Introduction and technical data

INDEX

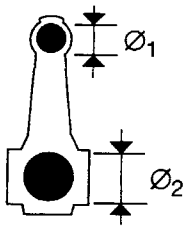
This manual is subdivided into sections headed by two digit numbers which appear in the parts microfiches and the repair time schedule.

The section **INTRODUCTION AND TECHNICAL DATA (00.)** has a dual function of introducing the model and supporting the remaining part of the manual.
It includes the technical data tables and specific information for the remaining part of the manual.

The remaining sections (10. - 33. - 55. - 70.) include only the descriptions for the operations to be carried out which have been modified for the 91 range. For the sections which remain unchanged, see the previous publications (From print n° 504.787 to n° 504.787/11)

This manual contains graphic representations and symbols in place of descriptions for mechanical components and repair operations.
The use of colour for a component or part of one, serves to highlight the components and draw the operator's attention to the object to be measured or checked.

For example:



Small end diameter

Big end bearing housing

Tighten to torque

THE OVERHAULING OF THE 1995 I.E. TURBO 16 VALVE ENGINE IS ILLUSTRATED IN THE "OVERHAULING PETROL ENGINE" BOOKLET (PRINT NO. 504,513/06)

The **DELTA HF integrale - 91 range** is a 2 box saloon with a load carrying structure; the 1995 cc, 4 cylinder in line, tranverse mounted engine runs on super petrol and is equipped with Weber/Marelli electronic injection/ignition; it is supercharged by a turbocharger and develops a power output of 151 kW corresponding to 210 CV DIN (bhp).
The four wheel drive is permanently engaged. There is a "Ferguson" type viscous joint on the centre differential. The self-locking rear differential is of the "Torsen" type.

The lines along which the DELTA HF intgrale 91 range have been styled are designed to:
- improve the characteristics of road holding and driveability
- increase the aggressive nature of the vehicle with features linked to improving the mechanics and aerodynamics of the vehicle

Below is a detailed list of the new features of the vehicle

VEHCLE EXTERIOR

Bonnet lid: aggressive, sporty appearance due to the larger projection (on account of the larger size of the mechanical components) with the addition of two side grilles which improve the air flow to the engine compartment
Front and rear wings: larger following the enlargement of the track
Rear side doors: new design to be in line with the rear wing
Spoilers: box section to be more robust and new shape to conform with the wings
Front bumper: redesigned to increase the open surfaces to increase the intake for cooling air into the engine compartment
Rear bumper: new design to be consistent with the larger wings
Front light clusters: smaller diameter (∅ 130 mm) but with improved lighting capacity (dipped beam headlamps) with a poly-elliptical reflector lens
Fog lights: new design with improved features
Tailgate: there is a spoiler on the tailgate which improves the penetration coefficient (CX) by 0.5 (with benefits at high speeds) recovering the increase in resistance due to the larger front end (as a result of the increased track). The spoiler can be fitted in different positions according to the requirements of the driver
Wheel rims: new design, with larger vents to improve brake cooling with 5 fixing bolts with 7½" duct

Front windscreen wiper: new design with 20" blades and built in spoiler for both arms
Fuel filler: completely new, with a design in line with the sporty nature of the vehicle
Badges: new yellow "HF" badge (which is a feature of larger Lancia models) with a small elephant recalling tradition (positioned on the front grille)

VEHICLE INTERIOR

Steering wheel: new designe with leather covered spokes, anotomical design and horn on the spokes
Instrumentation: different colour for instruments and graphics for individual panels, to achieve a more sporty look

Gear lever: new design with anotomical grip

MECHANICS

Track: the front track has been increased by 54 mm and the rear track by 60 mm in order to considerably improve stability and road holding
Front suspension with: **box section** track control arms, **stronger** struts, **reinforced** bushes, **shock absorbers** with larger diameter shank and attachments raised by 12.5 mm, **anti-roll bar** with attachments of track control arms achieved by means of connecting rods (giving more precise operation), **springs** which are larger and more rigid. In order to strengthen the front of the bodyshell and prevent variations in the front wheel geometry a **aluminimum bar has been added** which connects the front turrets (and consequently the shock absorber upper attachments)
Rear suspension with: **transverse track control arms and** stronger rods, new **springs, shock absorbers** with new setting adn increased travel, **anti-roll bar** with new geomety and varied rigidity, **dampers** which are stronger
Front brakes: new double cylinder fixed type aluminium calipers (Brembo) and self-ventilated brake discs (∅ 281 mm and 26 mm thick). **Brake servo** increased by 8"
Rear brakes: new single piston caliper sliding on rails (Girling-Colette) and new discs (∅ 251 mm)
Exhaust pipes: new single outlet exhaust pipe, with pipe diameter increased to 60 mm. **These features mean that the engine power output has been increased from 200 CV (DIN) (bhp) to 210 CV (DIN) (bhp)**
Steering: larger power assisted steering box and the addition of an oil cooling coil

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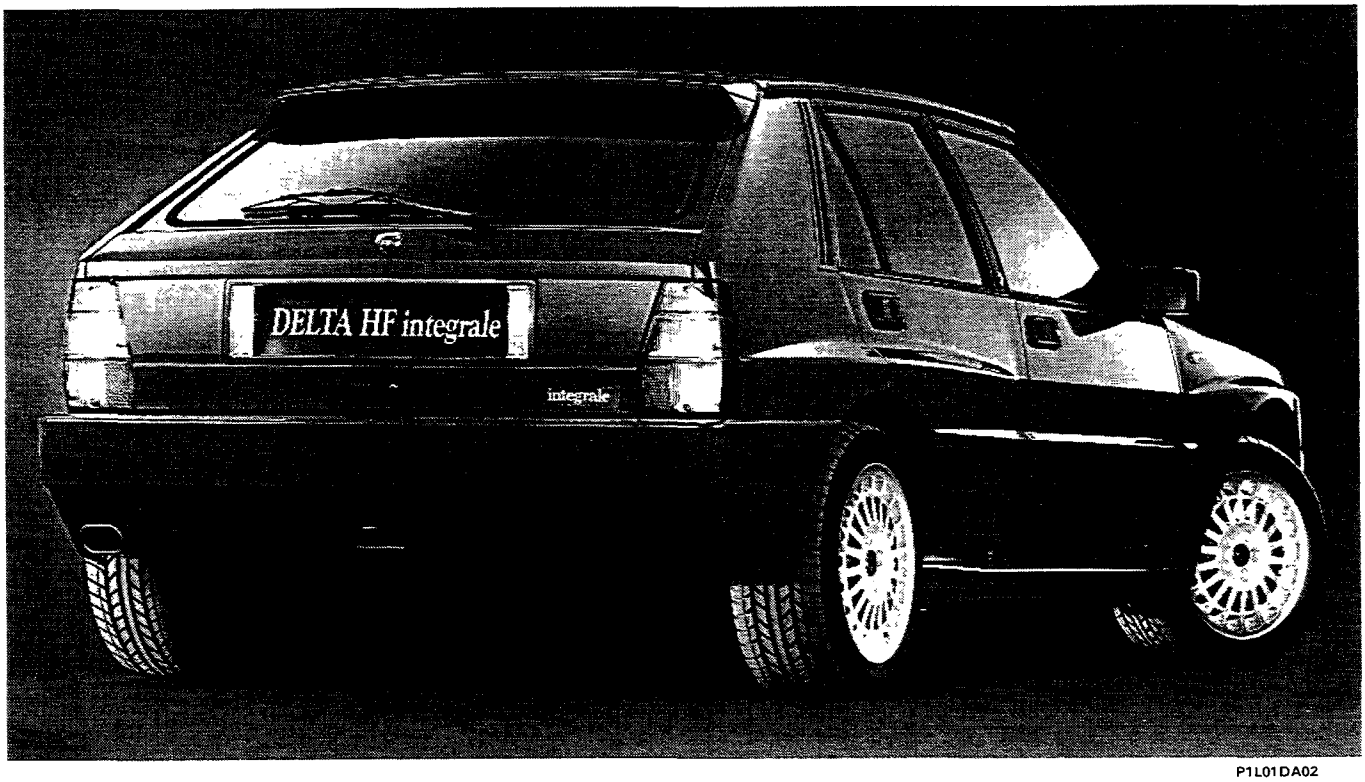
3/4 front view

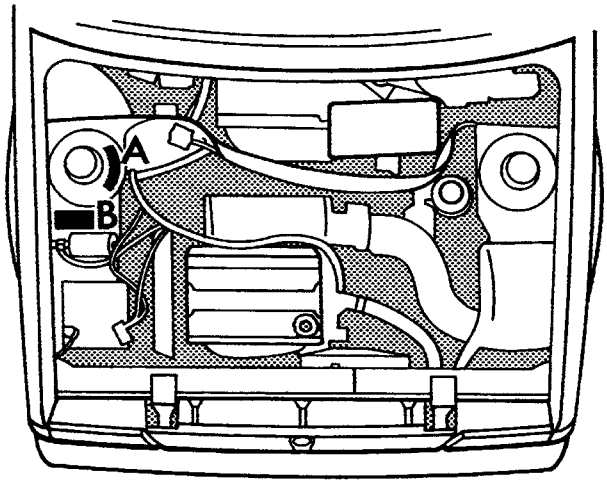


P1L01DA02

3/4 rear view

IDENTIFICATION DATA	CHASSIS	ENGINE	VERSION	5 speed gearbox
1995 *i.e. turbo 16v*	ZLA 831 ABO	831 E5.000	831 ABO 27	●

LOCATION OF IDENTIFICATION DATA ON VEHICLE



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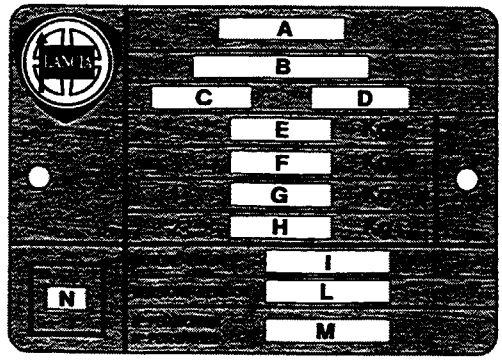

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A Chassis marking

- Vehicle type: (ZLA 831 ABO)
- chassis manufacture number.

NOTE *The engine type and number are stamped on the engine cylinder block-/crankcase behind the engine oil cartridge filter.*

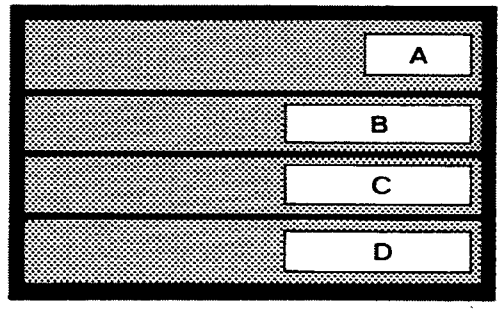
B V.I.N. Plate (EEC regulations)

A. Name of manufacturer.
B. Type approval number.
C. Vehicle type identification code.
D. Chassis manufacture number.
E. Maximum authorized weight of vehicle fully laden.
F. Maximum authorized weight of vehicle fully laden plus tow.
G. Maximum authorized weight on first axle (front).
H. Maximum authorized weight on second axle (rear).
I. Bodywork version code.
L. Engine type.
M. Spares number.
N. Correct value of smoke absorption coefficient (for Diesel engines).

Body paintwork identification plate

It is located on the inside of the bonnet lid

A. Paint manufacturer
B. Description of colour
C. Colour code
D. Colour code for retouches or spraying



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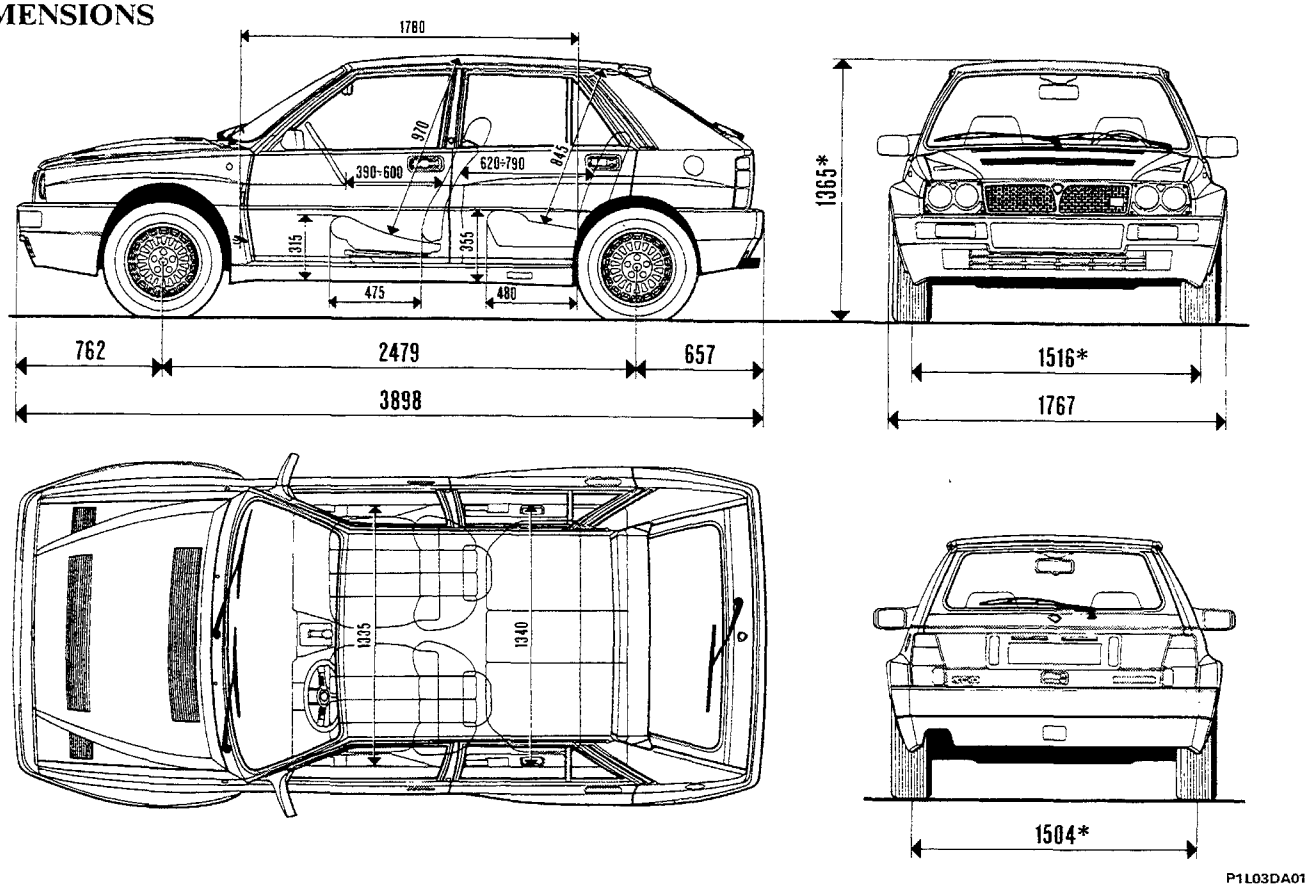
DIMENSIONS

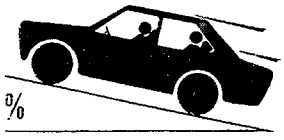
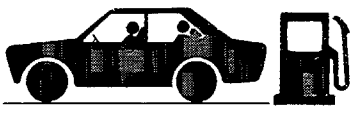


(*) Unladen vehicle
Luggage compartment capacity with rear backrest in normal position: 200 dm³ (7.06 cu ft).
Luggage comparment capacity with rear backrest folded down: 940 dm³ (33.19 cu ft).

WEIGHTS (in kg)

Kerb weight		1300
	+450 (100)	1750
	+ (100)	940 (1030 maximum permissible weight)*
	+ (100)	810 (1030 maximum permissible weight)*
		1200

* With the maximum permissible weight remaining unaltered

Speed kph 	1st	62
	2nd	100
	3rd	143
	4th	189
	5th	220
	R	62
Maximum climable gradient 	1st	58
	2nd	40
	3rd	25
	4th	17
	5th	12
	R	68
EEC fuel consumption figures (litres/100 km) 	Urban cycle (A)	11,2
	Constant speed 90 kph (B)	7,9
	Constant speed 120 kph (C)	10,5
	Average consumption (CCMC proposal) $\frac{A+B+C}{3}$	9,8

The fuel consumption figures in the table have been obtained in the course of official tests following procedures established by EEC regulations. The urban cycle fuel consumption figures, in particular, have been measured at the test bench whilst the figures for constant speeds of 90 and 120 kph are measured directly on a flat, dry road and during bench tests. These figures may provide a useful basis for comparison with other vehicles. Traffic conditions, driving styles, atmospheric conditions and the general state of the vehicle may, in practice, lead to fuel consumption figures which differ from those obtained from the above legal procedures.

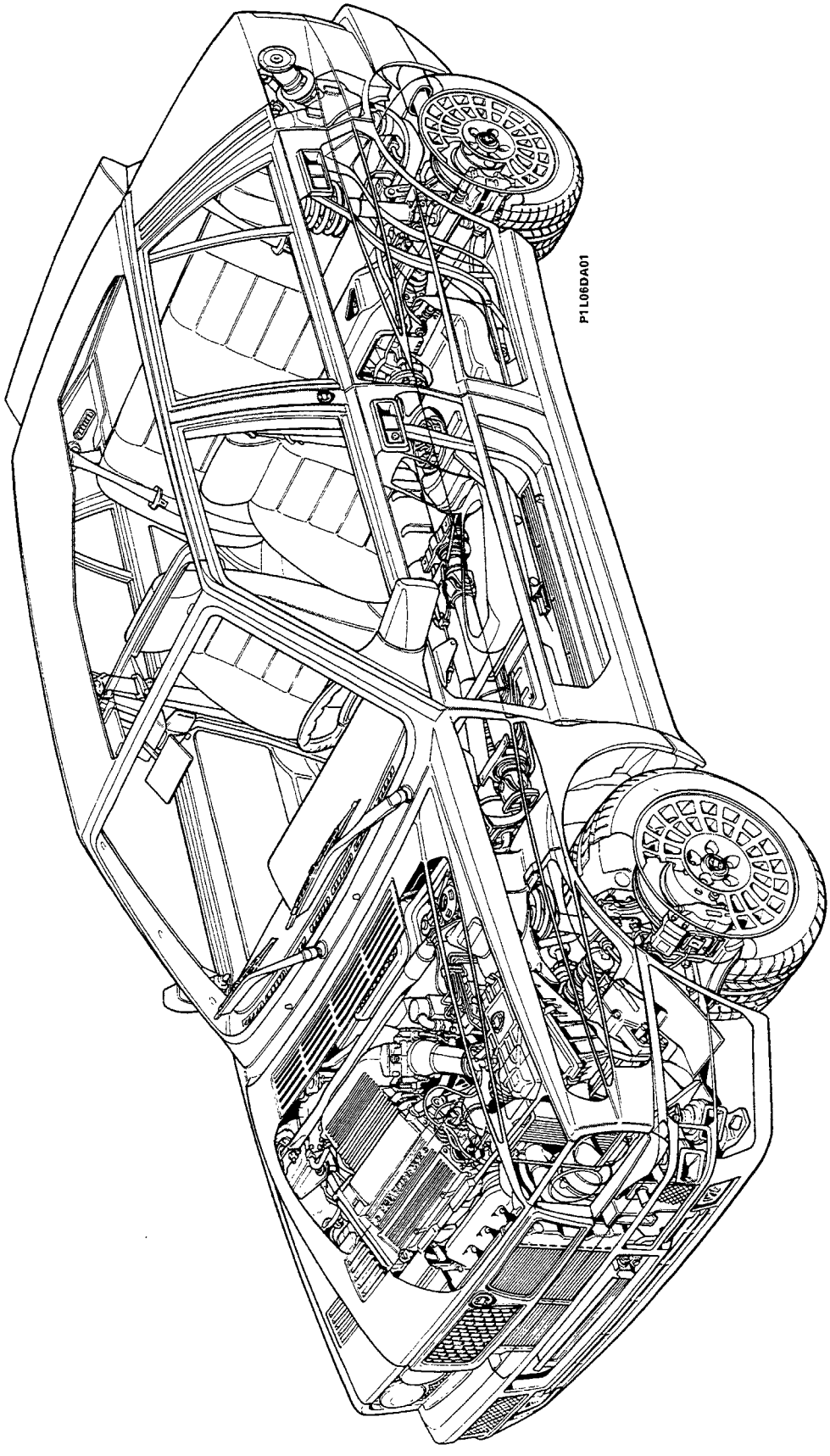
PASTEL BODY COLOURS	SEAT MATERIALS AND COLOURS Alcantara/velour
Lord Blue (438)	Black
White (210)	Black
Monza Red (210)	Black

METALLIC BODY COLOURS (OPTIONAL)	
Metallic black (632)	Black
Pearlescent Derby Green (340)	Black
Pearlescent Winner Red (180/A)	Black
Pearlescent Madras Blue (429/A)	Black

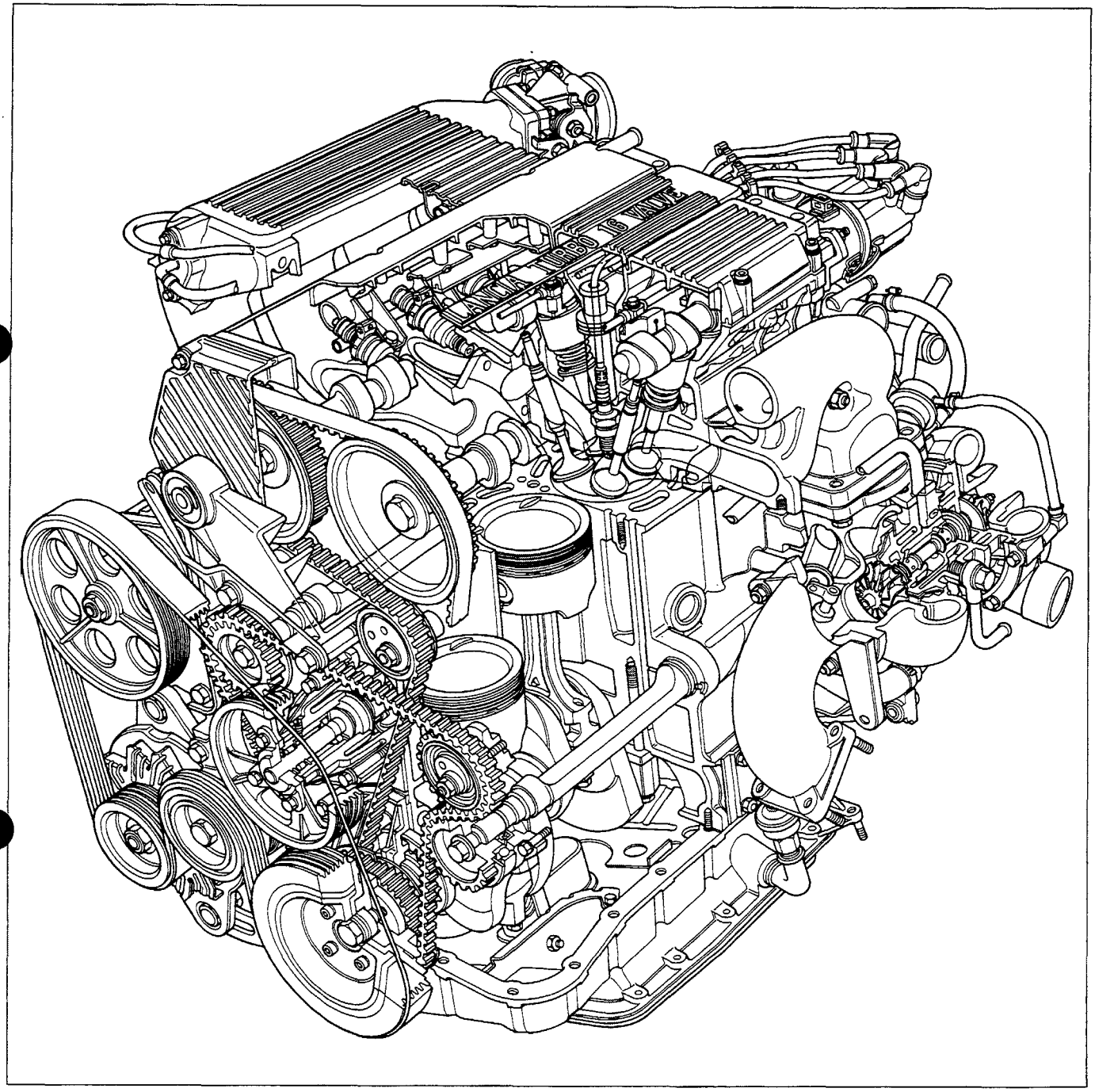
OPTIONAL EQUIPMENT	
Power assisted steering	▲
Automatic air conditioning	●
Control-System	●
Electrically operated sun roof	●
Metallic/pearlescent paint	●
Split folding rear seats	●
Fog lights	●
Alcantara Recaro seats	●
Headlamp alignment from inside the vehicle	●
Anti-lock brakes (A.B.S.)	●
Electric front windows	▲
Tinted windows	▲
Mecahnically adjusted exterior rear view mirror, passenger side	▲
Central locking	▲
Alloy wheels	▲
Leather sports steering wheel	▲
Front and rear inertia reel seat belts	▲
Electronic rev counter	▲
Spoiler in the same colour as the vehicle	▲
Rearscreen wash/wipe	▲
Steering wheel adjustable for height	▲
Instrument panel light dimmer	▲
Heated rear windscreen	▲
Recaro real leather seats	●

(▲) fitted as standard (●) available on request

LAYOUT OF MECHANICAL COMPONENTS ON VEHICLE



ENGINE ASSEMBLY, PARTIAL CROSS SECTION



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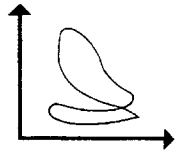
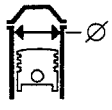
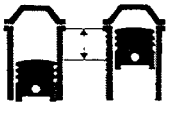
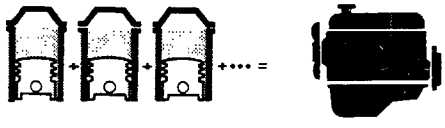
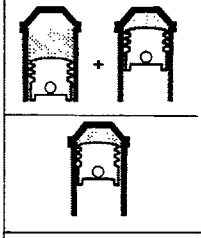
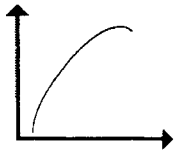
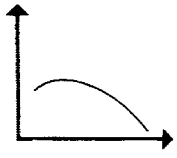
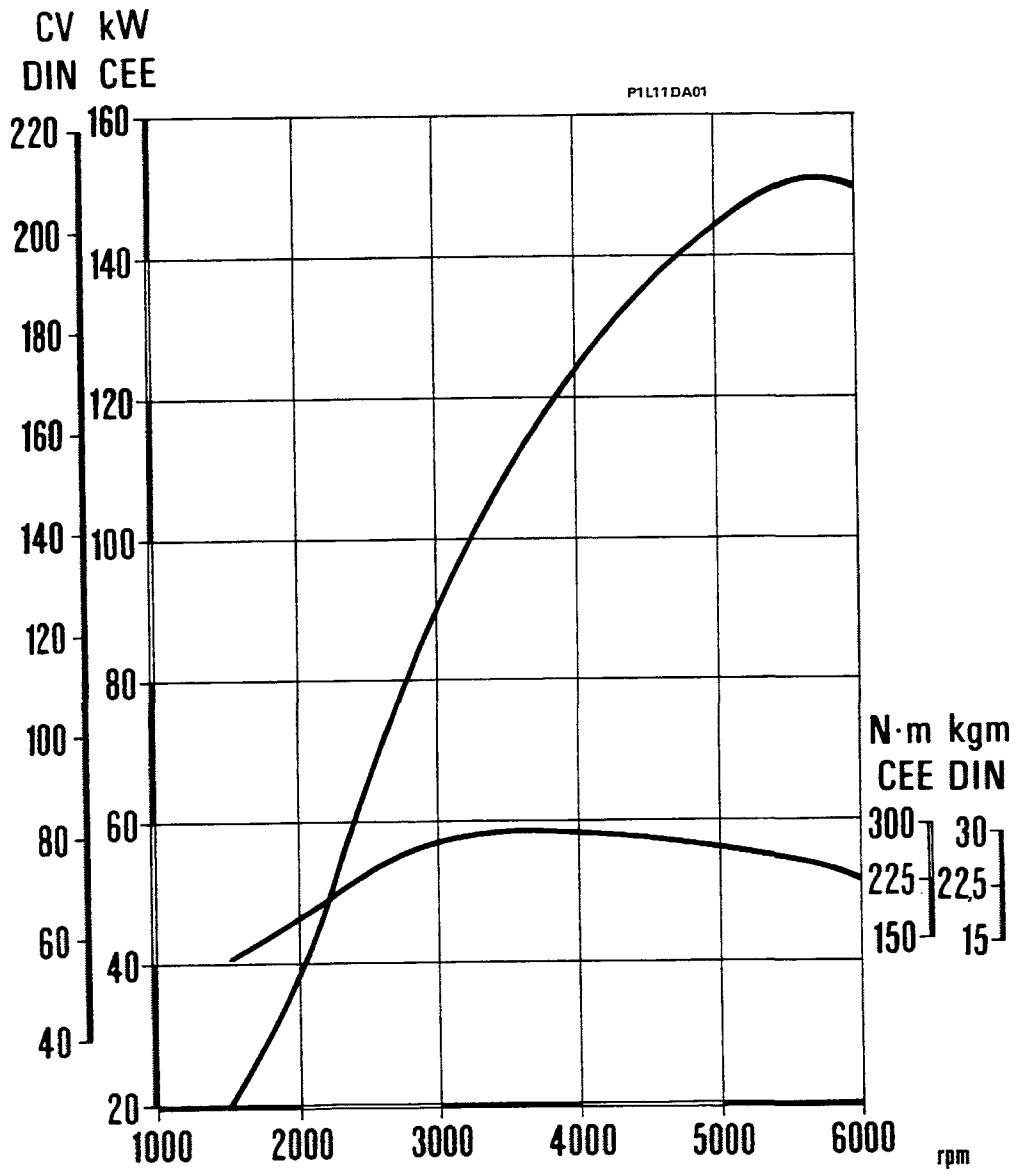
Description	Unit	Quantity dm³	Quantity (kg)
Petrol O.R. 95		57	-
50% + ▲	Total capacity of cooling system	6,2	-
SELENIA (SAE 15W40)	Total capacity	5,9	5,0
	Partial capacity (periodic replacement)	-	4,80
TUTELA DOT 4	Total capacity of hydraulic clutch and braking system — without ABS	0,56	-
	Total capacity of hydraulic clutch and braking system — with ABS		
a = TUTELA ZC 80S	a	3,80	3,40
b = TUTELA GI/A	b	-	-
TUTELA W 90/M DA	a	-	-
	b — Self-locking	1,1	1
a = TUTELA GI/A	a	0,75	-
b = K 854	b	-	-
c = TUTELA MRM2	c	-	0,10
+ DPT	3%	2	-
	~- 10 °C ~- 20 °C — 50%		
	100%		

▲ Distilled water

Name of product	Description International designation	Usage
SELENIA SAE 15 W/40	Multigrade engine oil containing polyalphaolefines and external synthetics. Exceeds specifications API SG and CCMC- G2/G3. Cuna NC 610 01 G2	Temperature - 15°C ÷ >40°C
Exceeds European specification CCMC-G2/G3'S SAE 10 W/30	Low ash content detergent oil for petrol engines. Service API "SF".	Temperature below -15°C ÷ 30°C
SAE 15 W/40		Temperature - 15°C ÷ >40°C
SELENIA Turbo Diesel SAE 15 W/40	Multigrade engine oil containing polyalphaolefines and external synthetics.Exceeds specifications API CD and CCMC-PD1, Cuna NC 610 01 CL. PD1.	Temperature - 15°C ÷ >40°C
Satisifes standards MIL-L-2104 D and CCMC-PD1 SAE 10 W/30	TUTELA DOT 4 Oil for diesel engines. Service API "CD".	Temperature below -15°C ÷ 30°C
VS Diesel Supermultigrade		SAE 15 W/40 Temperature£ 15°C ÷ >
SAE 80/W oil. Satisifies standards MIL-L-2105 and API GL4	+ Supermultigrade	TUTELA ZC 80S
TUTELA ZC 90	Non EP SAE 80 W/90 oil, for manual gearboxes, containing anti-wear additives.	Gearboxes and non hypoid differentials
TUTELA W 90/M DA	Special EP SAE 80 W/90 oil for normal and self-locking differentials. Satisfies standards MIL-L-2105 C and API GL5	Hypoid differentials Self-locking differentials. Steering boxes
TUTELA GI/A	"DEXRON II" type fluid for automatic transmissions.	Automatic gearboxes. Power assisted steering
TUTELA CVT	Oil for continuous variation automatic transmissions.	Continuous variation automatic tranmissions
TUTELA JOTA 1	Lithium soap based grease, consistency NLGI = 1	Greasing the vehicle except for components particularly exposed to water requiring special greases
TUTELA MRM2	Water-repellant, lithium soap based grease containing molybdenum disulphide, consistency NLGI = 2	Constant velocity joints
TUTELA MR3	Lithium soap based grease, consistency NLGI= 3	Wheel hub bearings, steering rod, various components
TUTELA DOT 3 Manual gearboxes and differentials	Fluid for hydraulic brakes, meeting regulations USA FMVSS n. 116, SAE J 1703, ISO 4925, CUNA NC-956-01	Hydraulic brakes and hydraulically operated clutches
K 854	Lithium soap based grease, consistency NLGI = 000, containing molybdenum disulphide	Rack and pinion steering boxes
SP 349	Special castor oil and sodium soap based grease containing graphite and molybdenum disulphide, compatible with brake fluid and brake circuit rubber seals	Load proportioning valve Load proportioning valve rod bush
Autofà n° 9 DP1	Alcohol based liquid detergent	To be used undiluted or diluted in windscreen washers and headlamp washers
Liquido Paraflu[11] FIAT	Mono-ethylene glycol based anti-freeze for cooling system	Cooling circuits. Percentage to be used 35% up to - 25°C 50% up to - 35°C
40°C	Diesel Mix	Additive for diesel fuel with protective action for diesel engines

CHARACTERISTICS

			831 D5.000
	Cycle	Cycle	OTTO 4 stroke supercharged
		Timing	with 2 overhead cams (TOHC)
		Type of fuel supply	Electronic injection/ignition
	Number of cylinders		4
	Cylinder liner (bore)	mm	84
	Stroke	mm	90
	Capacity	cc	1995
	Compression ratio		8 ± 0,15
Total volume of combustion chamber		cc	71,20 (in the cylinder head 40,6)
	Max power	kW (EEC) CV (DIN)	151 (210)
		rpm	5750
	Max torque	daNm (EEC) kgm (DIN)	29,8 (31)
		rpm	3500



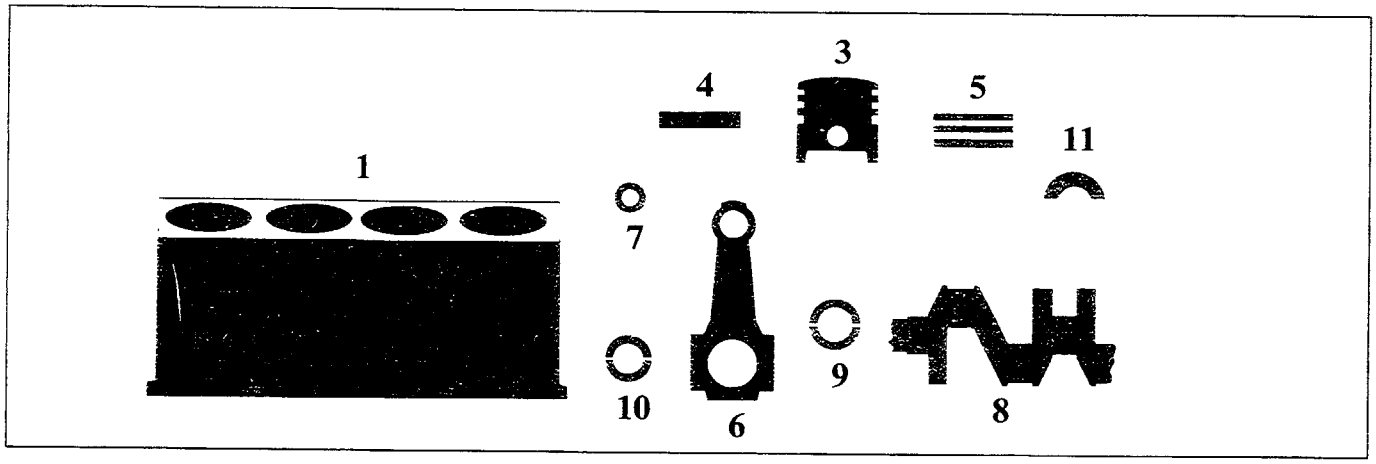
Typical power curves obtained by EEC method

The power illustrated can be obtained with the engine overhauled and run in, without a fan and with a silencer and air filter fitted, at sea level.

