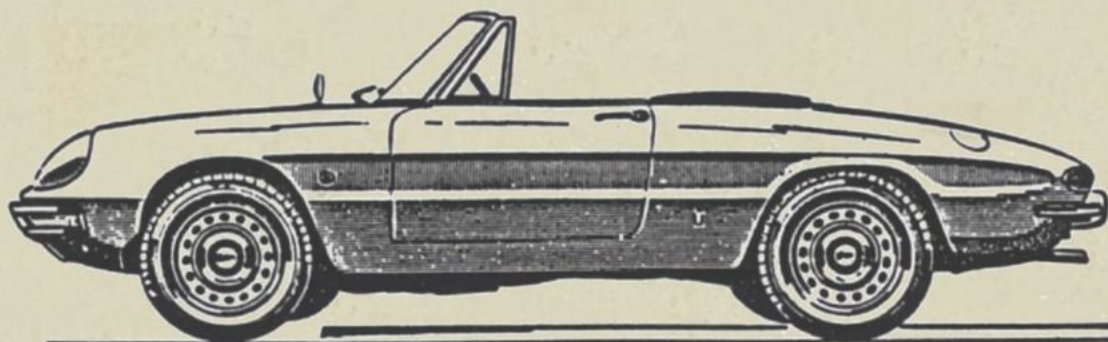


# SPIDER 1600



*Alfa Romeo*

**technical                      characteristics  
and  
principal inspection specifications**





## ERRATA CORRIGE

<u>Public. n° 1183</u> - vett. Spider 1600	} Caratteristiche tecniche e principi quote di controllo
<u>Public. n° 1208</u> - vett. GIULIA GTV	

pagg. 9 - COPPIE DI SERRAGGIO

Bulloni fissaggio forcella cambio all'albero di trasmissione:

Correggere 8,5 + 9,5 in 4,5 + 5,5

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Public. n° 1212 - Spider 1600 - Technical characteristics and principal inspection specifications

page 9 - TIGHTENING TORQUE SPECIFICATIONS

Bolts joining gearbox output shaft yoke to prop shaft yoke:

Amend 8.5 to 9.5 kgm (61.5 to 68.7 lb-ft) into  
4.5 to 5.5 kgm (32.6 to 39.7 lb-ft)

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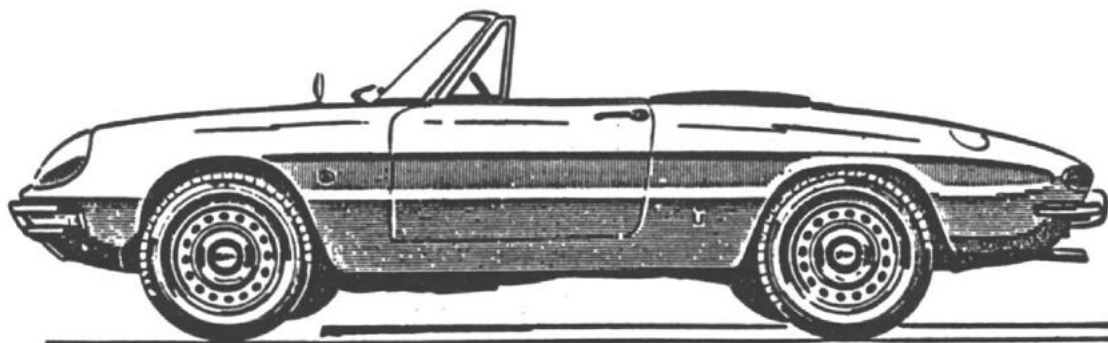
Public. n° 1213 - Spider 1600 - Caractéristiques techniques et principales cotes de contrôle

page 9 - COUPLES DE SERRAGE

Boulons de fixation de la fourchette de B. de vitesses à l'arbre de transmission:

serrage de 4,5 à 5,5 (au lieu de 8,5 à 9,5)

# SPIDER 1600



*Alfa Romeo*

**technical                      characteristics  
and  
principal inspection specifications**

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## TECHNICAL CHARACTERISTICS

### PRINCIPAL CHARACTERISTIC DATA

Number of cylinders . . . . .	4
Bore . . . . .	78 mm (3.07")
Stroke . . . . .	82 mm (3.23")
Total cylinder capacity . . . . .	1570 cc
Max. power at 6,000 rpm . . . . .	{ DIN 109 HP SAE 125 HP
Front track . . . . .	1310 mm 51.6"
Rear track . . . . .	1270 mm 50.0"
Wheel base . . . . .	2250 mm 88.6"
Min. turning circle . . . . .	10500 mm 413.4"
Overall length . . . . .	4250 mm 167.3"
Overall width . . . . .	1630 mm 64.2"
Overall height (unladen) . . . . .	1290 mm 50.8"
Dry weight . . . . .	940 kg 2,072 lbs
Number of seats . . . . .	2
Tires 155 × 15 . . . . .	{ PIRELLI cinturato S MICHELIN XA
Fuel consumption per 100 Km. (CUNA standard)	10.5 lt
	(32.0 mpg G.B.)
(For best engine performance, the use of premium-grade fuel is advised)	(27.0 mpg U.S.)

