Alfetta

Alfa Romeo

technical characteristics and principal inspection specifications

Technical characteristics

June 1972

Number and layout of cylinders	4 in line
Bore	80 mm
Stroke	88.5 mm
Total cylinder capacity	1779 cc
Max. power at 5,500 rpm	SAE 140 BHP (DIN 122 BHP)
Front track	1360 mm
Rear track	1350 mm
Wheelbase	2510 mm
Minimum turning circle	5050 mm
Overall length	4280 mm
Overall width	1620 mm
Overall height (unladen)	1430 mm
Kerb weight (full tank)	1060 Kg
Maximum towing weight	800 Kg
Number of seats	5

Tyres 165 SR 14" . . . . . CEAT Drive D2
CONTINENTAL RiP
GOOD YEAR G 800
MICHELIN ZX
PIRELLI Cinturato SR
KLEBER COLOMBES V 10

Fuel consumption for 100 Km (CUNA standard) . . . . . 11.5 lt

(for best engine performance, the use of premium grade fuel is advised)

June 1972

ENGINE

Front

LUBRICATING SYSTEM

Forced lubrication with gear pump

ENGINE COOLING SYSTEM

Sealed-type circuit with Alfa Romeo coolant mixture for protection down to -20° C, automatically-operated electric fan.

CLUTCH/GEARBOX/DIFFERENTIAL UNIT

Mounted on the De-Dion/Watt rear suspension

CLUTCH

Single plate, dry type; hydraulically operated, self-adjusting.

GEARBOX

Five synchromesh forward gears and reverse.

DIFFERENTIAL

In unit with the gearbox; floating-type driveshafts with constant velocity joints at both ends.

SERVICE BRAKES

Four discs, dual, servo-assisted hydraulic system with pressure regulator controlling the braking power to rear brakes mounted on the gearbox/differential unit.

HANDBRAKE

Mechanically operated independently from service brake through pads on rear calipers.

STEERING GEAR

Rack and pinion - Shaft in three sections with U-joints - Adjustable steering wheel.

FRONT SUSPENSION

Independent, with transverse wishbones and torsion bars, telescopic hydraulic shock absorbers and stabilizer rod.

REAR SUSPENSION

De-Dion/Watt, anchored to the body with a front joint and rear links for transverse location. Coil springs and rubber buffers, telescopic hydraulic shock absorbers and stabilizer rod.

WHEELS

$5\frac{1}{2}$J x 14" rims with cooling openings.

PERFORMANCE

DURING RUNNING IN	
Distance covered	Max. engine speed
Up to 500	3500 RPM
From 500 to 1500	4500 RPM

AFTER RUNNING IN	
With 41/10 final drive	
Gear	Max.speed Kph
1st	46
2nd	77
3rd	112
4th	148
5th	180
Rev.	53

Maximum gradient in 1st gear: 45%.

Engine oil pressure

Oil pressures with hot engine	min. pressure at idling speed	0.5/1 Kg/cm^2
	min. pressure at top speed	3.5 Kg/cm^2
	max. pressure at top speed	4.5/5 Kg/cm^2

W a r n i n g - Check that alternator warning light goes off as soon as the engine exceeds idling speed.

1 Kg/cm^2 = 14.22 p.s.i.

T y r e s

Inflation pressures when cold Kg/cm^2

		Front	Rear
165 SR 14 - CEAT Drive D2	Under all conditions	1.6	1.8
CONTINENTAL RiP		1.6	1.8
GOOD YEAR G 800		1.6	1.8
MICHELIN ZX		1.8	2
PIRELLI Cinturato SR		1.6	1.8
KLEBER COLOMBES V 10		1.6	2.1

Fuel, oil and coolant capacities

ALFA ROMEO antifreeze	8 lt
Fuel (reserve 8 lt)	49 lt
Engine oil (sump & filter), to max level (for regular changing	5.850 Kg
Oil in sump, to min. level	3.360 Kg
Oil in gearbox/differential unit	2.570 Kg
The total amount of oil in the circuit (sump, filter, passages) is	6.265 Kg

FLUID AND LUBRICANTS

	Grade	Recommended commercial equivalents		
	API - SAE - NLGI	A G I P	E S S O	S H E L L
Engine	SAE 20 W/50 API MS	F.1 Woom SAE 20 W/50	"UNIFLO"	Super Motor Oil "100"
Gearbox/Differential unit	SAE 90 API EP	F.1 Rotra MP SAE 90	Gear oil G X 90	Spirax 90 HD
Front wheel bearings	SAE NLGI 2/3	F.1 Grease 33 FD	Norva 275	Retinax AX
Steering gear	(See lubrication label in engine compartment)			
Brake and clutch fluid reservoir	ALFA ROMEO std.no. 3681.69903 AGIP Brake Fluid Super HD ATE "Blau S"			
Coolant	ALFA ROMEO antifreeze std.no.3681.69958			

S A E - Society of Automotive Engineers

A P I - American Petroleum Institute

N L G I - National Lubricating Grease Institute

In countries where the above mentioned lubricants are not available, it is possible to replace them with products of other leading makes provided that in accordance with the grades given in the table.

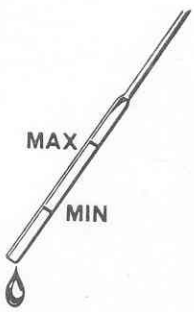
Description of lubricating circuit

The engine is pressure lubricated by a gear pump.The lubricating oil, from sump flows through the suction head strainer to the gear pump and, hence, through the filter to the crankshaft; a pressure relief valve in the pump body regulates the oil pressure.

The oil under pressure is delivered to the crankpin and main bearings and to the camshaft journals through suitable passages drilled into the shafts themselves.

The filter is fitted with a valve that by-passes the element if it should become clogged.

Pressure values of the circulating oil are transmitted to the instrument in the facia panel by the suitable transducer.



After having lubricated the various moving parts,the oil returns to the sump.

Regularly, check the oil level. When checking push the dipstick all the way down.

Never allow the oil to fall below the minimum or, while topping up, to exceed the maximum level.

Oil change (engine warmed up)

With the engine stopped, thoroughly drain off old oil from sump by removing the sump drain plug.

Renew the filter.

Clean and refit the drain plug.

Refill the sump with new oil and run the engine at idle speed.

After a few minutes of idling in order to fill up properly the lubricating circuit, top up the sump with the prescribed quantity of oil.

OIL FILTER

To remove impurities the engine oil is filtered by a full-flow filter.

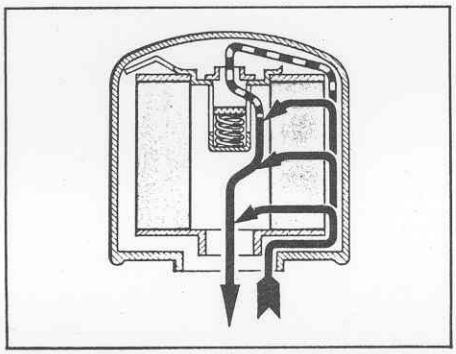
The filter is fitted with a valve that bypasses the element if it should become clogged.

At the prescribed intervals change the filter.

To remove the filter:

- slacken it with the suitable spanner, then unscrew the filter by hand.

After fitting the new filter to the engine, make sure that there are no oil leaks.



Oil flow with normal operation

Oil flow in an emergency

USE ONLY EARLY CARS.

WEBER 40 DCOE 32 Carburettor

Venturi	32 mm
Main jet	130
Main mixture tube	F 9
Main air metering jet	200
Idling jet (axial passage 200)	50 F 8
Idling air metering jet (with radial passage on idling jet)	120
Idling mixture adjusting screw with a needle tip included angle of	8°
Idling mixture adjusting screw needle seat	105
First progression hole (throttle side)	120
Second and third progression hole	100
Pump jet with horizontal spraying	35
Pump inlet valve with a by-pass of	60
Delivery of acceleration pump every 20 strokes (for each barrel)	3 to 5 cc
Travel of acceleration pump control rod	14 mm
Plunger spring free length	58 mm
Choke jet	65 F 5
Choke air passage (under choke valve gauze)	200
Choke mixture passage	100
Needle valve seat with a 50 gr. pre-loaded spring	150
Float weight	26 gr
Distance of fuel level from float chamber flange (with a pressure of 2 mts H_2O upstream of the needle valve)	29 to 29.5 mm
Distance of float from cover with float tongue in contact with the ball	8.5 mm

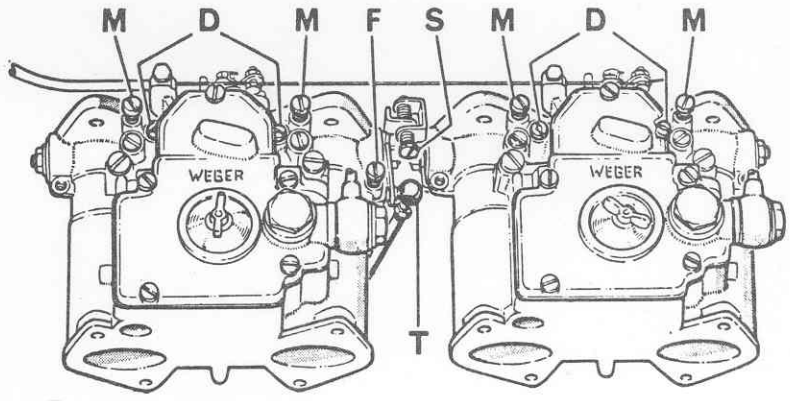
D Vacuum port

F Adjusting screw for minimum opening of throttle

M Idling mixture adjusting screw

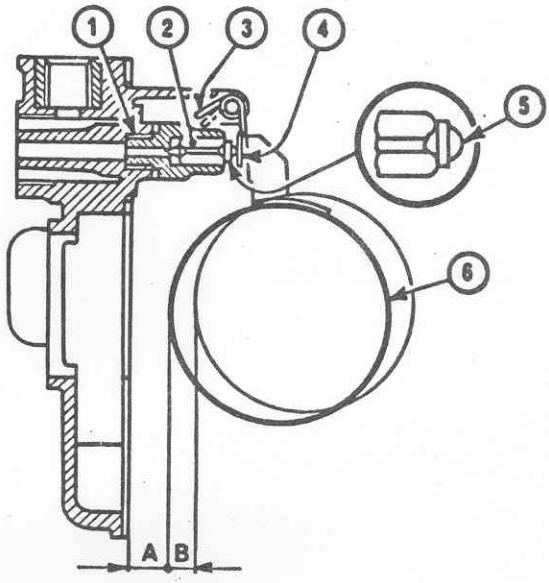
S Screw for synchronizing throttles of the two carburettors

T Joint for control linkage (to pedal)



Float level adjustment

WEBER 40 DCOE 32 carburettor



C a u t i o n

The float level should be checked whenever the float or the needle valve has been changed. In the latter case it is also advisable to replace the gasket and make certain the new valve is securely screwed into its seating.

Check the level of fluid in float chamber as follows:

- Make sure the float weight is as specified (26 grs), that there are no leaks or indentations and that float can rotate freely about the pivot pin.
- The float weight must not be altered;consequently haphazard repairs (tinning, etc.) are detrimental to proper float operation.
- Check that needle valve "1" is well screwed into its seating and that the spring-loaded ball "5" part of the needle "2" is not jammed.
- Hold the carburettor cover in a vertical position as shown in the figure so that the float "6" does not depress the ball.

- With the cover vertical and the float tongue "4" in light contact with the ball, the two floats should be at a distance A = 8.5 mm from the cover mating surface with the gasket fitted and well stuck to the cover.

- When the level has been set, check that the travel "B" of the float is 6.5 mm; if necessary, adjust the position of float pivot tail "3".

- The adjustment described above will correspond to a fuel level of 29 + 0.5 mm from the upper face of the float chamber (with a pressure of mts H_2O upstream of the needle valve).

- If distance "A" is not as specified, slightly bend the float tongue "4" until the correct distance is obtained; inspect the working surface of the float tongue "4" for any sign of nicks which may restrict the free movement of needle "2".

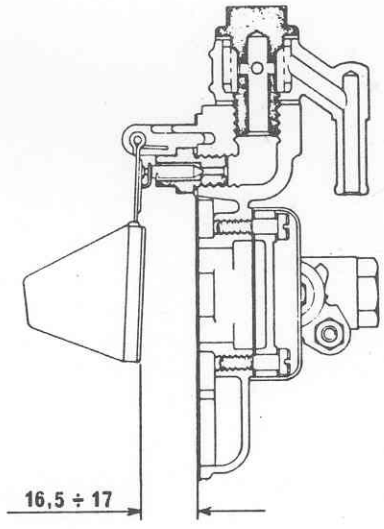
- Then fit the carburettor cover and check that the float can move freely without rubbing against the walls of the float chamber.