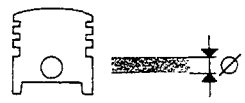
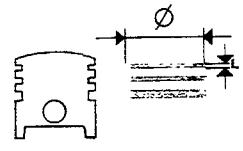
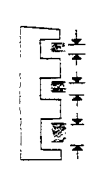
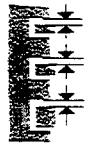
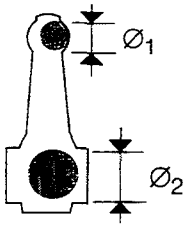
Test bench cycles of overhauled engines

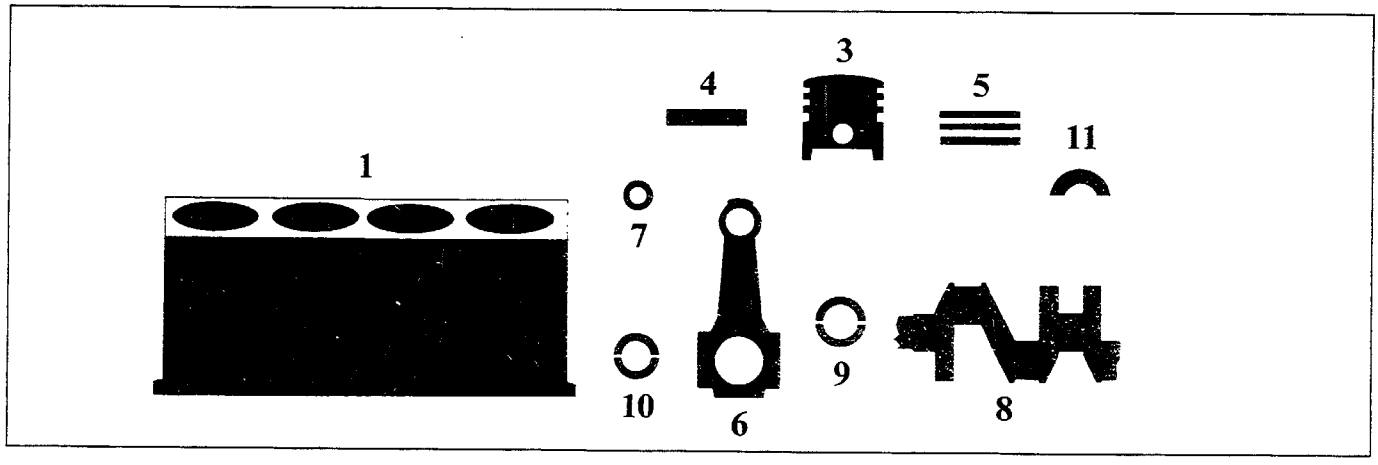
During the bench test of the overhauled engine it is not advisable to run the engine at maximum speed, but to stick to the figures given in the table; complete the running in of the engine in the vehicle.

Test speed (rpm)	Time in minutes	Load on the brakes
800 ÷ 1000	10'	no load
1500	10'	no load
2000	10'	no load



DESCRIPTION			Values in mm
1	Main bearing supports	L	23,100 ÷ 23,200
		A	56,717 ÷ 56,723
		B	56,723 ÷ 56,729
		C	56,729 ÷ 56,735
	Cylinder bore ⌀ (0,010)		84,000 ÷ 84,050
3	Piston	Y	15
		A	83,940 ÷ 83,950
		C	83,960 ÷ 83,970
		E	83,980 ÷ 83,990
	⌀ LANCIA >		0,4
3	Difference in weight between pistons		±5 g
3-1	Piston-Cylinder bore		0,050 ÷ 0,070
3	Gudgeon pin housing ⌀	1	21,996 ÷ 21,999
		2	21,999 ÷ 22,002

DESCRIPTION		Values in mm
4  Gudgeon pin	Ø 1	21,991 ÷ 21,994
	Ø 2	21,994 ÷ 21,997
	Ø [illegible] >	0,2
4-3 	Gudgeon pin - Housing	0,002 ÷ 0,008
3  Piston ring grooves	1 	1,535 ÷ 1,555
	2	2,020 ÷ 2,040
	3	3,967 ÷ 3,987
5  Piston rings	L 1 	1,478 ÷ 1,490
	L 2	1,987 ÷ 1,990
	L 3	3,925 ÷ 3,937
	Ø [illegible] >	0,4
5-3  Piston rings Piston ring grooves	1 	0,045 ÷ 0,077
	2	0,030 ÷ 0,062
	3	0,030 ÷ 0,062
5-1  Opening at ends in cylinder bore	1	0,30 ÷ 0,50
	2	0,30 ÷ 0,50
	3	0,25 ÷ 0,40
6  Small end bush housing	$Ø_1$	24,988 ÷ 25,021
	1	53,904 ÷ 53,910
Big end bearing housing	$Ø_2$ 2	53,898 ÷ 53,904
	3	53,892 ÷ 53,898



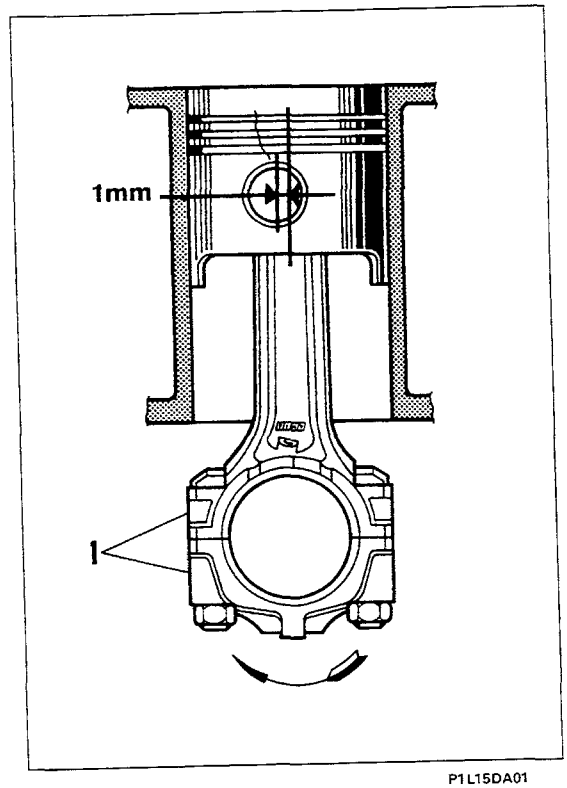
DESCRIPTION			Values in mm
7 Small end bush	$\varnothing_1$		25,065 ÷ 25,090
	$\varnothing_2$	1	22,004 ÷ 22,007
		2	22,007 ÷ 22,010
4-7	Gudgeon pin / Small end bush		0,010 ÷ 0,016
7-6	Small end bush / Bush housing		0,044 ÷ 0,102
8 Main journals	$\varnothing_1$	A	52,998 ÷ 53,004
		B	52,992 ÷ 52,998
		C	52,986 ÷ 52,992
8 Crank pins	$\varnothing_2$	1	50,799 ÷ 50,805
		2	50,793 ÷ 50,799
		3	50,787 ÷ 50,793
	L		27,975 ÷ 28,025
9 Crankshaft bearings	L	A	1,838 ÷ 1,844
		B	1,844 ÷ 1,850
		C	1,850 ÷ 1,856
	⌀ LANCIA <		0,254 ÷ 0,508

DESCRIPTION		Values in mm
9-8	Crankshaft bearings -Main journals	0,025 ÷ 0,049
10	Big end bearings — L — A	1,527 ÷ 1,533
	Big end bearings — L — B	1,533 ÷ 1,539
	Big end bearings — L — C	1,539 ÷ 1,545
	Big end bearings — ⌀ LANCIA <	0,254 ÷ 0,508
10-8	Big end bearings -Main journals	0,033 ÷ 0,057
11	Thrust washers — S	2,310 ÷ 2,360
	Thrust washers — S LANCIA >	0,127
11-8	Crankshaft end float	0,055 ÷ 0,305

Diagram showing fitting of connecting rod-piston assembly and direction of rotation in engine

1 = Area where matching number of cylinder bore to which connecting rod belongs is stamped.
The arrow shows the direction of rotation of the engine as seen from the timing side.

1 mm = Gudgeon pin offset on the piston.



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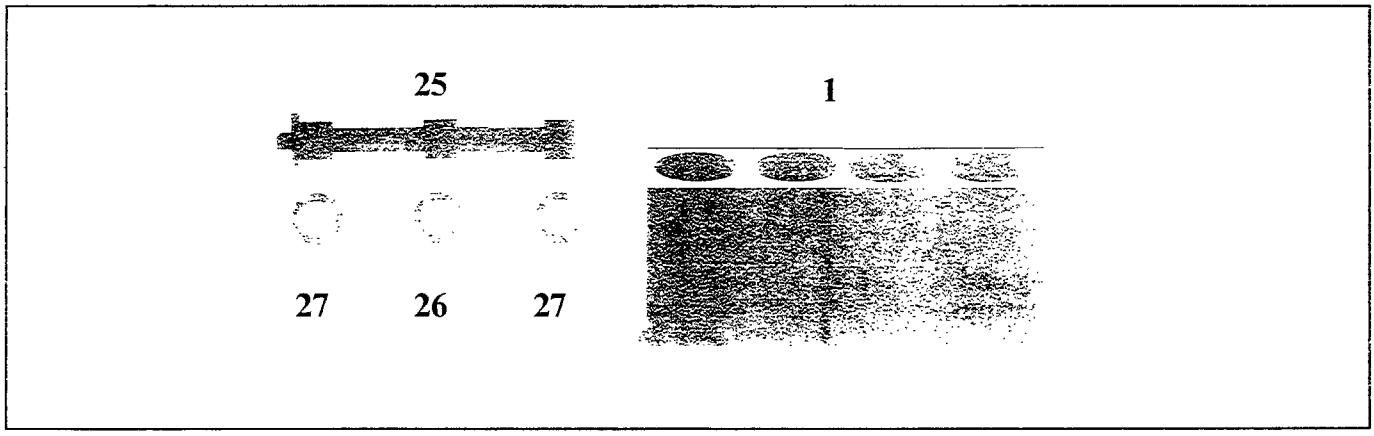
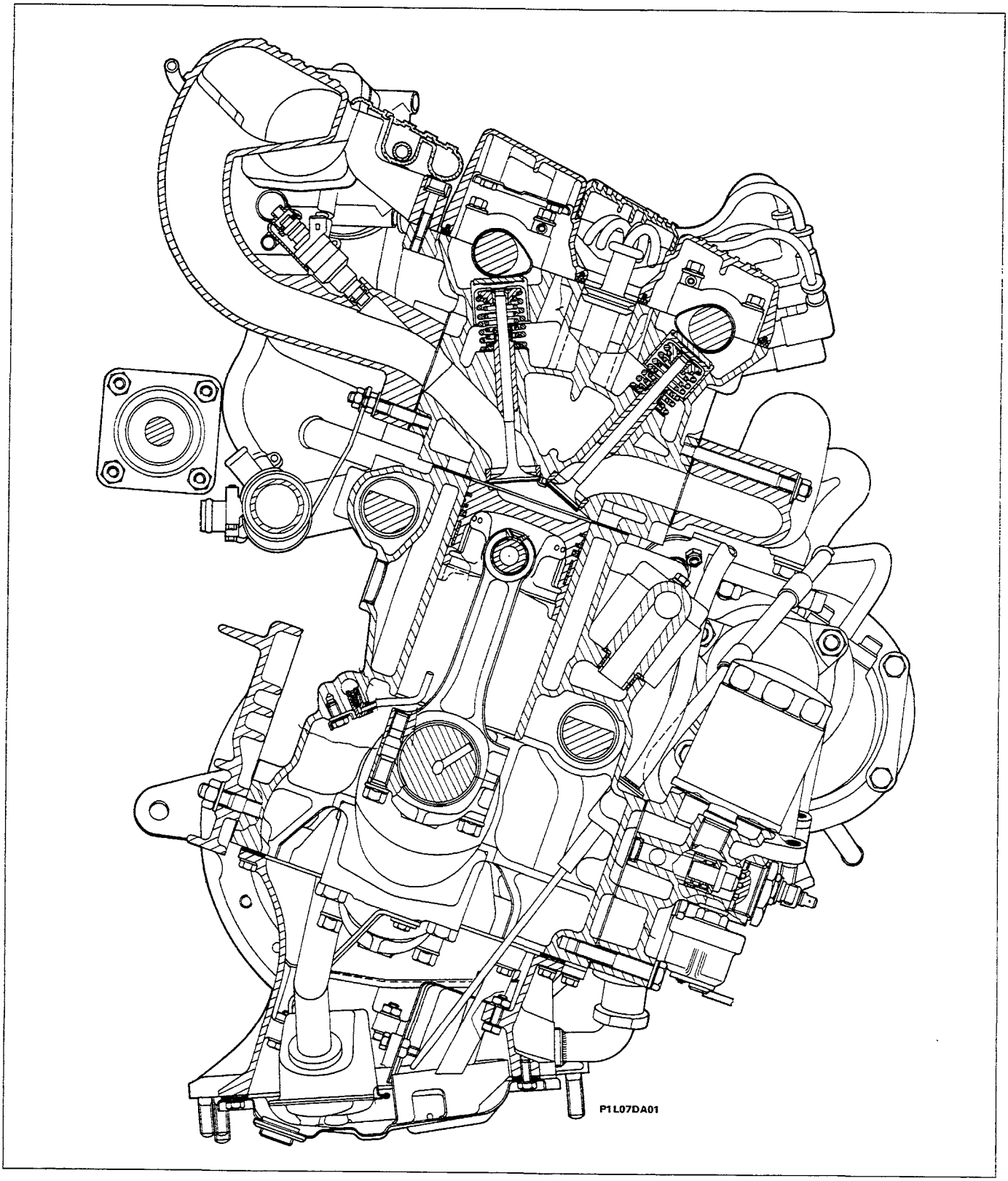
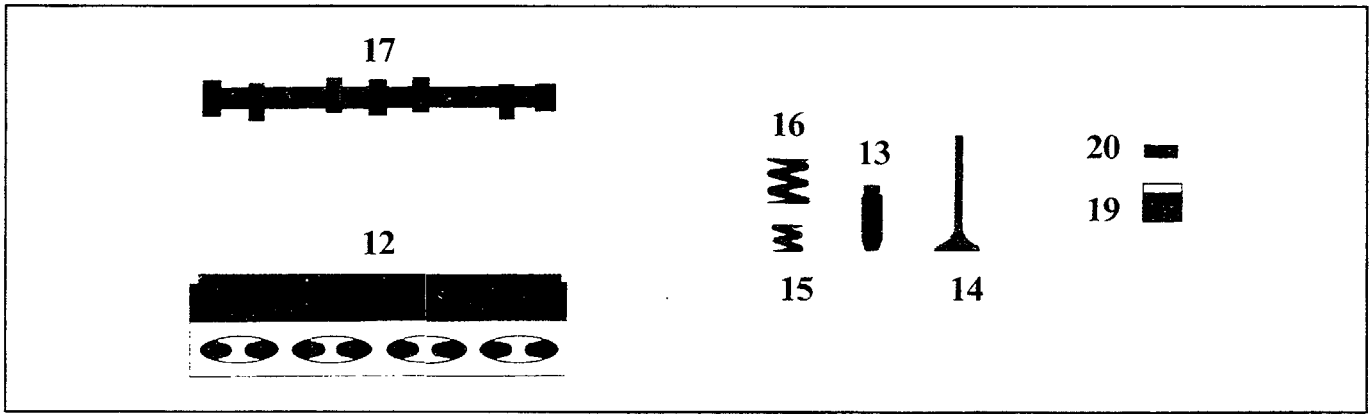


DESCRIPTION		Values in mm
25	Counter balance shafts	n° 2
	Shaft control	by toothed belt
26 Centre bush for counter balance shafts in housing	∅	37,020 ÷ 37,040
27 Ball bearings for counter balance shafts	∅	19,990 ÷ 20,000
25 Counter balance shaft centre bearing	∅	36,945 ÷ 36,960
25 Counter balance shaft bearings	∅	19,980 ÷ 19,993
26-1	Bush for shaft Housing	0,080 ÷ 0,150
25-26	Shaft bearing - Bush	0,060 ÷ 0,095
27-1	Ball bearings Cylinder block seats	+0,011 ÷ − 0,025
25-27	Shaft bearings Ball bearings	+0.020 ÷ − 0,003

CROSS SECTION OF ENGINE



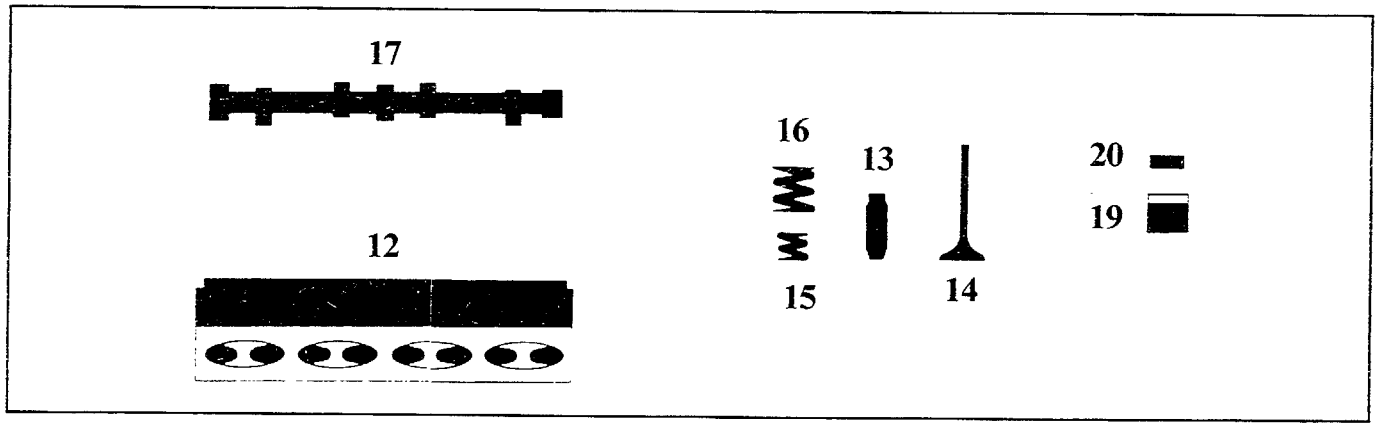
00.10



DESCRIPTION			Values in mm
12	Valve guide bore in cylinder head	∅	13,950 ÷ 13,977
	Valve seat	α →	45° ± 5'
		α >	45° ± 5'
		L	about 2
	Volume of combustion chamber in cylinder head	cc	40,6
13	Valve guide	$∅_1$	7,022 ÷ 7,040
		$∅_2$ →	14,010 ÷ 14,030
		$∅_2$ LANCIA >	0,05-0,10-0,25
13-12	Valve guide Bore in cylinder head	→	0,033 ÷ 0,080
		>	
14	Valves →	$∅_1$	6,974 ÷ 6,992
		$∅_2$	34,300 ÷ 34,500
		α	45° 30 ± 5'
	Valves >	$∅_1$	6,974 ÷ 6,992
		$∅_2$	28,300 ÷ 28,500
		α	45° 30' ± 5'

DESCRIPTION		Values in mm
14-13 Valve - Valve guide		0,030 ÷ 0,066
15 Internal valve spring	P_1	14,12 ÷ 15,10 daN
	H_1	31
	P_2	26,39 ÷ 28,74 daN
	H_2	21,5
16 External valve spring	P_1	36,68 ÷ 39,6 daN
	H_1	36
	P_2	55,91 ÷ 60,82 daN
	H_2	26,5
17 Camshaft bearings	Ø	28,480 ÷ 28,495
	L	19,670 ÷ 19,750
Cam lift		8,6
		7,5
Camshaft supports on cylinder head **12**	Ø	28,545 ÷ 28,570
	L*	19,450 ÷ 19,520
Tappet housings	Ø	37,000 ÷ 37,025
17-12 Camshaft bearings Camshaft housing supports	radial	0,050 ÷ 0,090
	axial	0,150 ÷ 0,300
19 Tappet	Ø	36,975 ÷ 36,995

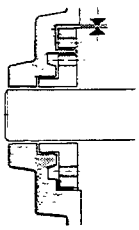
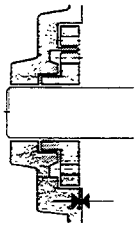
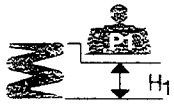
* Rear cap measurement



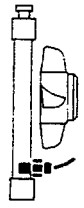
DESCRIPTION		Values in mm
19-18	Tappet Housing in cylinder head	0,005 ÷ 0,050
20	Shim S (0,05)	3,25 ÷ 4,70
17-20	clearance for timing check — inlet	0,80
	clearance for timing check — exhaust	0,80
	operational clearance — inlet	0,35 ± 0,04
	operational clearance — exhaust	0,40 ± 0,03

TIMING ANGLES

inlet	opens BTDC	8°
	closes ABDC	35°
exhaust	opens BTDC	30°
	closes ABDC	0°

	Values in mm
Engine lubrication system	forced feed by means of lobe pump with cartridge oil filter in series
Oil pump	lobe gears
Pump operated	through crankshaft
Oil pressure relief valve	incorporated in crankshaft front cover
 between pump casing housing and driven gear	0,080 ÷ 0,186
 between the upper side of the gears and the pump cover	0,025 ÷ 0,056
Full flow filter	cartridge
Insufficient oil pressure sender unit	electrical
 Operating pressure at a temperature of 100°C	3,4 ÷ 4,9 bar
 Oil pressure relief valve spring — P_1	11,1 ÷ 12,1 daN
H_1	35,3

COOLING SYSTEM

Cooling circuit		coolant circulation via centrifugal pump, radiator and two speed electrical fan operated by thermostatic switch
Water pump operated		through belt
 Thermal switch to engage fan	⇄	86° ÷ 94°C
	stop	81° ÷ 89°C
Engine coolant thermostat	opening	81° ÷ 85°C
	max opening	91° ÷ 93°C
	valve travel	⩾ 7.5 mm
Clearance between impeller vanes and pump casing		0,6 ÷ 1 mm
Pressure for checking system water tightness		0.98 bar
Pressure for checking exhaust valve on expansion tank cap		0.98 bar

FUEL SYSTEM - Description

Type	I.A.W. (MPI) injection/ignition
Fuel regulation pressure	2,5 bar
Pump (type)	electrical
Pump capacity (14 V supply with engine idling)	⩾ 120 litri/h

SUPERCHARGING (with turbocharger operated by exhaust gases with waste-gate valve)

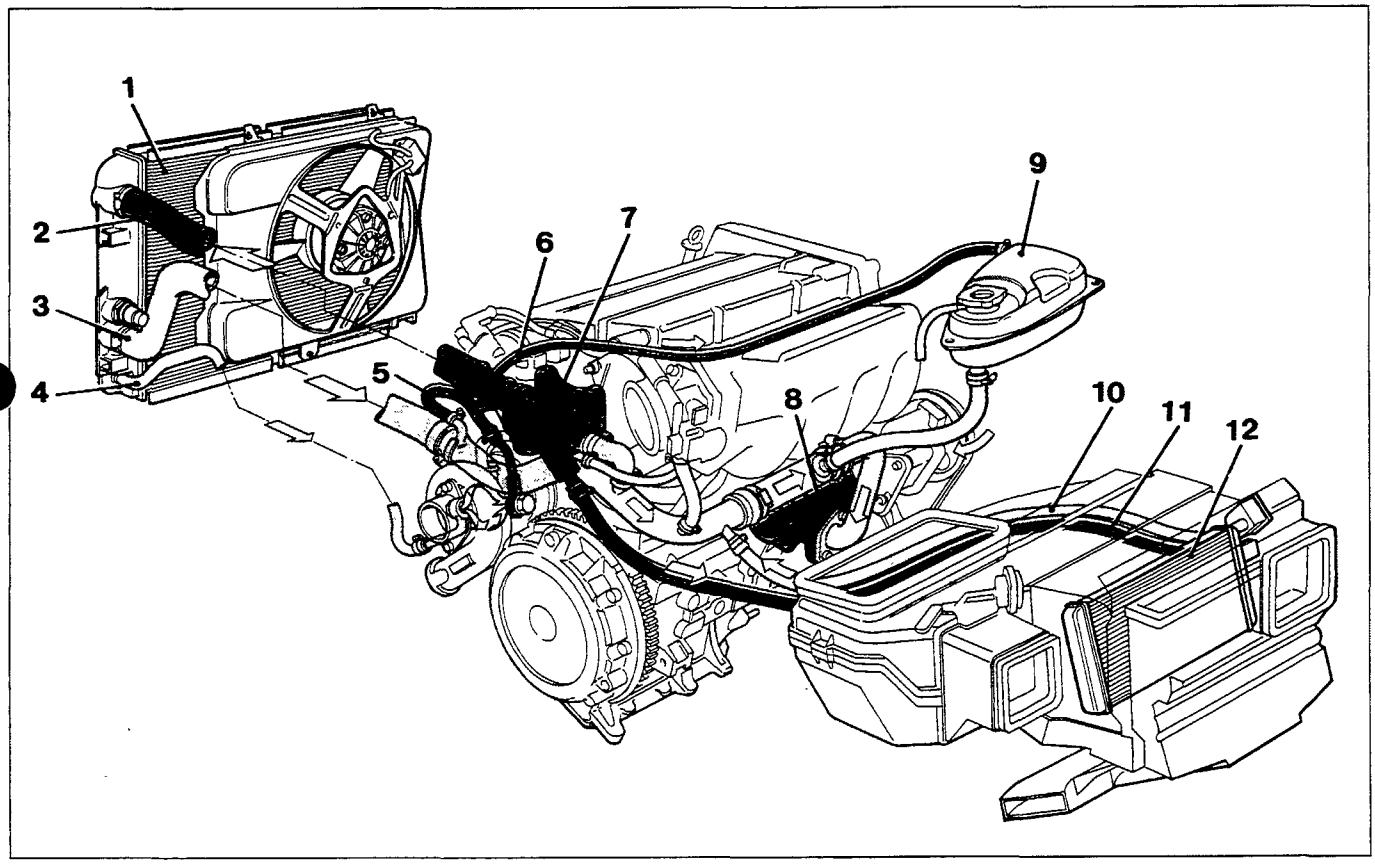
Turbocharger type:	Garrett T3
Maximum supercharging pressure	1 bar

Checking engine idle speed and carbon monoxide emissions

Engine idle speed	rpm	820 ÷ 880 (870 ÷ 930) (*)
Co idle emissions	(%)	1.5 ± 0,5

(*) With VAE valve disconnected: for further detailes see SECTION. 10 PAGE 6

DIAGRAM SHOWING OPERATION OF ENGINE COOLING SYSTEM



P1L31DA02 P1L31DA03

1. Engine coolant radiator
2. Coolant hose between thermostat and radiator
3. Coolant hose between radiator and pump
4. Coolant hose between the radiator and the turbocharger
5. Coolant hose between turbocharger and pump
6. Coolant return hose to expansion tank
7. Controlled by-pass thermostat for mixing coolant liquid
8. Water pump
9. Expansion tank
10. Coolant hose between heater/radiator and pump
11. Coolant hose between thermostat and heater/radiator
12. Heater/radiator

Supply circuit

Return circuit

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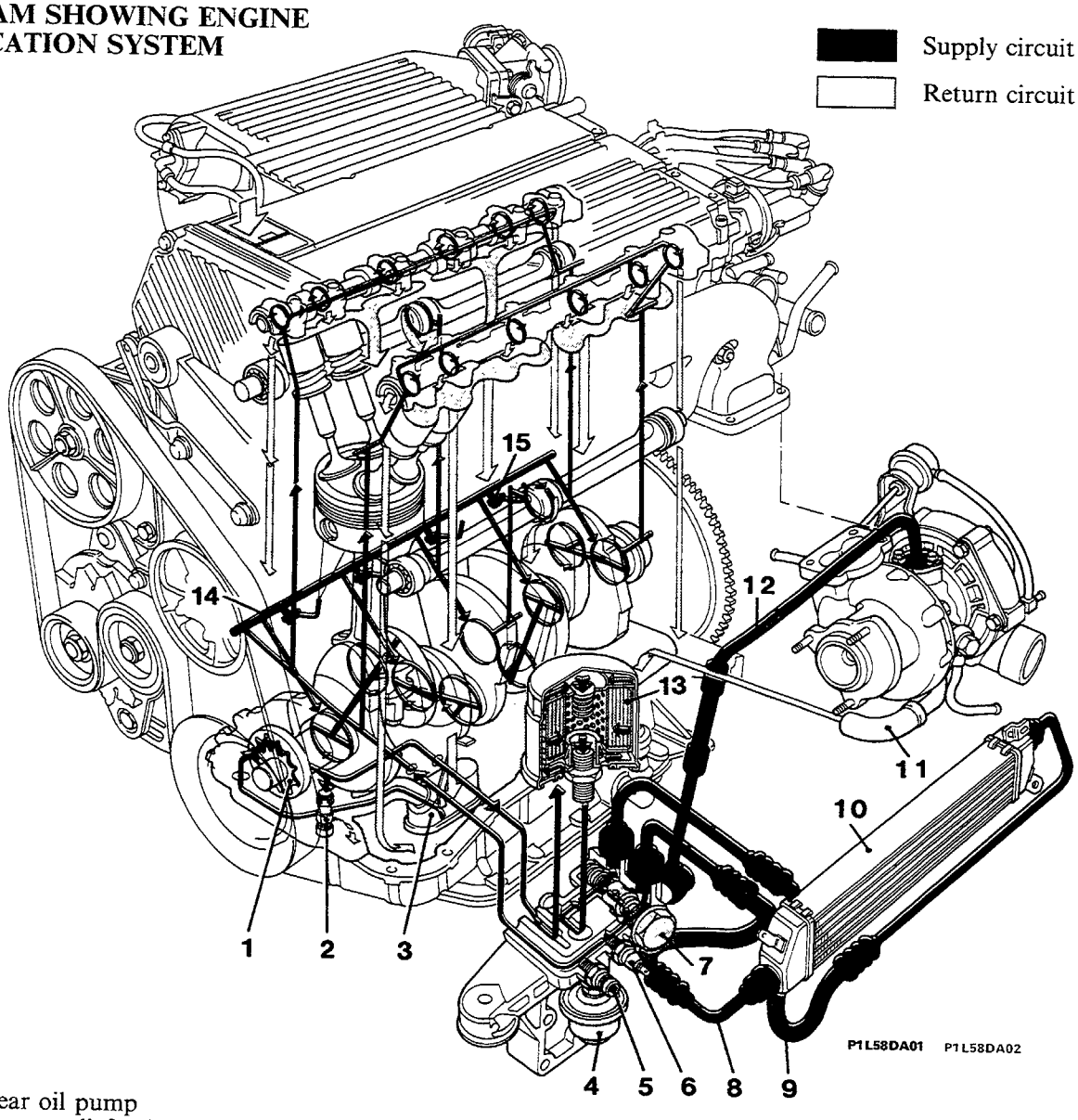
DIAGRAM SHOWING ENGINE LUBRICATION SYSTEM



1. Lobe gear oil pump
2. Oil pressure relief valve
3. Strainer with gauze filter
4. Oil pressure sender unit
5. Oil temperature sender unit
6. Switch signalling insufficient oil pressure
7. Plug for oil radiator thermostatic by-pass valve
8. Oil return pipe from cooling radiator to thermostatic valve
9. Oil supply pipe from thermostatic valve to cooling radiator
10. Engine oil cooling radiator
11. Oil return duct from turbocharger to sump
12. Main duct supplying oil under pressure to turbocharger
13. Full flow cartridge oil filter with safety valve for cutting out filter if filter element is blocked
14. Main duct supplying oil under pressure to various components
15. Piston cooling oil jets

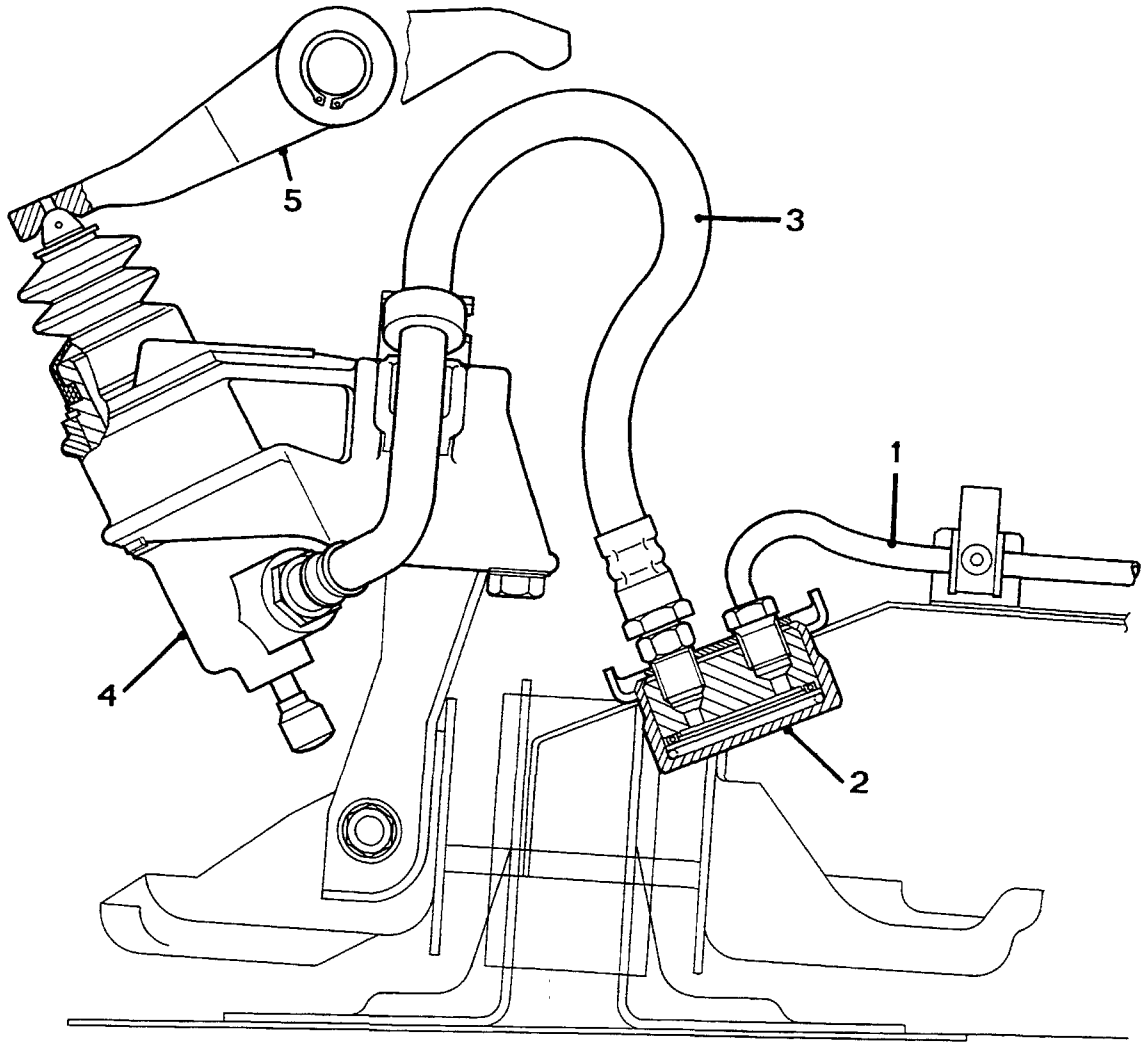
The jets piston cooling oil jets (15) have a built in ball valve which opens at a pressure of between 1.25 and 1.75 bar.
If it is not working properly, replace the jet

The thermostatic valve, located in the oil filter mounting, has the following function:

a) when the temperature is below 78° ± 2°C, the oil passes directly into the cartridge filter and returns to the engine.
b) when the temperature exceeds 83,5° the thermostatic valve is open and allows the oil to flow into the cooling radiator and thereby lower the temperature and ensure improved lubrication.

