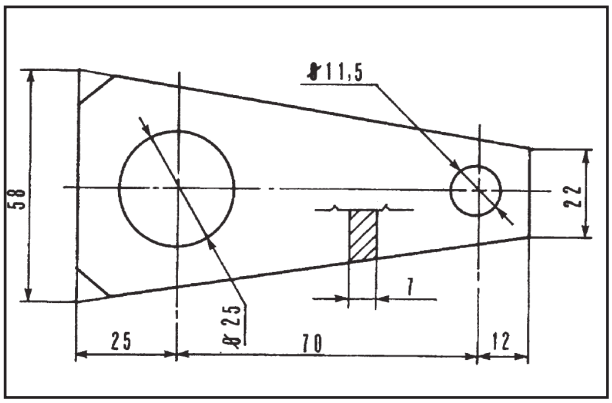
X **380000229** Device to synchronize the BOSCH injection pump to the engine.

X **380000322** Extractor for the injection pump drive gear.

X **380000215** Manual pump to test injection nozzles and synchronization of the DELPHI DP 150 injection pump.

Hook to lift the engine (**# 50075** – measurement in mm).

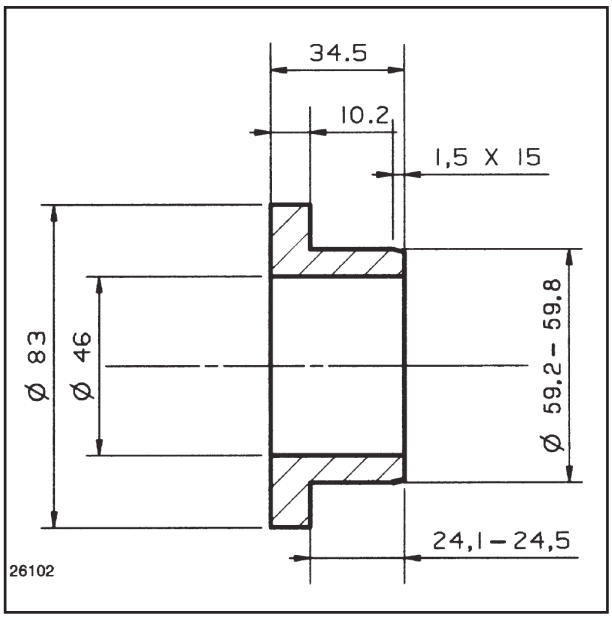
Manufactured with material UNI C40.



1

Tool to assemble the crankshaft front retainer (inscribe on the tool **# 50138** – values in mm).

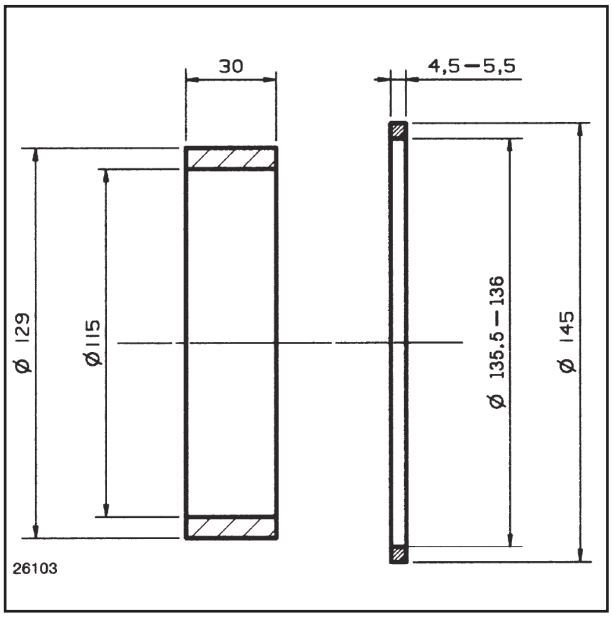
Material UNI C40.



2

Tool to assemble the crankshaft rear retainer (inscribe on the tool **# 50139** – values in mm).

Material UNI C40.