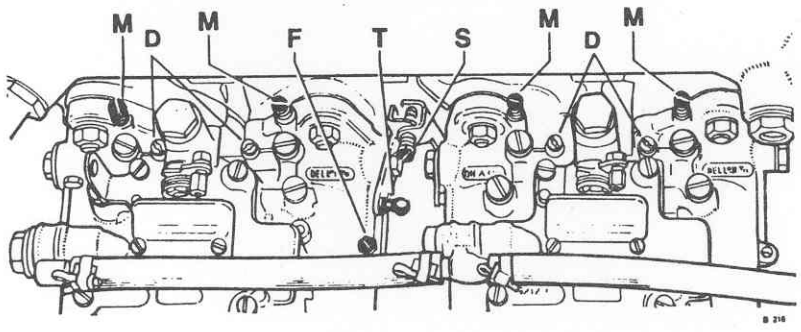
DELLORTO DHLA 40 Carburettor

Venturi	32 mm
Main jet	135
Main mixture tube	7772.5
Main air metering jet	200
Idling jet	50
Idling jet carrier 7850.1 — air passage	140
Idling jet carrier 7850.1 — axial passage	220
Idling mixture adjusting screw with a needle tip included angle of	6°
Idling mixture adjusting screw needle seat	120
First progression hole (throttle side)	120
Second and third progression hole	100
Pump jet with horizontal spraying	40
Delivery of acceleration pump every 20 strokes (for each barrel)	5.5 to 6.5 cc
Choke jet	70
Choke mixture passage	7482.1
Choke air passage	300
Needle valve seat	150
Weight of float 7298.2	10 gr
Distance of fuel level from float chamber flange with a pressure of 2 mts H_2O upstream of the needle valve (as measured in bowl)	25 to 26 mm
Distance of float from cover with float tongue in contact with the ball	16.5 to 17 mm
Diameter of air passages from bowl to air restrictors	6 mm

Float level checking

Make sure the float weight is as marked on the float itself, that there are no indentations and that float rotates freely about the pivot pin.
Hold the carburettor cover in a vertical position so that the float tongue is in light contact with the needle.
In this condition the two floats should be at the specified distance from the cover mating surface with the gasket fitted.





SOLEX C 40 DDH 5 Carburettor

Venturi	32 mm
Main jet	140
Main mixture tube (4 holes)	150
Main air metering jet	150
Idling jet	50
Idling air metering jet	130
Pump jet	35
Delivery of acceleration pump every 20 strokes (for each barrel)	5 to 7 cc
Choke jet	140
Choke air passage (mixture passage 125)	600
Needle valve seat	160
Needle valve seat shim	1 mm
Float weight	13.6 ± 0.5 gr
Level with a pressure of 2 mts H_2O (in bowl)	15.5 to 16.5 mm
Level with a pressure of 2 mts H_2O (in communicating vessels)	18 to 19 mm

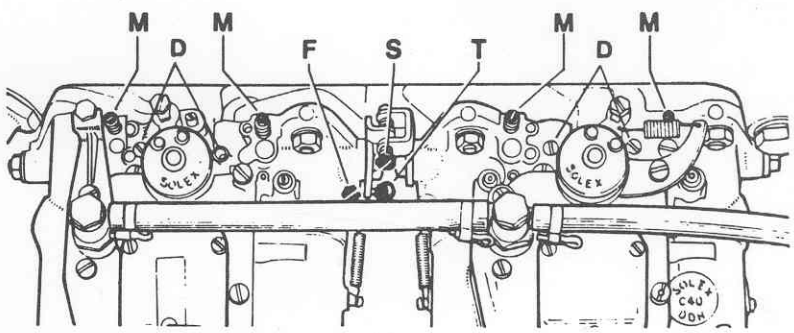
D Vacuum port

F Adjusting screw for minimum opening of throttle

M Idling mixture adjusting screw

S Screw for synchronizing throttles of the two carburettors

T Joint for control linkage (to pedal)



Idle adjustment

To adjust the idle, follow the directions given below applicable to all three carburettors and refer to the illustrations on the previous pages.

Preparatory steps

- Check the ignition timing and inspect the electric system (sparking plugs, distributor, coil, etc.) for proper operation.
- Remove the air filter element and clean it thoroughly.
- Check the flexible mounts between carburettors and intake manifold for tightness.

Aligning the throttle valves

- Detach the control linkage "T" from carburettors.
- Slacken the screws "F" and "S" almost fully.
- Operate the throttles a few times to make sure there is no binding.
- Fully depress the throttle control lever of rear carburettor so that the throttles are fully closed; then screw in the screw "S" until contact is made.

Note - A more accurate check of the throttle valve alignment can be made with the suitable vacuum meter C.2.0014 to be connected to the vacuum ports "D" after removal of screws. (Refer to Tool Bulletin n° 154).

Idling

- Back up the screws "M" of two turns from closed position.
- Tighten the screw "F" to contact, then screw it in one more turn to ensure feeding of engine.

- Connect the accelerator control linkage "T" to carburettors.

- Start the engine and warm it up.

- If necessary, back up the screw "F" very slowly until the engine runs at about 700 rpms.

Caution: if the engine runs unevenly, act on the screws "M" alternatively until an even operation is obtained. Again adjust the idle speed as outlined above.

Checking the carbon monoxide emissions at idling speed

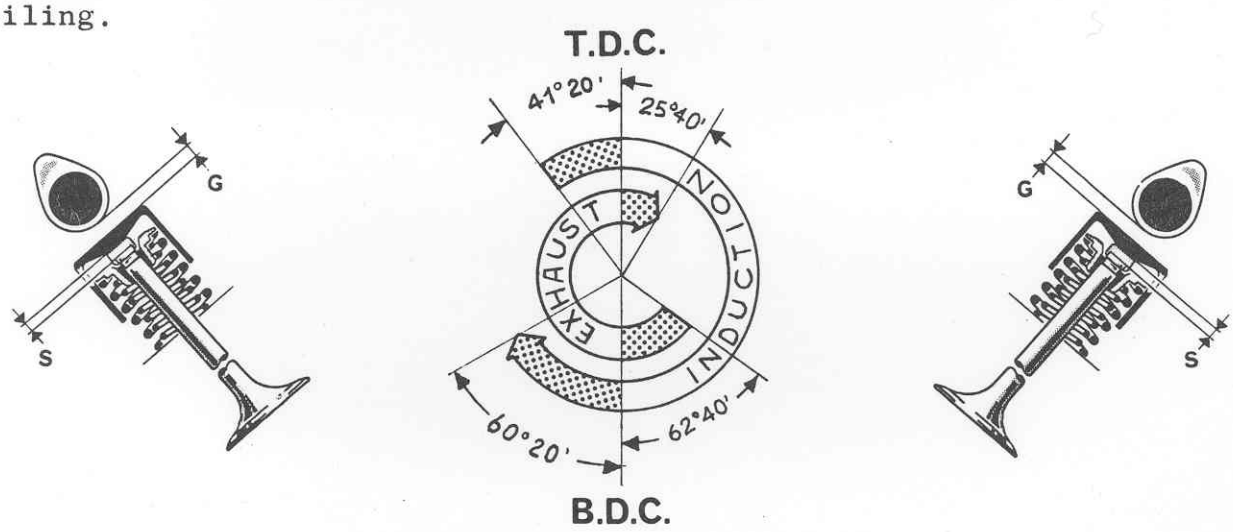
If it is necessary to check the CO concentration in the exhaust gases, proceed as follows:

- with the engine hot and idling, check the CO emission with a CO meter. If the concentration exceeds the prescribed limits, act on the mixture adjusting screws so as to lean the mixture.

The V-mounted overhead valves are directly operated by two camshafts, acting through oil bath cups.

Valve clearance adjustment

When the engine is cold carefully measure, with a feeler gauge the clearance "G" between the unlobed profile of cams and the valve cup ceiling.



Specified clearance { Intake G = 0.475/0.500 mm; Exhaust G = 0.525/0.550 mm }

If the clearance is not as specified, keep a record of the readings taken on the 8 valves. Remove the camshafts and the cups. Replace the adjusting pads of those valves whose clearance does not fall within the limits with new pads having such a thickness "S" as to bring the clearance "G" again within the specified limits.
To facilitate this adjustment the pads are made available in a series of thicknesses ranging from 1.3 to 3.5 mm in increments of .025 mm.

Angle values of the actual diagram of valve timing system with cold engine

(clockwise rotation direction of the crankshaft as seen from the front end)

Opening of intake valve (before TDC)	41° 20'
Closing of intake valve (after BDC)	60° 20'
Opening of exhaust valve (before BDC)	62° 40'
Closing of exhaust valve (after TDC)	25° 40'
Induction stroke	281° 40'
Exhaust stroke	268° 20'

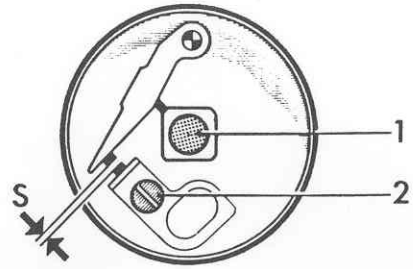
Checking the valve opening and closing angles

Specifications and procedure:

Clearance (with cold engine) between the unlobed profile of cams and the valve cup ceiling	intake	0.475/0.500 mm
	exhaust	0.525/0.550 mm
Opening of intake valves	lift of cup	0.20 mm
	corresponding to an angle, before TDC of . . .	23° ± 1° 30'
Closing of intake valves	lift of cup	0.20 mm
	corresponding to an angle, after BDC of . . .	42° ± 1° 30'
Opening of exhaust valves	lift of cup	0.15 mm
	corresponding to an angle, before BDC of . . .	51° ± 1° 30'
Closing of exhaust valves	lift of cup	0.15 mm
	corresponding to an angle, after TDC of . . .	14° ± 1° 30'

Firing order: 1 - 3 - 4 - 2

Bosch JF 4 - Marelli S 145 B Distributor setting



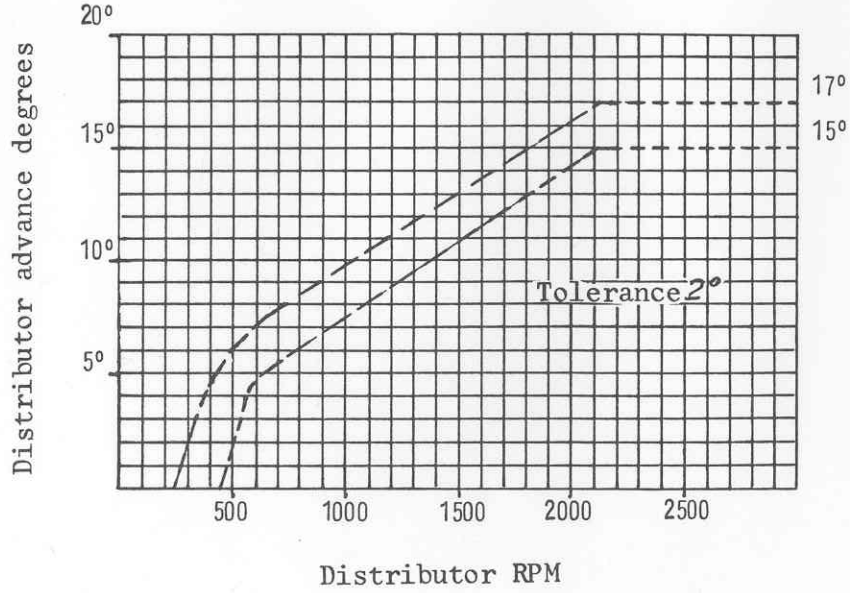
Check with a feeler gauge the contact-breaker point gap:
S = 0.35 to 0.40 mm (Dwell angle 57°/63°)

Adjust by means of screw "2" if necessary.

If contacts are burnt or pitted, they may be smoothed with a very fine file and then cleaned with petrol.

Soak the felt "1" with oil.

ADVANCE GRAPH

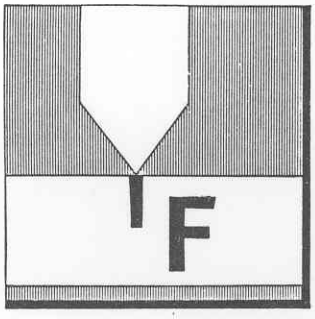


Centrifugal advance		
R.P.M.	Upper	Lower
250	Start	-
350	3.4°	-
400	4.5°	-
450	5.5°	Start
500	6.25°	2°
550	6.7°	4°
650	7.5°	5.2°
700	7.8°	5.5°
2125	17°	15°

Checking the ignition timing

To check the ignition timing, proceed as follows:

- rotate the crankshaft to bring no. 1 cylinder piston to the compression stroke, that is with both valves closed;
- by slightly rotating the crankshaft, bring the static advance mark "F" cut in the drive pulley into line with reference plate;
- remove the distributor cap and check that the contact-breaker points begin to open when the engine is turned further in its normal direction of rotation.



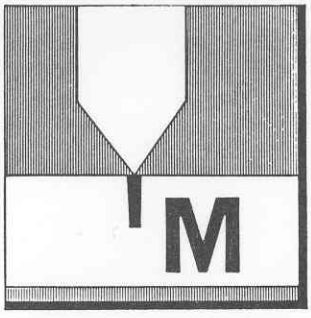
STATIC ADVANCE

3° ± 1° BTDC

A more accurate check should be made with a stroboscopic gun as follows:

- run the engine at about 4600 rpm and direct the light from the stroboscopic gun onto the pulley: if the timing is correct, the "M" (max. advance) stamped on the pulley will be seen in line with the reference plate.

If it is found that the max. advance is greater or less than the prescribed value, adjust the static advance accordingly, as it is better to have correct timing at high speeds.