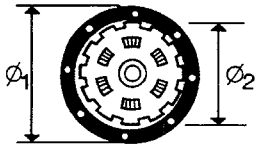
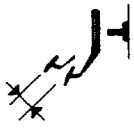
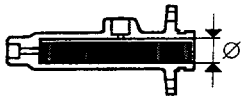
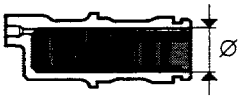
The thermostatic valve is not available as spares; if it is not working properly, replace the complete oil filter mounting.

DIAGRAM SHOWING HYDRAULIC CLUTCH OPERATION WITH VIBRATION DAMPER



P1L25DA01

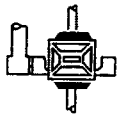
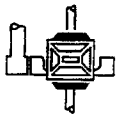
1. Oil pipe between clutch pump and hydraulic vibration damper (2)
2. Hydraulic vibration damper (reduces the vibrations developed by the power unit making the engagement of the clutch more smooth and gradual)
3. Oil pipe between damper (2) and operating cylinder (4)
4. Operating cylinder
5. Clutch control lever

		Values in mm
Type		 dry, single plate
 Operating mechanism		 diaphragm spring
Spring loading	daN	650
 Lining	$\varnothing_1$	236
	$\varnothing_2$	154
	Distance between pedal in end of travel position and rest position	142
Clutch release		hydraulic
	Clutch pump control $\varnothing$	18,75 (3/4")
	Operating cylinder $\varnothing$	25,4 (1")

GEARBOX

		Type	C.503.5.29
Synchronizers	spring ring (Porsche type)		-
	baulk ring		1 3 5 / 2 4
Gears	straight toothed		1 3 5 R / 2 4
	helical toothed		1 3 5 / 2 4
Gear ratios		1	3,500
		2	2,176
		3	1,524
		4	1,156
		5	0,917
		R	3,545
	Crown wheel reduction ratio		56/18 (3,11)
Ratio at the wheels		1	10,888
		2	6,767
		3	4,739
		4	3,595
		5	2,851
		R	11,025

CENTRE DIFFERENTIAL: Epicyclic, with torque shared between the front axle and the rear axle with a ratio of 47/53

 Differential internal casing bearing	 conical roller bearings
 Adjustment of bearing pre-loading	 by shims
 LANCIA (0,05) mm Thickness of shims	1,00 ÷ 1,60
 Interference to obtain exact bearing pre-loading mm	bearings not pre-loaded = 0,12 bearings pre-loaded (350 daN) = 0,08

FRONT DIFFERENTIAL

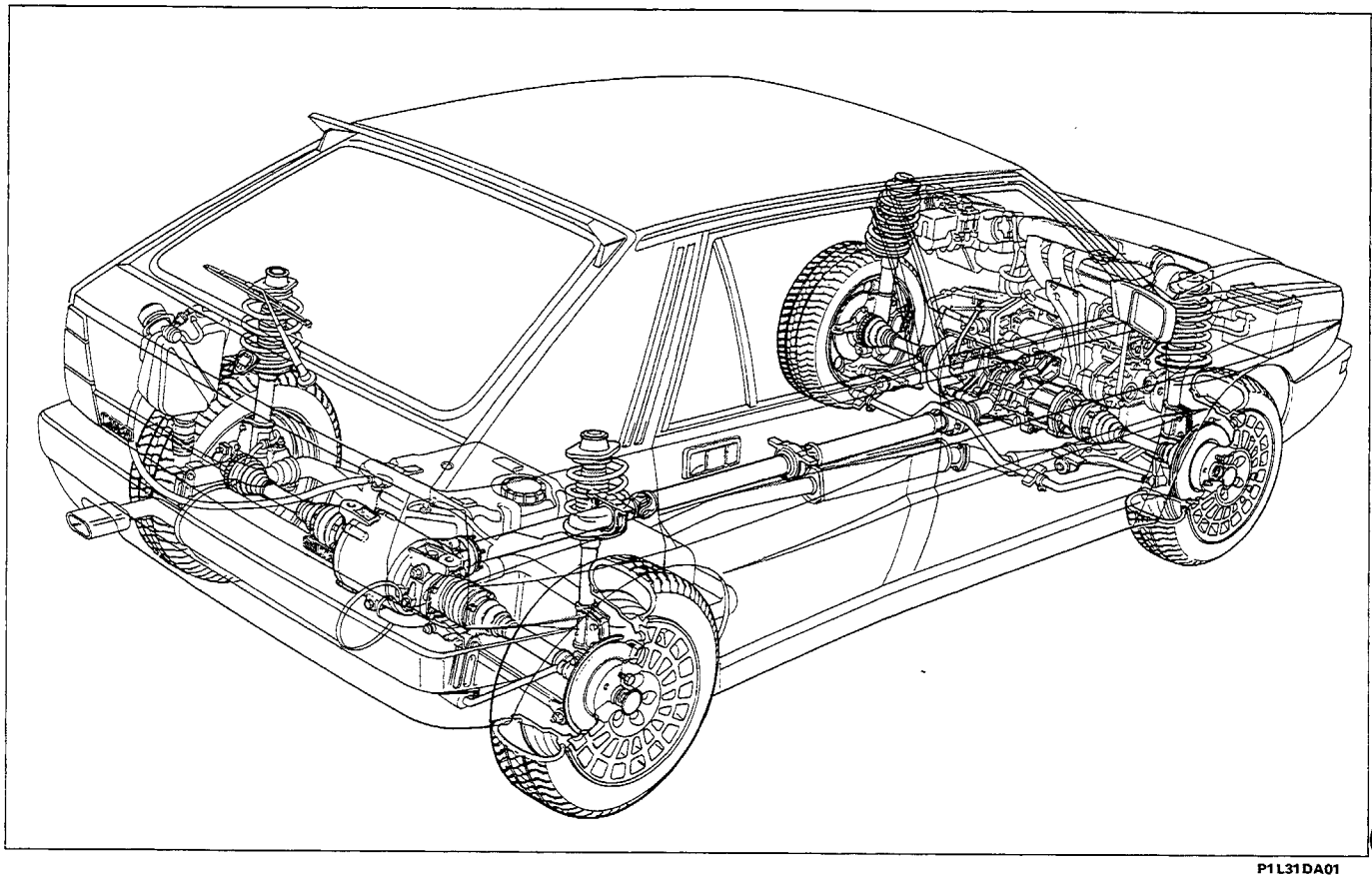
 Clearance between satellite and planet gears mm	⩽ 0,10
 Adjustment of clearance between planet and satellite gears	no adjustment is carried out

IDLER GEAR

 Idler gear ratio	43/19 (2,263)
 daNm Ring gear bearing rolling torque	0,18 ÷ 0,20
 Adjustment of ring gear bearings	 by shims
 LANCIA 0,025 mm Thickness of shims	1,475 ÷ 2,90
 Adjustment of idler gear bevel pinion position	 by shims
 LANCIA 0,02 mm Thickness of shims	2,55 ÷ 3,35
 daNm Bevel pinion bearing rolling torque	0,08 ÷ 0,12
 mm Clearance between pinion and ring gear	0,08 ÷ 0,15
 Adjustment of clearance between pinion and ring gear	 by shims
 LANCIA 0,025 mm Thickness of shims	1,475 ÷ 2,90

Type		in three sections
Supports		2 { 1 on the centre section with a ball bearing on the support 1 on the rear section with a ball bearing on the inside of the support dust cover
Sliding constant velocity joints		1, on the front section
Universal joints		2, on the centre section
Splined coupling		1, on the rear section
Spider radial clearance	mm	0,01 ÷ 0,04
Thickness of circlips for adjusting spider radial clearance	mm	1,50-1,53-1,56-1,59-1,62
Clearance between splined coupling grooves	mm	0,175 ÷ 0,350

LAYOUT OF DRIVE TRANSMISSION COMPONENTS



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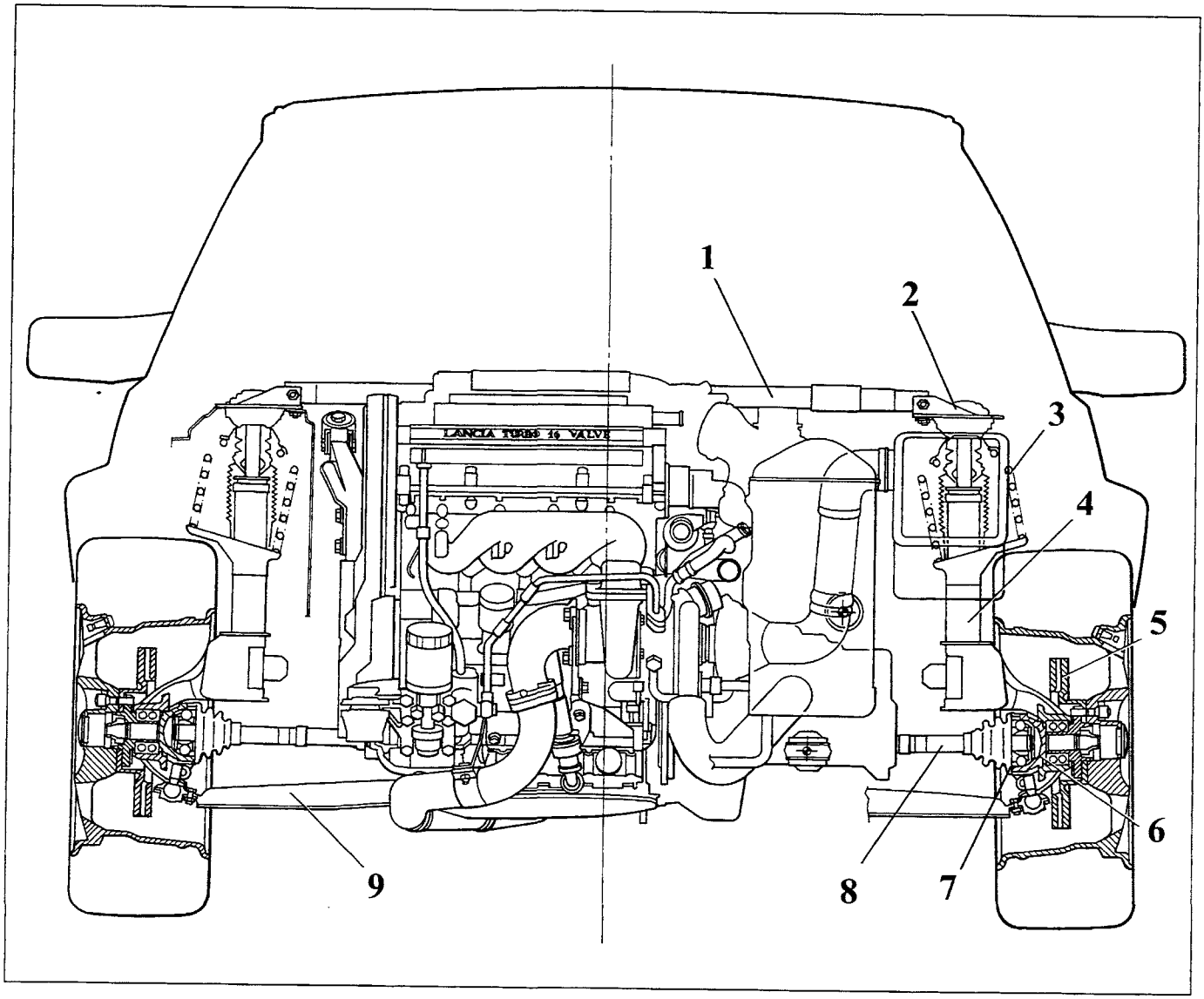
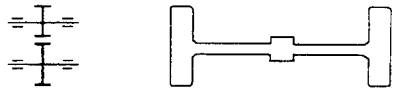
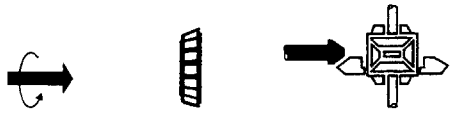
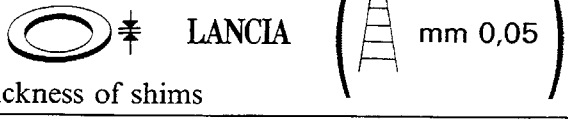
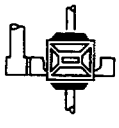
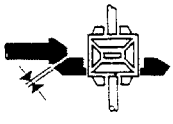
VIEW (PARTIAL SECTION OF FRONT WHEEL HUBS) OF POWER UNIT, SUSPENSION AND FRONT DRIVE

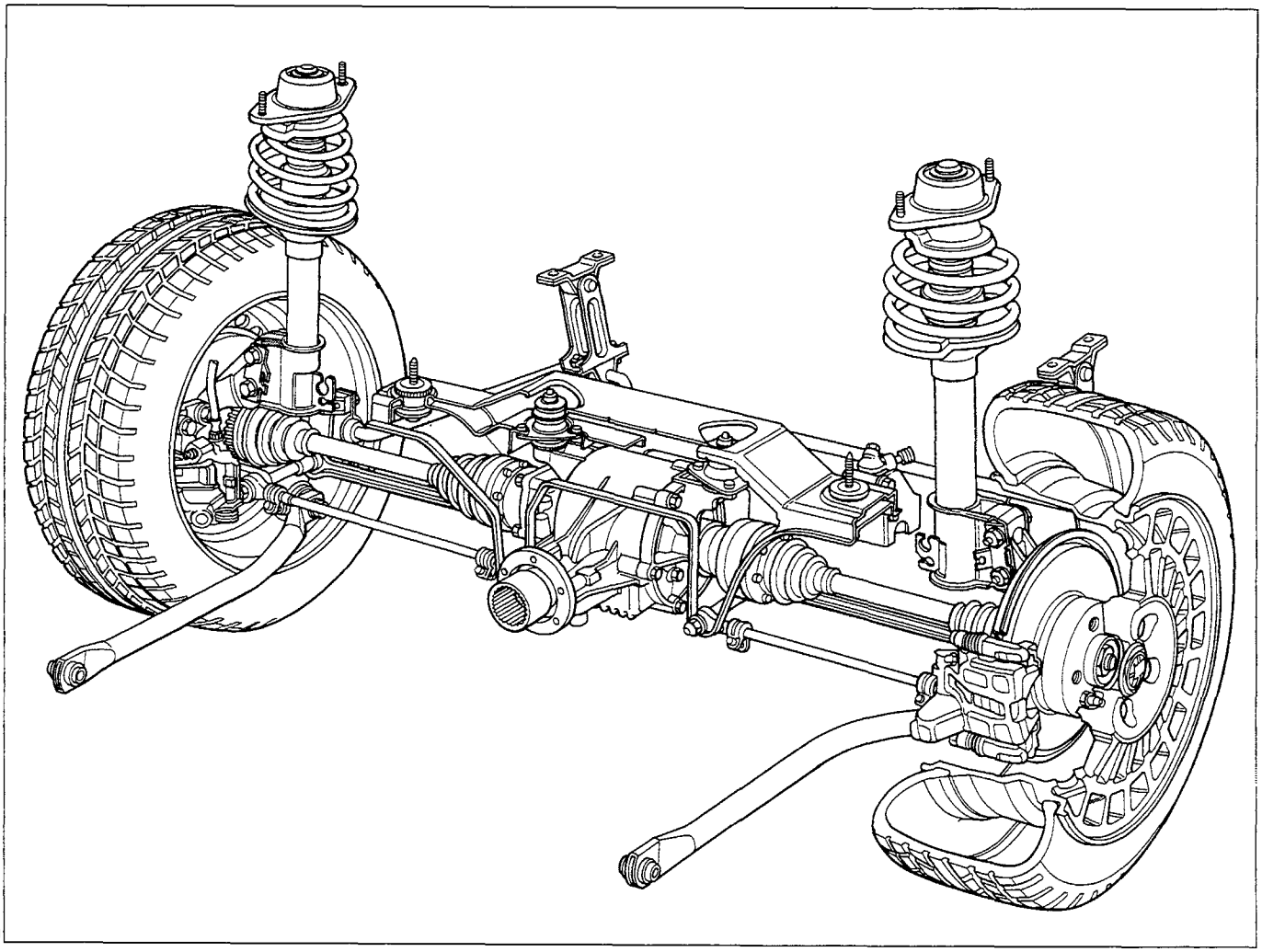


1. Bar connecting shock absorber turrets
2. Fixing for front shock absorber to turret
3. Front suspension spring
4. Front suspension
5. Ventilated brake disc
6. Front suspension steering knuckle
7. Constant velocity joint
8. Front drive shaft
9. Lower track control arm

 Crown wheel and pinion reduction	19/43 (2,263)
 Ratio at the wheels — 1st	10,888
2nd	6,767
3rd	4,739
4th	3,595
5th	2,851
R	11,025
 daNm Bevel pinion bearing rolling torque	0,08 ÷ 0,12
 Adjustment of bevel pinion position	 by shims
 LANCIA mm 0,05 Thickness of shims	2,55 ÷ 3,35
 Differential internal casing bearing	 conical roller bearings
 daNm Ring gear bearing rolling torque	0,18 ÷ 0,20
 mm Clearance between pinion and crown wheel	0,08 ÷ 0,15

 Adjustment of clearance between pinion and crown wheel	 by shims
 Adjustment of bearing pre-loading	
 Thickness of differential internal casing bearing pre-loading shims	0,18 ÷ 0,20

PARTIAL DIAGRAMMATIC VIEW OF REAR AXLE



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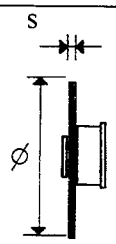
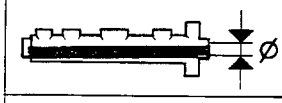
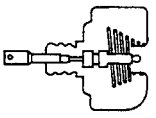
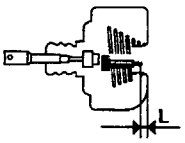
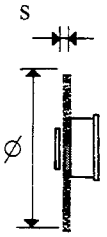
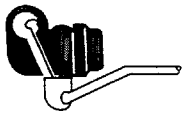
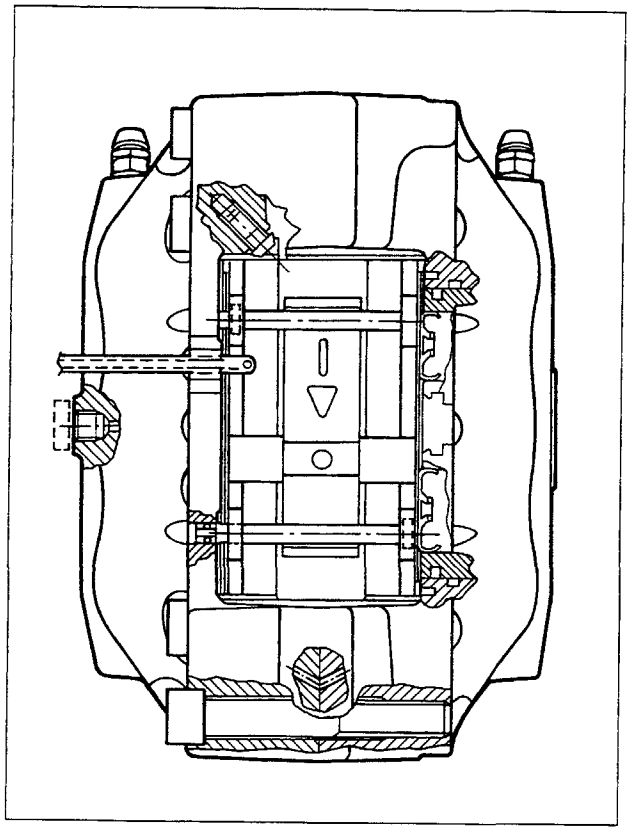
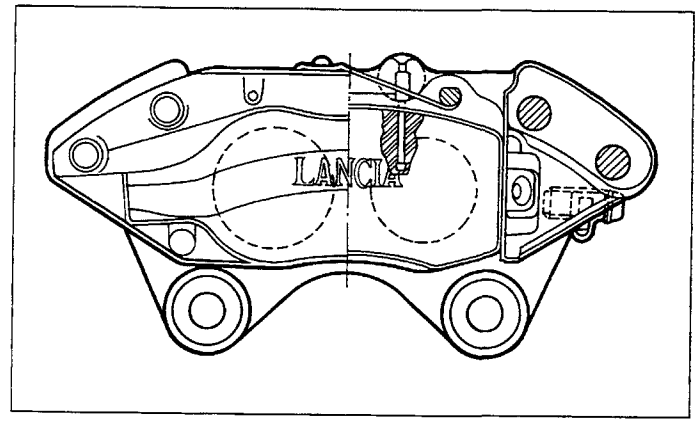
FRONT BRAKES		Values in mm
	Ø	281,2
Disc (internally ventilated)	s	25,90 ÷ 26,10
	s ≮	24,90
	s < allowed	24,20
 Brake pads	s < allowed	1,5
4 piston double caliper (Brembo)	$Ø_1$	38
	$Ø_2$	44
 Master cylinder (pump)	Ø	22,225 (7/8")
 Servo brake		ISOVAC 8" pneumatic vacuum servo acting on all four wheels
 Distance of hydraulic piston push rod from master cylinder support plate	L	22,45 ÷ 22,65

REAR BRAKES		
	Ø	251
Disc	s	9,80 ÷ 10,90
	s ≮	9,70
	s < allowed	9
 Break pads	s < allowed	1,5
Single piston caliper sliding on studs (Girling)	Ø	36
 Load proportioning valve		acting on rear wheels
Ratio (reduction)		0,36



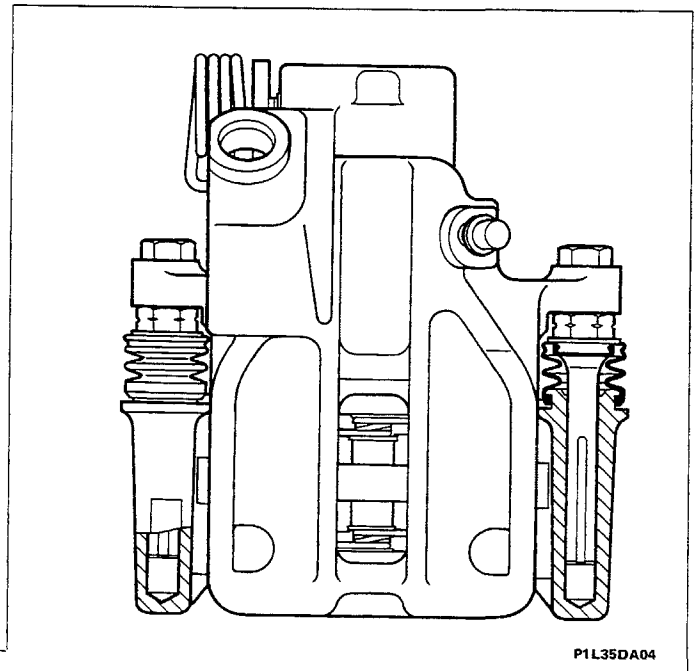
P1L35DA01

View from above, partial cross section of 4 piston fixed front caliper (Brembo)

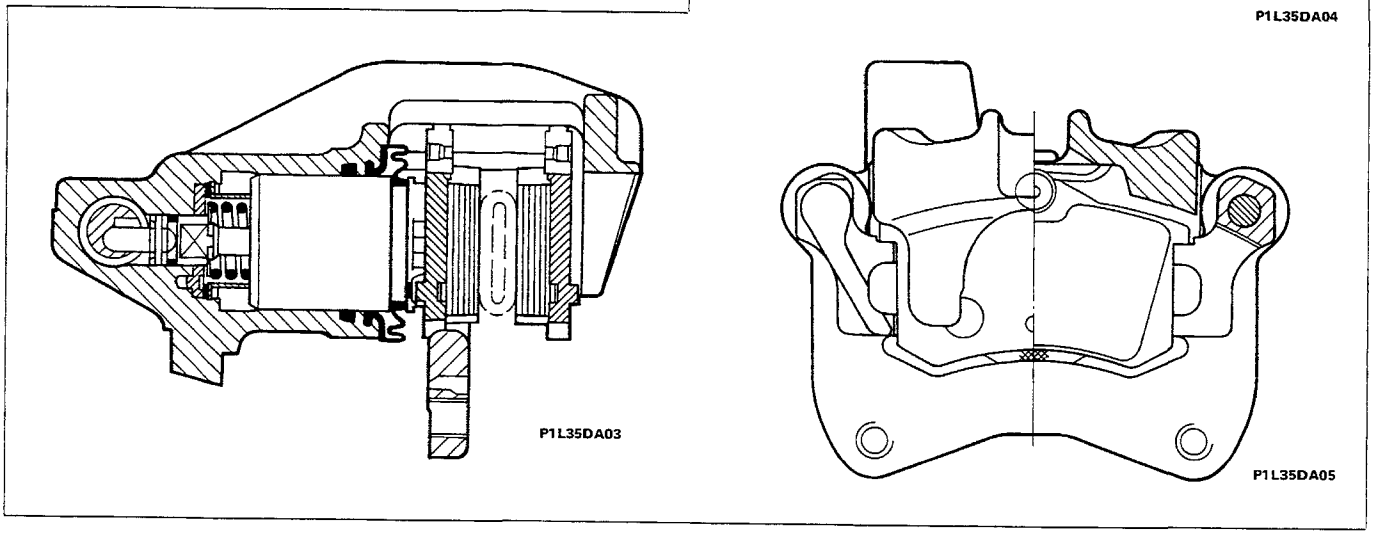


P1L35DA02

Side view, partial cross section, of 4 piston fixed front caliper (Brembo)

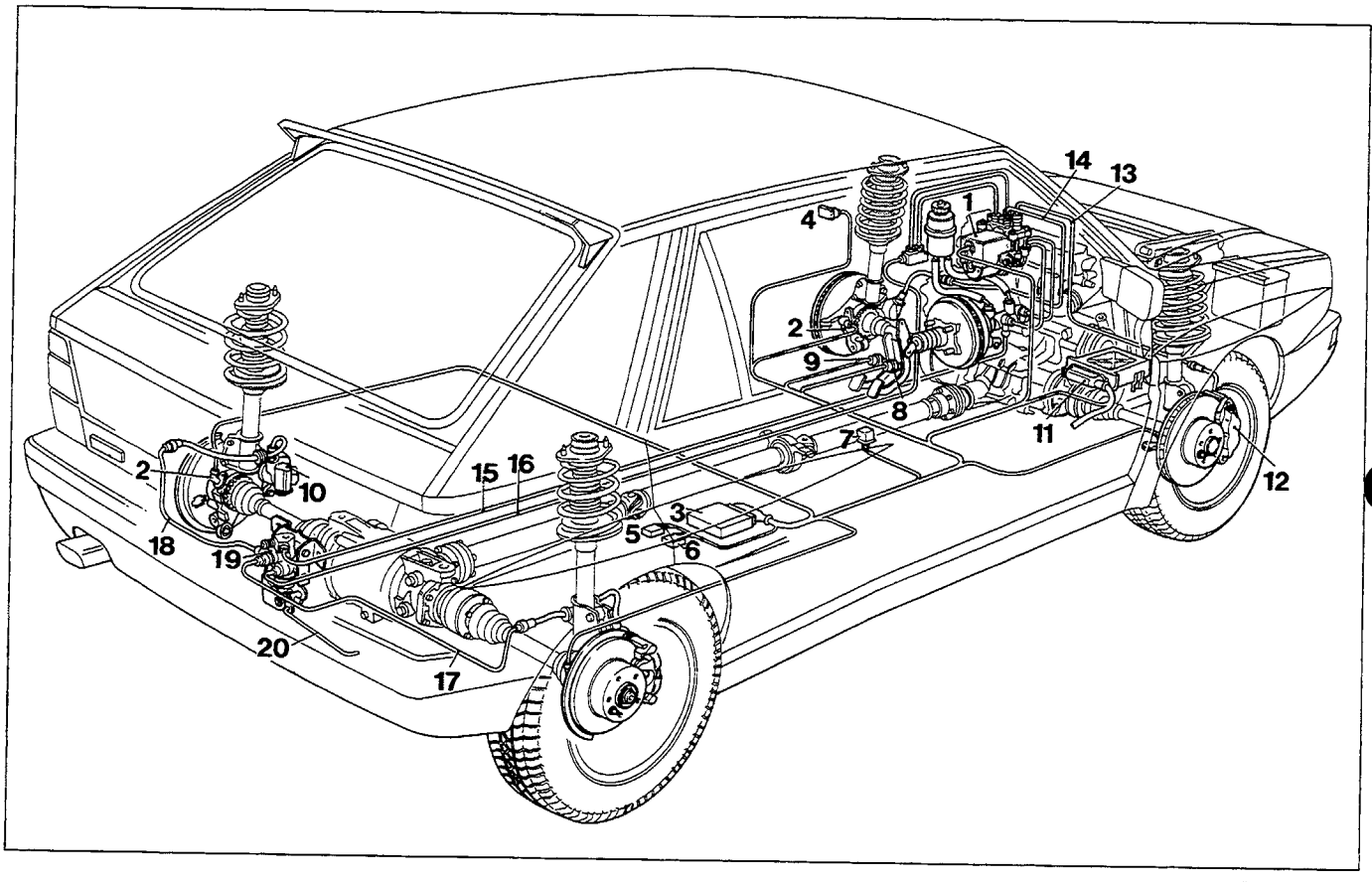


P1L35DA04



Partial cross section of rear caliper sliding on rails(Girling-Colette)

DIAGRAM SHOWING BRAKING SYSTEM WITH A.B.S.