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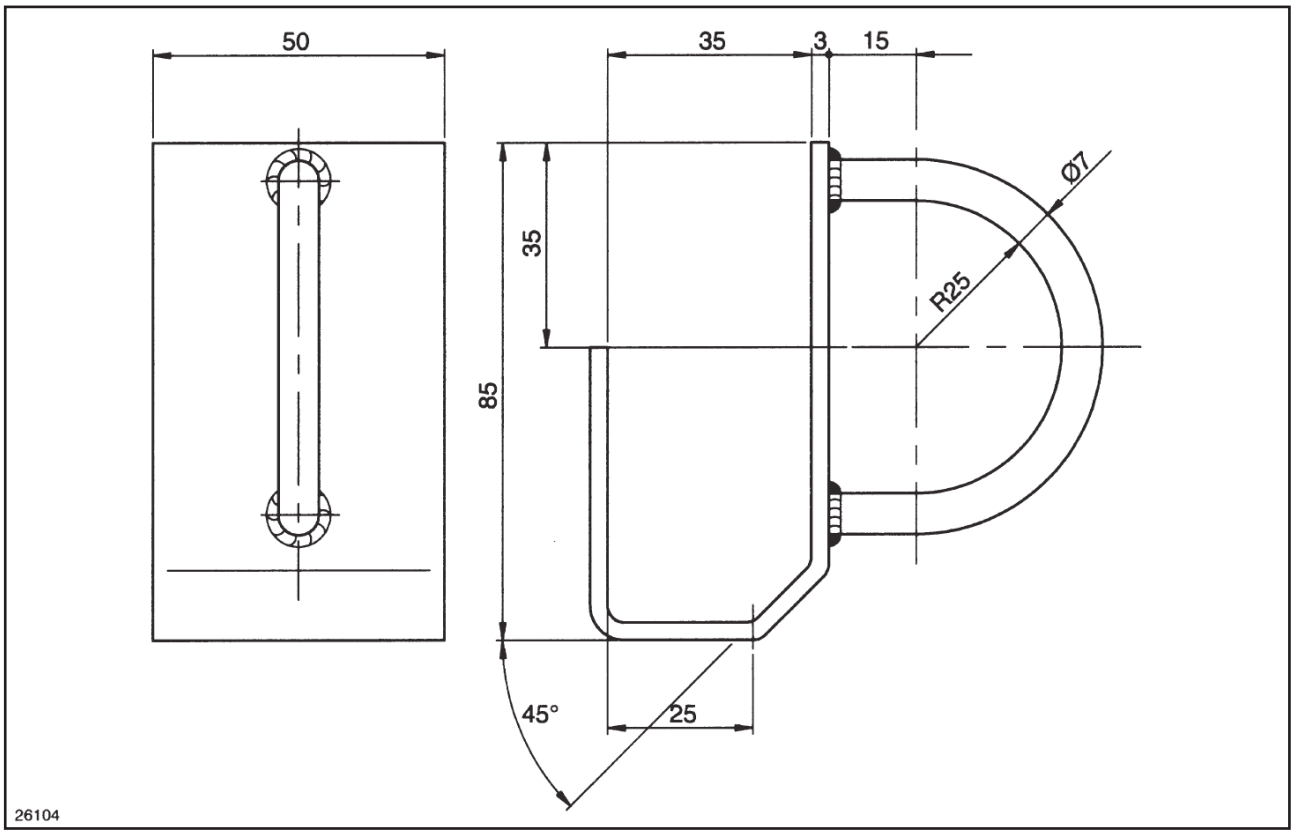
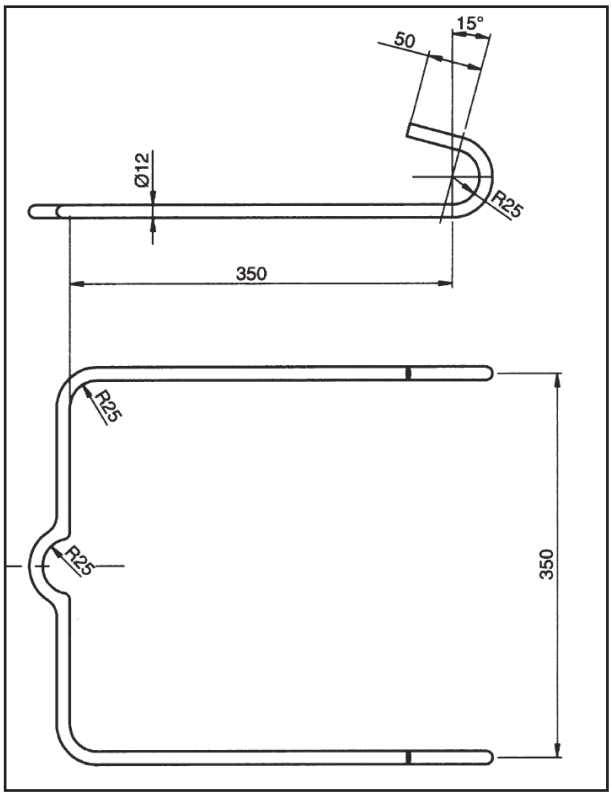