MAX ADVANCE

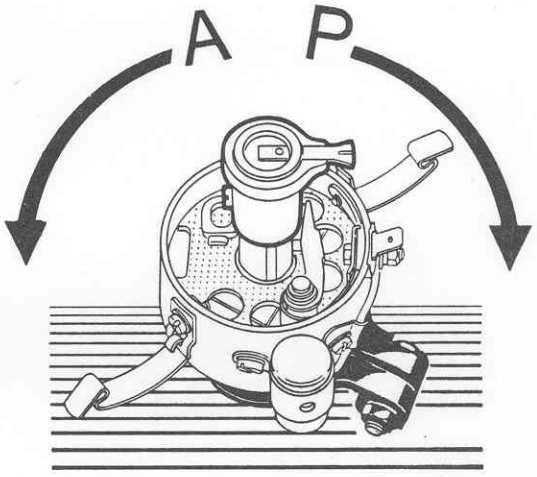
40° $^{+\ 0°}_{-\ 3°}$ at 4600 RPM

Timing adjustment

If the timing requires adjustment proceed as follows:

- unscrew the nut on the bolt securing the distributor body;
- rotate the distributor body anti-clockwise or clockwise according to whether it is necessary to advance "A" or to retard "P" the ignition setting;
- retighten the nut, taking care not to move the distributor body.

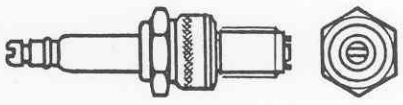
To re-set the timing after the distributor has been removed from the engine proceed as follows:



- rotate the crankshaft to bring no. 1 piston to the compression stroke, that is with both valves closed;
- by slightly rotating the crankshaft, bring the static advance mark "F" into line with the reference pointer.
- remove the distributor cap and rotate the drive shaft by hand to bring the rotor arm in line with the contact for no. 1 cylinder.
- make sure that in this position the contact-breaker points are about to open;
- then without disturbing the drive shaft, mount the distributor on its bracket and tighten the distributor bracket securing nut.
- check the ignition timing as described in the previous page.

SPARKING PLUGS

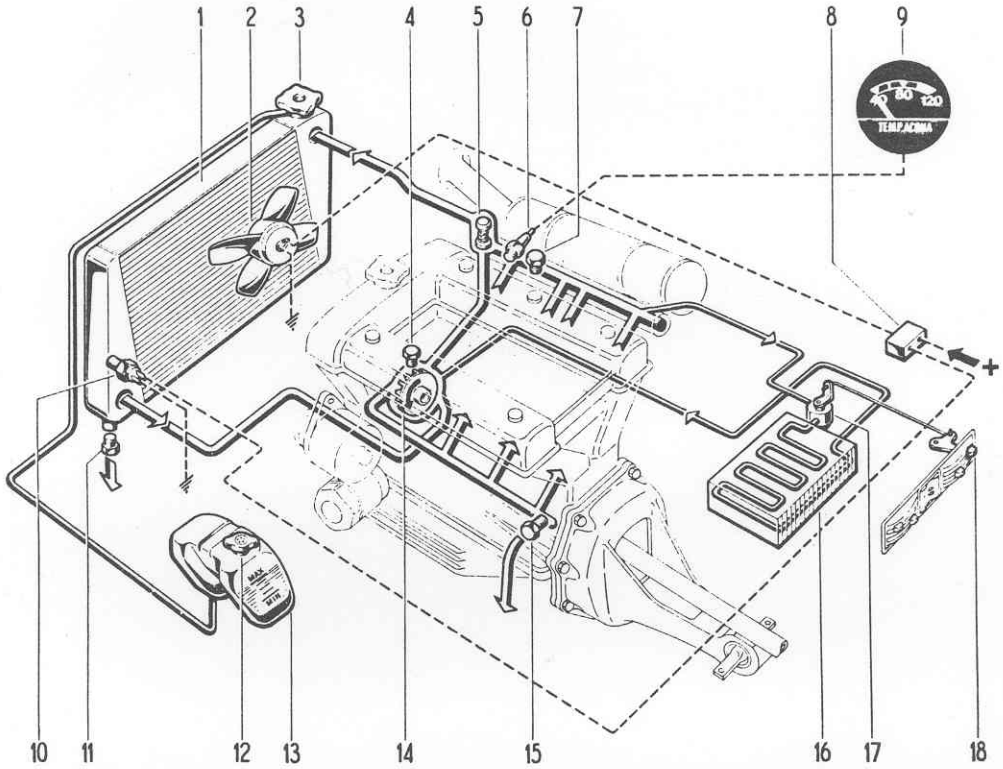
Lodge 2 HL



The sparking plugs are of the type with four points and a central electrode.

The only maintenance required is occasional cleaning with a brush of the central and earth electrodes.

No routine adjustment is necessary of the gap between the electrode and points.



1 Radiator
2 Electric fan
3 Radiator filler cap
4 Air bleed screw on pump
5 Thermostatic valve
6 Water thermometer sender
7 Air bleed screw on manifold
8 Electric fan relay
9 Water thermometer
10 Electric fan thermal switch
11 Radiator drain plug
12 Reservoir filler plug
13 Reservoir
14 Pump
15 Drain plug
16 Heater
17 Heater valve
18 Temperature control lever

The cooling circuit is of the sealed type with a compensating reservoir.

The coolant, kept in circulation by the pump "14", cools down the cylinder head and sleeves then flows, through return lines, to the thermostatic valve "5". Hence, according to the position of the valve spool, the coolant is sucked by the pump either from the thermostatic valve or the radiator outlet line.

The latter condition occurs when the thermostatic valve spool, according to the high temperature of coolant,moves to such a position as to allow the coolant to flow from engine to radiator through the upper outlet of thermostatic valve.

By gradually controlling the coolant flow, the thermostatic valve automatically regulates the engine temperature.

The electric fan "2", which automatically cuts in or out by means of the relay "8" in turn energized by the thermal switch "10", prevents engine overheating when ram ventilation of radiator is not enough for proper cooling.

Coolant temperature is indicated by the thermometer "9" via its sender "6".

The lever "18", by controlling the valve "17" and thus the temperature of the heater core,enables to regulate as desired the temperature inside the car.

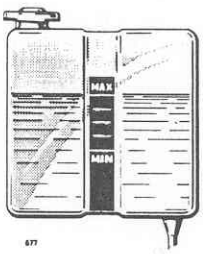
Cooling system maintenance

To ensure the efficient operation of the cooling system, the following procedure should be observed.

Occasionally, check level of coolant in the reservoir: this should be done exclusively with a cold engine as with a hot engine the level may increase remarkably, even after stopping the engine.

The level of mixture in the reservoir should never fall below the "Min" nor exceed the "Max.

To top up use Alfa Romeo Coolant Mixture, drawn from suitable containers, to be added to the compensating reservoir only.



If too frequent a topping up is required,have the cooling system checked thoroughly.

Should sudden and excessive leaks be experienced from the system,the use of fresh water is allowed provided that the specified mixture is restored and trouble remedied as soon as possible.

Warning

Never remove radiator cap unless absolutely necessary; in any case,to avoid severe injuries, wait that the liquid is cooled down to outside temperature.

Changing the coolant mixture

Every 18,750 mi (30,000 kms), or once a year whichever comes first, renew the coolant mixture after the circuit has been flushed with a suitable descaling compound.

Draining and replenishing the system

Proceed as follows: (refer to the illustration on page 20).

Draining:

- Remove filler cap. "3".

- Unscrew the radiator drain plug "11" and the air bleed screw "7".

- Turn on the heater valve "17".

- Remove the drain plug "15" from crankcase; let liquid drain off and empty the reservoir "13" by detaching the pipe.

  Reinstall drain plugs "11" and "15" and reconnect the pipe to the reservoir.

Replenishing:

- Remove filler caps and turn on the heater valve.

- Open the air bleed screws "7" and "4".

- Pour coolant mixture through filler port until coolant escapes from bleed screw "4"; then close this screw and again add coolant until it escapes from screw "7".

- With the bleed screw "7" opened and no cap on filler port of radiator, start the engine and keep it running for a few seconds in order to bleed air completely.

- Close the bleed screw "7".

- Add mixture to radiator filler port until full.

- Add mixture also to reservoir until "MAX" level is reached.

- Put caps on reservoir and radiator filler ports.

Important note

The Alfa Romeo Coolant Mixture gives full protection against freezing down to -20° C.

In places where the temperature falls below -20° C., the antifreeze mixture can be made stronger by varying its concentration.

The quantities of antifreeze to be added to radiator and reservoir depending on the lowest anticipated temperature are the following.

Temperature ° C	Amount of "Alfa Romeo Coolant Mixture" to be replaced with an equal quantity of "Alfa Romeo Antifreeze"		
	Radiator	Reservoir	Total
-28	800 cc	200 cc	1 lt.
-39	1.600 cc	400 cc	2 lt.
-50	2.400 cc	600 cc.	3 lt.

Electric fan

The electric fan starts operating automatically when the coolant reaches a temperature of 90-95° C.

In the event the temperature indicated by the thermometer "9" would exceed the above said values, check the cooling system; specifically, check for a faulty thermostatic valve; if it is correct, test the electric fan for proper cut-in temperature.

Voltage		12 V
Battery		60 Ah
Alternator	BOSCH	K 1 → 14 V 45 A 22
Voltage regulator	BOSCH	AD 1/14 V
Alternator: Motorola	SEV-MARCHAL	A.14 45/55
Voltage regulator: Motorola	SEV-MARCHAL	14 V
Starting motor	BOSCH	E F → 12 V 0.7 P S
Starting motor	PARIS RHONE	D 8 E 109 12 V
Ignition distributor	BOSCH	J F 4
	MARELLI	S 145 B
Coil	BOSCH	K 12 V
	MARELLI	BE 200 A
Electric fan	BOSCH	EPL 12 V
Windscreen wiper, two-speed	BOSCH	WS 462 V 5054 (4)
Windscreen wiper, two-speed	MARELLI	TGE 567 D
Windscreen wiper, two-speed	S W F	1E 4041 -1

Bulb's wattage

High beams (inner headlights)	55 halogen
Low beams (outer headlights)	55 halogen
Front parking lights and direction indicators	5/21
Tail lights - parking & stop	5/21
Tail direction indicators	21
Reversing light	21
License plate light	3
Engine compartment light	5
Courtesy light	5
Boot light	5
Side direction indicators	3
Lighting on instruments	3
Tell-tale for blower	3
Tell-tale for alternator	3
Tell-tale for parking lights	3
Tell-tale for high beams	3
Tell-tale for fuel reserve	3
Tell-tale for choke	3
Tell-tale for direction indicators	3
Tell-tale for handbrake	3
Tell-tale for heated rear window (optional)	1/2

BOSCH ALTERNATOR AND REGULATOR TEST SPECIFICATION

Alternator

(Bosch 0.120.400.786 - K 1→14 V 45 A 22)

Field winding resistance	∩ 4	- 0 + 10%
Stator winding resistance	∩ 0.17	- 0 + 10%
Field current 14 V	3 to 3.3 A	

Alternator/regulator unit test when hot (60° C)

At 1400 rpm	10 A
At 2200 rpm	30 A
At 6000 rpm	45 A

Regulator

(Bosch 0.190.601.006 - AD 1/14 V)

Voltage under load (28 to 30 A) . . . . . (At 4000 rpm steady)	13.9 to 14.8 V

Test under load should be performed with battery and a suitable rheostat connected in parallel.

TIGHTENING TORQUE SPECIFICATION

E N G I N E

			Kgm.	Manner of tightening
Cylinder head nuts *	Inspection	when cold	7.2/7.4	Slacken, in proper order, the nuts by one and one half turn and torque with lube between washer and nut.
		when hot	7.6/7.7	Warm up the engine and when hot retighten without unscrewing.
	After repairing	when cold	7.2/7.4	Retighten with lube
		when hot	7.6/7.7	Warm up the engine by actually driving the car and when hot retighten without unscrewing.
		when cold	7.2/7.4	After tested the car, slacken, when cold and in proper sequence, the nuts by one and one half turn and torque with lube between washer and nut.
Spark plugs			2.5/3.5	With graphite grease, when cold
Nuts of the camshaft caps			2 / 2.25	with oil
Bolts of the connecting rod caps			5/5.3	" "

* WARNING: In case of any repair work involving the removal of cylinder head, the gasket must be renewed at all times.