P1L36DA02

1. Anti-lock braking system hydraulic control unit
2. Rpm sensor
3. Electronic control unit
4. Device failure warning light
5. Longitudinal accelerometer
6. Transverse accelerometer
7. Main control relay with protection against excess voltage
8. Brake lights switch
9. Switch on clutch pedal
10. Flywheels
11. IAW injection/ignition control unit
12. Right front brake with 4 pistons (Brembo)
13. Right front brake pipe from ABS hydraulic control unit
14. Left front brake pipe from ABS hydraulic control unit
15. Brake pipe from master cylinder to load proportioning valve
16. Brake pipe from ABS hydraulic control unit to load proportioning valve
17. Right rear brake pipe
18. Left rear brake pipe
19. Rear brake load proportioning valve
20. Load proportioning valve control bar

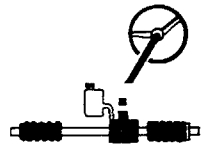
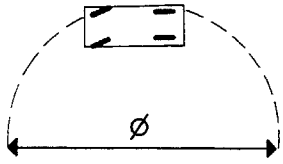
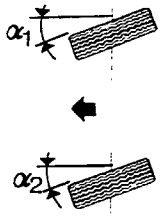
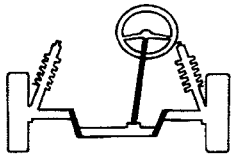
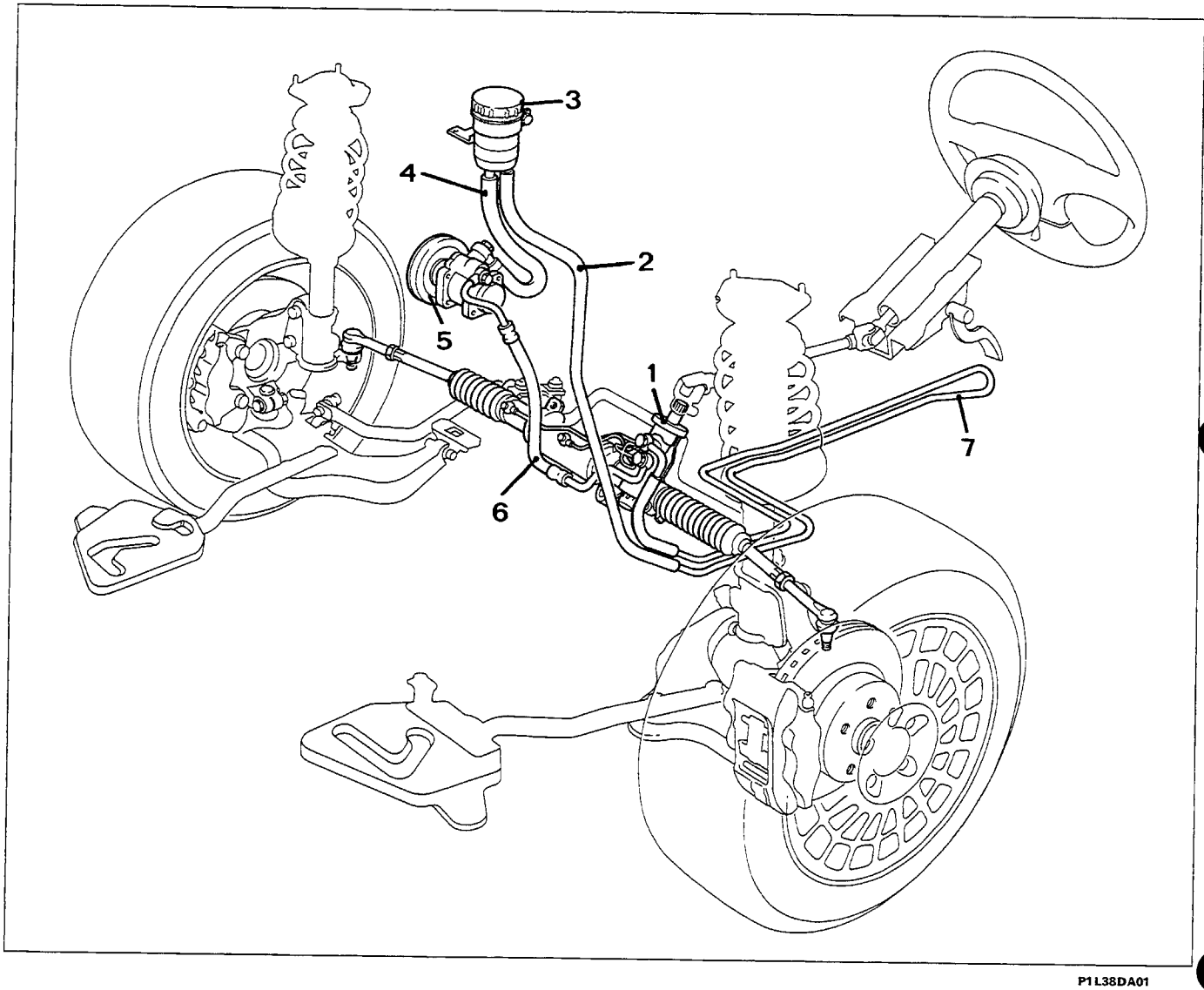
Type	 rack and pinion power assisted
 Ratio — no. of turns lock to lock	2,835
 rack travel	134 mm
 Minimum turning circle	10,4 m
 Steering angle — outer wheel α_1	30°46'
inner wheel α_2	35°4'
 Steering column	 with 2 universal joints

DIAGRAM SHOWING POWER ASSISTED STEERING



P1L38DA01

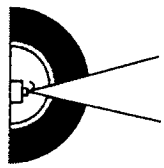
1. Power assisted steering box;
2. Oil return pipe to the reservoir (*);
3. Fluid reservoir;
4. Oil return pipe to the pump;
5. Pump for power assisted steering system
6. Pipe suppling oil under pressure;
7. Power assisted steering system fluid cooling coil which prolongs the oil return pipe to the reservoir (*). The coil is located under the floor in the front part of the vehicle. This coil considerably improves the cooling of the fluid.

WHEELS

Tyre	type		205/50 - ZR 15
	front	average load	2,2 bar
		heavy load	2,5 bar
	rear	average load	2,2 bar
		heavy load	2,5 bar
Rim	type		light alloy 7½Jx15"AH2-37

NOTE Spare wheel with light alloy wheel rim 3,50 Bx16" H2-37 and 115/70 R16" tyre
Speed limit: 80 km/h. Inflation pressure: 4,2 bar

WHEEL GEOMETRY

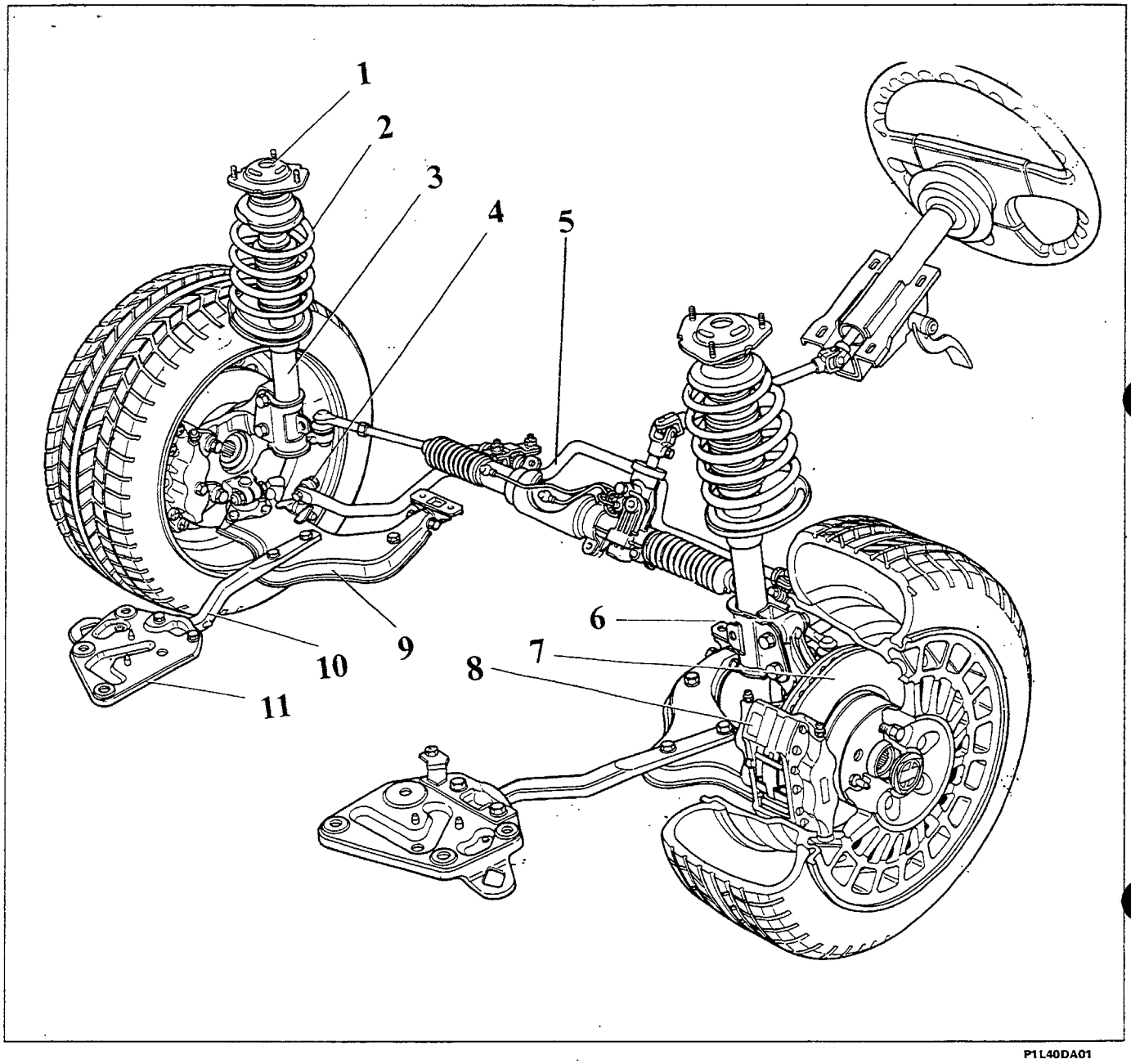


unladen car (*)

Front suspension	camber (**)	- 1' ± 30'
	caster (**)	4°10' ± 30'
	toe in	0 ÷ 2 mm (●)
Rear suspension	camber (**)	- 1°30' ± 30'
	toe in	3 ÷ 5 mm (●)

With tyres inflated to the correct pressure and vehicle in running order (with full fuel tank)
(**) Angles cannot be adjusted (●) Measured between the wheel rims

DIAGRAMMATIC VIEW OF FRONT SUSPENSION



1. Plate fixing shock absorber to dome
2. Front suspension spring
3. Front shock absorber
4. Rod connecting anti-roll bar to track control arm
5. Front anti-roll bar
6. Front supension damper
7. Front ventilated brake disc
8. 4 piston fixed brake caliper
9. Lower transverse track control arm
10. Lower longitudinal track control arm
11. Plate anchoring longitudinal track control arm to the bodyshell

Front suspension independent, Mac Pherson type with lower track control arm and damper comprising double acting gas telescopic hydraulic shock absorber and offset coil spring.
Anti-roll bar fixed to lower track control arms by 2 connecting rods.

Coil spring

Diameter of wire	mm	13,3 ± 0,05
Number of turns		5,39
Direction of coil		clockwise
Height of spring released	mm	387
Height of spring under a load of 412 daN	mm	180
The springs are subdivided into two categories, identifiable by a mark: yellow (1) for those under a load of: 412 daN		> 180
green (1) for those under a load of: 412 daN		⩽ 180

(1) Springs of the same category must be fitted.

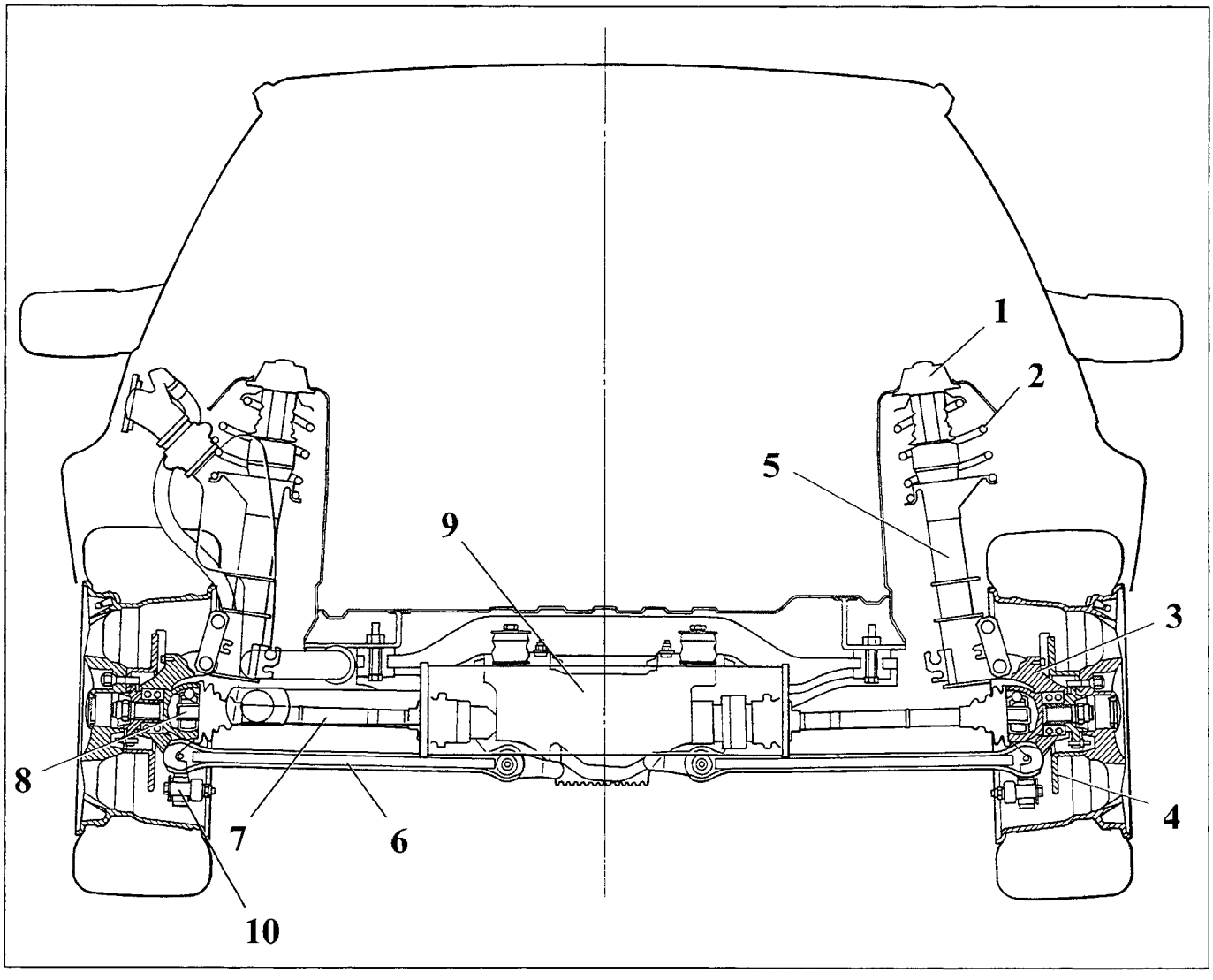
Front anti-roll bar

Diameter of wire (∅)	mm	24 ± 0,25

Shock absorbers

Type: telescopic, hydraulic, gas, double acting		Way-Assauto
Travel (start of damping action)	mm	157 ± 3
Maximum extension (start of damping action)	mm	526,5 ± 3

VIEW (PARTIAL CROSS SECTION OF REAR WHEEL HUBS) OF SUSPENSION AND REAR DRIVE



1. Rear shock absorber fixing to turret
2. Rear suspension spring
3. Rear suspension damper
4. Rear brake disc
5. Rear shock absorber
6. Transverse track control arm
7. Rear drive shaft
8. Constant velocity joint
9. Rear differential
10. Lower longitudinal track control arm

Rear suspension independent, Mac Pherson type with lower longitudinal track control arm and damper comprising double acting gas telescopic hydraulic shock absorber and offset coil spring.
Anti-roll bar

Coil spring

Diameter of wire	mm	11,5 ± 0,05
Number of turns		2,95
Direction of coil		clockwise
Height of spring released	mm	280
Height of spring under a load of 263 daN	mm	156,5
The springs are subdivided into two categories, identifiable by a mark:		
yellow (1) for those under a load of: 263 daN	having a height of mm	> 156,5
green (1) for those under a load of: 263 daN	having a height of mm	⩽ 156,5

(1) Springs of the same category must be fitted.

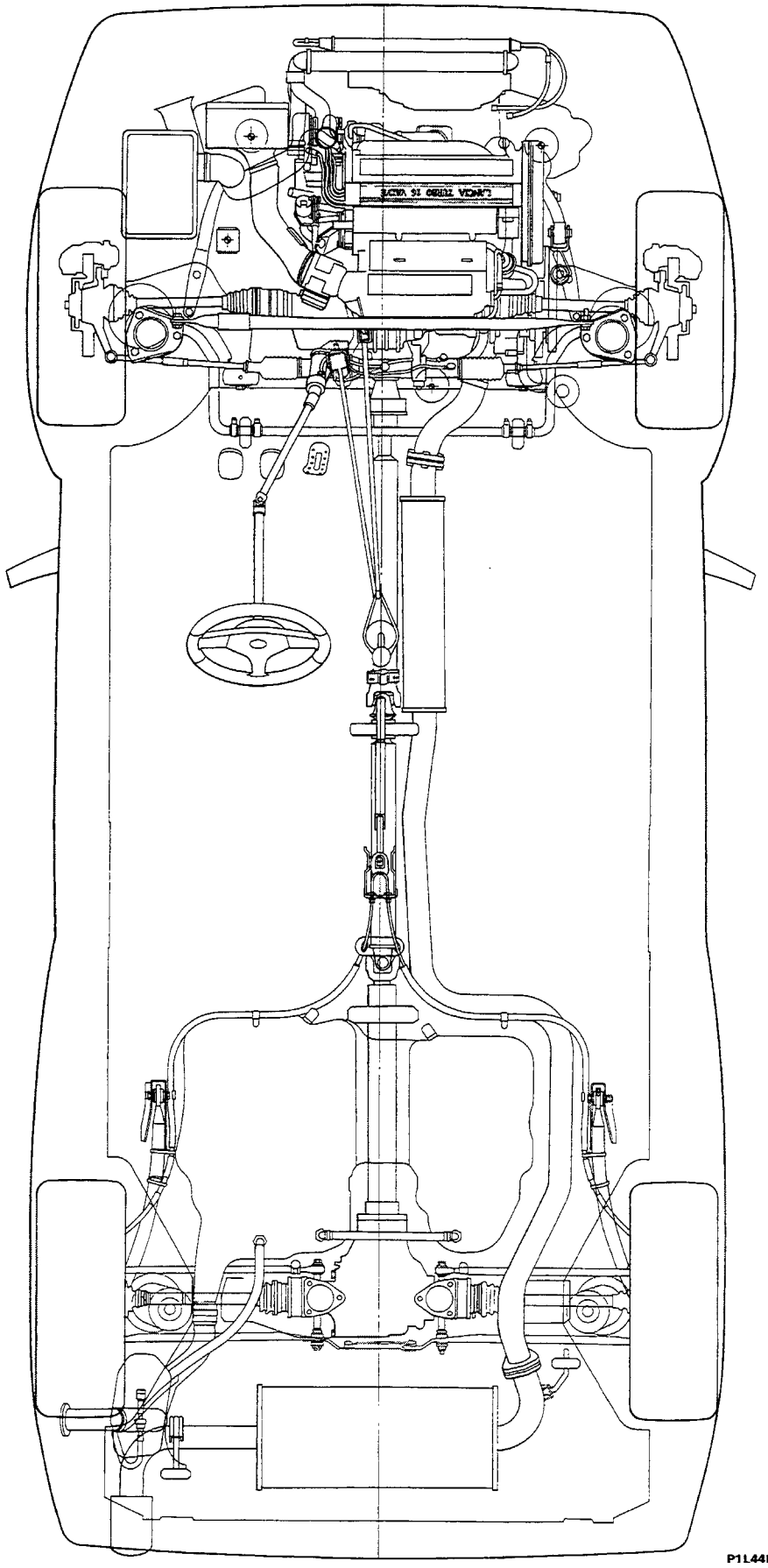
Rear anti-roll bar

Diameter of wire (∅)	mm	15

Shock absorbers

Type: telescopic, hydraulic, double acting, gas		Way-Assauto
Travel (start of damping action)	mm	165 ± 3
Maximum extension (start of damping action)	mm	565 ± 3

TOPOGRAPHICAL VIEW OF MAIN VEHICLE COMPONENTS



P1L44DA01

SUMMARY

STARTER MOTOR	M. Marelli E70R - 1,4 kW - 12 V
ALTERNATOR	M. Marelli AA125R - 14 V - 65 A
VOLTAGE REGULATOR	M. Marelli RTT 119 AC
BATTERY	12 V - 55 Ah - 225 A
IGNITION SYSTEM	Weber-Marelli (MPI) electronic injection/ignition system
IGNITION DISTRIBUTOR	DT 543 E
IGNITION COIL	M. Marelli BAE 504 DK
IGNITION COIL WITH CONTROL MODULE	M. Marelli AEI 600 L
SPARK PLUGS	Bosch WR6 DTC (with three point electrode)

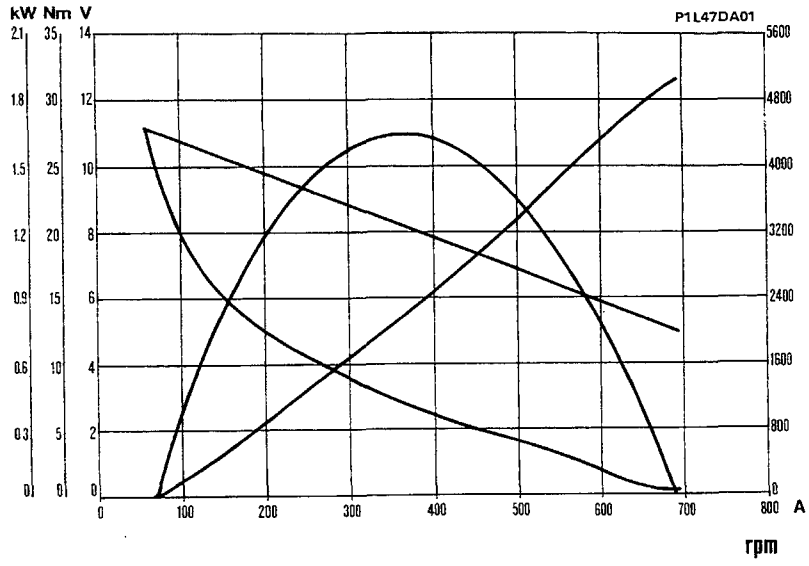
STARTER MOTOR

Type		M.MARELLI E70R-12V-1,4kW (with reduction gear)
Voltage	V	12
Nominal power	kW	1,4
Rotation, pinion side		clockwise
No. of poles		4
Field coil		series winding
Engagement		free wheel
Operation		solenoid
End float of armature shaft	mm	0,15 ÷ 0,45
Data for bench test		
Operating test (*):		
current	A	360 ÷ 380
speed	rpm	1150
voltage	V	8,15
torque developed	daNm	1,30
Engagement test (*):		
current	A	680 ÷ 700
voltage	V	4,9
torque developed	daNm	3,11
Free running test (*):		
current	A	60 ÷ 80
voltage	V	11,1
speed	rpm	4040
Relay Winding resistance (*)	pull in Ω	0,33 ÷ 0,37
	hold in Ω	1,13 ÷ 1,27
Lubrication Internal splines and shaft bushes		VS⁺ SAE 10 W
Engagement sleeve and intermediate disc		TUTELA MR3

(*) Data obtained at an ambient temperature of 20°C.

NOTE *When overhauling it is not advisable to undercut the insulator between the commutator bars*

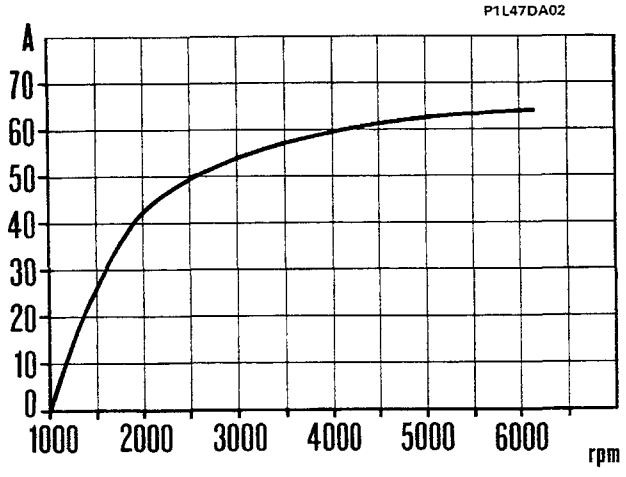
STARTER MOTOR TYPICAL CURVES



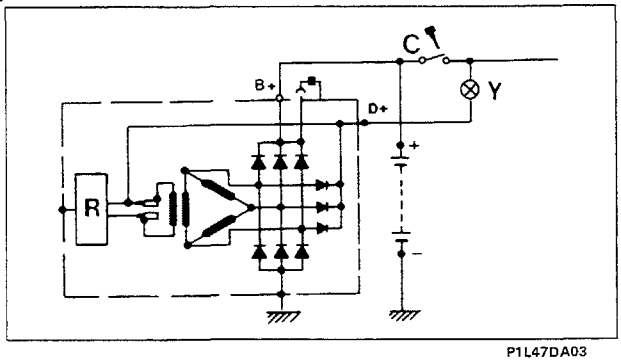
M. Marelli E 70R - 12 V - 1,4 kW

ALTERNATOR - TYPICAL OUTPUT CURVES

(at operating temperature, at a constant voltage of 13.5 V with bedded in brushes)

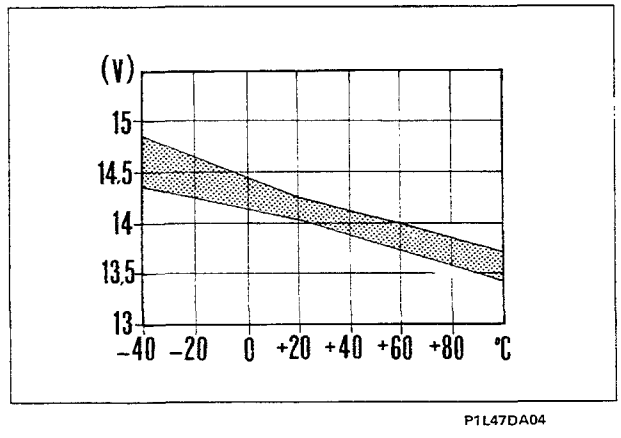


M. Marelli AA 125 R - 14V - 65A



Alternator wiring diagram

C = Ignition switch with key
Y = Alternator recharging warning light (12V - 3/5W)
R = Electronic voltage regulator



Typical voltage curve for regulator FIMM RTT 119 AC

ALTERNATOR

Make and type		M. Marelli AA 125R - 14 V - 65 A
Nominal voltage	V	12
Maximum current	A	65
Cut in speed when warm	rpm	1050 ÷ 1150
Current delivery on the battery at 7000 rpm at operating temperature	A	⩾63
Field winding resistance, between the slip rings (*)	Ω	2,6 ÷ 2,8
Direction of rotation (seen from control side)		clockwise
Engine/alternator transmission ratio		1 : 2
Diode rectifiers		bridge

(*) Data obtained at an ambient temperature of 25 °C.

VOLTAGE REGULATOR

Type		Built in electronic RTT 119 AC
Alternator speed for test	rpm	7000
Thermal stabilization current	A	30 ÷ 35
Test current	A	32 ÷ 33
Regulation voltage (*)	V	14 ÷ 14,3

(*) Data obtained at an ambient temperature of 20 °C.

BATTERY

Nominal voltage	V	12
Capacity (20 hour discharge)	Ah	55

WEBER-MARELLI I.A.W. MULTIPLE INJECTOR ELECTRONIC INJECTION/IGNITION SYSTEM COMPONENTS

1995 ie turbo

Description	Quantity	Type
Injection/ignition system electronic control unit	1	WH4WE.08/90 P-9D
Butterfly casing assembly	1	56 CFL 54/51
Fuel pressure regulator (2,5 bar)	1	RP7/2,5 bar
Fuel manifold assembly	1	CB 42
Injectors	4	IW 058
Support for solenoid valve for automatic idle adjustment	1	SCV 01
Solenoid valve for automatic idle adjustment	1	VAE 06/01
Electric fuel pump	1	PI022.13
Fuel filter	1	FI 02/2
Absolute pressure sensor (2 bar)	1	APS 02/03
Absolute pressure sensor (3 bar)	1	APS 05/01
Air temperature sensor	1	ATS 04
Coolant temperature sensor	1	WTS 05
Butterfly valve position sensor (potentiometer)	1	PF 09/N 02

00.55

ELECTRONIC INJECTION/IGNITION SYSTEM	1995 ie turbo 16v

Type	I.A.W. (Weber-Marelli multipoint injectio/ignition

ELECTRONIC IGNITION POWER MODULE

Make and type	M. Marelli AEI 600L
Firing order	1 – 3 – 4 – 2

DISTRIBUTOR

Make		M. Marelli
Type		DT 453 E
Coil winding resistance of impulse generator at 20°C	Ω	758 ÷ 872

COIL WITH BUILT IN POWER CONTROL

Make		M. Marelli
Type		BAE 504DK
Ohmic resistance of primary winding at 20°C	Ω	0,405 ÷ 0,445
Ohmic resistance of secondary winding at 20°C	Ω	4020 ÷ 5280

TDC AND RPM SENSOR

Make and type		M. Marelli SEN 8 D
Sensor winding resistance	Ω	612 ÷ 748
Distance (gap) between crankshaft sensor pulley and tooth	mm	0,4 ÷ 1

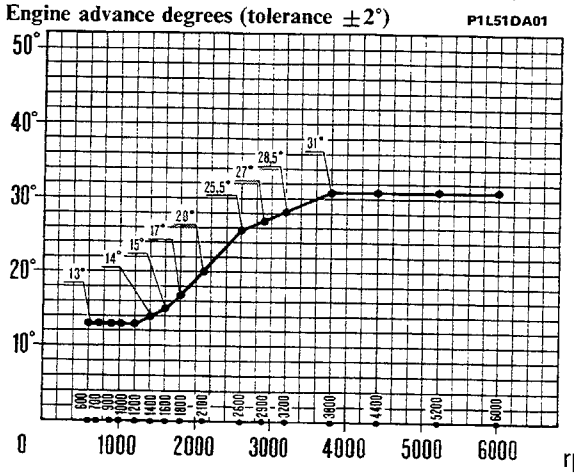
ENGINE IDLE ADVANCE

Engine idle speed	15° ± 3°

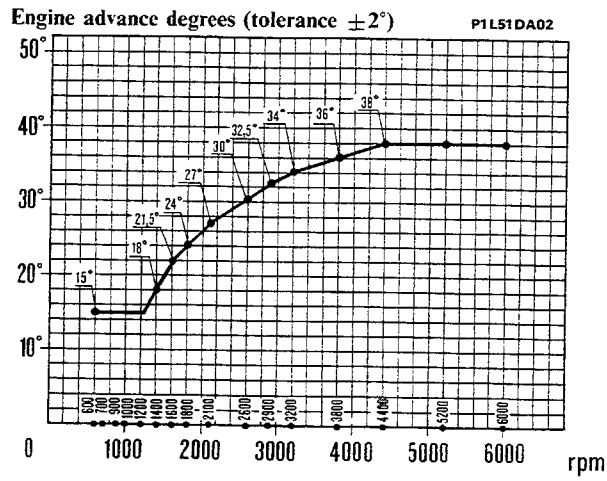
Make and type		Bosch WR6DTC (with 3 point electrode)
Thread		M 14 × 1,25
Electrode gap	mm	0,80 ÷ 1,00

IGNITION ADVANCE DIAGRAMS FOR EIGHT VACUUM VALUES IN THE INLET MANIFOLD

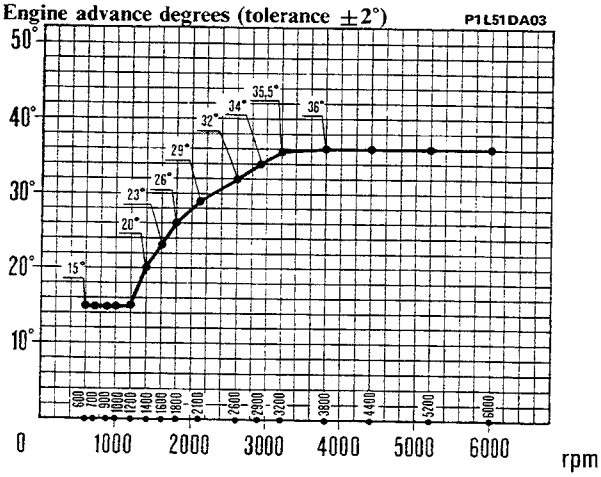
0,20 bar (150 mmHg)



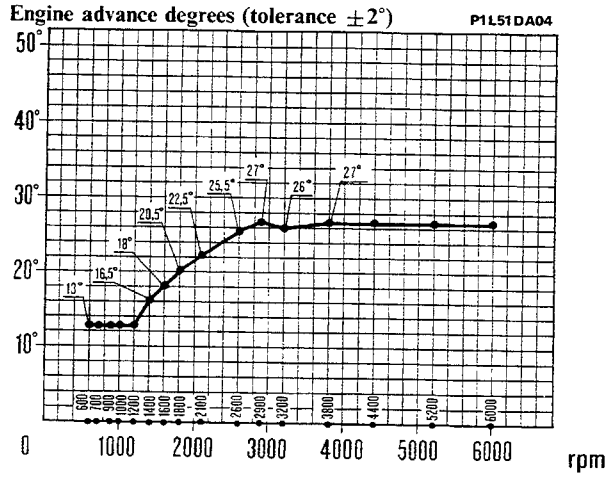
0,28 bar (210 mmHg)