4

Rear supports to lift the hood (# **50131** – measurements in mm).
Manufactured with material UNI Fe 42C – Quantity = 2.

Front hook to lift the hood (**50132** – values in mm).

Manufactured with material UNI C40.



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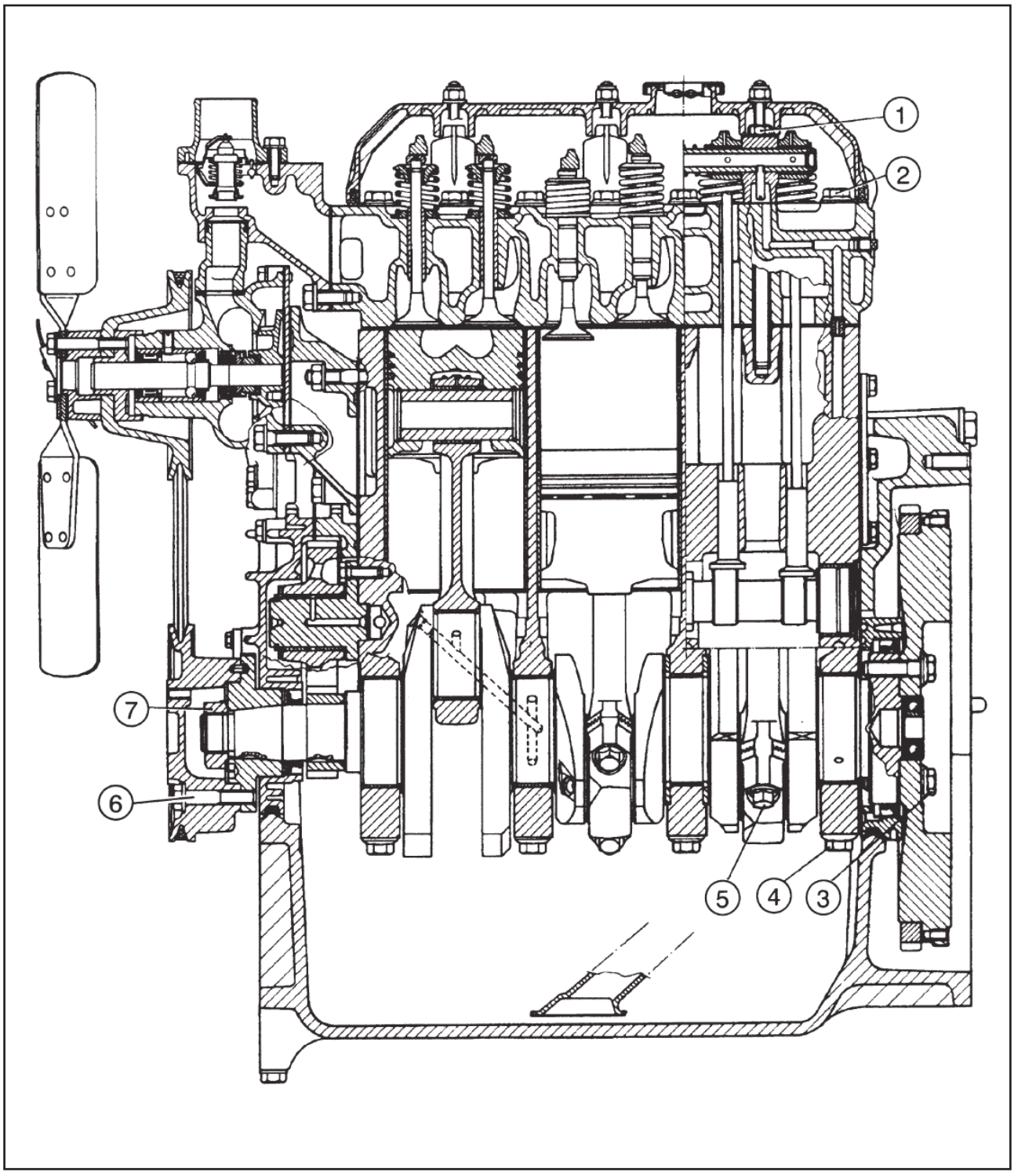
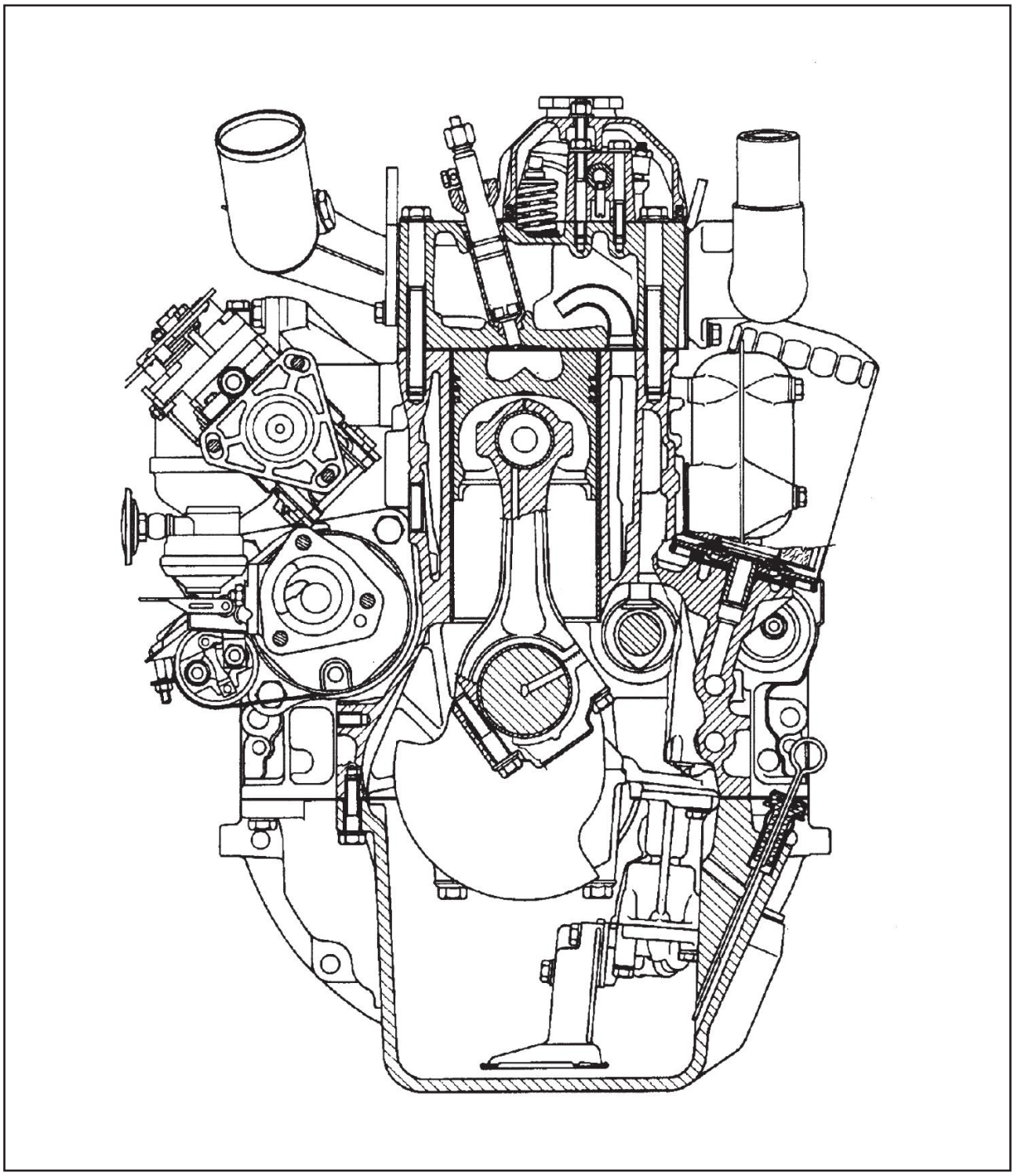