	Kgm.	Manner of tightening
Nuts of main bearing caps	4.7/5	with oil
Locknuts of main bearing caps	1.1/1.3	" "
Screws securing flywheel to crankshaft	9.7 / 10	" "
Nut of damper pulley	19/20	" "
Oil drain plug on sump	7/8	dry
TN 07.74.1.2 Thermostat on manifold . use instant gasket if leaking (1 Kgm — 1.6 Kgm)	~~3.5/4~~ N.A	"
PROPELLER SHAFT		
Screws securing front flexible coupling to flywheel (to tighten these screws use special tool A.5.0192 and torque to 4.35/4.85 Kgm).	4.85/5.35	"
Screws securing front flexible coupling to shaft (to tighten these screws use special tool A.5.0191 and torque to 4.35/4.85 Kgm).	4.85/5.35	"
Screws securing intermediate flexible coupling to propeller shaft sections (to secure the flexible coupling to the prop. shaft front section, use tool A.5.0191 and torque to 4.35/4.85 Kgm). (to secure the flexible coupling to the prop. shaft rear section, use tool A.5.0190 and torque to 4.35/4.85 Kgm).	4.85/5.35	"
Screws securing rear flexible coupling (to tighten these screws use tool A.5.0192 and torque to 4.35/4.85 Kgm).	4.85/5.35	"
Nut securing central bearing flange	9.5 / 10.5	"
GEARBOX/DIFFERENTIAL UNIT AND REAR FRAME		
Nut securing rear gear lever	3.07/3.51	"
Nut securing clutch input shaft yoke	9.5 / 10.5	"
Cylinder hose adapter	0.8/1	"

	Kgm.	Manner of tightening
Screws securing pressure plate to flywheel	1.275/1.650	dry
Nut of mainshaft	9.5 / 10.5	"
Nut of pinion shaft	11.40/12.60	"
Screws securing ring gear	6.8/7.5	with oil
Oil filler and drain plugs	1.5/1.8	dry
Reversing light switch	4.05/4.95	"
Nuts joining clutch/gearbox unit castings to the intermediate flange	1.690/2.370	"
Screw securing de-Dion tube front link to cross-member	9/11	"
Screw securing gearbox support to body	4/4.5	"
Nut securing bellcrank to de-Dion tube	6/10	"
Bolt securing rear link to bellcrank	4/5	"
Bolt securing rear link to body	4/5	"
Bolt securing gearbox/differential unit to body	4.5/5.5	"
Nut securing shock absorber to link	2.4/2.95	"
Nut securing shock absorber to body	2.4/2.95	"
Screws securing stabilizer rod bracket to body	2.0 / 2.5	"
Bolt securing link to stabilizer rod	4/5	"
Nuts securing wheel to hub	6/8	"
Nut securing stabilizer rod link to de-Dion tube	4/5	"
Nut securing wheel hub to driving flange	33/36	"
Bearing ringnut	23/27	"

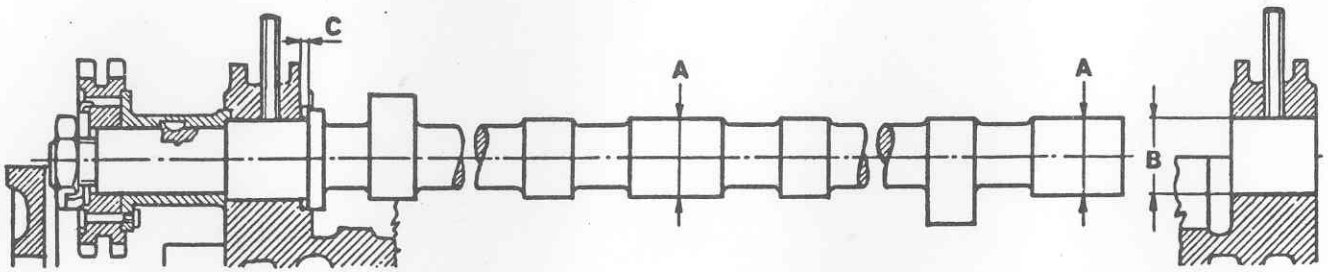
	Kgm.	Manner of tightening
Screws securing drive shaft to driving flange	2.8/3	with Molikote BR2 grease
Screws securing drive shaft to brake disc spacer	2.8 / 3	with Molikote BR2 grease
Nuts securing brake caliper to support	4.65/5.35	d r y
Screws securing brake discs to output shaft	5.13/5.67	"
"A T E" B R A K E S		
Fitting of caliper inlet pipe . . . with gasket	1/1.5	"
Fitting of caliper inlet pipe . . . less gasket	0.8/1.1	"
F R O N T F R A M E		
Nuts securing lower wishbone links to body	8.2/9.2	"
Nut securing suspension slanting arm to body	4/4.5	"
Bolt securing suspension upper arm to body	3/3.5	"
Nut securing upper ball joint to upper arm	8.2/9.2	"
Nuts securing lower wishbone to its shaft	3/3.5	"
Nut securing shock absorber to body	2.4/2.95	"
Nuts securing lower wishbone joints	2/3.5	"
Locknuts for securing lower wishbone joints	6/7.2	"
Nuts securing joints to wishbones	1.5/2	"
Screws securing shock absorber to lower wishbone	2.5/3.2	"
Bolts attaching torsion bar support cross-member to body	8.2/9.2	"

	Kgm.	Manner of tightening
Screws securing stabilizer rod to body	2.5/3	d r y
Nut securing stabilizer rod link to lower wishbone	2/2.5	"
Screws securing brake caliper to steering knuckle	7.5/8.5	"
Screws securing splash shield to steering knuckle	0.8/1	"
Nut securing steering wheel to shaft	5/5.5	"
Bolt securing steering column to bracket	1.3/1.6	"
Screw securing intermediate shaft to rack	2/2.5	"
Screw securing rack to body	2.7/3	"
Nut securing joint to steering knuckle	4.5/5.5	"
Nut securing joint to steering knuckle lever	5.5/9	"
Bolts securing joint to steering pinion shaft	2.3/2.8	"
Screws securing ZF steering rack adjuster	1.5	"
Screws securing ZF steering pinion adjuster	1.5	"
Steering rod to ZF rack attaching parts	5	"

All dimensions, unless otherwise stated, are in millimetres

Camshafts

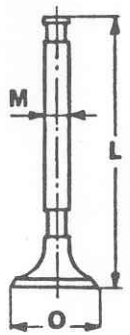
Diameter of journals	A =	26.959/26.980
Diameter of journal bearings	B =	27.000/27.033
Radial clearance between journals and bearings	B-A =	0.020/0.074
End play of camshaft in thrust bearing	C =	0.065/0.182



Valves and valve guides

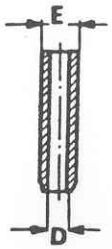
		Intake		
		LIVIA H	A T E	GARRONE
VALVES	valve poppet dia. O	41.000/41.150	41.000/41.200	41.000/41.150
	valve stem dia. . M	8.972/8.987	8.972/8.987	8.972/8.987
	Total length . . . L	106.900/107.155	106.365/107.235	106.565/107.435

		Exhaust (sodium cooled)	
		A T E	LIVIA C
VALVES	Diameter of valve poppet . . . . . O	37.000/37.200	37.000/37.150
	Diameter of valve stem . . . . . M	8.945/8.960	8.935/8.960
	Total length L	106.450/106.550	106.520/107.305



N.B.: LIVIA - ATE - GARRONE intake valves are alternative supply.

Valve guide	Outside diameter with guide removed . . . . . E =	14.033/14.044
	Inside dia. with guide assembled in cylinder head . D =	9.000/9.015
Projection of intake valve guides from their recesses in cylinder head		13.300/13.500
Projection of exhaust valve guides from their recesses in the cylinder head		16.300/16.500
Clearance between guide assembled in cylinder head and valve stem	intake	0.013/0.043
	exhaust	0.040/0.080
	ATE exhaust valves	0.040/0.070
Height of cylinder head when new		111.913/112.000
Minimum grinding limit of cylinder head		111.500
Tolerance of flatness of head surface (block side)		0.05

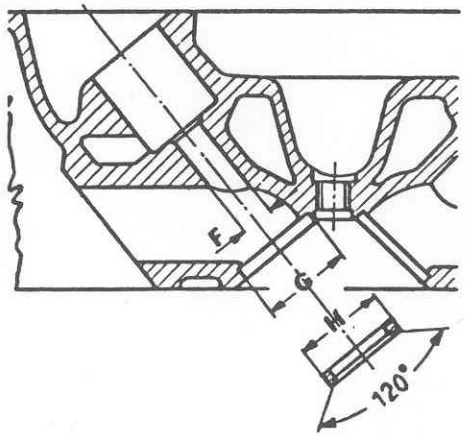


Note - In the event of head renewal, cut reference marks on front camshaft caps by using the special tool A.4.0129 as directed in the I.S. 03.70.2.1.

Valve seats

Diameter of valve guide seat in cylinder head . . . . . F = 13.990/14.018

Interference between seat and valve guide 0.054/0.015

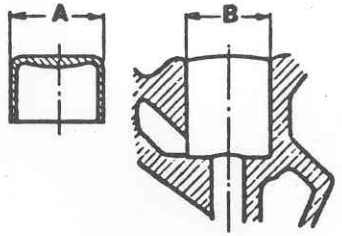


		Intake	Exhaust
Outside diameter of the valve seat insert H =	Standard	42.597/42.632	38.597/38.632
	Oversized	42.897/42.932	38.897/38.932
Diameter of recess in the cylinder head for valve seat insert G =	Standard	42.532/42.557	38.532/38.557
	Oversized	42.832/42.857	38.832/38.857

Interference between valve seat insert and recesses in cylinder head 0.040/0.100

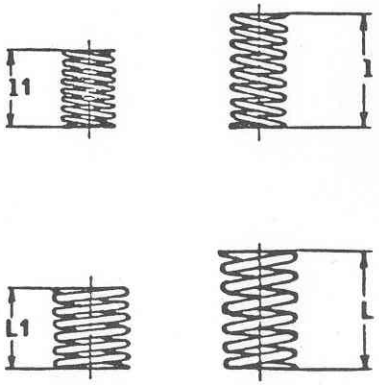
Valve cups

Diameter of cup A =	standard	34.973/34.989
	oversized	35.173/35.189
Diameter of cup seat in cylinder head B =	standard	35.000/35.025
	oversized	35.200/35.225
Clearance between seat and cup		0.011/0.052



Valve springs

	Length		Test load
	Free	Under test load	
Inner spring . . . . . l =	46.50 47.35 47.00	l1 = 26	22.24/23.16 Kg.
Outer spring . . . . . L =	51.30 52.80	L1 = 27.5	35.67/37.13 Kg.
	52.00		35.87/37.33 Kg.



Connecting rods

Length between ℄ of big end and ℄ of small end of connecting rod . . . . . D		156.950/157.050
Inside diameter of the big end of connecting rod E		53.695/53.708
Inside diameter of bushing in the small end of rod C		22.005/22.015
Thickness of connecting rod bearings . . . . F*	A - Red	1.831/1.837
	B - Blue	1.837/1.843
Radial clearance between crankpin and bearing for big end of connecting rod	A - Red .	0.023/0.058
	B - Blue .	0.021/0.056
Maximum out of parallelism between ℄ of big end hole and ℄ of small end hole		0.078
Offset of big end ℄ with respect to small end ℄ M		1.500
Tolerance in weight between con rods of the same engine		2 gr

N/A * Note: the color code and letters A or B are stamped on bearing edge. Paint on side of shell.

NO4. champher to flywheel side

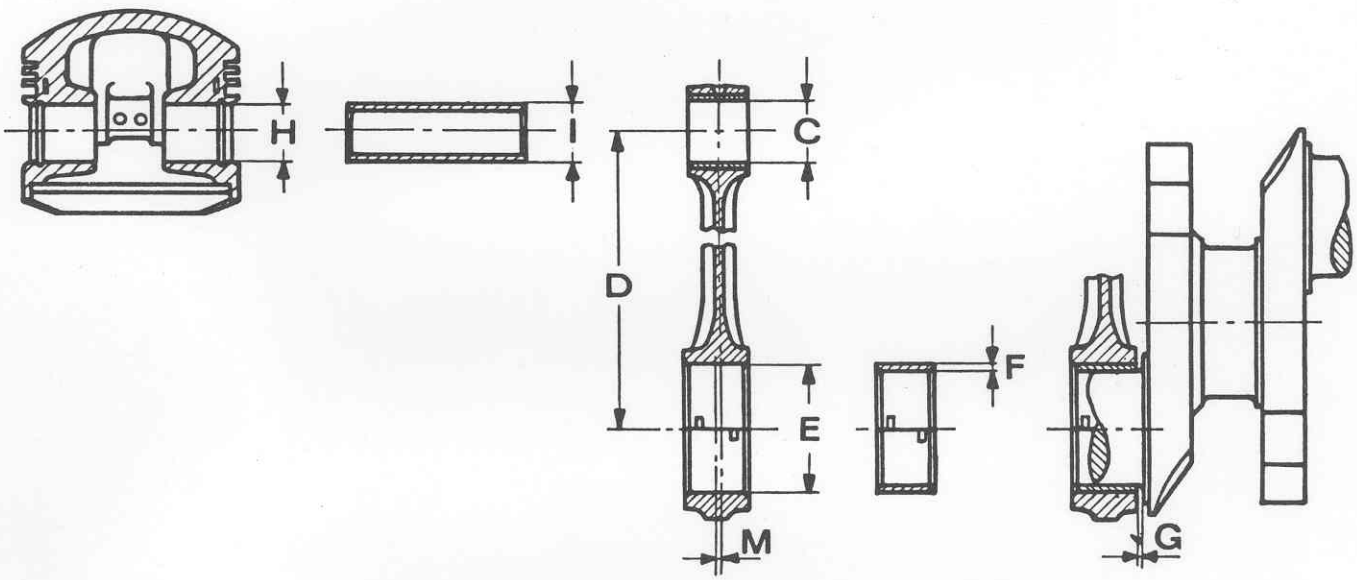
Piston pins

O.D. of pin I	Black color	21.994/21.997
	White color	21.997/22.000
Clearance between piston pin and small end hole	Black color	0.008/0.021
	White color	0.005/0.018

PISTON PIN HOLES

	Black mark	White mark
BORGO piston . . . . . .H	22.000 / 22.002	22.003 / 22.005

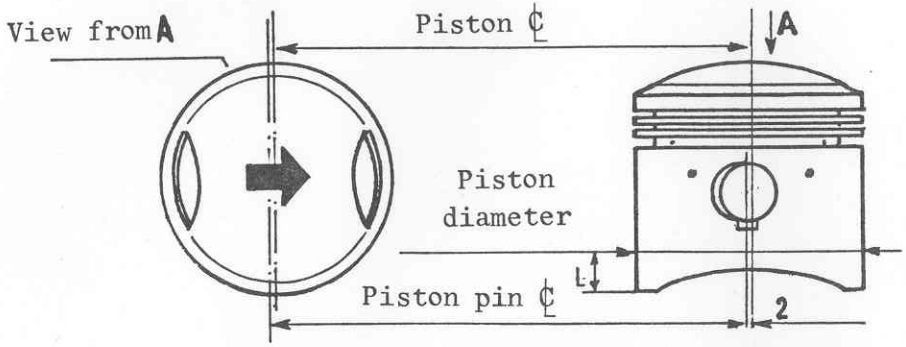
End play of the connecting rods on the crankpins . . . . . G = 0.2 / 0.3

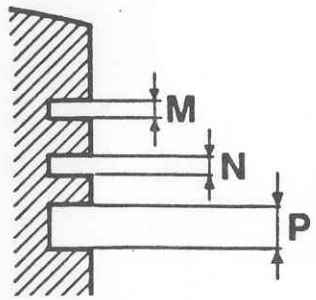


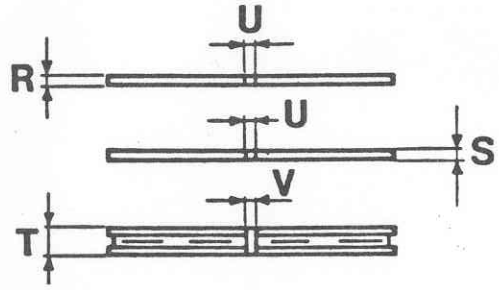
Pistons and piston rings

Diameter of pistons to be measured at right angle to the hole for piston pin and at a distance of L = 15 mm from the lower border of skirt.