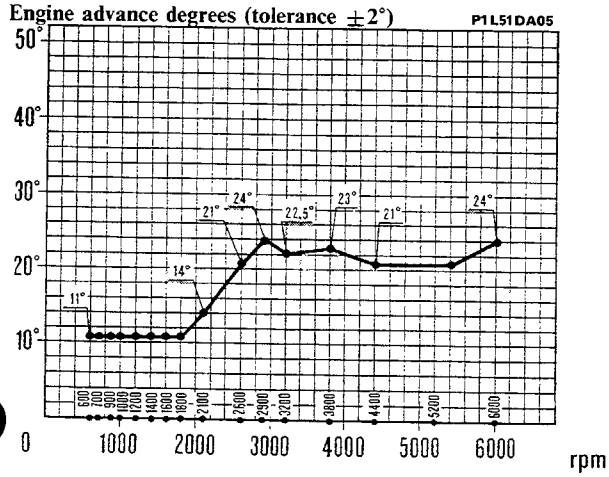
0,48 bar (360 mmHg)



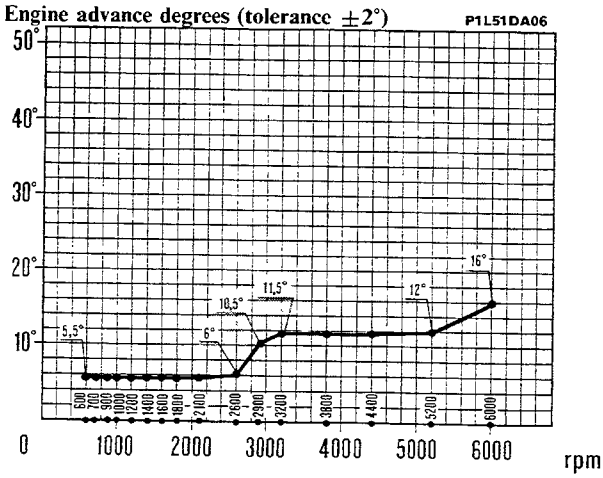
0,91 bar (690 mmHg)



1,18 bar (900 mmHg)

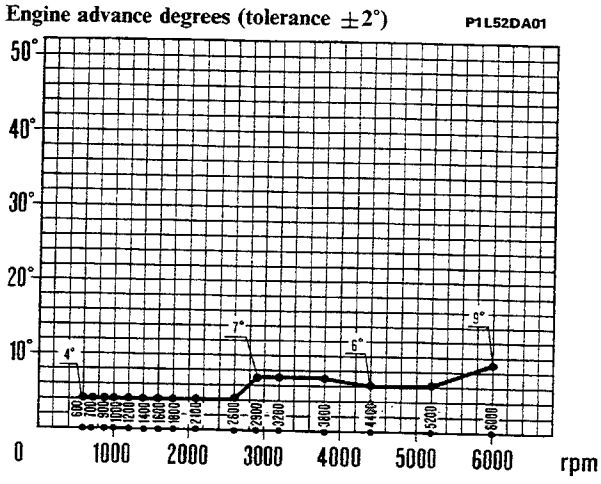


1,62 bar (1230 mmHg)



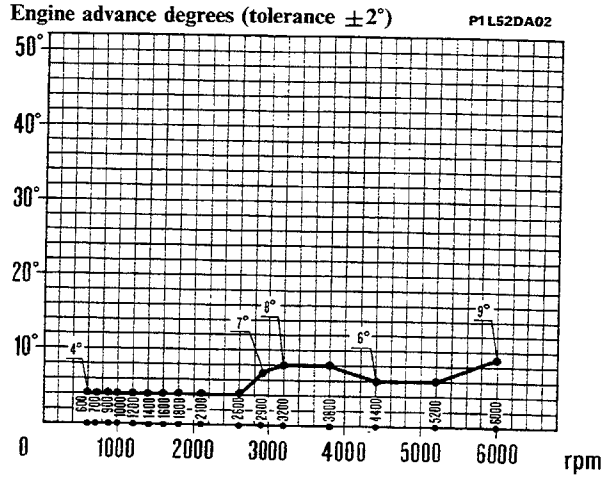
1,86 bar (1410 mmHg)

Engine advance degrees (tolerance ±2°)



2,10 bar (1590 mmHg)

Engine advance degrees (tolerance ±2°)



FREE SERVICE

Together with the LANCIA documents the owner of each new vehicle receives a free service coupon to be used after the first 1000 - 1500 km which recommends the following "systematic checks" as laid out in the "Owner's Handbook" in accordance with the application of the warranty:

Check and, if necessary, adjust	– idle CO content – engine idle speed – crankshaft drive belt tension – handbrake lever travel – tyre wear – headlamp alignment – tappet clearance – exhaust pipe tightening – condition of load proportioning valve protective boot
Check for leaks from the	– power assisted steering system – braking system – hydraulic clutch system
Check	– correct fitting of injectors – ignition advance
Check and, if necessary, top up levels of	– power assisted steering fluid – brake fluid – engine coolant – windscreen and headlamp washer fluid – hydraulic clutch system fluid
Check	– tightening of inlet and exhaust manifolds
Replace	– engine oil – cartridge oil filter – manual gearbox oil – rear differential oil

PLANNED MAINTENANCE

Suitable maintenance is an important factor for prolonging the life of a vehicle in good operating conditions with optimum performance. In order to achieve this, LANCIA has prepared a series of checks and maintenance operations in the six planned services in the Warranty Booklet identified by the three main services interspersed with the lubrication/inspection services. Each replacement or repair operation which is necessary during a Planned Maintenance Service will be carried out with the Owner's prior approval.

The planned maintenance services are offered by the entire LANCIA Service Network.

It is advisable to immediately notify our Service Departments of any small problems (e.g. leaks of essential fluids, however slight, etc) and have them seen to without delay or waiting for the next Service.

PLANNED MAINTENANCE

	15000 km or 1 year	**30000 km or 2 years**	45000 km or 3 years	**60000 km or 4 years**	75000 km or 5 years	**90000 km or 6 years**
Checking tyres for condition and wear	●	●	●	●	●	●
Checking operation of front disc brake pad wear sensor	●	●	●	●	●	●
Checking condition of rear disc brake pads	●	●	●	●	●	●
Visually inspect condition of: exterior bodywork and underbody protection, pipes (exhaust - fuel supply - brakes), rubber parts (protective boots - sleeves - bushes etc.)	●	●	●	●	●	●
Check condition and tension of various drive belts and adjust if necessary		●		●		●
Check/adjust tappet clearance		●		●		●
Check and, if necessary, adjust engine idle: check exhaust gas emissions	●	●	●	●	●	●
Check crankcase ventilation system						●
Replace fuel filter		●		●		●
Replace cartridge air filter		●		●		●
Top up fluid levels (engine coolant - brakes - windscreen wiper - hydraulic clutch - power assisted steering etc)	●	●	●	●	●	●
Check condition of timing toothed belt				●		
Replace spark plugs	●	●	●	●	●	●
Check ignition/injection system		●		●		●
Lubrication service: change engine oil and filter	●	●	●	●	●	●
Change gearbox oil				●		
Check gearbox oil level		●		●		●
Change rear differential oil		●		●		●
Check condition of counter balance shaft drive belt		●		●		●

REPLACEMENTS OUTSIDE OF PLAN

Every 60.000 km (or 2 years)	– Paraflù liquied
Every 105.000 km	– Timing belt – Counter balance shaft drive belt
Every 120.000 km	– Manual gearbox oil
Every 2 years	– Brake fluid (DOT3 or DOT4)

Lubrication service

In order for the engine to run smoothly and efficiently, it is advisable to use the type of oil recommended in the table on page 8.

If the vehicle is regularly subjected to heavy usage (a great deal of town driving, journies in dusty areas, constant mountain driving, towing a trailer or caravan, harsh climatic conditions, constant motorway driving at high speeds, etc), then the "Lubrication services" should be carried out at more frequent intervals.

Additional operations

After the operations in the "Planned maintenance" programme have been carried out the following checks are also required:

Every 500 Km or before long journies check:	- engine oil level - engine coolant level - brake fluid level - tyre inflation pressure - hydraulic clutch fluid level

It is advisable to use "Genuine LANCIA spare parts", the only ones which offer the same quality as the components originally fitted on the vehicle.
Regularly use Oliofiat which is at home in LANCIA engines.

ENGINE

1840207814	Tool (∅ 18-22 mm) for removing front counter balance shaft bearings from cylinder block/crankcase (to be used with 1840206000)
1850088000	Spanner (13 mm) for adjusting manifold fixing nuts
1850113000	Spanner (12 mm) for engine oil drain plug
1852137000	Spanner with 1/2" socket for cylinder head fixing bolts
1852150000	Spanner for bolts fixing engine tappet covers
1853003000	Spanner (19 mm) for bolt fixing camshaft gear, on vehicle
1854033000	Spanner for adjusting ring nut fixing electric pump or fuel filter on tank
1854038000	Spanner for adjusting ring nut fixing fuel level sender unit on tank
1860054000	Drift (∅ 22 mm) for removing and refitting con rod bush
1860162000	Pressure gauge with unions for checking engine oil pressure (scale 0-9,81 bar)
1860183000	Pliers (∅ 75-110 mm) for removing and refitting piston circlips
1860303000	Tool for fitting gudgeon pin circlips on piston
1860395000	Drift for removing valve guides
1860443000	Pressure lever for inserting tool for retaining tappets whilst adjusting valve clearance
1860454000	Drift for fitting oil seal on valve guides
1860456000	Support for cylinder head whilst replacing tappet shims (at the bench)
1860470000	Support for cylinder head during overhauling
1860486000	Drift for fitting valve guides
1860490000	Tool for retaining valve leakage test equipment 1895868000 (to be used with 1860470000)
1860592000	Universal hook for lifting and moving engine/gearbox assembly
1860592010	Tool for removing and refitting engine/gearbox assembly (to be used with 1860592000)
1860605000	Band (∅ 60-125 mm) for introducing normal and oversize pistons in cylinders
1860644000	Tool for removing and refitting valves
1860699000	Drift for fitting crankshaft rear oil seal (to be used with 1870007000)
1860745100	Tool for tensioning toothed belts (to be used with specific components)
1860745200	Tool for tensioning timing toothed belt (to be used with 1860745100)
1860745400	Tool for tensioning counter balance shaft drive belt (to be used with 1860745100)
1860747000	Tool for retaining tappets whilst replacing shim during adjustment of valve clearance (to be used with 1860443000)
1860758000	Tool for removing cartridge oil filter
1860765000	Tool for retaining camshaft toothed pulley
1860768000	Tool for rotating crankshaft in vehicle
1860769000	Support for cylinder head whilst removing and refitting valves
1860770000	Drift for fitting camshaft gaskets and crankshaft front seal
1861001011	Pair of brackets for fixing engine to rotating stand 1861000000

1867028000	Pair of threaded pins for rotating crankshaft (at the bench)
1867029000	Flywheel lock
1876036000	Cable with contacts for rotating engine whilst adjusting valve clearance
1890385000	Reamer (∅ 7 mm) for engine valve guide openings
1895362000	Cooling system leakage test equipment
1895683000	Engine cylinder compression test equipment (scale 4,05 - 18,2 bar)
1895683002	Cards for device 1895683000
1895762000	Dynamometer for checking trapezoid and poly-V belt tension
1895868000	Valve leakage test equipment
1895890000	Pressure gauge with unions for measuring electric pump supply pressure
1896248000	Gauge for checking valve stem height after refacing cylinder head seats

CLUTCH

1875029000	Guide pin for centering clutch plate
1875084000	Tool for removing thrust bearing from clutch release mechanism

GEARBOX

1846001000	Pair of half rings for remoivng gearbox main shaft bearing, engine side (to be used with 1846017000)
1850113000	Spanner (12 mm) for gearbox oil drain plug
1855035000	Spanner (19 mm) for removing and refitting gearbox
1870595000	Support for engine whilst removing and refitting gearbox-differential unit
1870600000	Support for gearbox-differential unit whilst removing and refitting
1871001014	Support for gearbox-differential unit whilst overhauling (to be fitted to 1861000000 or **1871000000)**

FRONT AND REAR DIFFERENTIAL

1845062000	Tool for removing constant velocity joint from front wheel drive shaft (to be used with 1847017001)
1847017004	Plate for removing flanged shaft from planet gear (to be used with 1847017001)
1870100002	Drift for fitting front differential cover seal and bearing and front and rear differential pinion seal
1870152000	Drift for fitting differential circlip on differential bevel pinion
1870430000	Tool for determining thickness of front and rear differential bevel pinion adjustment shim (to be used with 1870404000, 1895884000 and 1895113000)
1870432000	Tool for retaining front and rear differential bevel pinion whilst adjusting fixing nut
1870433000	Tool for checking clearance between front differential pinion and ring gear (to be used with 1895684000)
1870434000	Drift for fitting rear differential right flanged shaft support seal (to be used with 1870007000)
1870435000	Drift for fitting front and rear differential pinion bearing outer races (to be used with 1870007000 and 1840005002)
1870436000	Support for front and rear differentials (at the bench)

1870437000 Tool for removing rear differential bearing inner race from front and rear differential bevel pinion shaft (to be used with 1846017000)

1870438000 Tool for removing front and rear differential casing bearing inner races (to be used with 1840005001, 1840005302 and 1840005400)

1870439000 Tool for checking rolling torque for front differential casing bearings and rear differential bevel pinion bearings (to be used with 1895697000)

1870440000 Tool for checking front and rear differential pinion/ring gear teeth (to be used with 1870433000, 1870439000, 1870442000 and 1870443000)

1870441000 Tool for retaining bevel pinion whilst adjusting fixing nut and checking rear differential pinion/ring gear clearance (to be used with 1895684000)

1870443000 Tool for checking rolling torque for rear differential casing bearings (to be used with 1895697000)

1870597000 Drift for fitting oil seal on differential casing covers (to be used with 1870007000)

1875017000 Tool for removing and refitting differential bearing races (to be used with 1840005003)

1875019000 Tool for removing and refitting differential bearing races (to be used with 1840005003)

1895655000 Tool for determining thickness of differential bearing adjustment shims (to be used with 1895884000)

BRAKING SYSTEM

1856132000 Spanner (10-11 mm) for adjusting brake fluid pipe unions

STEERING

1847035000 Steering track rod end extractor

1874556000 Tool for adjusting TRW rack ball joint

SUSPENSION AND WHEELS

1847017004 Plate for extracting wheel hubs (to be used with 1847017001)

1854015000 Spanner (19 mm) for locking and unlocking shock absorber fixing nut

1870152000 Drift for fitting bearing and hub on rear stub axle

1874555000 Pneumatic tool for compressing suspension springs when fitting shock absorbers

ELECTRICAL EQUIPMENT

1850087000 Spanner for spark plugs

1857504000 Spanner (29 mm) for adjusting air conditioning system compressor pipe unions

1876046000 Lever for removing blade type terminal from connector block

1895879000 Tool for checking cylinder no. 1 piston TDC for positioning sensor carrier plate (static advance electronic ignition) (to be used with 1895881000)

1895895000 Tool for positioning sensor carrier plate, timing side (static advance electronic ignition)

BODYWORK

1859008000 Spanner for ring nuts fixing external rear view mirror

1878017000 Pliers for closing seat cushion spring hooks

1878031000 Set of suction pads (4) for lifting windscreen and rearscreen window glass

1878076000 Tool for cutting vehicle interior plastic lining

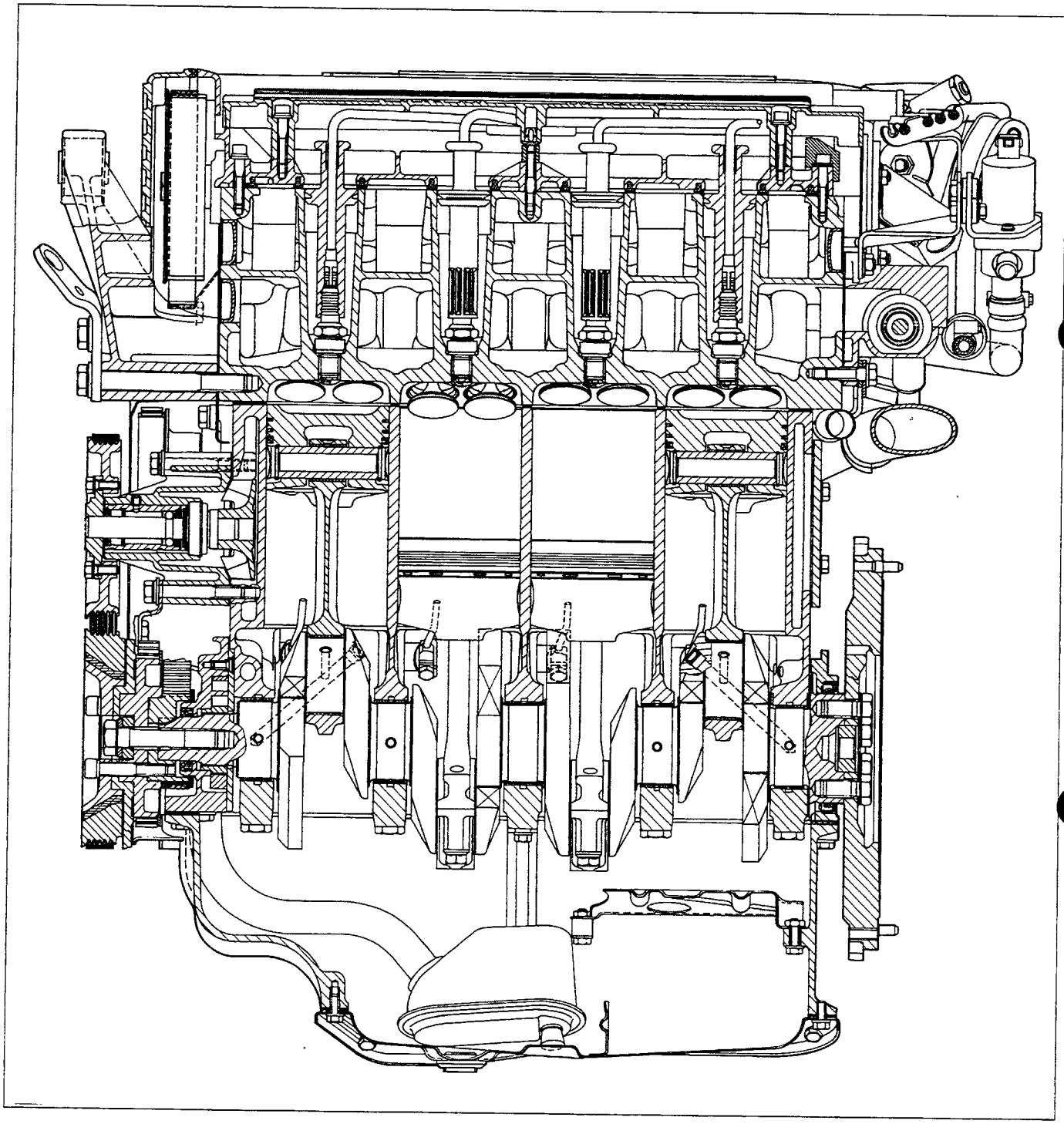
1878077000 Tool for removing door panel or plastic fixing buttons

1878085000 Tool for remoivng front and rear window glass trim

ORDINARY TOOLS

1840005000	Universal extractor
1840206000	Percussion extractor (to be used with specific tools)
1846017000	Base for half ring extractors
1847017001	Percussion extractor (to be used with specific tools)
1861000000	Rotating stand for overhauling engines (also for gearboxes and differentials)
1861000001	Pair of tools for attaching engine mounting brackets to rotating stand 1861000000
1870007000	Grip for drifts and fitting tools
1870404000	Support for measuring depths and projections (to be used with 1895881000)
1871000000	Rotating stand for overhauling gearboxes and differentials
1874549000	Support for raising rear part of vehicle (to be used with hydraulic jack)
1876048000	Extractor for MINI HYLOK CONTACT (MHF) Ø2,15 mm terminals
1895113000	Gauge (0,05-0,10 ... 0,80 mm) for checking various clearances
1895684000	Dial gauge with magnetic base
1895697000	Dynamometer (0-4,90 Nm) for measuring bearing rolling torque
1895881000	Dial gauge to be used with specific tools (measuring capcity 10 mm; shank length 16.7 mm)
1895884000	Dial gauge to be used with specific tools (measuring capacity 5 mm; shank length 16.5 mm)

LONGITUDINAL SECTION OF ENGINE



P1L23DA01

DESCRIPTION	Thread size	Tightening torque
		daNm
ENGINE		
Centre bearing cap to crankcase fixing, bolt	M 12 x 1,25	2 + 130°
Bearing caps to crankcase fixing, bolt	M 12 x 1,25	2 + 90°
Rod to aluminium sump and torque distributor fixing, nut	M 10 x 1,25	5
One-way oil drain valve	3/8" 14 NPTF	5
Bracket to Ferguson join aluminium sump, differential and bell housing fixing, nut	M8	2,5
Rear aluminium sump brackets and bell housing fixing, nut	M 10 x 1,25	5
Mounting bracket to torque distributor fixing, bolt	M 12 x 1,25	9,5
Cylinder head to crankcase fixing, bolt	M 10 x 1,25	5+ 90° + 90°
Camshaft cap fixing, bolt	M 8	2,5
Inlet manifold to cylinder head fixing, nut	M 8	2,5
Exhaust manifold to cylinder head fixing, nut	M 8	2,5
Inlet manifold mounting to cylinder head fixing, bolt	M 8	2,5
Big end fixing, bolt	M 10 x 1	2,5 + 50°
Flywheel to crankshaft fixing, bolt	M 12 x 1,25	14,2
Poly-V belt and power assisted steering pump drive pulley fixing, bolt	M 8	2,5
Timing gear to crankshaft fixing, bolt*	M 14 x 1,5(Left)	19
Belt tensioner bearing to mounting fixing, bolt	M 10 x 1,25	4,4
Belt tensioner mounting to alternator and power assisted steering mounting fixing, bolt	M 8	2,3
Poly-V belt tension adjustment screw stop, nut	M 10 x 1	4,4
Timing gear fixing, bolt	M 12 x 1,25	11,8
Camshaft belt tensioner bearing fixing, nut	M 10 x 1,25	4,4

* The bolt should not be lubricated

DESCRIPTION	Thread size	Tightening torque daNm
Counter balance shaft gear fixing, bolt	M 12 x 1,25	11,8
Counter balance shaft cover fixing, bolt	M 8	2,3
Counter balance shaft belt tensioner fixing, nut	M 8	2,3
Turbocharger to exhaust manifold fixing, nut	M 10 x 1,5	5,9
Union to turbocharger fixing, nut	M 10 x 1,5	5,9
Turbocharger mounting bracket to crankcase fixing, bolt	M 8	2,9
Turbocharger mounting bracket and exhaust pipe mounting bracket to crankcase	M 8	2,9
Oil supply pipe to turbocharger fixing, bolt	M 8	2,3
Filler for adjustable union fixing oil supply pipe to oil filter mounting	M 14 x 1,5	5
Oil supply pipe support bracket to exhaust manifold fixing, bolt	M 10 x 1,25	4,3
Oil return pipe from turbocharger to sump fixing, bolt	M 8	2,3
Filler for adjustable union fixing coolant return and supply hoses to turbocharger	M 16 x 1,5	3,2
Oil filter mounting and engine mounting to crankcase fixing, bolt	M 10 x 1,25	4,3
Plug for thermostatic valve on oil filter mounting	M 35 x 1,5	11,8
Oil level dip stick fixing, bolt	M 8	2,5
Water pump to crankcase fixing, bolt	M 8 x 1	2,5
Water pump union to casing fixing, bolt	M 8	2,3
Accelerator outer cable reaction bracket to inlet manifold fixing, bolt	M 8	2,5
Coolant return pipe to inlet manifold fixing, nut	M 8	2,3
Thermostat to cylinder head fixing, nut	M 8	2
Complete coolant return pipe to cylinder head fixing, bolt	M 8	2,3

DESCRIPTION	Thread size	Tightening torque daNm
Water pump drive pulley to hub on pump bearing fixing, bolt	M 8	2,5
Alternator and power assisted steering pump mounting to crankcase fixing, nut	M 10 x 1,25	4,3
Alternator and power assisted steering pump mounting to crankcase fixing, bolt	M 10 x 1,25	4,3
	M 8	2,5
Alternator bracket to mounting fixing, bolt	M 10 x 1,25	4,3
Alternator bracket fixing, nut	M 10 x 1,25	4,3
Alternator fixing, nut	M 12 x 1,25	6,9
Support brackets to power assisted steering pump fixing, bolt	M 8	2
Power assisted steering pump support brackets to mounting fixing, bolt	M 10 x 1,25	4,3
Power assisted steering driven pulley fixing, nut	M 14 x 1,5	9,5
Spark plugs	M 14 x 1,25	3,7
Oil temperature sender unit	M 14 x 1,5	3,7
Coolant temperature sender unit	M 16 x 1,5 tapered	4,9
Oil pressure switch	M 14 x 1,5	3,2
Oil sump plug	M 22 x 1,5 tapered	5

FUEL CIRCUIT

Fuel pump immersed in tank fixing, ring nut	131 x 6	6
Fuel level gauge to tank fixing, ring nut	81 x 4	3
Filler for adjustable union fixing fuel supply pipe to filter (aluminium filter housing)	M 14 x 1,5	3,5
Filler for adjustable union fixing fuel supply pipe to filter (steel filter housing)	M 14 x 1,5	4
Filler for adjustable union fixing fuel supply pipe to filter	M 12 x 1,5	3,5
Nut for union fixing fuel pipe between filter and injector manifold to manifold	M 14 x 1,5	3,5

DESCRIPTION	Thread size	Tightening torque
		daNm
LUBRICATION CIRCUIT		
Nuts at end of flexible oil supply pipe from engine to radiator	M 22 x 1,5	5
Nuts at end of flexible oil return pipe from radiator to engine	M 22 x 1,5	5
Engine oil cooling radiator fixing, bolt	M 6 x 1	1
ENGINE EXHAUST		
Exhaust pipe to turbocharger fixing, nut for stud	M 10 x 1,5	3,7
Flanges for fixing silencers to exhaut pipe fixing, bolt	M 8 x 1,25	1,5
Exhaust pipe mounting bracket to collar fixing, bolt	M 10 x 1,25	5
Collar on exhaust pipe to bracket fixing, nut	M 8 x 1,25	2,5
Exhaust pipe to flexible mounting fixing, nut	M 8 x 1,25	1
POWER UNIT MOUNTING		
Power unit mounting flexible mounting support, engine side, fixing, bolt	M 8 x 1,25	1,7
Flexible mounting, engine side, to engine, fixing, bolt	M 12 x 1,25	5
Flexible mounting to engine side support fixing, bolt	M 10 x 1,25	3,1
Power unit anchoring rod, engine side, fixing, bolt	M 10 x 1,25	4,2
Power unit anchoring rod, bodyshell side, fixing, bolt	M 10 x 1,25	4,2
Flexible mounting bracket, gearbox side, fixing, bolt	M 8 x 1,25	1,6
Flexible mounting to gearbox side bracket fixing, bolt	M 12 x 1,25	8,5
Flexible mounting support to bodyshell, gearbox side, fixing, bolt	M 10 x 1,25	3,5
Flexible mounting brackets, gearbox side, fixing, bolt	M 10 x 1,25	6
Flexible mounting to gearbox side mounting fixing, bolt	M 10 x 1,25	6
Complete flexible mounting to gearbox fixing, nut	M 10 x 1,25	6

DESCRIPTION	Thread size	Tightening torque
		daNm
Complete flexible mounting, gearbox side, fixing, bolt	M 12 x 1,25	8,5
Central attachment flexible mounting bracket fixing, nut	M 12 x 1,25	5
Centre flexible mounting bracket to differential fixing, bolt	M 10 x 1,25	5
Centre flexible mounting to supports fixing, bolt	M 12 x 1,25	8,5
Centre mounting to bodyshell side support fixing, bolt	M 10 x 1,25	3,1
Centre flexible mounting to bodyshell fixing, bolt	M 8 x 1,25	1,8

CLUTCH

Clutch mechanism to flywheel fixing, bolt	M 8 x 1,25	2
Nut for bolt hinging brake and clutch pedals	M 8 x 1,25	2,3
Pedals to bodyshell fixing, bolt	M 8 x 1,25	2,3 1,4

MANUAL GEARBOX-DIFFERENTIAL

Clutch release sleeve mounting cover fixing, bolt	M 6 x 1	0,75
Left side cover to casing fixing, bolt	M 8 x 1,25	2,5
Gearbox casing to support fixing, bolt	M 8 x 1,25	2,5
Rear cover to gearbox casing fixing, bolts	M 8 x 1,25	2,5
Support fixing gearbox assembly to engine, nut for stud	M 12 x 1,25	8,5
Differential cover to engine/gearbox mounting fixing, bolt (length 55 mm)	M 8 x 1,25	2,5
Differential cover to engine/gearbox mounting fixing, bolt (length 80 mm)	M 10 x 1,25	5
Gear control rod spring retaining, bolt	M 8 x 1,25	2,5
Magnetic plug	M 22 x 1,5	4,6
Main shaft gears locking, ring nut	M 22 x 1,5	15

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DESCRIPTION	Thread size	Tightening torques daNm
Lay shaft gears locking, ring nut	M 22 x 1,5	15
Main rear bearing retaining plate fixing, bolt	M 8 x 1,25	2,5
Lay shaft rear bearing retaining plate fixing, bolt	M 8 x 1,25	2,5
1st and 2nd speed selector fork fixing, bolt	M 8 x 1,25	2,5
3rd and 4th speed selector fixing, bolt	M 8 x 1,25	2,5
3rd and 4th speed selector fork fixing, bolt	M 8 x 1,25	2,5
5th speed and reverse selector fixing, bolt	M 8 x 1,25	2,5
Complete reverse gear lelver fixing bolt	M 8 x 1,25	2,5
5th speed selector fork fixing, bolt	M 8 x 1,25	2,5
Gearbox control shaft bush to casing fixing, bolt	M 6 x 1	0,75
Gear control lever to internal shaft fixing, nut	M 8 x 1,25	2,5
Gear control lever to external shaft fixing, bolt	M 8 x 1,25	2,5
Speedometer mounting fixing, bolt	M 6 x 1	1
Crown wheel fixing, bolt	M 8 x 1,25	3,5
Reversing light switch, bolt	M 12 x 1	3
Drive shaft joints to front differential fixing, bolt	M 8 x 1,25	4,2

EXTERNAL GEARBOX CONTROLS

Gear engagement control rod rear flexible mounting fixing, bolt	M 6 x 1	0,6
Gear engagement control lever joint to rod fixing, bolt	M 6 x 1	0,9
Gear engagement lever to floating mounting fixing, bolt	M 6 x 1	0,6
Flexible bush to gear engagement control rod (flexible coupling) fixing, bolt	M 6 x 1	0,9

DESCRIPTION	Thread size	Tightening torques
		daNm
Gear engagement control rod to gearbox ouput rod fixing, bolt	M 10 x 1,25	3,5
End of gear engagement control rod to flexible bush fixing, bolt	M 6 x 1	0,9
Bracket fixing reaction rod flexible bush to gearbox fixing, bolt	M 8 x 1,25	2
Mounting for reaction rod flexible bush to bracket on gearbox fixing, nut	M 8 x 1,25	1,3

ENGINE-GEARBOX FIXINGS

Bell housing to engine fixing, nut	M 12 x 1,25	8
Bell housing to engine fixing, bolt	M 12 x 1,25	8,5
Flywheel cover to bell housing fixing, bolt	M 6 x 1	0,8
Starter motor to bell housing fixing, bolt	M 8 x 1,25	2,2
Bell housing to engine fixing, bolt	M 12 x 1,25	5,5

FRONT DIFFERENTIAL: IDLER GEAR

Joint support fixing, bolt	M 8 x 1,25	2,5
Joint support cover fixing, bolt	M 6 x 1	0,75
Cover for front differetnial casing/idler gear fixing, bolt	M 8 x 1,25	2,5
Cover for front differential casing/idler gear fixing, bolt	M 10 x 1,25	5
Bevel pinion locking, nut to be staked	M 20 x 1,5	17 ÷ 28
Crown wheel fixing, bolt	M 10 x 1,25	8,8

FRONT DIFFERENTIAL TO DISTRIBUTOR FIXINGS

Filler for adjustable union fixing oil supply pipe to oil filter mounting	M 16 x 1,5	3,5
Union for fixing oil supply pipe to bevel pinion mounting	M 16 x 1,5	3,5
Front differential rod to engine sump fixing, nut	M 10 x 1,25	5,1

DESCRIPTION	Thread size	Tightening torques daNm
Bevel pinion mounting to gearbox fixing, bolt	M 12 x 1,25	8,8
Bevel pinion mounting fixing, bolt	M 8 x 1,25	2,5

PROPELLER SHAFT

Propeller shaft to front differential fixing, bolt	M 8 x 1,25	4,2
Propeller shaft intermediate support cross member fixing, nut	M 8 x 1,25	1,5
Nut for stud on rear differential fixing propeller shaft	M 10 x 1,25	5
Propeller shaft safety cross member fixing, nut	M 6 x 1	0,6
Propeller shaft shield fixing, nut	M 8 x 1,25	1

REAR DIFFERENTIAL

Pinion locking, nut to be staked	M 20 x 1,5	17 ÷ 28
Crown wheel fixing, bolt	M 10 x 1,25	8
Magnetic, threaded, tapered oil drain plug	M 22 x 1,5	4,6
Left cover fixing, bolt	M 10 x 1,25	5
Threaded, tapered, oil filler plug	M 22 x 1,5	4,6
Right cover fixing, bolt	M 8 x 1,25	2,5
Nut for stud on right cover	M 8 x 1,25	2,5
Differential flexible mounting to rear cross member fixing, nut	M 8 x 1,25	1,5
Rear differential to flexible mounting on rear cross member fixing, bolt	M 14 x 1,5	8,7

BRAKING SYSTEM

Front brake caliper to steering knuckle fixing, bolt (with 2 washers)	M 12 x 1,5	10,5
Rear brake caliper to stub axle fixing, bolt	M 10 x 1,25	4,8