With 41 : 9 final drive . . . . .

Max. Speeds						
Gear	Running in				After running in	
	up to 1000 Km (600 mi.)		1000 to 3000 Km (600 to 1900 mi)			
	Km / h	mph	Km/h	mph	Km/h	mph
1st	25	16	35	20	44	27
2nd	45	28	55	35	74	46
3rd	65	40	80	50	108	67
4th	90	55	110	70	146	91
5th	115	70	140	85	over 185	115
Rev.	-	-	-	-	48	30

Oil pressures with hot engine . . .	min. pressure at idling speed : .5 - 1 Kg/cm <sup>2</sup> (7 - 14 psi)
	min. pressure at top speed : 3.5 Kg/cm <sup>2</sup> (50 psi)
	max. pressure at top speed : 4.5 - 5 Kg/cm <sup>2</sup> (65 - 70 psi)

**WARNING:** Check that generator warning light goes off as soon the engine exceeds 1.100 rpm.

## TIRES

Inflation pressures (with tire cold)

	Front wheels		Rear wheels	
	Kg/cm <sup>2</sup>	psi	Kg/cm <sup>2</sup>	psi
PIRELLI 155 × 15 Cinturato S. . . . .	1.7 *	24.1	1.8 *	25.6
	1.8 **	25.6	2.1 **	29.8
MICHELIN 155 × 15 XA . . . . .	1.7 *	24.1	1.7 *	24.1
	1.9 **	27	1.9 **	27

\* Inflate to the lower pressure for use with low load and short peaks in speed.

\*\* Inflate to the higher pressure for use with full load and max. speeds (highways).

## REFILLINGS

		G.B.	U.S.
Water (engine & radiator) . . . . .		7.5 lts	1.65 gals
Fuel (reserve 7 lts/ 1.5 gals GB/ 1.8 gals US) . . . . .		46 lts	10.1 gals
Oil . . . . .	Engine (pan & filter) . . . . . to max level *	5.00 Kgs	4.95 qts
			5.95 qts
		3.25 Kgs	3.2 qts
			3.8 pts
	Gearbox . . . . .	1.65 Kgs	3.2 pts
	Differential . . . . .	1.25 Kgs	2.5 pts
	Steering box . . . . .	.25 Kg	.5 pt

(\*) This quantity is that needed for regular changing; the total amount of oil in the circuit (sump, filter, passages) is 5.75 Kgs. (5.7 qts G.B.) (6.8 qts U.S.).

## PRESCRIBED OILS AND LUBRICANTS

Parts to be lubricated	API-SAE-NLGI Number	Recommended commercial equivalent	
		AGIP	SHELL
Engine * . . . . .	SAE 20 W 40 API MS	F.1 Supermotoroil Multigrade 20 W/40	X 100 Multigrade 20 W/40
Gearbox . . . . .	SAE 90	F.1 Rotra SAE 90	Dentax 90
Steering box and differential	SAE 90 EP	F.1 Rotra Hypoid SAE 90	Spirax 90 EP
Propeller shaft universal joints and sliding sleeve . . . . .	NLGI 1	F.1 Grease 15	Retinax G
Front wheel bearings . . . . .	NLGI 2/3	F.1 Grease 33 FD	Retinax AX
Brake fluid . . . . .	Castrol Girling Brake Fluid Amber		

(\*) For steady temperatures below 0°C (32°F) we advise the use of: AGIP F.1 Supermotoroil Multigrade 10W/40  
SHELL Super Motor Oil

SAE - Society of Automotive Engineers

API - American Petroleum Institute

NLGI - National Lubricating Grease Institute

In countries where recommended lubricants are not available it is possible to replace them with products of other leading Companies provided that in accordance with the prescribed specifications.