	Class A (Blue)	Class B (Pink)	Class C (Green)
BORGO piston diameter	79.945 / 79.955	79.955 / 79.965	79.965 / 79.975







N.B. - On reassembly, make sure the arrow marked on piston is pointing toward the rotation direction of crankshaft (i.e. toward exhaust side).

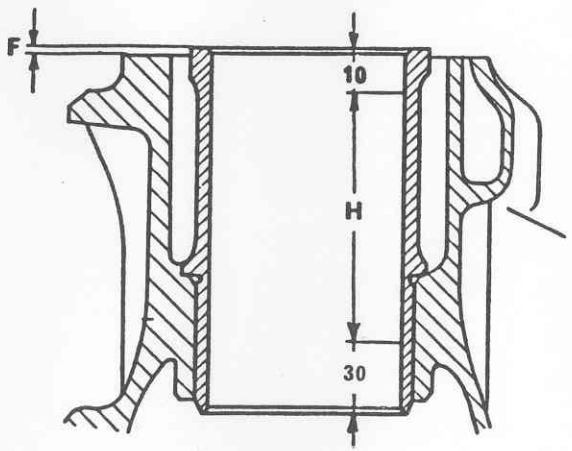
Height of grooves for piston rings	chromium-plated compression ring	M =	1.525/1.545
	oil scraper ring	N =	1.775/1.795
	oil control ring	P =	4.015/4.035
Thickness of rings	chromium-plated compression ring	R =	1.478/1.490
	oil scraper ring	S =	1.728/1.740
	oil control ring	T =	3.978/3.990
End play of rings in grooves	chromium-plated compression ring		0.035/0.067
	oil scraper ring		0.035/0.067
	oil control ring		0.025/0.057
Gap of compression ring and oil scraper ring (to be inspected in ring gauge or in cylinder sleeves)		U =	0.30/0.45
Gap of oil control ring (to be inspected in ring gauge or in cylinder sleeves)		V =	0.25/0.40
Tolerance in weight between piston assemblies of the same engine			2 gr

Cylinder sleeves

For cylinder classification purpose, use the minimum diameter recorded.

	Blue - A	Pink - B	Green - C
Cylinder sleeve diameter	79.985/79.994	79.995/80.004	80.005/80.014

Clearance between cylinder sleeve and piston 0.030/0.049



H = area of measurement

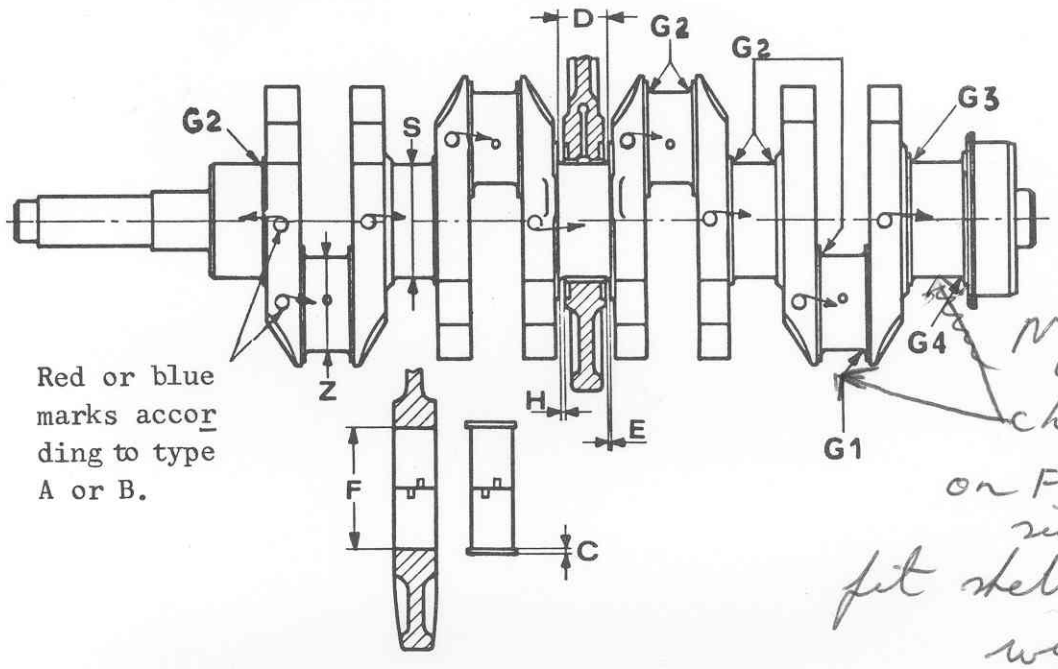
Projection of sleeves from cylinder block * . . . . . F = 0.01/0.06

Surface roughness . . . . . R = 05/1 μ

Elongation and taper of sleeves 0.01

* Note: To check the projection of cylinder sleeves use tool C.6.0148 as directed in Tool Bulletin no. 144.

Crankshaft



Diameter of main journals	S	A - Red	59.961/59.971
		B - Blue	59.951/59.961
Diameter of crankpins	Z	A - Red	49.988/49.998
		B - Blue	49.978/49.988
Thickness of main bearings	C	A - Red SFCM	1.824/1.830
		A - Red CLEVITE	1.829/1.835
		B - Blue SFCM	1.830/1.836
		B - Blue CLEVITE	1.835/1.841
Diameter of seat for main bearings in crankcase	F	=	63.657/63.676
Length of central journal	D	=	30.000/30.035
Thickness of thrust rings for central journal	E	=	2.310/2.360
End play of crankshaft	H	=	0.080/0.265
Clearance between journals and main bearings: A - Red, bearings SFCM			0.026/0.067
Clearance between journals and main bearings: A - Red, bearings CLEVITE			0.016/0.057
Clearance between journals and main bearings: B - Blue, bearings SFCM			0.024/0.065
Clearance between journals and main bearings: B - Blue, bearings CLEVITE			0.014/0.055

Note - Clearance = main bearing ID - (twice bearing thickness + journal OD).

Fillet radii	Crankpin no. 4, flywheel side	G1 =	2.7/3.1
	Main journals and crankpins	G2 =	1.7/2.1
	Rear main journal — Crank side	G3 =	3.7/4.1
	Rear main journal — Flywheel side	G4 =	1.2/1.6
Main journals & crankpins surface roughness		R =	0.16 μ
Maximum elongation of main journals and crankpins			0.007
Maximum taper of main journals and crankpins as measured on their full length			0.01
Maximum error of parallelism of main journals and crankpins as measured on their full length			0.015
Maximum misalignment allowed between main journals			0.01
Maximum misalignment between ℄ of the two pairs of crankpins and ℄ of main journals			0.300

PROPELLER SHAFT

Maximum out of balance at 4500 rpm	1 gr.cm.
Maximum run out of shaft	0.15 mm
Maximum run out of front section of shaft as measured at the centring dowels	0.06 mm
Out of square between dowels and planes of yoke for flexible joint	0.05 mm

Lubricate the centring recesses:

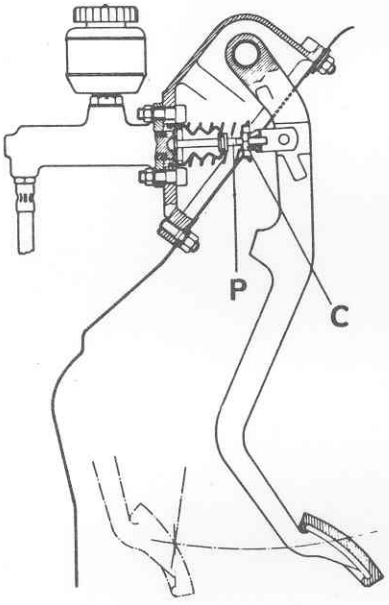
With 7 cc. of	molikote BR 2 grease	at engine side
With 11 cc. of	molikote BR 2 grease	at central joint
With 2 cc. of	molikote BR 2 grease	at clutch side

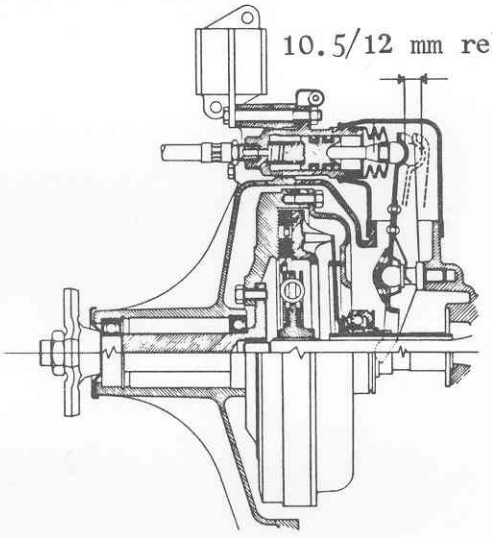
For the in-car tightening of the screws of propeller shaft joints at engine side, central and clutch side, use special tools A.5.0191, A.5.0192 and tighten as specified on page 28.

For renewal of flexible joints use special tools:

- A.2.0201 for the front joint
- A.2.0263 for the centre and rear joints

The clutch is of the self-adjusting, hydraulically-operated single-plate dry type. The clutch assembly is mounted at the rear on the gearbox/differential unit.
The clutch pedal acts on a master cylinder supplied by the fluid reservoir. When the clutch pedal is depressed the fluid under pressure actuates the piston in the cylinder connected to the clutch release lever.
The driven plate is controlled by means of a diaphragm spring. This type of clutch has the throwout bearing constantly in contact with the diaphragm spring; thus, no more clearance exists and the wear is automatically taken up.
No regular adjustment of the play is required.



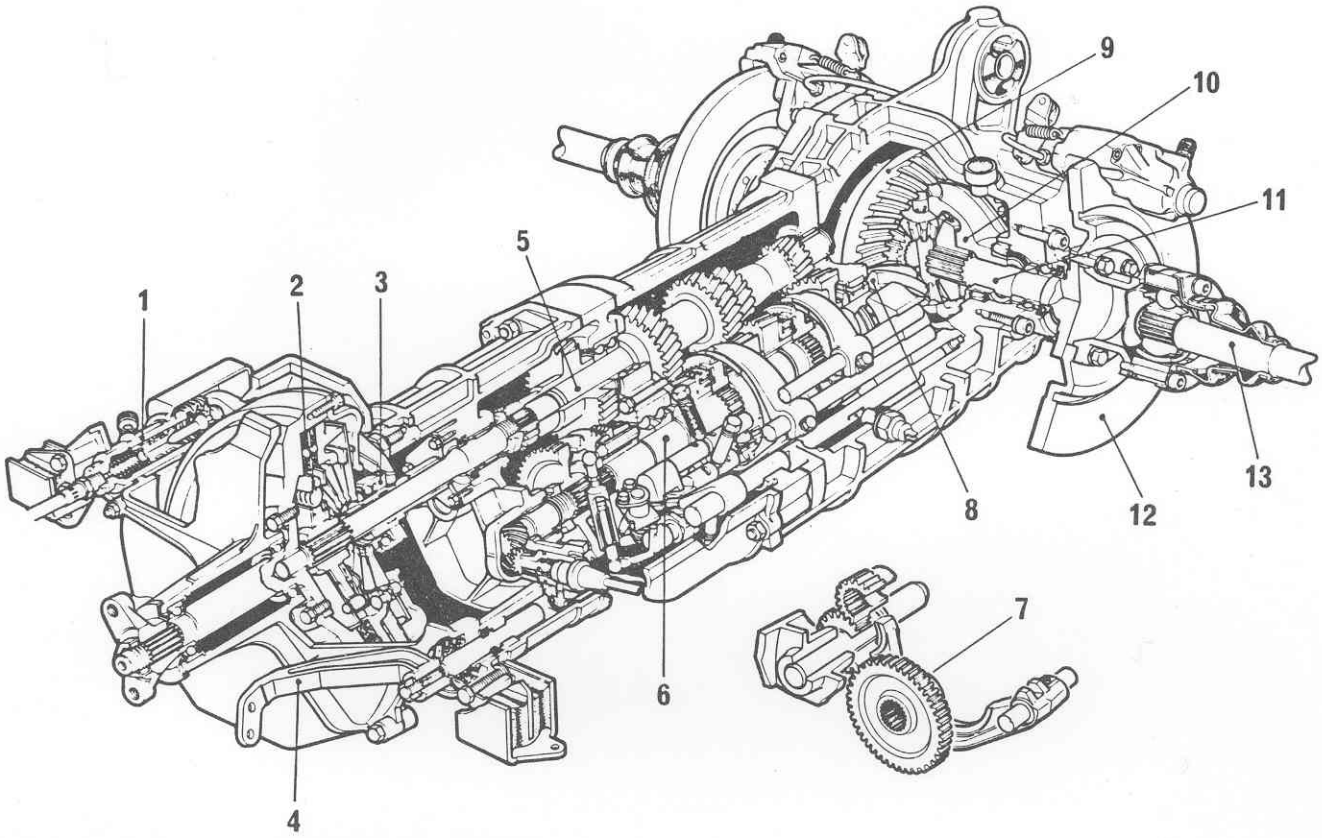


If necessary, check that, when the clutch pedal is depressed fully the push rod of slave cylinder moves through a total travel of 10.5 to 12 mm.