DESCRIPTION	Thread size	Tightening torques daNm
Front and rear brake discs to hub fixing, bolt	M 8 x 1,25	1,2
Front and rear brake discs to hub fixing, bolt	M 8 x 1,25	2,3
Brake shield fixing, bolt	M 6 x 1	0,9
Brake servo to pedals fixing, nut	M 8 x 1,25	1,4
Male union for pipes with enlarged ends for fixing rigid pipe to brake servo pump	M 10 x 1	1,8
Male union for pipes with enlarged ends fof fixing rigid pipe to flexible pipe on front and rear brake calipers	M 10 x 1	1,8
Male union for pipes with enlarged ends for fixing rigid pipes to load proportioning valve	M 10 x 1	1,8
Union for fixing rigid pipes to load proportioning valve	M 12 x 1	1,8
Union for fixing flexible pipes to brake calipers	M 10 x 1	2,1
Load proportioning valve to rear cross member fixing, bolt	M 8 x 1,25	2
Handbrake to vehicle floor fixing, nut	M 8 x 1,25	1,4

STEERING

Steering rod ball joint to steering knuckle fixing, nut	M 10 x 1,25	3,5
Power assisted steering to bodyshell fixing, bolt	M 8 x 1,25	2,1
Side steering rod fixing, nut	M 12 x 1,5	6
Steering control rod shaft universal joint fork fixing, bolt	M 8 x 1,25	2
Steering wheel to steering column fixing, nut (for steering wheel with aluminium hub)	M 16 x 1,5	3,7
Nut for locking device for adjusting position of steering wheel (tighten the nut to the recommended torque with the lever in the locked position)	M 12 x 1,25	2,5
Steering column to mounting fixing, bolt	M 6 x 1	0,5
Filler for oil supply pipe adjustable union on power assisted steering pump	M 14 x 1,5	2,3

DESCRIPTION	Thread size	Tightening torques
		daNm
Filler for oil return pipe adjustable union on power assisted steering pump	M 18 x 1,5	3,4
Filler for adjustable union for oil supply pipe on power assisted steering pump	M 14 x 1,5	2,3
Oil reservoir to mounting fixing, bolt	M 6 x 1	0,5

FRONT SUSPENSION

Shock absorber stem to flexible mounting fixing, nut with polyammide ring	M 14 x 1,5	5
Flexible mounting at end of shock absorber stem to suspension turret fixing, nut	M 8 x 1,25	3,6
Wheel hubs to constant velocity joints fixing, nut	M 24 x 1,5	36
Wheels to hubs fixing, bolt	M 12 x 1,25	9,8
Ball joint to track control arm fixing, nut with flange	M 8 x 1,25	3,2
Differential side constant velocity joint fixing, nut	M 8 x 1,25	4,2
Ball joint to steering knuckle fixing, nut	M 10 x 1,25	9,5
Flexible bushes to suspension arm and pins fixing, nut	M 10 x 1,25	4,5
Anti-roll bar to bodyshell fixing, bolt	M 8 x 1,25	1,8
Shock absorber bracket to steering knuckle fixing, nut	M 12 x 1,25	10
Front bush for track control arm to chassis fixing, bolt	M 10 x 1,25	5
Rear bush for track control arm to chassis fixing, bolt	M 10 x 1,25	5
Pin to end of suspension arm fixing, bolt	M 10 x 1,25	5,6
Brake caliper to steering knuckle fixing, bolt	M 12 x 1,25	9,5
Pins to suspension arm fixing, bolt	M 10 x 1,25	5,6
Track control arm front plate to bodyshell fixing, bolt	M 10 x 1,25	4
UNIBAL to suspension arm fixing, nut	M 8 x 1,25	

DESCRIPTION	Thread size	Tightening torques
		daNm
Shock absorber mounting and shock absorber turret supporting bar plate fixing, nut (*)	M 8 x 1,25	3,6
Shock absorber turret connecting bar to plate fixing, nut (*)	M 12 x 1,25	9
Shock absorber turret connecting bar adjustment rod (*)	M 14 x 1,5	1
Shock absorber turret connecting bar adjustment rod lock, nut (*)	M 14 x 1,5	3

REAR SUSPENSION

Shock absorber to flexible mounting fixing, nut	M 12 x 1,25	5
Shock absorber to stub axle fixing, bolt	M 10 x 1,25	5,8
Complete flexible mounting to bodyshell turret fixing, nut	M 8 x 1,25	1,8
Anti-roll bar joint to bodyshell fixing, bolt	M 8 x 1,25	1,2
Anti-roll bar to joint mounting fixing, bolt	M 6 x 1	1
Anti-roll bar to stub axle fixing, bolt	M 8 x 1,25	2,3
Rear cross member to bodyshell fixing, bolt	M 12 x 1,25	6
Longitudinal rods fixing, bolt	M 10 x 1,25	6
Transverse rods fixing, bolts	M 10 x 1,25	6
Wheel hubs to constant velocity joints fixing, nut	M 24 x 1,5	32
Rear wheels to hubs fixing, bolt	M 12 x 1,25	8,6

BODYWORK

Upper hinge to bonnet lid and lower hinge to bracket fixing, bolt	M 8 x 1,25	0,8
Bodyshell side ball joint and tailgate side fixing, pin	M 8 x 1,25	1,5
Moveable hinge to tailgate reinforcement fixing, bolt	M 8 x 1,25	1,5
Tailgate hinge to bodyshell fixing, nut	M 6 x 1	0,4
Tailgate hinge to bodyshell side fixing, nut	M 6 x 1	1

(*) See the fitting instructions on page 73

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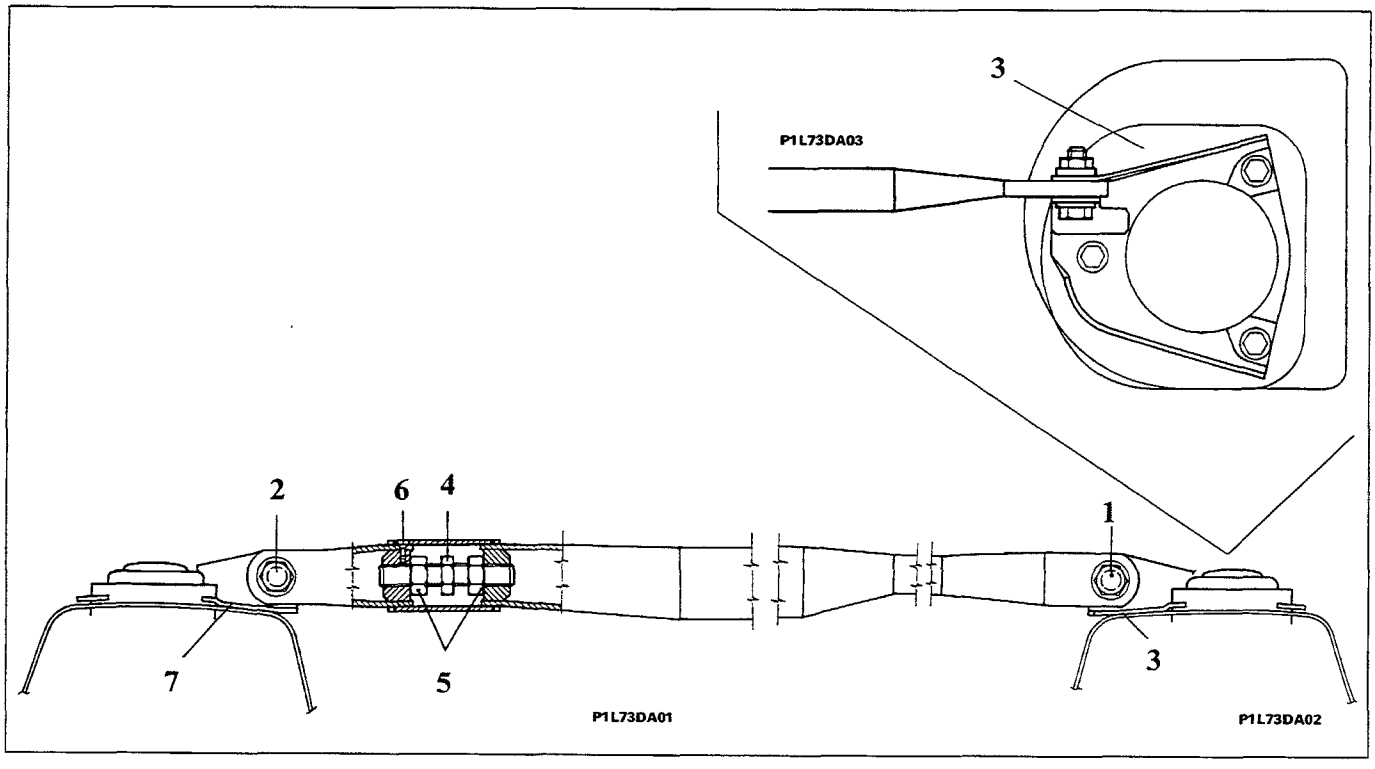
DESCRIPTION	Thread size	Tightening torques
		daNm
Rear tailgate lock striker to reinforcement fixing, flanged bolt	M 6 x 1	1
Rear tailgate upper and lower hinges to door fixing, bolt	M 10 x 1,25	3,5
Front door upper and lower hinges to door fixing, bolt	M 10 x 1,25	3,5
Front and rear door upper and lower hinges to bodyshell fixing, bolt	M 10 x 1,25	3
Front and rear door locks to door fixing, bolt	M 6 x 1	0,25
Front and rear door lock striker to bodyshell fixing, bolt	M 8 x 1	2,5
	M 6 x 1	1
Front bumper bracket to bodyshell fixing, bolt	M 10 x 1,25	4,5
Rear bumper bracket to bodyshell fixing, bolt	M 10 x 1,25	3
Front bumper to bracket side fixing, bolt	M 8 x 1,25	1,2
Front and rear bumper to bracket centre fixing, bolt	M 10 x 1,25	3
Rear bumper centre fixing bolts with nut with polyammide ring	M 10 x 1,25	3
Front and rear bracket for battery drip tray to bodyshell fixing, bolt	M 8 x 1,25	1,5
Battery drip tray side partition to bodyshell fixing, nut	M 8 x 1,25	0,9
Front and rear mounting to battery drip tray fixing, bolt	M 8 x 1,25	1,5
Lock to fuel filler flap fixing, nut	M 6 x 1	0,4
Front seat fixed guide rail to bodyshell fixing, bolt	M 8 x 1,25	3,2
Front seat fixed guide rail to mounting fixing, bolt	M 8 x 1,25	3,2
Bracket for hook for lifting and towing vehicle to bodyshell fixing, bolt	M 10 x 1,25	6,1
Front plate for raising vehicle to cross member fixing, bolt	M 10 x 1,25	3

INSTRUCTIONS FOR FITTING FRONT SHOCK ABSORBER TURRET CONNECTING BAR



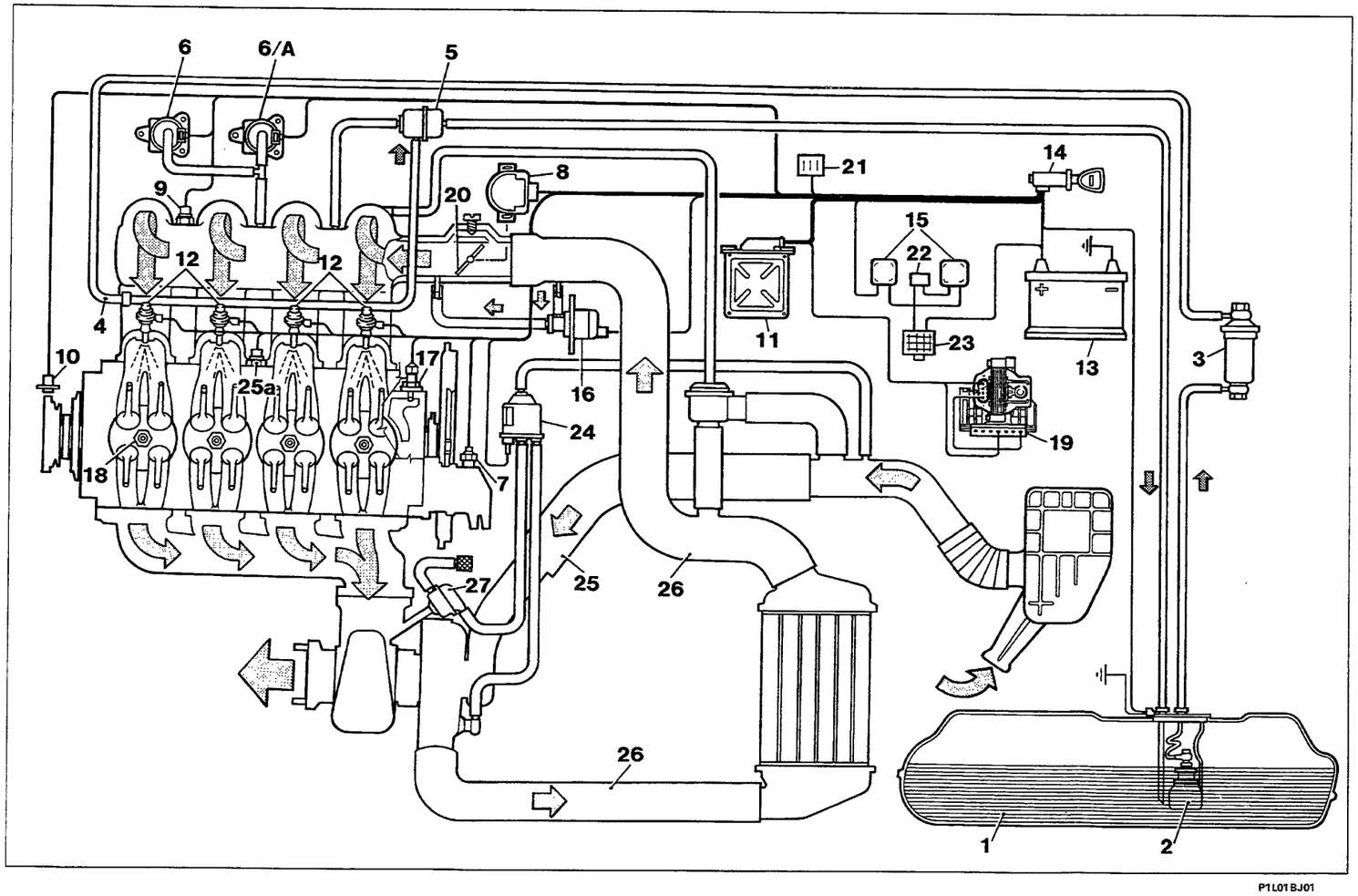
Before fixing the bar it is necessary to check that the plates 93 and 7) are correctly positioned so that the areas where the bar is fixed are flat.

The bar connecting the shock absrober turrets should be fixed to the anchorage plates (3 and 7) ***with the vehicle unladen and with the wheels on the ground***

The instructions for correctly fitting the shock absorber turret connecting bar are as follows:

1. Fix the connecting bar to the right plate (3) using the bolt (1)
2. Adjust the length of the connecting bar in such a way as to be able to fix the left plate (7), using the bolt (2)
3. Using a torque wrench, tighten the bolts (1 and 2) and the fixing nuts (connecting bar to plate) to a torque of 9 daNm
4. Using a torque wrench, tighten the centre bolt (4) for adjusting the length of the connecting bar to a torque of 1 daNm (the bar is slightly shortened during this operation)
5. Using a torque wrench, tighten the two lock nuts (5) fixing the length of the connecting bar to a torque of 3 daNm
6. Fit the covering sleeve and fix it to the connecting bar using the bolt (6).

DIAGRAM SHOWING I.A.W. (M.P.I.) INJECTION/IGNITION SYSTEM



P1L01BJ01

1. Fuel tank
2. Electric fuel pump
3. Fuel filter
4. Fuel manifold
5. Fuel pressure regulator
6. Intake air absolute pressure sensor

6A. Intake air absolute pressure sensor

7. HT distributor with injection timing sensor
8. Butterfly valve position sensor
9. Intake air temperature sensor
10. Rpm and TDC sensor
11. Electronic control unit
12. Injectors
13. Battery
14. Ignition switch
15. Injection/ignition relay feeds
16. Supplementary air solenoid valve for automatic engine idle adjustment
17. Coolant temperature sensor
18. Spark plugs
19. Ignition coil with power module
20. Butterfly valve
21. Diagnostic socket
22. Unattached fuse
23. Connector block
24. Solenoid valve controlling supercharging pressure
25. Air intake duct from filter

25A. Detonation sensor

26. Compressed air ducts from turbocharger
27. Supercharging adjustment actuator (waste-gate valve)

Description of system

The injection system on this version belongs to the latest generation of injection/ignition system developed by Marelli - Weber known as I.A.W. The injection system of the type with multiple injectors (multipoint-injection), one per engine cylinder, supplied at low pressure and controlled directly by the control unit in a SEQUENTIAL AND TIMED manner.
It uses two absolute pressure sensors and a solenoid valve controlling the supercharging pressure operating in Duty-Cycle.

The calculation of the amount of air drawn in for a given quantity of fuel to be injected is carried out by the control unit, also known as the electronic control unit, by processing the signals sent by the temperature sensor and the engine intake air absolute pressure sensor.
The ignition is of the inductive discharge, digital electronic type; the optimum ignition advance is decided on by the control unit by consulting a map stored in its memory according to different operating parameters in order to optimize the opposing requirements of maximum power and minimum consumption, at the same time keeping harmful exhaust emissions to a minimum level.
The idle speed is controlled by the control unit through a special additional air solenoid valve V.A.E. which (according to requirements) adjusts a flow of air parallel to the butterfly when the latter is in a closed position.

With the simultaneous control of the fuel injection, the ignition and the idle speed being carried out by a single control unit, this makes it possible to adjust each parameter according to the others with total interaction, in such a way as to fully exploit the potential of all three systems.

Composition of the system

The system, see the reference numbers on the previous page, is composed of:

1. A control unit or electronic control unit (11)
2. A set of sensors which send information to the control unit concerning the engine operating conditions to allow it to process the most suitable intervention strategies:
   a. Engine rpm and TDC sensor (10)
   b. Timing sensor (located in ignition distributor)
   c. Intake air temperature sensor (9)
   d. Intake air vacuum/pressure sensors (6) and (6/A)
   e. Coolant temperature sensor (17)
   f. Butterfly position sensor (8)
3. A set of actuators which carry out the strategies processed by the control unit:
   a. injectors (12)
   b. ignition control module (19)
   c. additional air solenoid valve (16) for adjusting idle speed (V.A.E.)
   e. fuel pump (2)
4. A diagnostic socket (21), located near the control unit, to link the Fiat-Tester with the control unit, the diagnosis of the sensors and the manual control of the actuators.
5. Two relay feeds for the injection/ignition system (15)

Operating principle

Injection system

The control unit establishes the amount of fuel to be injected on the basis of the result of the calculation of the quantity (weight) of air drawn in by the invidual cylinder.
The system used is the **"engine speed - air intake density"** (Speed-density) type, i.e. it calculates the quantity of air according to the density of the air in the inlet manifold and the engine speed; this density is determined by the control unit according to the information received from the temperature and intake air pressure sensors.
The control unit also consults a map stored in its memory which, on the basis of the required engine speed and load conditions (i.e. vacuum or pressure in the inlet manifold) supplies the optimum volumetric output for the engine. The map stored in the memory is based on results obtained from practical tests.

Ignition system

The ignition system is operated by the control unit which controls the advances. The map of advance values stored in the control unit memory helps in calculating the optimum advance values according to the rpm parameters and vacuum in the engine inlet manifold, suppling the control unit with the correct value to use.
The engine timing sensor sends the control unit the position of each cylinder in relation to TDC. This allows it to decide the exact moment in which to send the power module the signal to strike the spark at the spark plug for the relevant cylinder.
The power module, having received the command from the control unit, lets the current flow from the ignition coil primary winding until it it completely energized, then it cuts off the current flow creating the high tension in the secondary winding necessary for the spark between the spark plug electrodes.

Idle adjustment system.

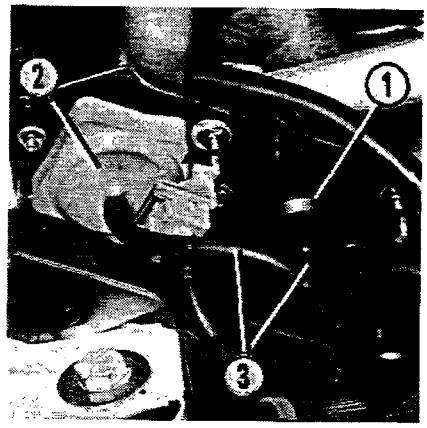
In order to idle, in other words run with the butterfly valve completely closed, the engine requires a certain amount of air and fuel in order to supply a power which is sufficient to overcome the internal friction and maintain the rotation speed; this power should increase whilst the engine is warming up and when an additional load is applied due to a service being switched on.
The increase in power supplied by the engine involves a greater amount of fuel and air being sent to the cylinders for combustion.
The V.A.E. valve allow the flow of air parallel to the butterfly valve under the direct control of the control unit, varying the flow rate of the air according to the fuel injected and keeping the engine at a constant idle speed.
Whilst the engine is warming up (i.e. after starting until it reaches operating temperature), as well as the additional flow of air to maintain the idle speed, an increase in the stoichiometric ratio of the fuel/air mixture is required, or an increase in the amount of fuel injected; the electronic control unit takes care of this using the signals coming from the coolant temperature sensor.

Operating strategy

The system is controlled by the control unit, which receives signals from the sensors and on the basis of which it decides the strategy for controlling the actuators.
In order to determine the operating strategy, the control unit consults information stored in its memory.
The data is condensed in the form of maps which for an input value corresponding to the signal sent by a sensor, supply output data, equivalent to the signal to send to the actuator: the output information is further modified according to the operating conditions which are read by the control unit by means of signals sent by other sensors.
The operation of calculating the parameters is carried out for each engine rev in such a way that the system adapts instantly to the operating conditions and the engine usage requirements.
The control unit is also capable of adjusting the signal sent to the actuators according to the supply voltage, in as far as variations in the latter involve a different response for the actuators.

The electronic control unit is also able to carry out the following operations:
- Diagnosing the control unit input controls with "recovery" of the fixed, pre-memorized values, if there is a breakdown of the sensors.
- Lighting up the diagnosis bulb if there is a defect in one of the system components
- Dialogue with the FIAT-TESTER and activating the actuators for service checks.

Location of absolute pressure sensors under the mounting bracket



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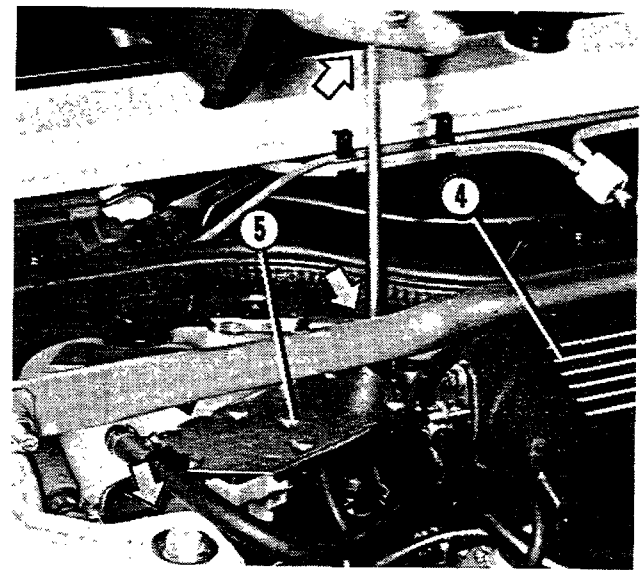


P1L03BJ01

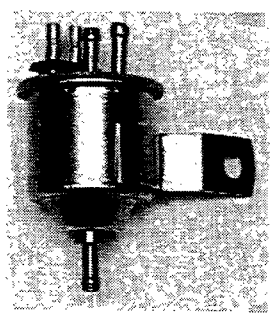
Removing-refitting absolute pressure sensor carrier bracket (the arrows show the fixing bolts)

1 - ABSOLUTE PRESSURE SENSORS

For the Delta HF integrale 16v version two absolute pressure sensors are used. These are connected via a rubber pipe (3) to the inlet manifold (4) and fixed under the bracket (5) in the engine compartment.
The pressure sensor (1) provides the voltage signal proportional to the absolute pressure in the inlet manifold for pressure values of up to 1600mmHg, whilst the absolute pressure sensor (2) supplies it for pressure values of up to 2280 mmHg. **With the use of two absolute pressure sensors a clearer signal is obtained in as far as for supercharging pressures greater than 0.7 bar the sensor (1) is no longer sufficient to fuarantee the reading of the signal with good reliability.** Therefore when the supercharging pressures in the inlet manifold exceed 0.7 bar, the electronic control unit switches the reading of the signal over to sensor (2).

The sensors can be differentiated through the different colour of their base and cover, one is black, the other grey. When removing-refitting the sensors, always match the sensor and electrical connector which are the same colour.

2 - SOLENOID VALVE CONTROLLING SUPERCHARGING PRESSURE



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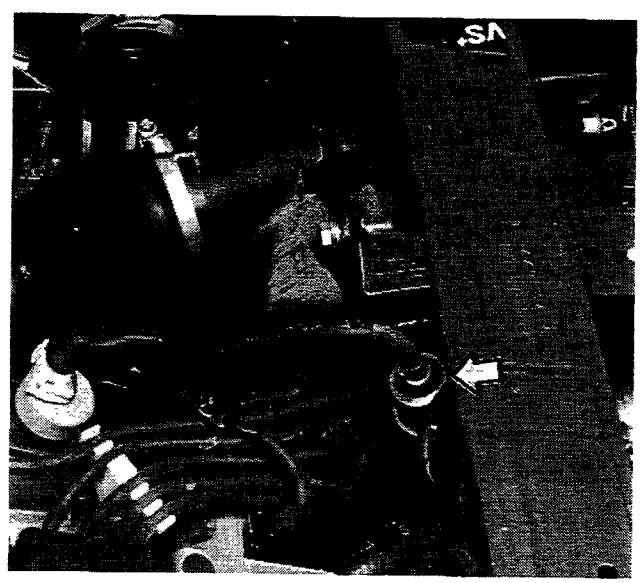
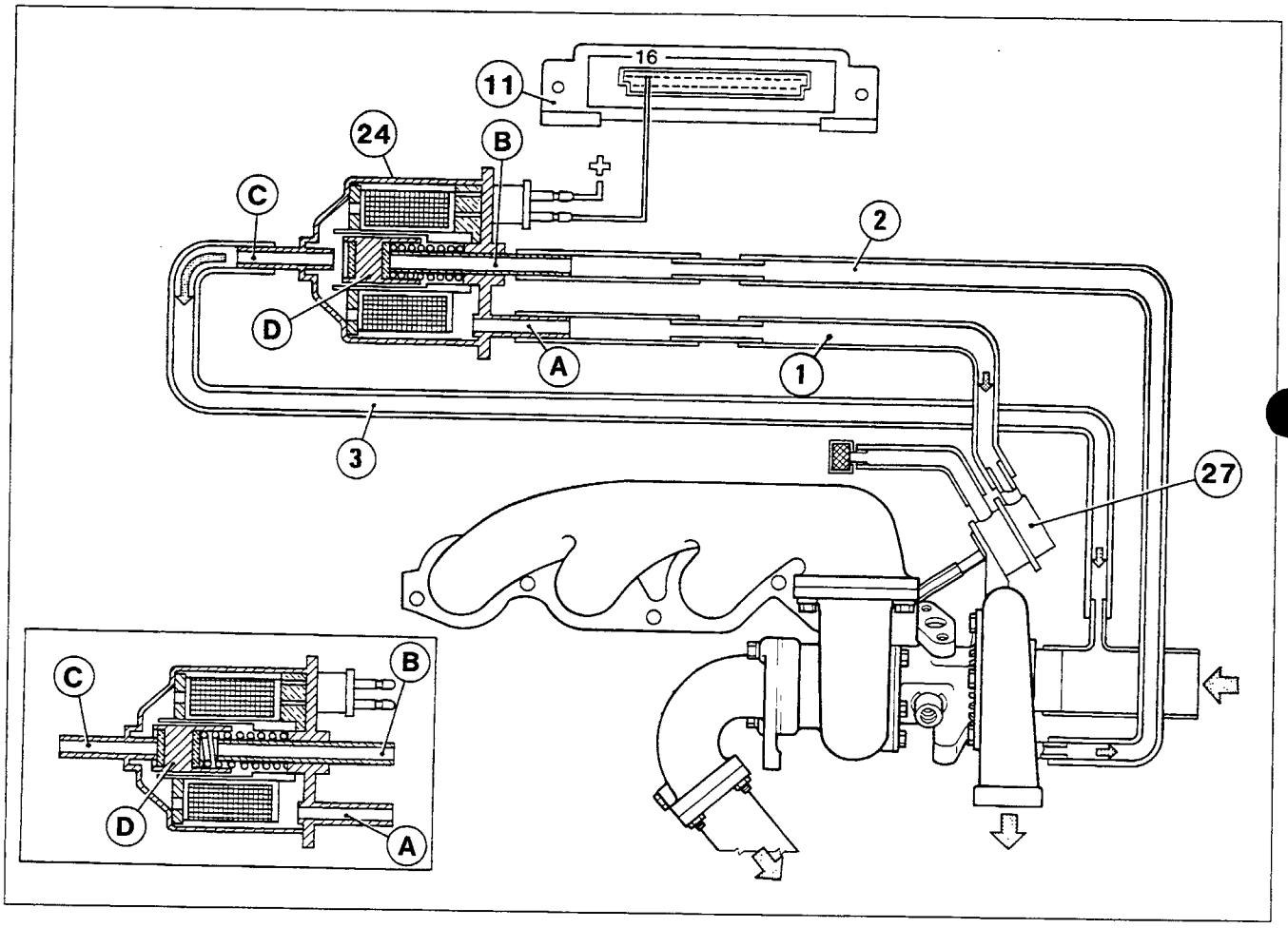


P1L03BJ03

Location on vehicle of solenoid valve for controlling supercharging pressure

DIAGRAM SHOWING CONNECTION OF SUPERCHARGING DEVICE SOLENOID VALVE



P1L04BJ01

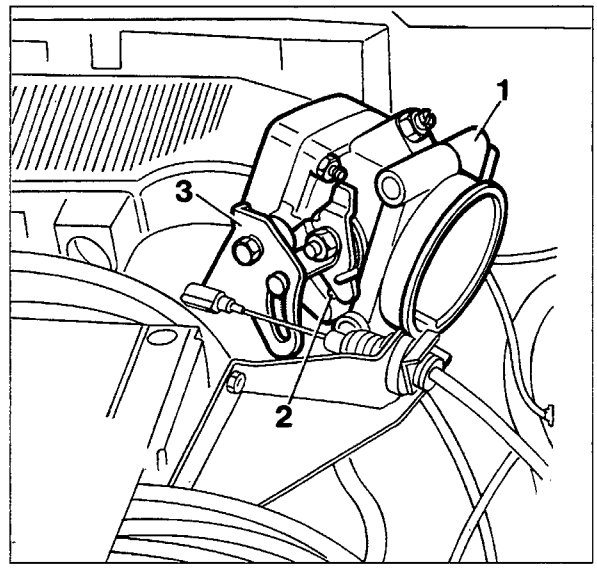
Operation of controlled supercharging device

The solenoid valve (24) for the above mentioned device is permanently controlled by the injection/ignition electronic control unit via the terminal (16).
The supercharging device solenoid valve (24) is a three way A-B-C solenoid valve.
Duct A is connected by means of the sleeve (1) to actuator (27) for the waste-gate valve.
Duct B is connectred by means of the sleeve (2) to the turbocharger excess pressure duct.
Lastly, duct C is connected by the sleeve (3) to the turbocharger intake duct.
When the solenoid valve, operating in Duty-cycle, is not activated by the control unit, cylinder D closes channel C, leaving ducts A and B in contact with one another, on account of which the excess supply pressure arriving in duct.B acts on the waste-gate valve actuator (27).In this way the excess supply pressure is only reguated by the mechanical calibration of the waste-gate valve.
When the solenoid valve is activated by the electronic control unit, cylinder D, magnetized by the coil winding, starts generate an impulse controlled by a Duty-cycle signal: in this way duct C opens for variable periods. These opening periods vary according to the sample curves stored in the control unit memory which take into account the pressure in the inlet manifold, the engine speed and the position of the butterfly valve.
The opening of duct C allows part of the pressure, which was previously acting on the waste-gate valve actuator (27) in the turbocharger inlet manifold to be discharged via sleeve 3, thereby increasing the supercharging pressure.

ADJUSTING BUTTERFLY VALVE CONTROL ROD

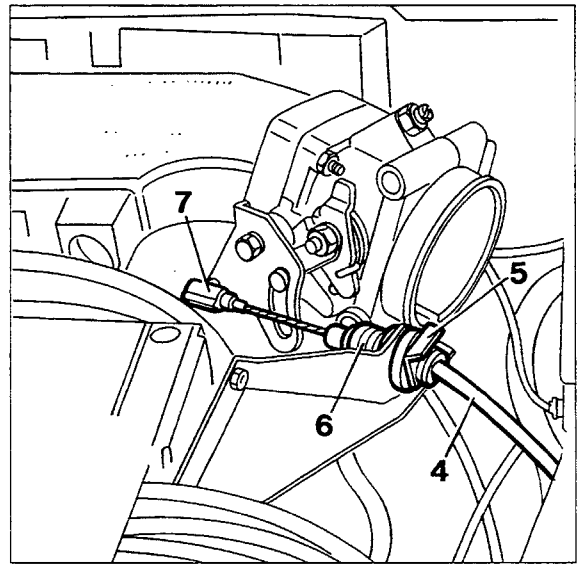
NOTE *The butterfly valve stop screw (2) is regulated in the Factory and should never be tampered with because it is adjusted in such a way that a pre-arranged flow of air can enter the engine with the butterfly closed.*

1. Butterfly casing
2. Butterfly valve stop screw
3. Control lever
4. Butterfly valve control cable
5. Bush stop plate
6. Rod adjustment bush
7. Butterfly valve control rod end



P1L05BJ01

To check whether the control valve is properly adjusted (in terms of length) simply start up the engine, let it reach operating temperature and allow it to idle.
At this point disconnect the end of the rod from the control lever: the engine should continue idling without a change in speed.
If the speed alters, the length of the rod must be altered until it is correct by regulating the adjustment bush (6), after having removed the stop plate (5).
The length of the control rod is correct when, reinserting the end (7) in the butterfly valve control lever (3), the engine speed, which should be 900 ± 30 rpm, does not alter.