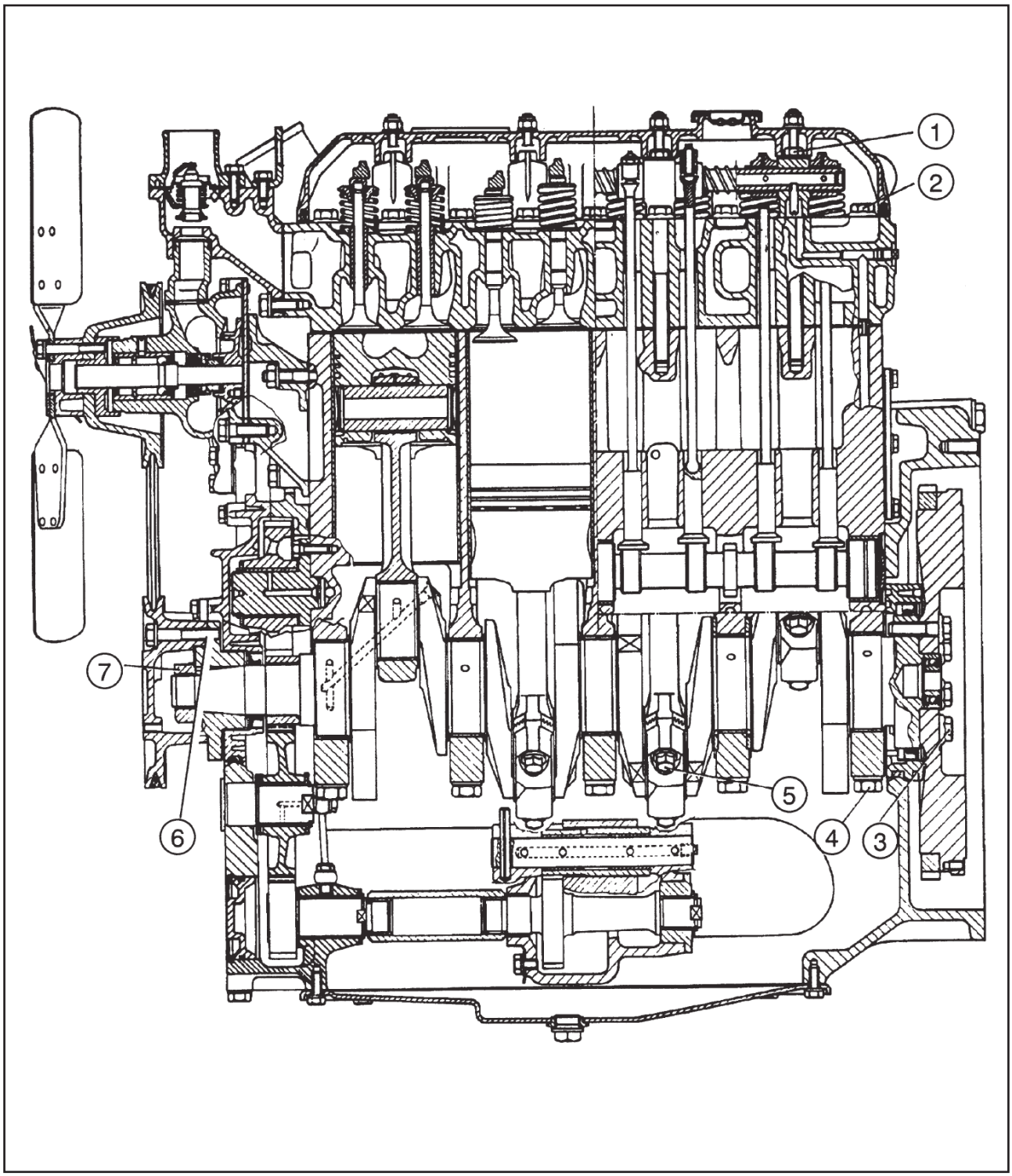
6

Longitudinal section of the 3 cylinder engine



7

Cross-section of the 3 cylinder engine



8

Longitudinal section of the aspirated 4 cylinder engine