If adjustment is needed, proceed as follows:

- slacken the locknut "C" on master cylinder push rod clevis.
- screw in or unscrew the push rod "P" to increase or diminish its travel until the travel of the rod slave cylinder falls within the above specified limits. In this conditions, the travel of master cylinder rod shall in turn be 22 to 25 mm.

The thickness of the clutch plate under a load of 480 kg should be 8.7/9.1 mm. The wear limit is 6 mm.



1 Clutch slave cylinder
2 Clutch plate
3 Throwout bearing
4 Gear selector lever
5 Input shaft
6 Output shaft
7 Reverse gears
8 Pinion
9 Ring gear
10 Differential case
11 Differential output shafts
12 Brake discs
13 Driveshafts

The gearbox has 5 synchromesh forward gears and one reverse.
All gears are constant mesh helical gears except those of reverse which are straight spur gears.
The gear lever is floor mounted and connected to the gearbox by rods and levers.

Transmission ratios

1st gear	3.30 : 1
2nd gear	2 : 1
3rd gear	1.37 : 1
4th gear	1.04 : 1
5th gear	0.83 : 1
Reverse gear	2.86 : 1

G E A R B O X

End play between sliding sleeve and fork	0.2/0.57
End play of pinion shaft gears	0.10/0.15
Radial clearance of pinion shaft gears	0.10/0.15
Calibration of springs for striking rod balls — Free length	30.6
Calibration of springs for striking rod balls — Length under test load	18.8
Calibration of springs for striking rod balls — Test load	9.18/9.95 Kg
Squareness between the thrusting faces of the spacer of the pinion shaft rear roller bearing and the axis of rotation. Out of square	0.02
Interference fit of the spacer onto the pinion shaft	0.019/0.060
Trueness of mainshaft bearing seats and of intermediate flange with respect to the centring seat in the clutch shaft. Tolerance	0.03
Squareness of the shoulder face of rear bearing inner race to the bearing seats. Tolerance	0.03
Trueness of pinion shaft front & rear roller bearings with the bushings of the gears and intermediate bearing seats	0.02
Squareness of thrusting face of rear bearing inner race with respect to the bearing seats	0.02

With the special tool A.5.0181, tighten the mainshaft nut to 8.8/9.8 Kgm.

Differential

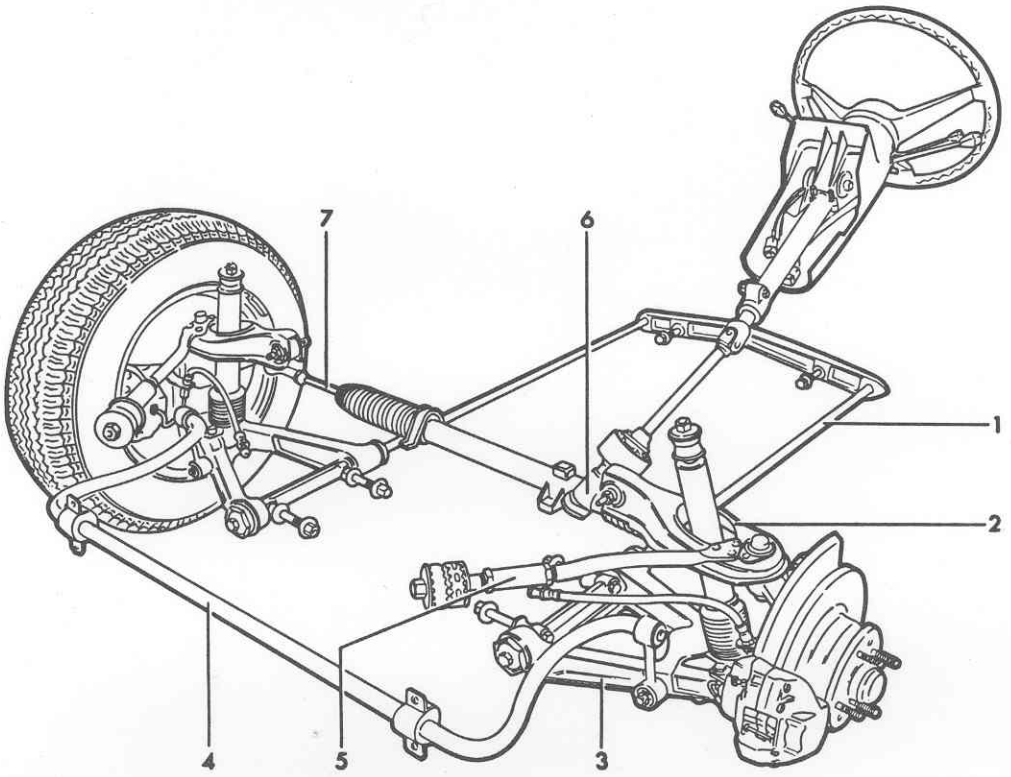
The differential is in unit with the gearbox. The 41 : 10 final drive is of the hypoid type.
The rear brakes are at the differential output shafts.
The axle driveshafts are of the floating type with constant velocity joints at both ends.

Overall ratios

1st gear	13.53 : 1
2nd gear	8.20 : 1
3rd gear	5.62 : 1
4th gear	4.26 : 1
5th gear	3.40 : 1
Reverse gear	11.73 : 1

Inspection specifications

The out of square of ring gear thrusting face with respect to the differential bearing seats should not exceed	0.025
The eccentricity of ring gear flange shoulder with respect to differential bearing seats should not exceed	0.025
Play of differential side gear splines	0.07/0.13
The out of square of brake disc shoulder with the seats of oil sealing ring and bearing should not exceed .	0.05
Interference fit between the bearing retaining ring and its seat on differential output shaft	0.023/0.057
Backlash between differential gears	0/0.05
To tighten the pinion shaft nut use the special tool A.5.0126.	
Revolving torque of differential bearings (with special tools C.5.0123, C.5.0124 and C.2.0037)	10/20 Kg/cm
Backlash between ring gear and pinion	0.13.0.18
Tightening torque of nuts securing cover to differential carrier	1.8/2.2 Kgm



1 Torsion bar
2 Upper arm
3 Lower wishbone
4 Stabilizer rod
5 Slanting arm
6 Steering gear
7 Steering rod

The front wheels are independently suspended and connected to the body by transverse arms.

Springing is by two torsion bars attached longitudinally to the lower wishbone shaft at the front and to a supporting cross member at the rear.

Double-acting hydraulic telescopic shock absorber are located between the lower arms and the body.

The suspension system is completed by a transverse stabilizer rod which improves the stability of the vehicle when cornering.

Upward and downward movement of the arms is restricted by stops attached to the bottom and the top of the cross member.

Adjustment of clearance in wheel bearings

When performing regular servicing or whenever the removal of wheel hubs is required, adjust the bearing clearance as follows:

- Pre-load the bearings by applying a torque of 2 to 2.5 Kgm to the hub nut; at the same time rotate the hub to set the bearings properly and to prevent the rollers from brinelling the races.
- Slacken the nut and tighten it again to 0.5 - 1 Kgm with a torque wrench.
- Back up the nut by a quarter turn and insert the split pin; if the slot in the castellated nut and the hole in the axle are not aligned, screw in the nut of the minimum required to line up the hole and the next slot.
  Lightly tap on the stub axle end with a mallet.
- Make sure the bearing retainer plate is not blocked by inserting the tip of a screwdriver in the plate holes; the plate should be easily rotated.
- If the plate is blocked,unscrew the nut by one slot and tap slightly on the stub axle end with a mallet.

Wheel bearing lubricating instructions

The quantity of lubricating grease should be about 55 grammes for each hub; do not exceed such a quantity to avoid bearing overheating, grease leakage, etc.

The grease should be well distributed inside the bearings and into side recesses.

Subsequently, at the regular schedule, remove the hub cover and pack the outboard bearing.

Ball joints

End play of lower ball joint in its socket . . . . . 1 mm

N o t e - Ball joints required no regular lubrication being provided with special grease seals which retain the grease packed in by factory on assembly.

Steering gear

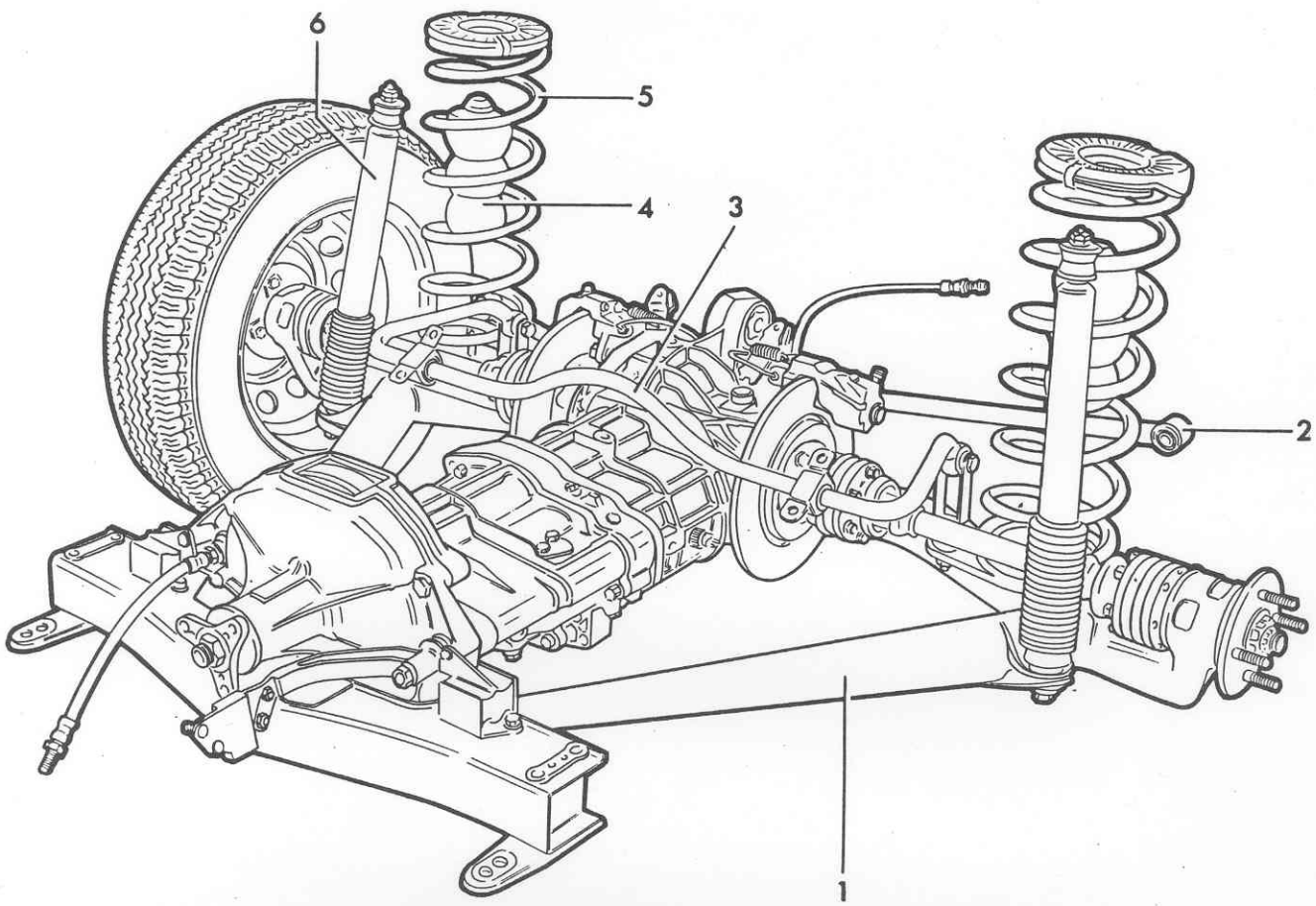
The steering is of the rack and pinion type. The steering column, in three sections, is adjustable. The steering box and the ball joints of steering rods require no regular lubrication.

Installation directions for ZF steering gears

Adjust the play of the rack so that it can move without binding through a travel of at least 164 mm corresponding to 3.52 turns of the steering wheel.

On installation lubricate the inner parts with the specified grease (see page 5) and apply 25 gr. of the same grease to the rack teeth.

Max end play of pinion shaft . . . . . 0.05 mm



1 De-Dion tube link
2 Rear link
3 Stabilizer rod
4 Bump stop
5 Spring
6 Shock absorber

De-Dion tube anchored to the body with links and a joint at the front and with rear links for transverse location.

Coil springs, rubber stops, telescopic hydraulic shock absorbers and stabilizer rod complete the suspension.