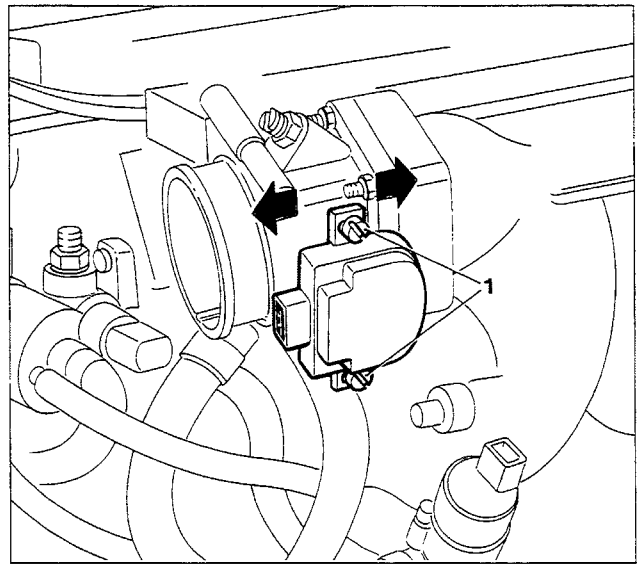


P1L05BJ02

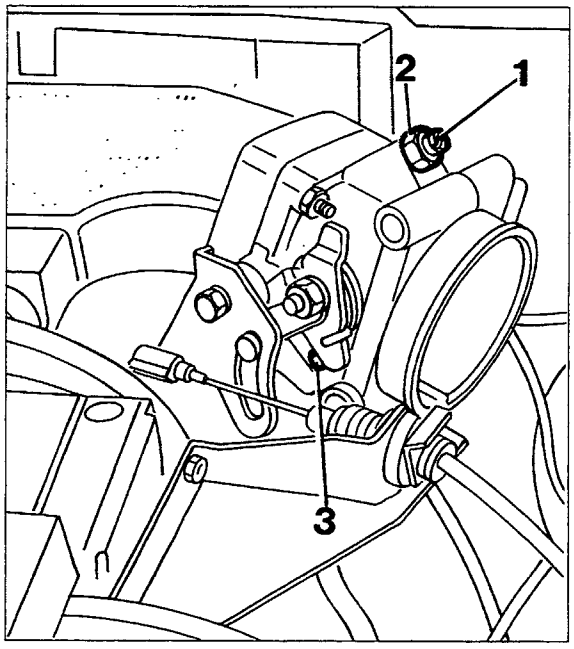
ADJUSTING CORRECT POSITION OF BUTTERFLY VALVE SENSOR

Loosen the bolts (1) which fix the sensor to the butterfly casing, rotate the sensor until it is in the end of travel position in both directions and then release it.
The two springs (the one inside the sensor and the butterfly valve return spring) opposing each other determine the exact position of the sensor.

NOTE *It is advisable, given the importance of this operation on the initial adjustment of the system, to* ***always*** *carry it out using the FIAT-LANCIA Tester.*



P1L05BJ04 P1L05BJ03



P1L06BJ01

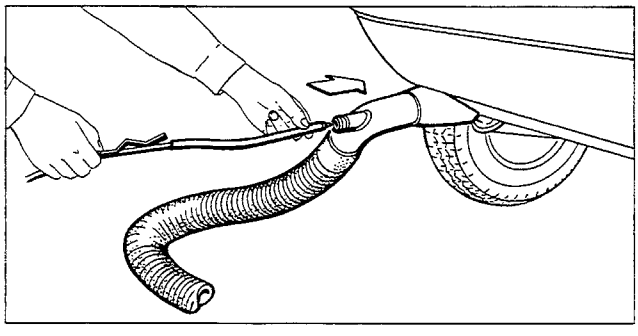
ADJUSTING IDLE SPEED AND CARBON MONOXIDE (CO)

Idle speed adjustment (ignition advance 14° ± 3°)

Previoulsy check the condition of the connection pipes between: the inlet manifold and the absolute pressure sensors; the fuel pressure regulator and the inlet manifold; the servo brake vacuum pipe; the air pipes for the automatic idle adjustment solenoid valve (VAE).

The adjustment of the idle speed is carried out with the engine at operating temperature, i.e. when the cooling circuit fan has come on at least 4 or 5 times. **The adjustment of the idle is carried out with the fan switched off and the other services switched off (heated rear windscreen, air conditioning, headlampes, etc).** If the fan comes on during the adjustment, do not work until it has completely stopped.

- **Disconnect the connector for the V.A.E. valve** and check that the idle speed is **900 ± 30 rpm.**
- If the idle speed is not correct, loosen the by-pass screw (1) lock nut (2) until the speed is 900 ± 30 rpm.
- Reconnect the V.A.E. automatic idle adjustment solenoid valve connector: the engine operating speed should not undergo any variation but should stay at **900 ± 30 rpm without any speed oscillations.** However, when an additional load is engaged, such as the windscreen wiper, heated rear windscreen, etc. the engine speed may go down to the idle speed of **850 ± 30 rpm and stop at that speed until the intervention of the V.A.E. valve.**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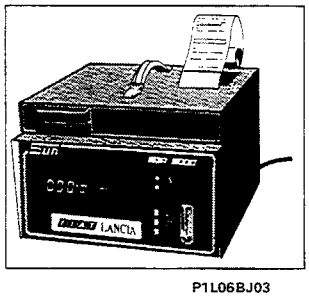

P1L06BJ03

NOTE *The butterfly valve stop screw (3) is adjusted in the Factory and* ***should never be tampered with,*** *since it is adjusted in such a way that a pre-set flow of air can enter the engine with the butterfly closed.*

Checking and adjusting CO idle percentage

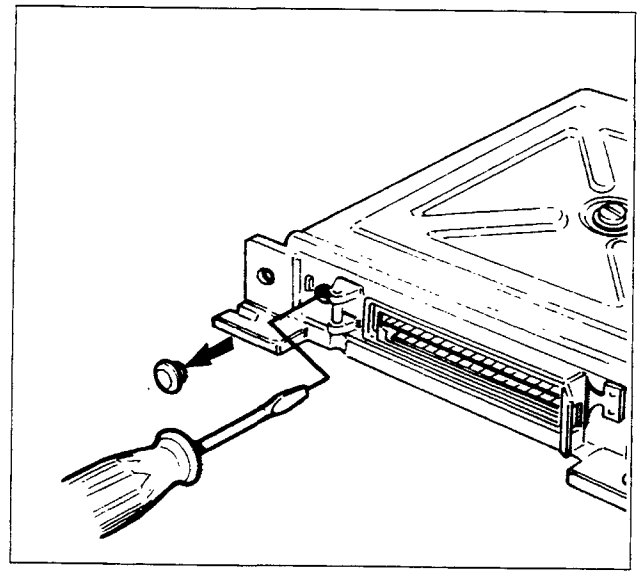
- Insert the exhaust gas analyzer probed into the rear silencer;
- connect the exhaust gas analyzer sensor;
- read off the CO values.

If the **CO** percentage is outside of the permitted tolerance (**1,5 ± 0,5%**) the trimmer adjustment screw on the injection control unit must be regulated as described below. For the location of the I.A.W. control unit see page 9.

Remove the CO anti-tamper plug from the control unit and adjust the CO strength with the engine at operating temperature and at the correct idle speed, using a 4 mm maximum screwdriver, to tighten or loosen the adjustment screw until the desired CO value is obtained.
The CO adjustment screw has a rotation range of several turns.**Do not force this screw, to avoid possible damage to the control unit.**

The rotation speed should not vary during the adjustment of the CO, if this is not the case, reset the correct rotation speed adjusting only the butterfly casing by-pass screw, checking, at the same time, that the CO content does not vary.

If it appears to be impossible to get the CO values within the permissible limits, the cause may be sought in the following problems: spark plugs worn or of the wrong type, sensors broken or defective (coolant/air temperature, absolute pressure), excess fuel pressure, injectors dripping, incorrect timing, poor engine cylinder compression, irregular ignition advance, air leaking into the inlet ducts or even CO adjustment trimmer broken.



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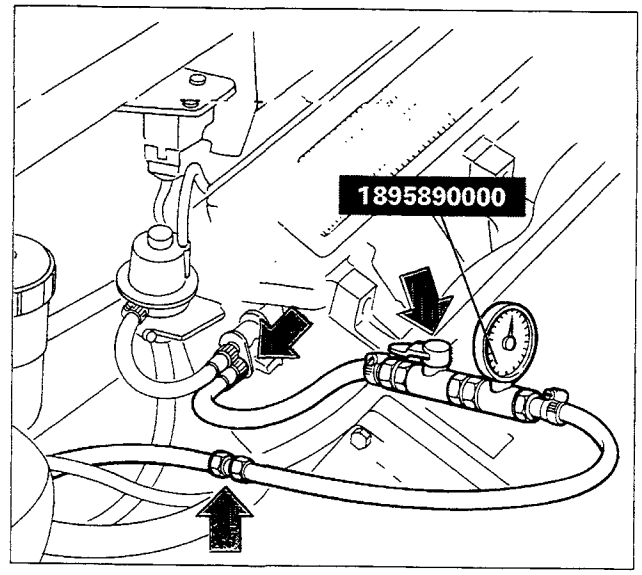
CHECKING FUEL SUPPLY CIRCUIT

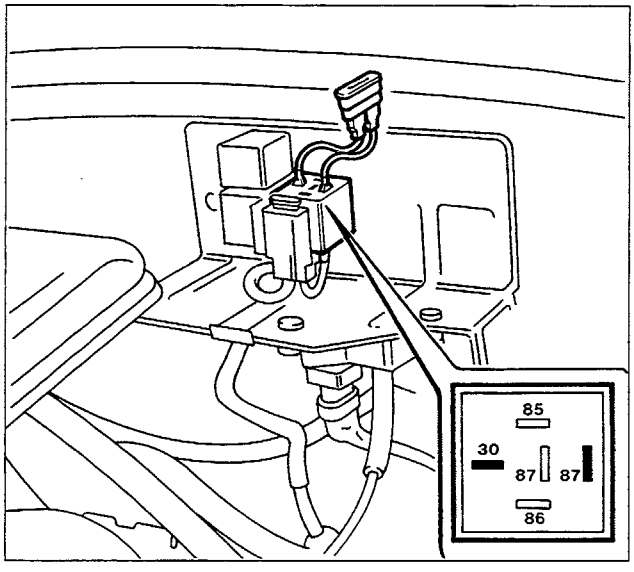


P1L07BJ02

1st Test Checking fuel pressure

Disconnect the pipe coming from the filter, on the injector fuel manifold supply side.

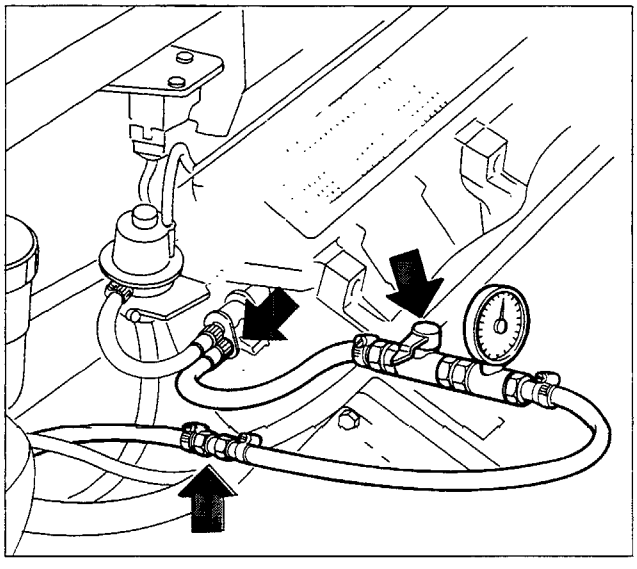
Place pressure gauge 189589000 between the end of the disconnected pipe and the injector fuel manifold with the control lever in the open position as illustrated.



P1L08BJ01

- with the help of the FIAT-LANCIA Tester, operate the electric pump (fuel pump test). If this equipment is not available, proceed as described below:
- Extract the electric pump relay feed; connect terminals 30 and 87 of the relay holder socket using an unattached cable with a 7.5 A fuse (see diagram)
- The pressure reading on the gauge should stabilize, under the test conditions at **2,5 bar ± 0,2 bar**. If the pressure is insufficient, carry out the next test.

Take great care when connecting terminals 30 and 87 in as far as an incorrect connection between the terminals (30 and 87) could irreparably damage the IAW electronic control unit.



P1L08BJ03 P1L08BJ02

2nd Test

Checking maximum fuel supply pressure (or efficiency of electric pump)

The same connections as for the previous test apply.

- close the control lever (shown by the arrow) fuel tap (upstream of the pressure gauge)
- operate the electric pump with engine switched off, as described above: the pressure should reach **4,5 bar and not exceed 7 bar** (pump safety valve calibration). If this is not the case, replace the electric pump because it is faulty.

If in the 1st test (see previous page) the pressure reading is **more than 2,5 bar it is necessary to:**

- disconnect the fuel return pipe from the pressure regulator and temporarily replace it with a pipe which goes into a container which is suitable for collecting the fuel
- operate the electric pump, with the engine switched off, as described above, then read off the pressure value reached on the gauge:
  a) if it reaches 2,5 bar the fuel return pipe to the tank must be replaced because it is obstructed or bent.

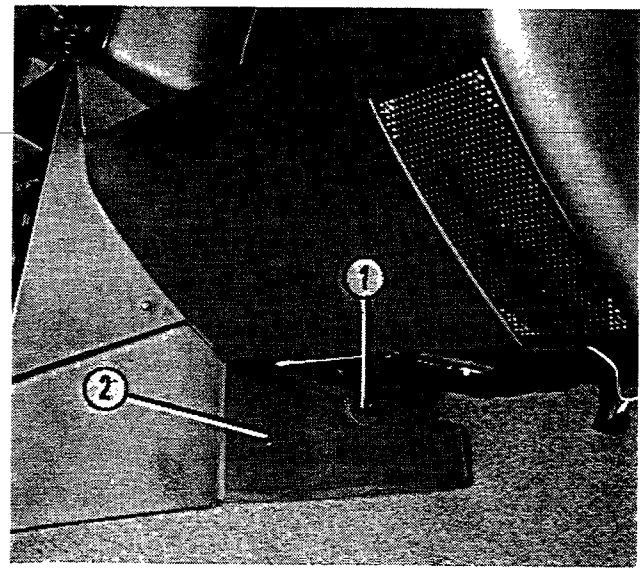
Checking injectors for leaks

To check if there are leaks from the injectors simply implement the connection for the 1st test (see page 7, adjustment pressure check), but take care to place the control tap operating lever downstream (instead of upstream) of the pressure gauge.
Then proceed to:
- start the electric pump with the engine switched off, as recommended
- completely close the tap lever (shown by the top arrow) on the pressure gauge once the adjustment pressure has been reached. In this way the pressure in the fuel manifold and the injectors is the same. Then:
- switch off the electric pump
- observe as soon as it stabilizes (i.e. decreases lightly) **that the pressure remains constant for about 60 secs.**

If this is not the case, there is a leak from one or more injectors or from a union.
- Proceed to remove the injectors and the fuel manifold from the inlet manifold, keeping the connection with the pressure gauge.
- Repeat the previous test, leaving the pressure gauge tap open.
- After having supplied the electric pump with the engine switched off (following the instructions on page 8), visually inspect whether there are drips from any of the injectors or from any sections of the pipe connections.
  Replace any leaking injector and/or renew any faulty seals where there is a leak from.

LOCATION OF IAW INJECTION/IGNITION CONTROL UNIT

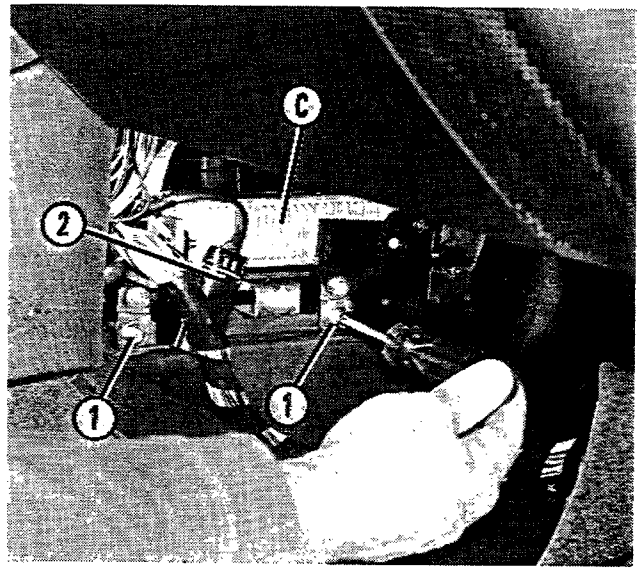
To gain access to the control unit simply undo the knob (1) retaining the panel (2).



P1L09BJ01

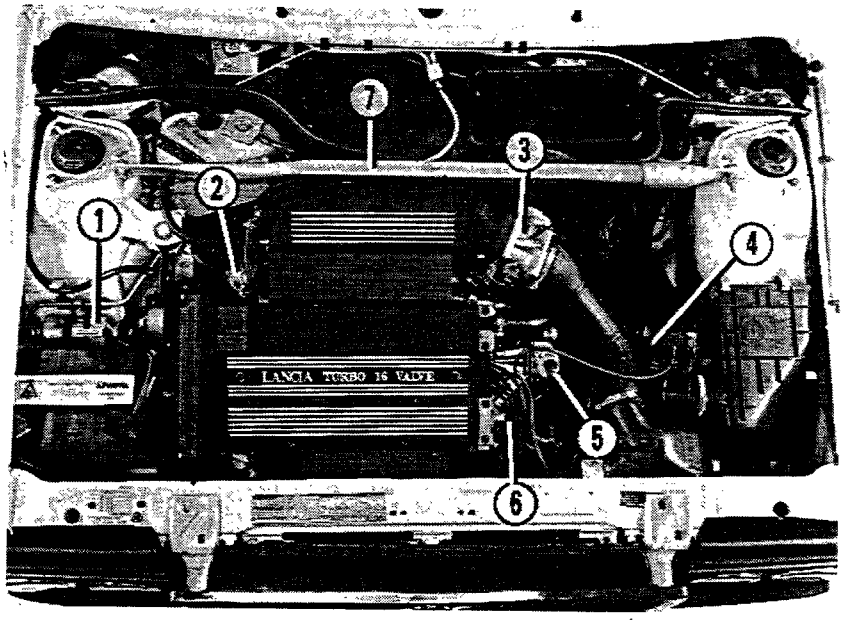
Removing-refitting injection/ignition electronic control unit

To regulate the control unit CO adjustment screw (C) the former must be removed from its housing. To do this, use a 7 mm screwdriver, to loosen the two bolts (1) fixing the control unit (C) to its mounting. After this it is easy to extract the control unit from its housing. To adjust the CO, see the instructions on page 7.



P1L09BJ02

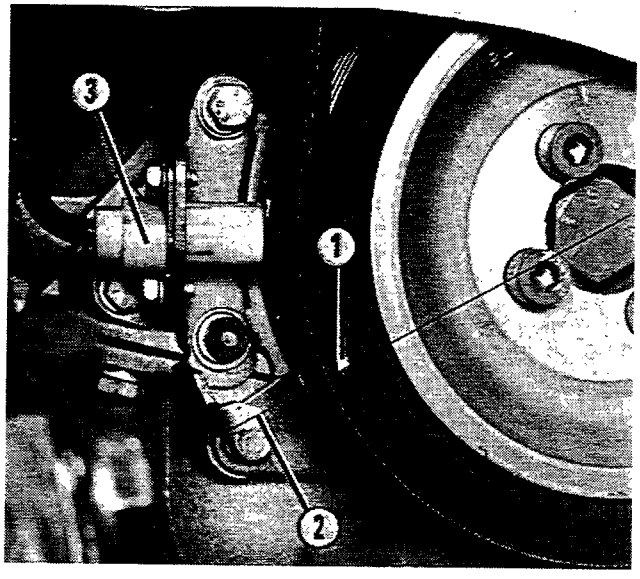
1. Bolts fixing control unit to mounting.
2. FIAT-LANCIA Tester diagnostic socket for repairs to the I.A.W. injection/ignition system



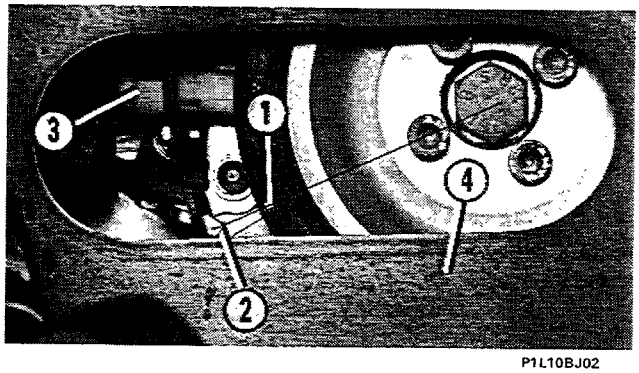
P1L10BJ01

Engine compartment for DELTA integrale HF 1995 16v turbo i.e.

1. Fuel filter. It can **only be fitted in one direction** shown by an arrow stamped above its casing, which represents the direction of the flow of fuel inside it.
2. Engine fuel supply pressure regulator.
3. Butterfly casing. It is the heated type provided with **a screw for adjusting the engine idle speed with the supplementary air valve (VAE) disconnected.**
4. Ignition power unit and ignition coil
5. Supplementary air solenoid valve for automatic adjustment of engine idle speed (VAE)
6. High tension distributor, with built in timing sensor.
7. Strenghtening bar for front section of bodyshell.



P1L10BJ03



P1L10BJ02

Location of slit for checking TDC reference marks and engine ignition advance in right wheel arch liner (with protection removed)

1. TDC reference mark on crankshaft pulley.
2. End of sensor carrier plate for TDC reference with previous sign.
3. Rpm and TDC sensor
4. Plastic wheel arch liner

There are no variations as far as the various checks on the IAW system sensors are concerned compared to those for the previous model. In particular, the position of the rpm and TDC sensor is determined in the saem way and with the same tool. The only variation is that the TDC can be more easily detected using reference marks, designed for this purpose, on the crankshaft pulley and on the end of the rpm and TDC sensor carrier plate, which do not involve the use of a dial gauge on the piston crown.

Location of rpm and TDC sensor and TDC and ignition advance reference marks with right wheel arch liner removed

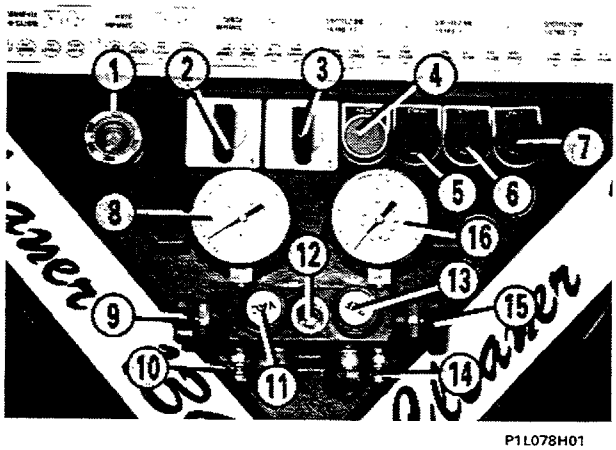
NOTES *The UP 12 equipment should only operate in an upright position and before the coolant fluid accumulates in the pressurizing metering cylinder it should absorb about 2 kg.*
So that the equipment is always ready for use it is advisable to always have 2 kg of coolant fluid in the metering cylinder.

LIST OF PROBLEMS WHICH MAY OCCUR, THEIR CAUSES AND THE OPERATIONS TO BE CARRIED OUT TO REMEDY THEM

PROBLEMS	CAUSES	OPERATIONS TO BE CARRIED OUT
ALARM warning light coming on	Manually operted valves incorrectly positioned	Reposition the valves (**)
	Filters blocked	Replace the filters (**)
The compressor continues to operate after recovering all the coolant	Inlet press. switch incorrectly ad.	Reset it at 0.3 bar
	Inlet press. switch not workg prop.	Replace the pressure switch
	Leaks in the system	Eliminate the leaks
Compressor not pumping	Compressor very hot	Let it cool down
	Solenoid valve EV2 not working properly	Replace solenoid valve EV 2
	Lack of oil	Top up the level
	Valves not correctly positioned	Check and reposition the valves
Vacuum pump not reaching desired degree of vacuum	Lack of oil	Check the level of the oil
	Safety valve for 5 way pressure gauge not working properly	Check the safety valve
	Leaks in the system	Eliminate the leaks

(**) Manually switch the safety pressure switch back on (P in the diagram at the top of page 77)

CLEANER 12 EQUIPMENT



P1L078H01

View of upper tilted panel

1. Humidity indicator
2. Function selector
3. Function switch
4. "ON" button
5. "PUMP" warning light
6. "LOCKED" warning light
7. "LEVELS" warning light
8. Low pressure side gauge
9. Low pressure side "LOW" tap
10. Union for low pressure side flexible pipe
11. "VAC" tap
12. Fluid indicator
13. "REF" tap
14. Union for high pressure side flexible pipe
15. High pressure side "HIGH" tap
16. High pressure side gauge

The colour of the indicator (1 in the diagram at the foot of the previous page) reveals the quantity of humidity present in the coolant fluid in a liquid state which has passed through the first three filters and the values depending on the temperature corresponding to the three different colours are given in the table below:

INTERNAL DISC COLOUR	SYMBOL	HUMIDITY CONTENT (in parts per million)		
		24° C	38° C	52° C
LIGHT BLUE	DRY (SECCO)	Less than 5	Less than 10	Less than 20
VIOLET BLUE	CAUTION (ATTENZIONE)	5 ÷ 10	10 ÷ 30	20 ÷ 50
RED	WET (UMIDO)	More than 15	More than 30	More than 50

When the centre disc is light blue in colour this means that the coolant fluid is in good condition; when the colour changes to dark blue this means that the filters are still in good condition and there is a certain, acceptable percentage of humidity in the coolant fluid.
When the colour starts to lose its bluish hue and take on a violet tone then the filter must be replaced.

The filters should be replaced at the end of the operation in progress even if the centre disc has by now become red because the purity of the coolant fluid is kept at an acceptable level by the safety filter F3 (third filtering station).

To estimate the temperature of the coolant fluid in the humidity indicator rest a thumb on the transparent part and depending on how it feels use the scale of colours in the table above in relation to the temperature in the diagram which follows:

Cold to touch	Use colour column corresponding to 24°C
Hot to touch	Use colour column corresponding to 52°C
No sensation	Use colour column corresponding to 38°C

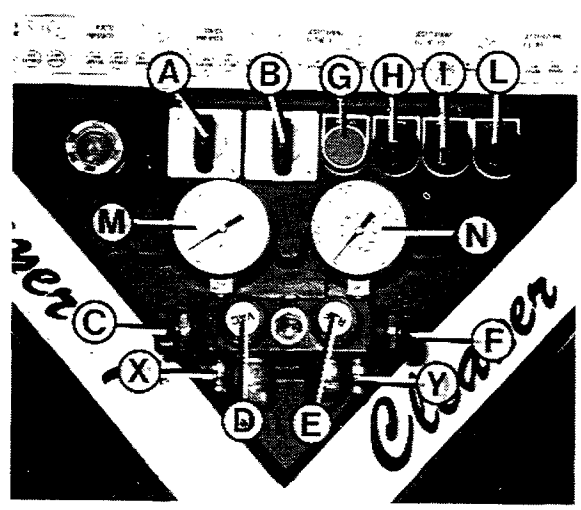
The maximum acceptable humidity value for the coolant fluid is 15 parts per million.

REPLACING THE FILTERS

REPLACING THE ANTACID FILTER

In order to replace the antacid filter F1 (1 in the diagram at the top of the next page) carry out the following operations:

- connect the equipment to a 220 V 50 HZ electrical grid and turn the knob for the general switch to the ON position;
- make sure that all the taps for the equipment pressure gauges are closed;
- turn the knob for the function switch (B) to position 3 and the one for the selector (A) to position 1;



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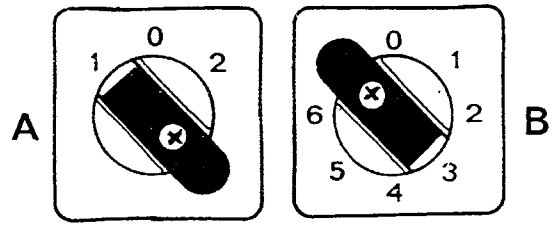
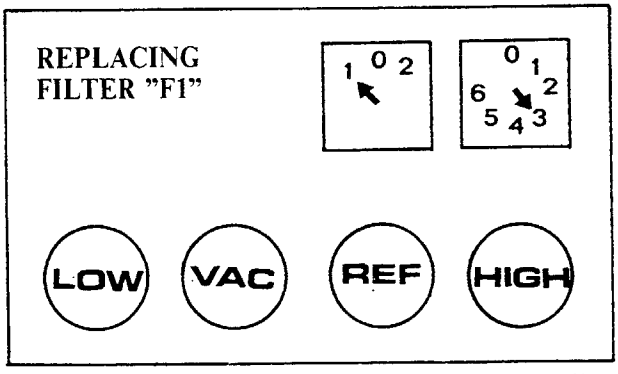
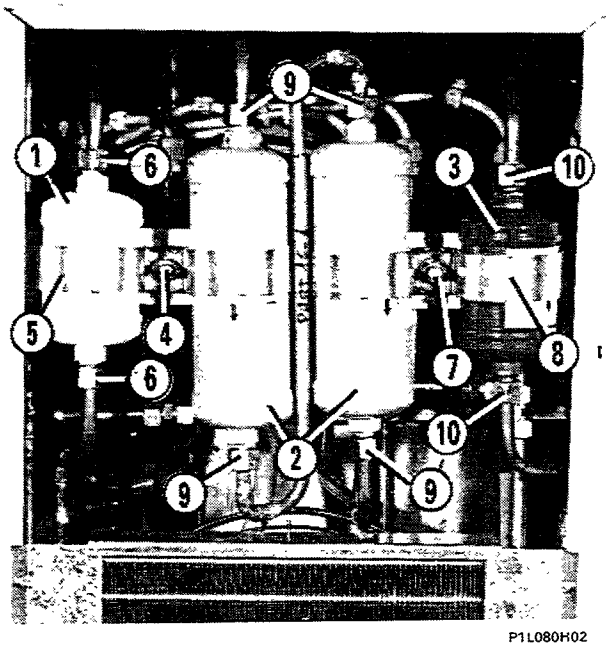
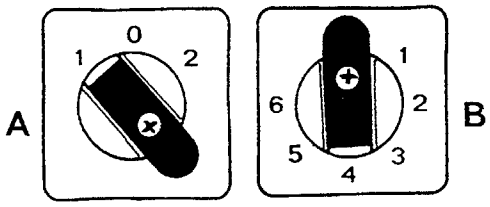


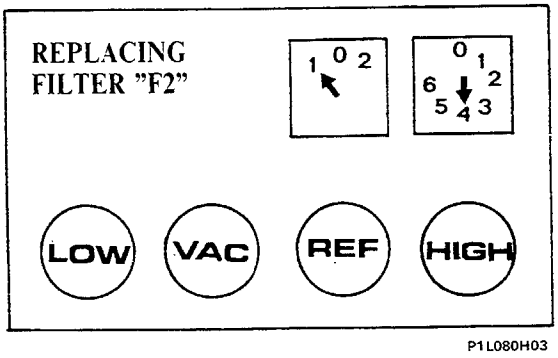


All the taps should remain closed

- return the knobs for switch (B) and selector (A) mentioned above to position 0;
- turn the knob for the general switch to the OFF position;
- remove the left rear panel for the equipment (after having undone the two bolts fixing it at the bottom to the frame);
- undo the nut (4) and remove the mounting bracket (5);
- undo the two unions (6) and replace the filter (1) with a new one taking care that the arrow is facing downwards;
- before retightening the unions (6) on the new filter check that the seals «O-Rings» are fitted and that they are intact and lubricated with vaseline or compressor anti-freeze oil.





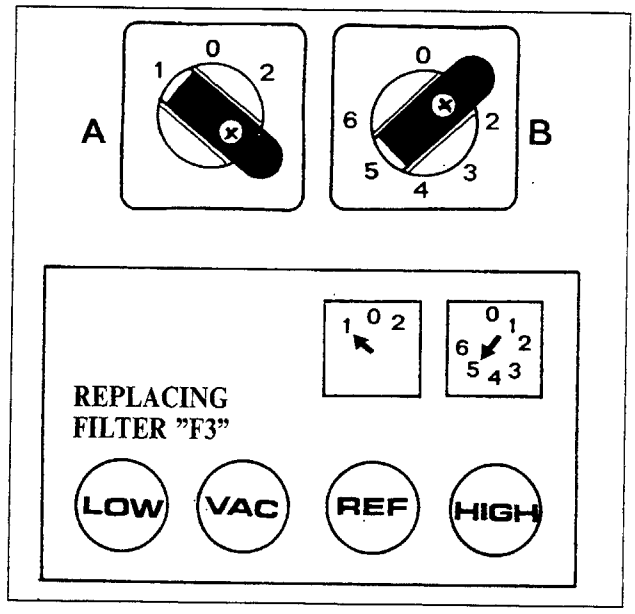


All the taps should remain closed

REPLACING MAIN FILTERS

In order to replace the main filters F2 (2) carry out the same operations as described previously for replacing the antacid filter F1 (1) bearing in mind that the knob for the function switch (B) should be turned to position 4 and that the nuts (4 and 7) must be undone, the mounting brackets (5 and 8) removed and the unions (9) undone.