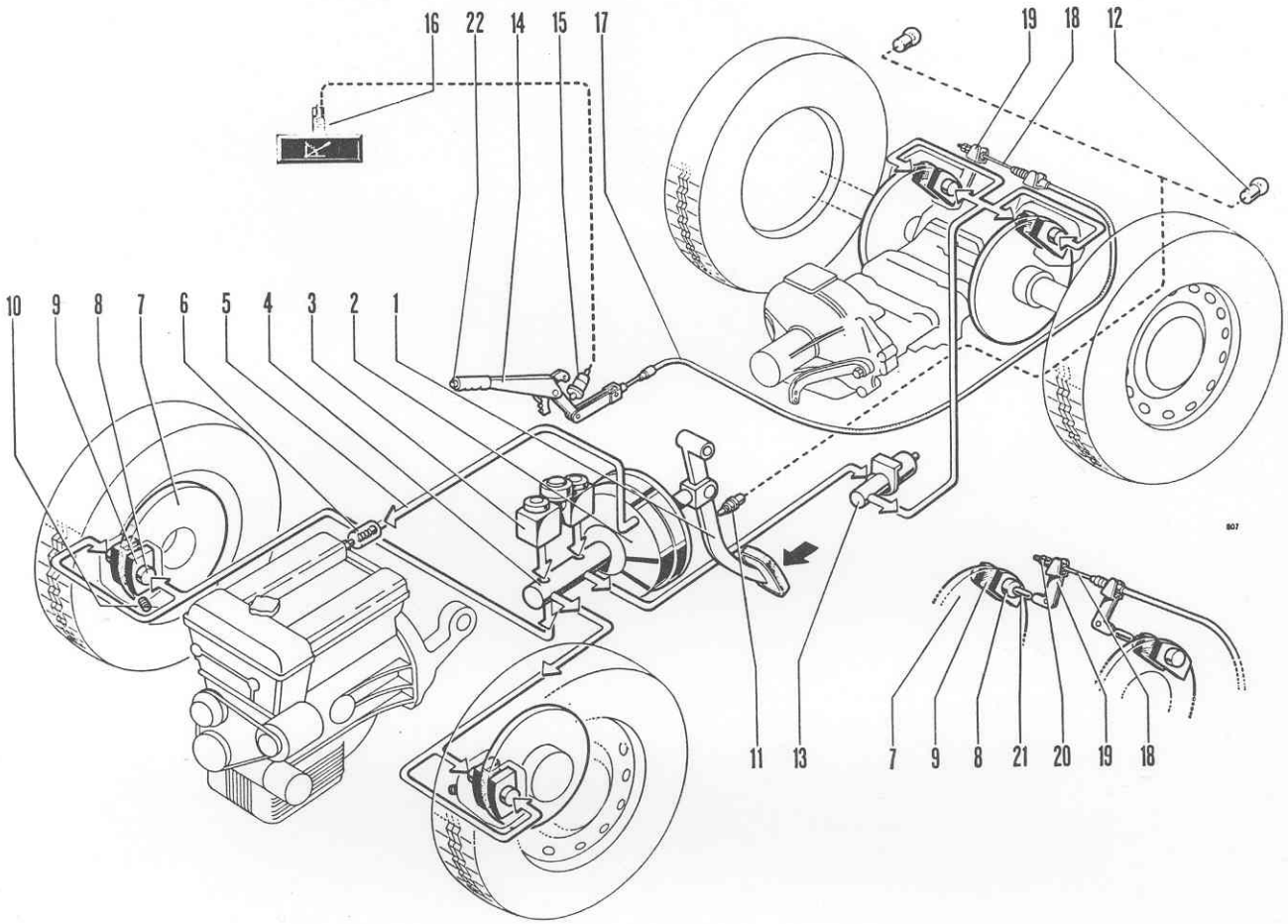
Checking of suspension springs

Free length mm.	Length under test load mm.	Test load Kg.	Group	Identification mark
469	282.5	203/208	1	One yellow strip
		209/215	2	Two yellow strips
		216/221	3	Three yellow strips

Axle driveshafts

The axle driveshafts have constant velocity joints at their ends each joint containing 70 grs. of Molykote BR2 grease.

When dismantling and rebuilding the driveshafts, care should be taken not to damage the rubber boots by pinching them between the shaft and the boot support.



1 Pedal
2 Vacuum servo
3 Fluid reservoir
4 Tandem master cylinder
5 Vacuum pipe
6 Check valve on vacuum port
7 Discs
8 Pistons
9 Friction pads
10 Air bleed screw
11 Stop light switch
12 Stop light bulb
13 Pressure regulator
14 Handbrake lever
15 Switch for handbrake warning light
16 Warning light bulb
17 Handbrake cable sheath
18 Handbrake cable
19 Handbrake pad operating lever
20 Adjuster
21 Handbrake pad push rods
22 Release button for handbrake lever

The brake system consists of two separate circuits.

Each one of the circuits, front and rear, is assisted by the vacuum servo and controlled by the tandem master cylinder with one cylinder operating the front brakes and the other cylinder the rear brakes. The friction pads of the front and rear brakes are directly actuated by the pistons within cylinders integral with the calipers.
The brakes are self-adjusting.

A regulator inserted in the rear brake circuit, regulates the pressure between front and rear brakes to provide balanced braking action.
The pressure regulator must never be tampered with; specifically, do not attempt to act on the adjusting nut as it is factory sealed.

To maintain the brakes in good operation condition, follow the servicing instructions given below:

Take care to prevent the minimum level of fluid in the reservoir from falling below the maximum level by more than a quarter.

For renewal or topping up, it is absolutely essential to use only the specified fluids drawn from freshly opened sealed containers.

When adding fluid, leave the strainer in place so as to filter the fluid.

Renew the brake fluid at the prescribed periods. For effective and reliable operation of the brake system, the pipes must always be full of fluid and free of air bubbles.

Excessive and spongy brake pedal action is an indication of the presence of air bubbles in the system.

Compressed air must not be used for replenishing the system.

Should flushing of the brake circuit be required, use exclusively fluid of the specified type.

Compressed air or alcohol must on no account be used to dry a flushed system.

Brake discs

When a brake disc is replaced it is necessary to check it for run-out after installation·

- use a dial indicator mounted to a suitable support.

Maximum permissible run out as measured at the swept surface should not exceed 0.22 mm.

N o t e - run-out readings can be misleading if bearing clearance is not as specified; therefore, check and adjust if necessary, according to factory instructions.

If the disc is scored, the grinding of the surfaces is allowed providing not to exceed an undersize of 1 mm, equalized on both faces, i.e. 0.5 mm each face; disc thickness grinding limit 10 mm front and 9 mm rear.

Inspection specifications of disc surfaces:

- Max. out of parallelism with disc mounting plane: 0.05 mm;
- Max. out of flatness: 0.025 mm and max.difference in thickness: 0.038 mm as measured along any radial line;
- Max. out of flatness: 0.025 mm and max.difference in thickness: 0.015 mm as measured along any circular line;
- The surface should show no sign of scoring or porosity.

The surface roughness should be:

- 32 microinches as measured circularly;
- 50 microinches as measured radially.

Friction pads

Pads are of the ATE Necto 243 GG. type. Colour mark: green - white - green. An arrow on the rear pads shows the proper positioning of pads according to rotation direction of brake discs.

	Front	Rear
Thickness when new	15 mm	
Wear limit	7 mm	

Note - On reinstalling the rear caliper, check with a feeler gauge that the clearance between disc and pads is 0.1 mm. Adjust, if necessary, by acting on the adjusting screws.

Calipers

On replacement of disc or caliper, measure the clearance between caliper and disc on each side; the difference should not exceed 0.5 mm.

To centralize the caliper about the disc, insert shims between caliper and mounting flange as required.

Hand brake

It is mechanically operated and acts on the rear wheels through the inboard pads which spread apart against the discs.

The linkage can be adjusted by means of the adjuster "20" (refer to page 51); prior to adjustment, check the clearance between disc and pads:

Specified clearance . . . . . 0.1 mm

The handbrake is correctly adjusted when the wheels become locked as the lever is drawn through half is total travel.

A warning light on the facia panel will indicate that the parking brake is applied.

Bleeding the brake system

The bleeding should be performed with the greatest care and following these instructions:

Fill the reservoirs, if necessary, with the genuine fluid freshly drawn from sealed containers; during bleeding operations pay attention that fluid level does not drop below the full by more than a quarter.

Push rubber pipes over the bleed screws of a front and a rear wheel (either the two at right side or the two at left side); the other end will lead to glass containers half full of fluid.

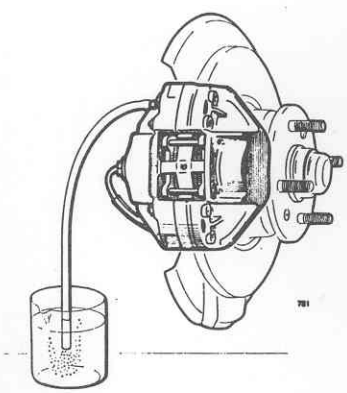
Loosen the bleed screws of front and rear wheel at the same time; depress the brake pedal several times allowing it to return slowly and waiting a few moment before depressing it again.

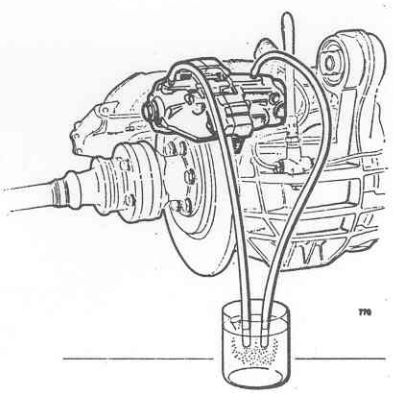
This sequence must be repeated until the pipes discharge fluid free from air bubbles.

Then, hold the pedal down, tighten the bleed screws and remove the pipes.

Proceed the same way for the other two wheels; then top up fluid in the reservoirs.

If the bleeding has been carefully performed, it will be found that, when brake pedal is depressed,direct action on the fluid can be felt, free of resilience,immediately at the end of the free travel. If not, repeat the procedure.





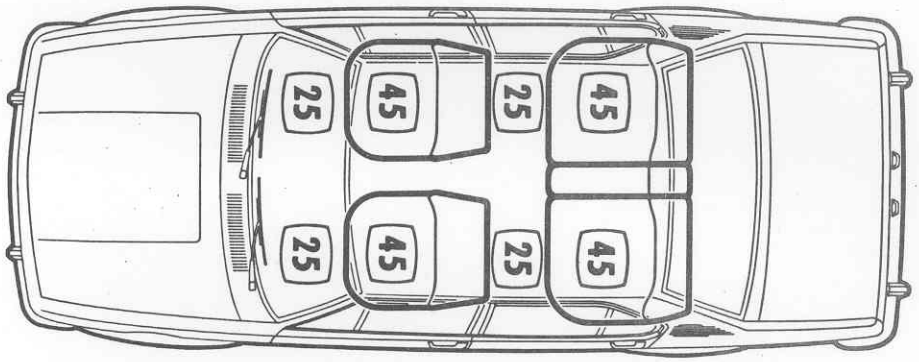
Checking of wheel angles and car "trim" under static load

Put the car under static load,with shock absorbers and stabilizer rod disconnected, with full tank or equivalent with spare wheel, tool kit and the tyres inflated as specified.

Before checking, slightly move the car up and down so as to settle the suspensions.

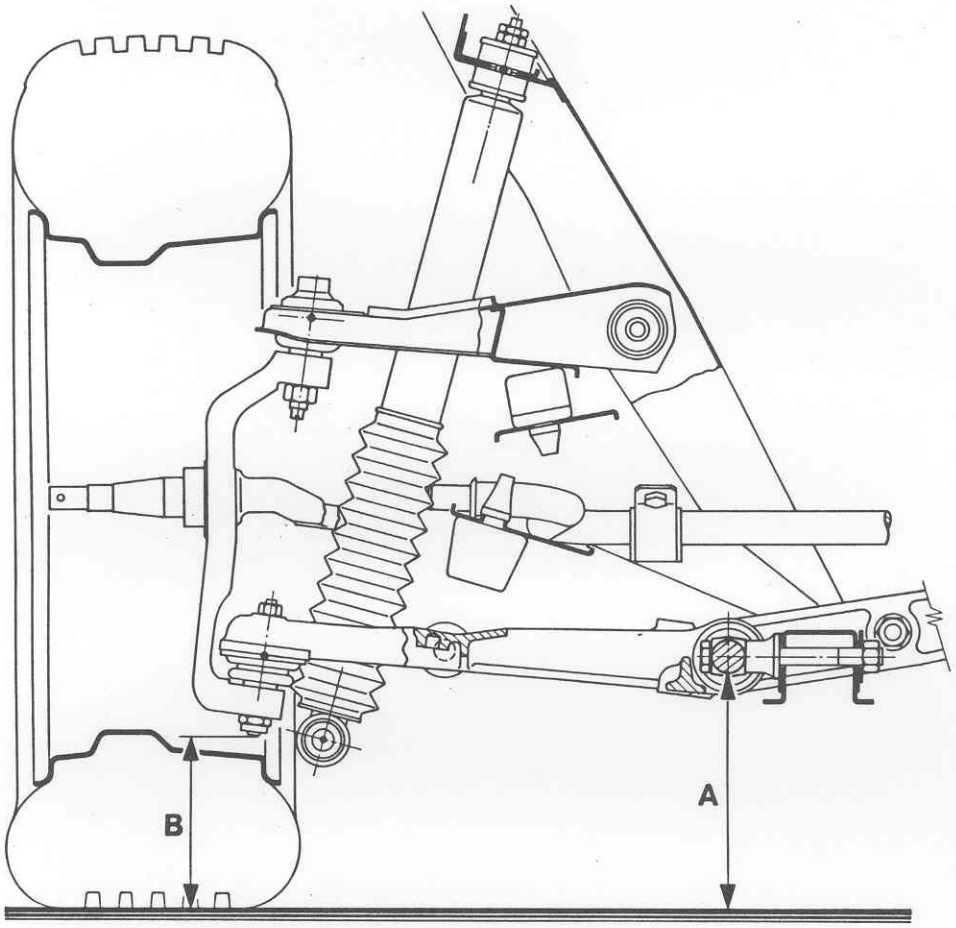
Front seats
- 1 weight of 45 Kgs on each seat
- 2 weights of 25 Kgs on flooring where feet rest