NOTE *When each of the above mentioned filters is removed from its housing, there should be a slight vacuum when carrying out the replacement; if there is not this could be a symptom of a malfunction in the system and page 87 should be consulted.*



All the taps should remain closed

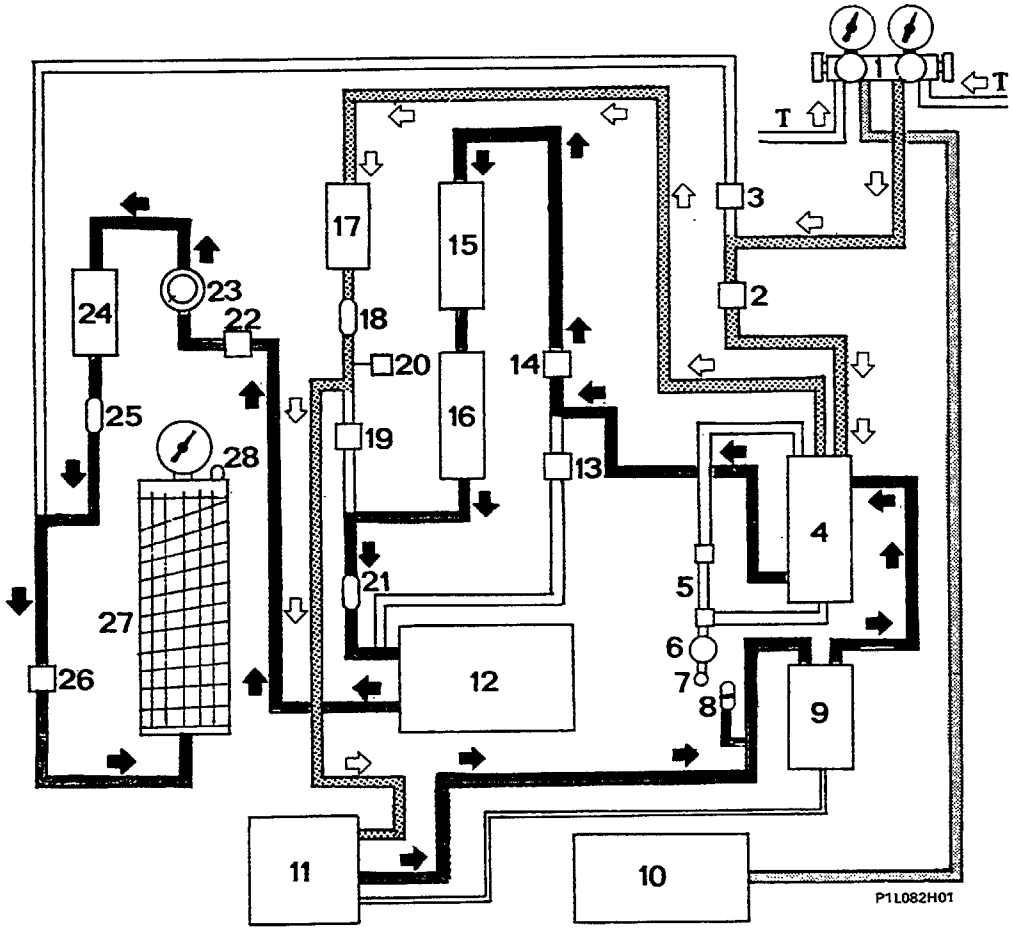
REPLACING THE SAFETY FILTER

In order to replace the safety filter F3 (3) carry out the same operations described previously for replacing the other filters (1 and 2) bearing in mind that the knob for the function switch (B) should be turned to position 5 and that the nut (7) must be undone, remove the mounting bracket (8) and undo the unions (10).

After replacing the previously mentioned filters and anchoring them to the equipment frame, carry out the following operations:

- turn the knob for the general switch to the ON position;
- connect the equipment to a canister of R 134 A or to the vehicle climate control system containing the same coolant fluid and carry out an absorption and purification stage to eliminate air and humidity from the equipment.
- at the end of the operation close the various taps and turn the knobs for the switch (B) and the function selector (A) to position 0 and turn the knob for the general switch to the OFF position;
- using an appropriate electronic leak detector, check the various unions which were previously undone when replacing the filters;
- return the left rear panel to its housing and fix it at the bottom to the equipment frame using two bolts;
- check the quantity of coolant fluid in the metering cylinder and if it is insufficient, top up using a canister.

NOTE *When the filters are replaced the humidity indicator disc should be red and before it changes again to light blue it may be neccesary to absorb and recycle up to 2.5 kg of coolant fluid.*
During this period of time the fluid recovered is pure even if the colour of the humidity indicator disc has still not settled down completely.



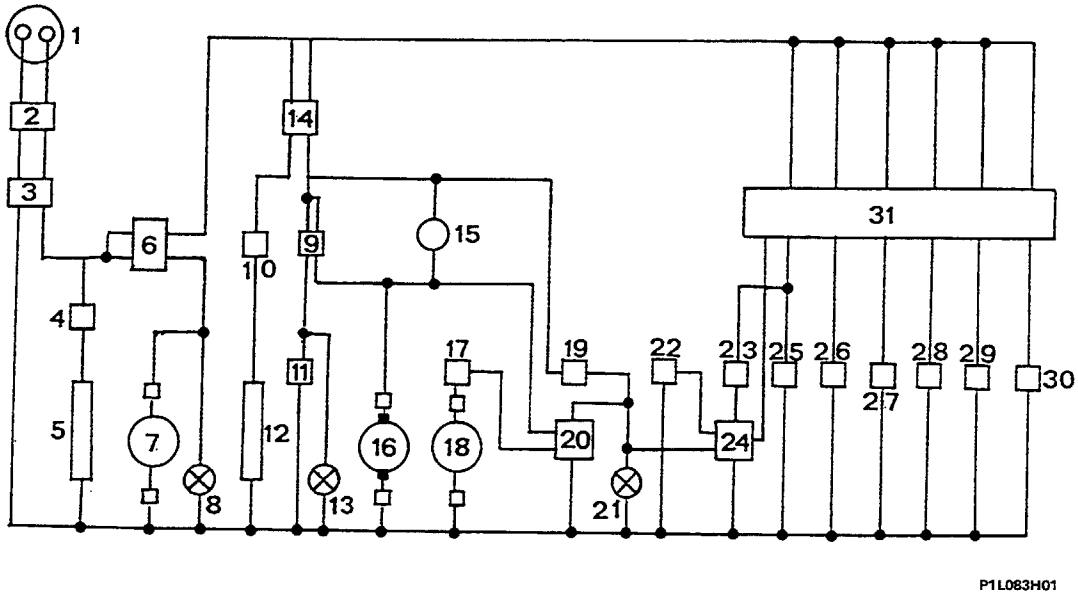
High pressure circuit Low pressure circuit Vacuum circuit

Diagram showing flow of coolant fluid inside the equipment

1. Pressure gauges
2. Solenoid valve EV2
3. Solenoid valve EV1
4. Oil separator
5. Oil level indicator
6. Oil drain tap
7. Oil drain union
8. Maximum pressure switch
9. Oil separator with heater
10. Vacuum pump
11. Compressor
12. Condenser
13. Solenoid valve EV7
14. Solenoid valve EV4
15. Main filter F2
16. Main filter F2
17. Antacid filter F1
18. Single-acting one-way valve
19. Solenoid valve EV5
20. Minimum pressure switch
21. Single-acting one-way valve
22. Solenoid valve EV6
23. Humidity indicator
24. Safety filter F3
25. Single-acting one-way valve
26. Solenoid valve EV3
27. Metering cylinder
28. Safety valve

The white arrows indicate the direction in which the coolant fluid flows at low pressure inside the equipment before reaching the compressor.

The black arrows indicate the direction in which the coolant fluid flows at high pressure inside the equipment before accumulating in the metering cylinder.



Wiring diagram for equipment

1. Supply cable socket
2. General switch
3. Thermal magnet switch
4. Thermostat for heater (5)
5. Metering cylinder heater
6. Function selector
7. Vacuum pump motor
8. "PUMP" warning light
9. Minimum pressure switch
10. Thermostat for heater (12)
11. Alarm
12. Oil separator heater
13. "LOCKED" warning light
14. Compressore relay feed
15. "ON" switch
16. Condenser cooling fan
17. Maximum pressure switch
18. Compressor
19. Maximum level sensor
20. Too full relay
21. "LEVELS" warning light
22. Fluid pressurizing solenoid valve EV3
23. Minimum level sensor
24. Pressurizing valve relay feed
25. Pressurizing solenoid valve EV1
26. Main filters by-pass solenoid valve EV7
27. Humidity indicator solenoid valve EV6
28. Main filter return solenoid valve EV5
29. Main filter inlet solenoid valve EV4
30. Absorption solenoid valve EV2
31. Function switch

FUNCTION SWITCH	SOLENOID VALVES ENERGIZED						
KNOB POSITIONS	EV1	EV2	EV3	EV4	EV5	EV6	EV7
0							
1		*	*	*		*	
2	*		*				
3			*	*		*	
4			*		*	*	*
5	*	*		*			

The following functions correspond to the three positions of the selector (6 in the diagram on the previous page)Absorption, pressurizing system, replacing filters.
- 0 Equipment switched off.
- 2 Draining system.

In addition to the energizing of the solenoid valves (as shown in the diagram at the foot of the previous page) the following functions correspond to the six position of the switch (31):

- 0 Off
- 1 Absorption and Purification
- 2 Pressurizing system
- 3 Replacing antacid filter "F1"
- 4 Replacing main filter "F2"
- 5 Replacing safety filter "F3"

When the relay (24) is in the rest position it allows the energizing of solenoid valve EV3 (22) and the latter is de-energized, if during the pressurizing operation, the relay coil is energized by the sensor (23) if the coolant fluid inside the metering cylinder reaches the minimum level.

When the relay (14) is energized it allows the operation of the compressor.

The minimum pressure switch (9) de-activates the compressor and the condenser fan and causes the "LOCKED" warning light to come on.

The maximum pressure switch (17) de-activates the compressor when the pressure of the coolant fluid in the circuit reaches 15 bar.

When the relay (20) becomes energized by the sensor (19) (if the coolant fluid inside the metering cylinder reaches the maximum level) it de-activates the compressor and lights up the "LEVELS" warning light.

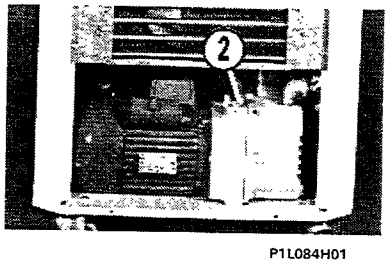
MAINTENANCE

For the Cleaner 134 equipment to be working at maximum efficiency whilst carrying out the operations of draining a vehicle climate control system this depends on the operation of its vacuum pump and for this reason before using the equipment the level of oil in the pump has to be checked and it is necessary to check for any impurities by carrying out the following operations:

- start up the pump by rotating the selector lever to position 2 and after having checked the level of the oil through the special inspection window (1) partly undo the ballast (2) to release any gases which have not condensed which could pollute the oil and cause serious damage to the pump;
- after 5 minutes operation check that the level of the oil which is visible through the inspection window (1) reaches at least halfway and that there are no impurities on the surface.

If there is nothing specifically wrong with the equipment, in particular with the vacuum pump, then they are ready for use.

Bear in mind that with the pump hot the level of the oil should be between the extreme levels on the inspection window (1) because if the level is higher then the pump will become blocked with oil and overheat with a decrease in its performance whilst if the level is lower there could be insuf ficient lubrication with the danger of seizing.



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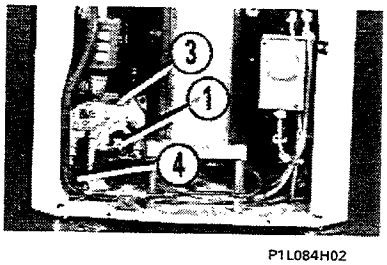

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It should also be rememeberd that the oil level should be checked for topping up with the pump hot.

OIL CHANGE

The first time the oil for the vacuum pump should be changed is after 100 hours of operation whilst subsequent oil chages should be carried out when the oil is no longer clear but becoming greyish.

To replace the oil when the pump is hot, carry out the following operations:

- undo the filler and drain plugs (3) and (4) and let the oil, which will come out rather quickly, drain with the impurities it contains;
- retighten the drain plug (4) and via the filler cap (3) introduce 0.45 litres of special oil (viscosity 6° Engler) into the pump and check that it reaches the correct level.

LIST OF PROBLEMS WHICH CAN OCCUR DURING THE VARIOUS OPERATING STAGES OF THE EQUIPMENT, THEIR PROBABLE CAUSES AND THE OPERATIONS TO BE CARRIED OUT TO REMEDY THEM

OPERATION OF ABSORPTION AND RECYCLING		
PROBLEMS	**CAUSES**	**OPERATIONS TO BE CARRIED OUT**
Compressor not working	LOCKED warning light on	Operation of absorption ended
	LOCKED warning light off due to:	
	- incorrect positioning of knobs for function selector or switch;	Correctly position the knobs for the function selector and switch
	- break in the supply circuit for the compressor or the LOCKED warning light	Locate the break and restore the continuity for the circuit
	- lack of current or break in the connecting cable between the electrical grid and the equipment	Check whether the lack of current is due to a temporary factor or to a deficiency in the workshop system and if this is the case restore the efficiency of the connecting cable between the equipment and the grid
	LEVELS warning light coming on due to:	
	- metering cylinder too full	Transfer part of the coolant fluid from the metering cylinder into a canister
	- compressor not working properly	Seek technical advice from the manufacturer
Compressor switches on and off frequently	Leak in the inlet circuit or obstruction in the high pressure circuit	Seek technical advice from the manufacturer
Compressor noisy	Poor lubrication due to:	
	- inefficient oil separator heating band	Replace the heating band
	- capillary pipe not working properly	Seek technical advice from the manufacturer
The desired degree of vacuum in not reached during absorption	Minimum pressure switch incorrectly calibrated	Re-set the minimum pressure switch
	Leaks from solenoid valve EV1	Clean and/or replace solenoid valve EV1 (see notes on page 88)
	Leaks in the inlet circuit	Seek technical advice from the manufacturer

PROBLEMS	CAUSES	OPERATIONS TO BE CARRIED OUT
Level of coolant fluid in metering cylinder above maximum level	Maximum level sensor not working properly	Replace the sensor (*)
Level of coolant fluid in metering cylinder below minimum level	Minimum level sensor not working properly	Replace the sensor (*)
The value of the pressure inside the metering cylinder does not increase	Thermostat defective Heater in metering cylinder not working properly	Re-set the thermostat Replace the heater component
Signal of humidity in the coolant fluid absorbed and recycled by the appropriate indicator	Saturation of drying agents in drier filters Humidity indicator not working properly	Replace the filters (*) Replace the humidity indicator (*)

(*) See notes on page 88

OPERATION OF DRAINING THE VEHICLE CLIMATE CONTROL SYSTEM		
PROBLEMS	**CAUSES**	**OPERATIONS TO BE CARRIED OUT**
The vacuum pump is not working	PUMP warning light off due to:	
	- incorrect positioning of knobs for function selector or switch;	Correctly position the knobs for the function selector and switch
	- break in the supply circuit for the vacuum pump and/or PUMP warning light	Locate the break and restore the continuity for the circuit
	- lack of current or break in the connecting cable between the electrical grid and the equipment	Check whether the current failure is due to a temporary factor or to a deficiency in the workshop system and if this is the case restore the efficiency of the connecting cable between the equipment and the grid
	Vacuum pump not working properly	Seek technica advice from the manufacturer

PROBLEMS	CAUSES	OPERATIONS TO BE CARRIED OUT
Vacuum pump working but not reaching the desired degree of vacuum	VAC tap closed REF tap open Pump oil polluted	Open the VAC tap Close the REF tap Change the pump oil

OPERATION OF PRESSURIZING THE VEHICLE CLIMATE CONTROL SYSTEM		
PROBLEMS	**CAUSES**	**OPERATIONS TO BE CARRIED OUT**
Coolant fluid does not flow from teh equipment to the vehicle system	LEVELS warning light comes on since the level of the coolant inside the metering cylinder is at the minimum level	Transfer coolant fluid from a canister to the equipment metering cylinder
Coolant fluid does not flow or only flows very slowly	The pressure between the equipment and the vehicle system is balanced	Transfer coolant fluid from the metering cylinder to the vehicle climate control system by activating the latter

OPERATION OF REPLACING THE FILTERS		
PROBLEMS	**CAUSES**	**OPERATIONS TO BE CARRIED OUT**
The desired degree of vacuum is not reached whilst replacing the antacid filter	Leaks from solenoid valve EV2 Leaks in the inlet circuit	Clean and/or replace solenoid valve EV2 Seek technical advice from the manufacturer
The desired degree of vacuum is not reached whilst replacing the main filters	Leaks from the single-acting one-way valve located near the condenser Leaks from the inlet circuit	Seek technical advice from the manufacturer
The desired degree of vacuum is not reached whilst replacing the safety filter	Leaks from solenoid valve EV3 or EV6 Leaks from the inlet circuit	Clean a/o replace solenoid valve EV3 a/o EV6 (*) Seek technical advice from the manufacturer

(*) See notes on page 88

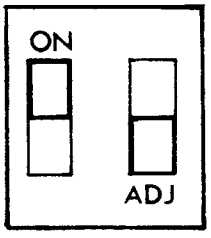
NOTES *Before carrying out any operation which involves opening the coolant fluid circuit except replacing the filters it is necessary to remove any coolant residues by connecting a second piece of equipment to the Cleaner 12 equipment suitable for absorbing and recycling*

In the tables on the previous pages the remedy operations which require opening the coolant fluid circuit are markedwith an (*)

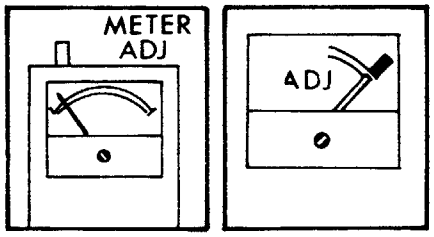
When the equipment is switched off, i.e. not supplied all the solenoid valves are in the closed position i.e. they do not allow the flow of coolant fluid.

CALIBRATING ELECTRONIC VACUUM GAUGE A-14

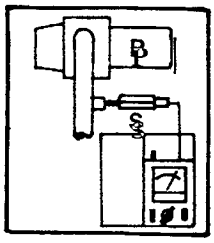
Proceed as follows with the calibration:



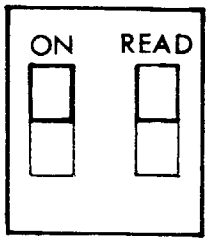
1. Position the left switch in ON and the right switch in ADJ



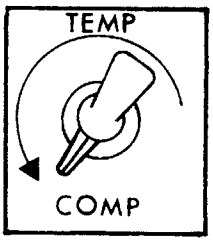
2-3. Turn the knob (shown by METER ADJ) until the instrument needle is on the ADJ line



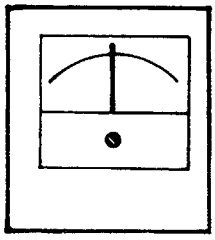
4. Connect the vacuum gauge cable to the sensor (S) on the pump inlet pipe (P)



5. Position the switch on READ

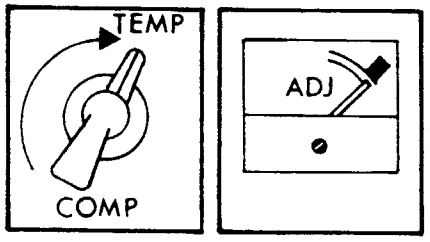


6. Turn the knob completely in an anti-clockwise direction



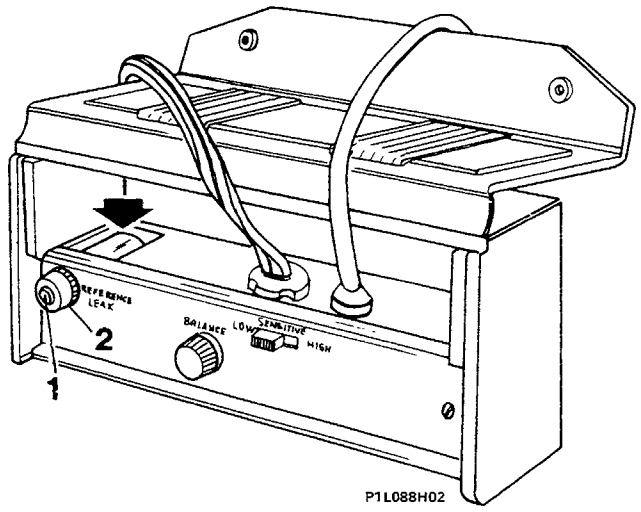
7. The instrument needle will assume a certain value on the scale

8-9. Turn the knob in a clockwise direction until the instrument needle is on the ADJ line



P1L088H01

GENERAL ELECTRIC H 10 ELECTRONIC LEAK DETECTOR



P1L088H02

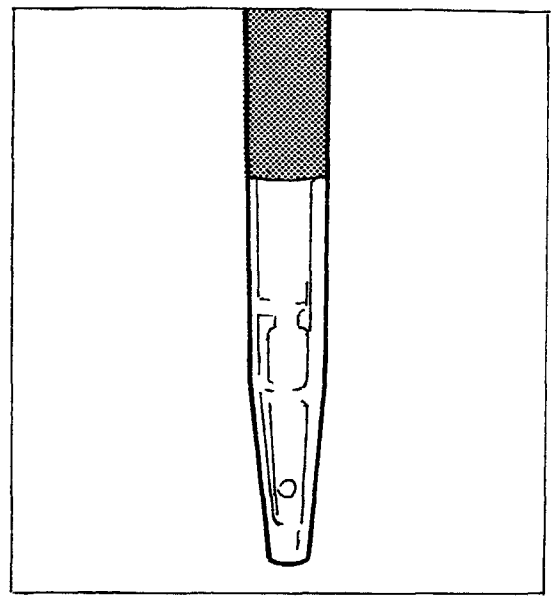
Instructions for use

Before using the leak detector for the first time, undo the bolt (1) from the cap (2) for the bottle on the control panel (Reference leak) and wait about 15 minutes so that the reference leak stabilizes. The bolt for the cap is only used when transporting the leak detector and should not be re-used.

Check that the reference leak bottle contains a certain amount of R 11 coolant; the level of the fluid should be checked through the special inspection window (shown by the arrow).

The bottle is filled with enough R 11 coolant for about 1 year.
Connect the supply cable plug to a 220 V socket and the leak detector will warm up immediately.

Do not try to operate the leak detector at a different voltage from that indiacted (220 V) because it could be irreparably damaged.



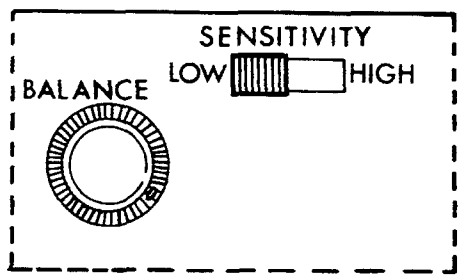
Check that sufficient air passes through the sensor, keeping it in a vertical position, with the point downwards and observing the ball inside it: if the flow of air is sufficient the ball will be rise and float above the point filter.

The height of the ball in the sensor is of no importance, what is important is that it rises.

If the ball does not rise, before establishing whether the equipment is broken, it is worth gently tapping the sensor point to make sure that it is not simply stuck.

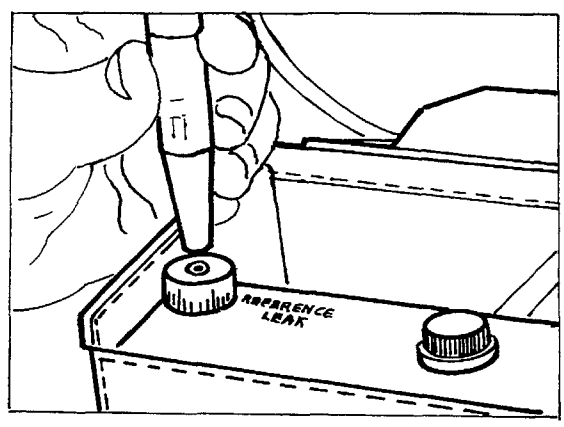
If after this operation the ball does not rise, send the instrument to the Manufacturer to be checked.

Move the sensitivity switch to the "HIGH" position or the "LOW" position, being aware that the low sensitivity is used when searching for fairly large leaks and when the instrument is new whilst high sensitivity is used for searching for small leaks.



After the leak detector has been used for a certain length of time, the response of the sensitive element decreases on account of which it is necessary to move the switch to the high sensitivity position to search for any size leak.

In order to check this condition move the sensitivity switch to the "LOW" position then turn the balance knob until the warning light just stops flashing and keeping the sensor close to the reference leak see whether or not the lamp flashes.



P1L089H01

If the light does not flash or the frequency of the flashing tends to decrease when the sensor is constantly held over the reference leak, the sensitivity switch should be moved to the "HIGH" position and the balancing must be carried out once again.

In order to carry out this last operation, turn the balancing knob until the neon light for the sensor, which should be kept far away from the reference leak, just stops to flash.

If properly adjusted, the light will flash and continue to flash as long as the sensor is held close to the reference leak, whilst when it is moved away the flashing will decrease and then stop.

On certain types of leak detector the flashing may not cease when the sensitivity switch is adjusted to the "HIGH" position. This is not an indication of a problem but rather excessive sensitivity; in such a case the switch should be placed in the "LOW" position until the sensitive element settles down.

The reference leak can be used often when it is necessary to ensure good operation of the leak detector and to compare the findings in determining the extent of the leak.

When the sensor comes close to the reference leak (as illustrated in the diagram below) the response is

about the same as would be obtained from a leak of FREON 12 of 14.2 grams/year.
A leak which causes the same flashing rhythm produced by the reference leak is the same extent as the latter.
Keep the sensor as close as possible to the point which has to be checked and move it at a speed of about 2..5 cm/sec sliding it along the system pipes and joins where a leak is suspected.
When the sensor intercepts a coolant leak the flashing rhythm increases and continues as long as the sensor is held close to the leak.

NOTE *In order to prolong the life of the sensitive element never place the sensor in a current of coolant gas and never draw in cigarette smoke with the sensor.*
In a very polluted atmosphere the flashing of the neon light is not stable; consequently it is impossible to check for leaks; in order to reduce this problem it is necessary to suitably ventilate the test area.
The same unstable flashing can be caused by voltage variations in the supply grid for which reason a voltage stabilizer should be used.

BATTERY OPERATED TIF HLD 5500 ELECTRONIC LEAK DETECTOR

Instructions for use

This instrument is automatically calibrated and therefore ready to use.
Move the switch from OFF to ON; the instrument will let out a "BIP" sound then, after having removed the sensor, equipped with a micro-pump, from its housing in the side of the instrument, search for any leaks by moving it slowly (at about 2 cm/sec) along the section of the system being examined.
If there is a leak the frequency of the "BIP" noise increases until it becomes a continous sound.
The instrument will automatically zero straight afterwards and is ready for use again.
In polluted atmospheres or in the presence of large leaks, the instrument will always give an exact reading for the gas leak whilst searching for the latter may be difficult in well ventilation areas therefore it is necessary to use protective screens during the search process.
In situations where large leaks are concealing smaller ones, locate and eliminate the large leaks first and then the smaller ones and if this is not easy, isolate the probable area of the leak with a cloth and then look for the leak a few minutes later.

CHARACTERISTICS OF THE ROTARY COMPRESSOR

Make and type	SEIKO SEIKI SS - 96
Cylinder diameter and stroke	90 × 163 mm
Capacity	96 cc per revolution
Quantity of DH-150CX anti-freeze oil	140 ÷ 160 cc
Operating voltage for electro-magnet coupling	12V
Minimum voltage for engaging electro-magnet coupling	7,5 V
Current absorbed by electro-magnet coupling	about 5 A
Power aborbed by the electro-magnet coupling	36 W at 20° C
Quantity of coolant fluid (R10) for pressurizing the system	0,9 kg

CHARACTERISTICS OF SYSTEM CONTROL COMPONENTS

DESCRIPTION	CIRCUIT CONCERNED	CABLE COLOUR	FUNCTION	CALIBRATION VALUES
Three stage pressure switch	1st level energizing circuit for coil for one of the two relay feeds for the compressor pulley electro-magnet coupling	[A]	circuit open	btwn 1.716 bar & 2,206 bar
			circuit closed	btwn 1.765 bar & 2.45 bar
	2nd level energizing circuit for coil for relay feed for radiator and condenser cooling fan	[B]	circuit closed	btwn 13.7 bar & 15.7 bar
			circuit open	btwn 9.806 bar & 11.767 bar
	3rd level energizing circuit for coil for one of the relays for energizing the compressor pulley electro-magnet coupling	[A]	circuit open	btwn 23.5 bar & 28.44 bar
			circuit closed	btwn 18.6 bar & 22.55 bar
Anti-frost thermostat	energizing circuit for coil for one of the two relay feeds for the compressor pulley electro-magnet coupling	[C]	circuit open	-1° ÷ +1° C (0° ± 1°C)
			circuit closed	4° ÷ 6° C (5° ± 1° C)
Thermostatic switch on hose connecting engine/radiator	energizing circuit for coil for one of the two relay feeds for the compressor pulley electro-magnet coupling	[D]	circuit open	100° C
			circuit closed	110° C
Thermostatic switch on compressor	energizing circuit for compressor pulley electro-magnet coupling	[E]	circuit open	btwn 145° C & 155° C
			circuit closed	btwn 125° C & 135° C

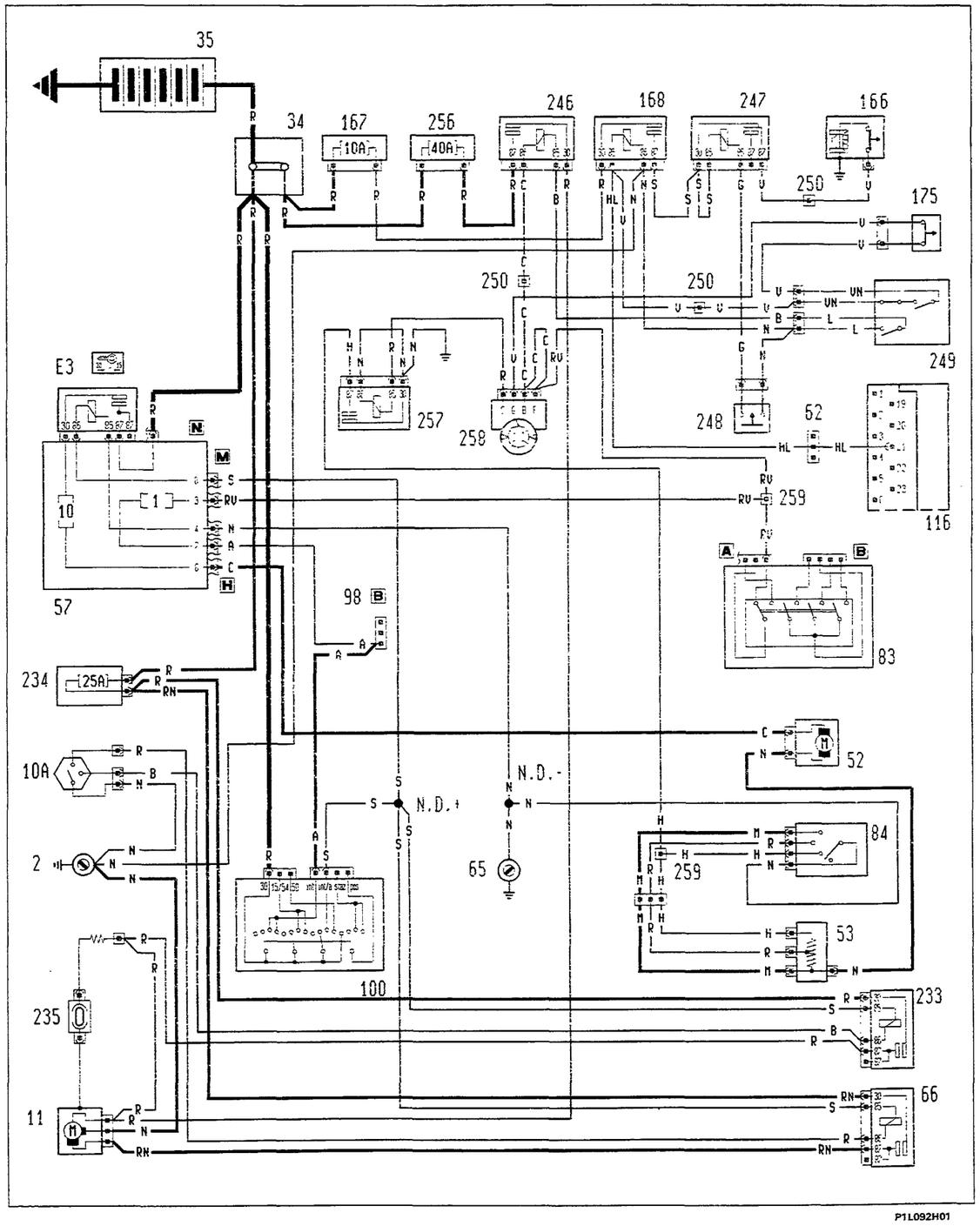
[A] Green/Black cable terminals for pressure switch at red connector which is connected to connector for two Green cables

[B] Light Blue cable terminals for pressure switch at white connector to which three cables are connected, one white and two black joined to the same terminal

[C] Green cables at connector to which cables connected to anti-frost thermostat are connected

[D] One Black cable and one Yellow cable at two square connectors

[E] Green cable at cylindrical connector which is connected to cable terminal for thermostatic switch



Wiring diagram for climate control

2. Left front earth cable loom
10 A. Two level thermal switch for engaging radiator and condenser cooling fan
11. Radiator and condenser cooling fan
34. Connector block
35. Battery
52. Car interior climate control fan
53. Resistor for electric fan (52) speed
57. Junction unit
62. Connection for electronic injection cables
65. Earth cable loom under dashboard
66. Radiator and condenser cooling fan relay feed
83. Hazard warning lights switch
84. Electric fan (52) speed selector switch
98. Steering column switch unit
100. Ignition switch
116. Injection/ignition (I.A.W.) electronic control unit
166. Compressor pulley electro-magnet coupling
167. 10 A fuse
168. Compressor pulley electro-magnet coupling relay feed
175. Anti-frost thermostat
233. Radiator and condenser cooling fan second speed relay feed
234. 25 A fuse
235. Resistor for radiator and condenser cooling fan first speed
246. Relay for engaging radiator and condenser cooling fan
247. Relay for switching off compressor
248. Thermostat for switching off compressor
249. Three stage pressure switch
250. Connections
256. 40 A fuse
257. Relay for engaging electric fan (52) first speed
258. Climate control on switch
259. Terminal