Rear seats
- 2 weights of 45 Kgs on seat
- 2 weights of 25 Kgs on flooring where feet rest



Front suspension height

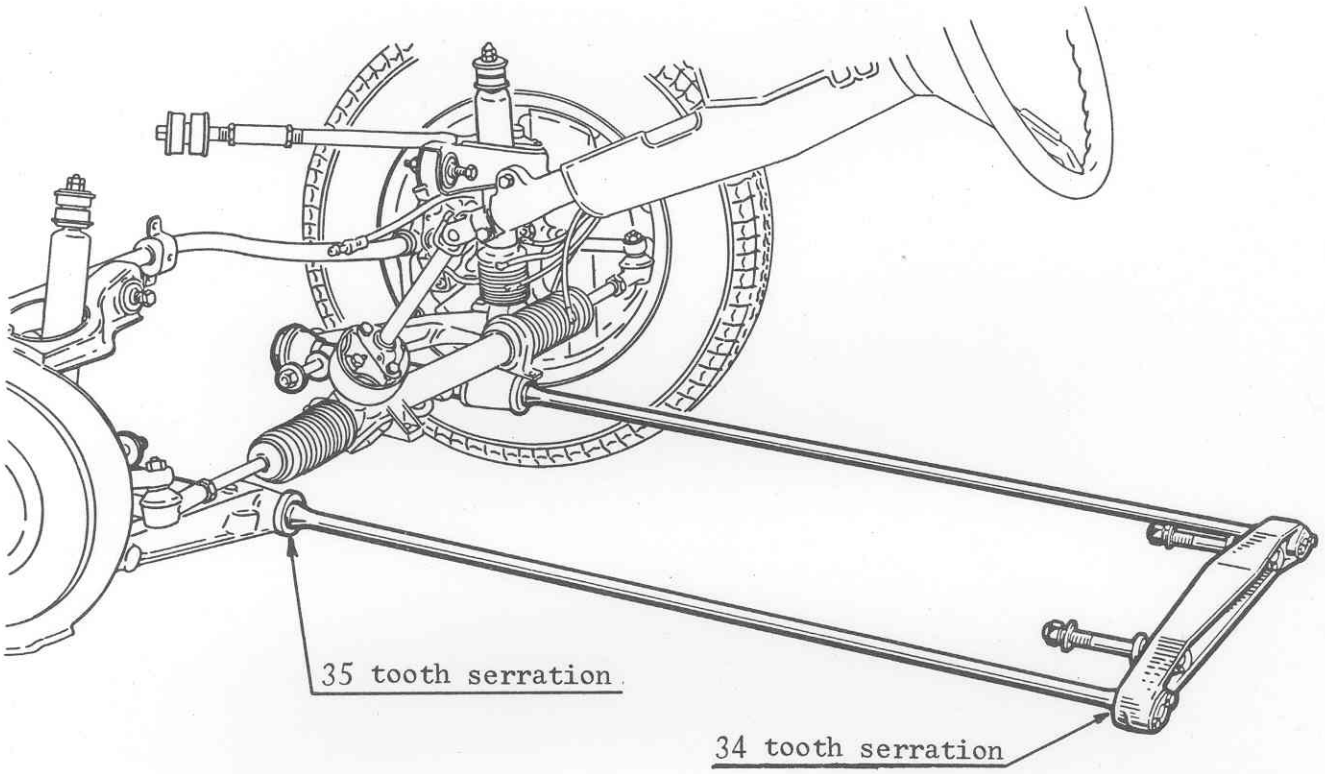
A - B = 44 ± 5 mm



Dimension "A" must be measured in correspondence of the lower line of wishbone shaft as shown.

Note: when torsion bars are renewed, A minus B should be 49 ± 5 mm.

FRONT SUSPENSION HEIGHT ADJUSTMENT



Suspension height is adjusted by rotating the torsion bars.

Minimum adjustment: 1.5 mm.

To rise the suspension in height, rotate the left torsion bar and the right torsion bar respectively anticlockwise and clockwise (as seen from the rear).

Note - The torsion bars have a 35 tooth serration at the front and a 34 tooth serration at the rear.

Adjustment example

Suppose the left suspension is affected and the height is 6 mm lower. To correct, proceed as follows:

- Raise the car and put it on stands;

- Remove the wheel.
- Reference marks at the front and rear seats indicates the installation position of the torsion bars. From the reference mark count in clockwise direction as many teeth as required to bring the suspension back to the correct height bearing in mind that each tooth corresponds to 1.5 mm. In this example an adjustment of four teeth is required, therefore mark the 4th tooth both at the front and at the rear.
- Raise the lower wishbone with the aid of the jack R.7.0010 and of the tools A.2.0265, A.2.0069 so that the upper arm is pushed apart from the rebound stop and disconnect the stub axle from the lower ball joint (the shock absorber and the stabilizer rod have already been detached) by using the tool A.3.0377.
- Release the torsion bar by letting slowly down the lower wishbone until the torsion bar can be taken out of its seats by means of the tool A.3.0374 and after the retainer at the rear support has been removed.
- Rotate the torsion bar anticlockwise until the 4th tooth previously marked lines up with the reference mark at the original installation position on the rear support.
  Bring the lower wishbone in such a position as to align the reference mark on it with the 4th teeth at the front end of the torsion bar. Put the torsion bar back again into its seat.
- Refit all parts previously removed.

N o t e

In the event the suspension should be lowered, change the adjustment over from left bar to right bar and viceversa.

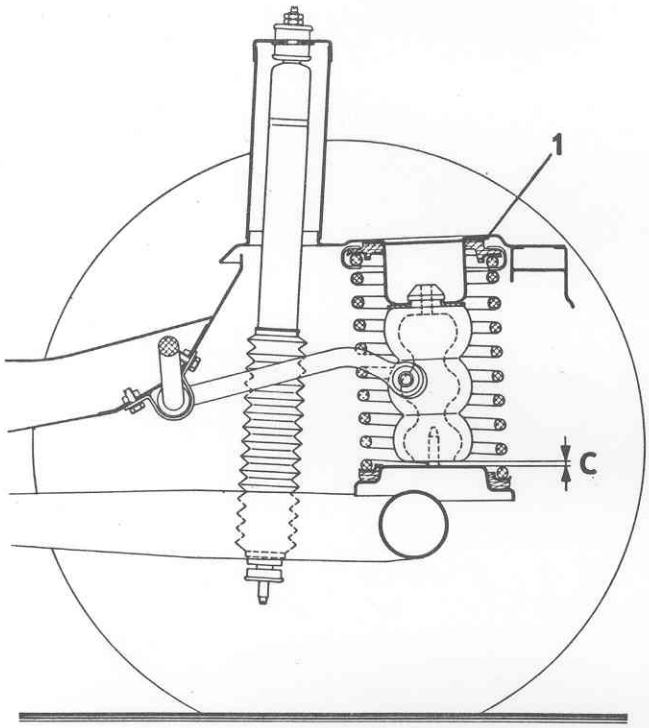
W a r n i n g

For proper operation the torsion bars must never be interchanged.

Left bar - yellow mark and letter "L" or "S" on front end.

Right bar - blue mark and letter "R" od "D" on front end.

REAR SUSPENSION HEIGHT ADJUSTMENT



Distance of spring seat from rubber stop

$$C = 5 \pm 5$$

Later cars = 44 ± 5 mm.

Note - To adjust add shims in "1" as shown.

To adjust the rear suspension height add shims as follows:

1 - Disconnect the drive shafts at one end.

2 - Remove the rear links from their attachments to the body (shock absorbers and stabilizer rod have already been detached).

3 - Raise the car with the aid of the tool A.2.0075 and rest it on stands of at least 0.4 meter in height.

4 - Remove the wheels.

5 - Slowly let down the axle to relieve the springs.

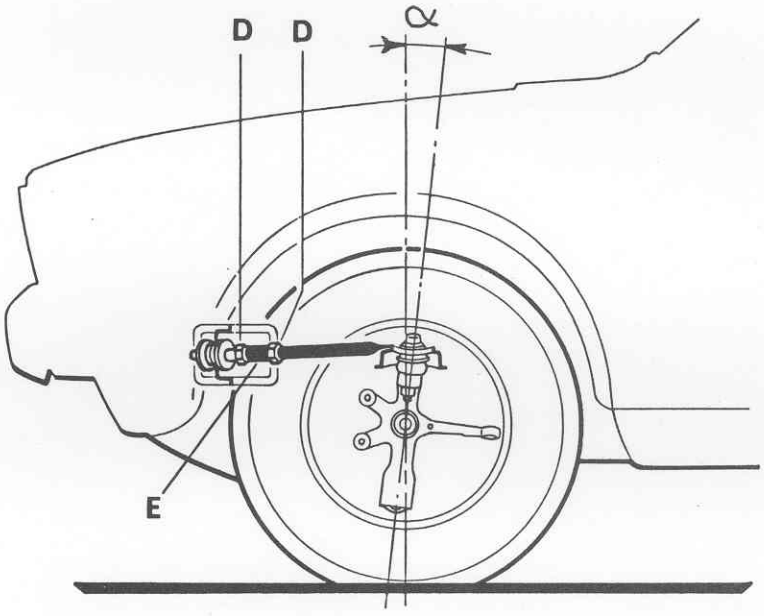
6 - Remove the springs and add shims at the top seat to reinstall, proceed in reverse order of removal.

Note: the bolts securing rear links to body should be tightened to the specified torque with suspension height properly adjusted.

WHEEL ANGLES

In the condition as specified check the wheel angles.

Caster angle: $\alpha = 4° 30' \pm 30'$

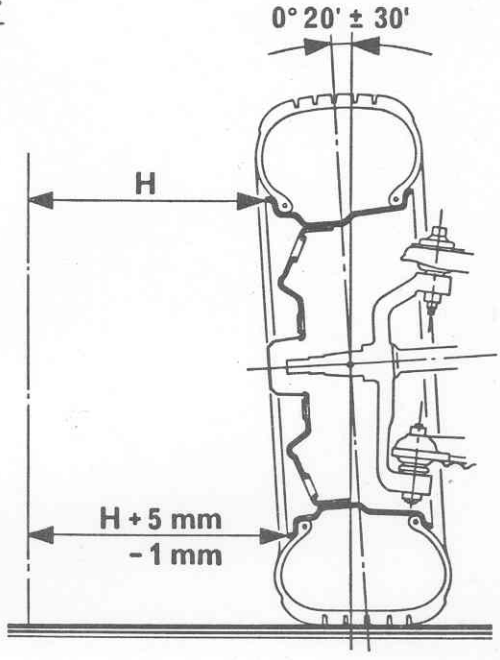


The difference in caster angle between R.H. and L.H. wheel must not exceed 0° 20'.

To adjust, loosen jam nuts "D" and rotate bushing "E".

WARNING - Small adjustment of the caster angle allow to correct slight drift tendency of the car.

Front wheel camber



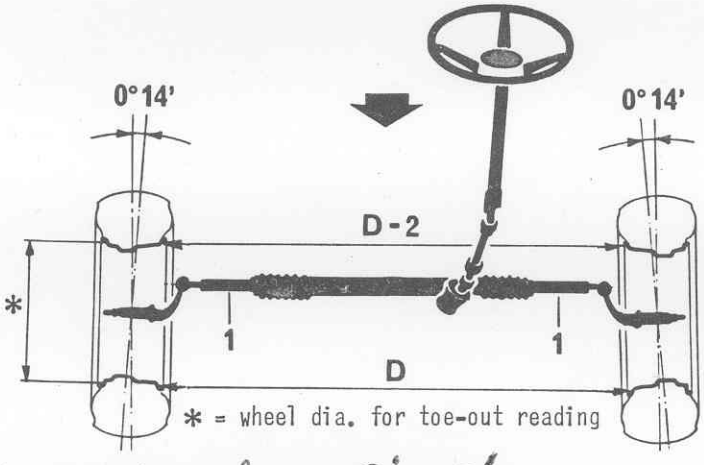
Max. difference in camber angle between R.H. and L.H. = 0° 40'.

To adjust, insert shims between spacer and lower wishbone shaft attachments.

1 mm shim = 0° 15'

Warning: adjustments are allowed only toward the negative side.

Front wheel toe-out



1 Full turn of rod = 0° 35'

To adjust toe-out act on rods "1" so that either of the wheels has a 1.5 mm toe-out. total 3 mm static load 2 mm antistatic load
If the steering wheel spokes are not symmetrically disposed for straight ahead direction, withdraw the steering wheel from the shaft and mount it again on the shaft with the spokes in symmetrical position. While resetting the steering wheel, pay attention that the notch controlling the self-effacing device of direction indicator lever is in line with the pawl on the lever itself. If the pawl and notch cannot be brought into alignment, re-align them as follows: detach the steering shaft from the U-joint and rotate the steering shaft just enough to line up notch and pawl.

Full Lock 30° at each wheel
total 60° lock to lock.

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