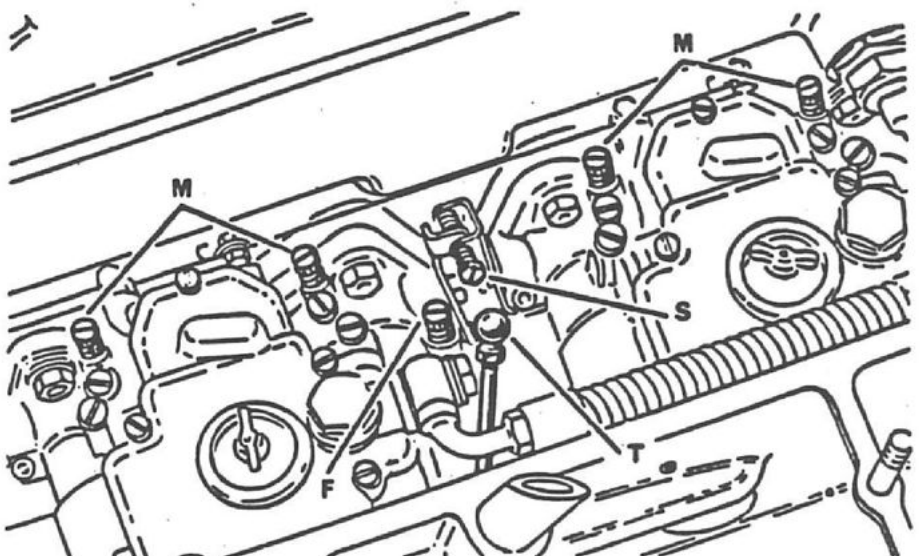
## CARBURETION

### 2 Carburetors Weber 40 DCOE 27

Venturi . . . . .	30 mm (1 <sup>3</sup> / <sub>16</sub> " )
Main jet . . . . .	120
Main air metering jet . . . . .	180
Idling jet . . . . .	50 F 11
Idling air metering jet . . . . .	120
Choke jet . . . . .	65 F 5
Acceleration pump jet . . . . .	35
Travel of acceleration pump control rod . . . . .	14 mm (.55")
Delivery of acceleration pump every 20 strokes (for each barrel) . . . . .	5 ± 1 cc.
Needle valve seat dia. . . . .	150
Float weight . . . . .	26 grs
Distance of fuel level from float chamber flange (with a pressure of 2 mts (6"6") H <sub>2</sub> O upstream the needle valve . . . . .	29 + .5 mm (1.12 to 1.16")

### IDLING ADJUSTMENT

- F** Adjusting screw for minimum opening of throttle.
- M** Idling mixture adjusting screw.
- S** Screw for synchronizing throttles of the two carburetors.
- T** Joint for control linkage (to pedal).



### PREPARATORY STEPS

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

### ALIGNING THE THROTTLE VALVES

- Detach the control linkage T from carburetors.
- 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.

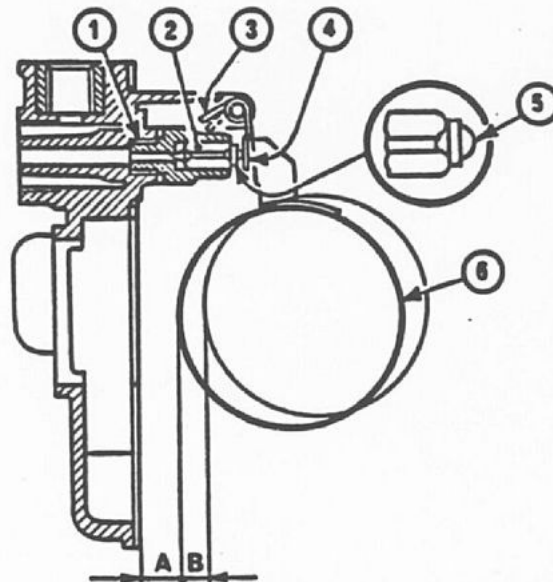
### IDLING

- Back up the screw M of half a turn.
- Tighten the screw F to contact, then screw it in one more turn to ensure feeding of engine.
- Connect the acceleration control linkage T to carburetors.
- Start the engine and warm it up.
- If necessary, back up the screw F very slowly until the engine runs at about 600 to 700 rpms.



## FLOAT LEVEL ADJUSTMENT

### WEBER 40 DCOE 27 Carburettor



**Check the level of fluid in float chamber as follows :**

- Make sure the float weight is as specified (26 grs - .9 oz), 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 (5).
- With the cover vertical and the float tongue (4) in light contact with the ball, the two floats should be at a distance  $A = 8.5 \text{ mm } (.33")$  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  $6.5 \text{ mm } (.26")$ ; if necessary, adjust the position of float pivot tail (3).
- The adjustment described above will correspond to a fuel level of  $29 + .5 \text{ mm } (1.14 + .02")$  from the upper face of the float chamber (with a pressure of 2 mts - 6'6" H<sub>2</sub>O upstream 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 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.

**CAUTION** - 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.

## VALVE TIMING

### Checking of valve opening and closing angles

Clearance (with cold engine) between the unlobed profile of cams and the valve cup ceiling :

lift of cup . . . . .	.475 to .500 mm (.0187 to .0197")
exhaust . . . . .	.525 to .550 mm (.0206 to .0216")

Opening of intake valve :

lift of cup . . . . .	.20 mm (.008")
corresponding to an angle before TDC of	$18^{\circ}30' \pm 1^{\circ}30'$

Closing of intake valve :

lift of cup . . . . .	.20 mm (.008")
corresponding to an angle after BDC of	$42^{\circ}30' \pm 1^{\circ}30'$

Opening of exhaust valve :

lift of cup . . . . .	.15 mm (.006")
corresponding to an angle before BDC of	$42^{\circ}30' \pm 1^{\circ}30'$

Closing of exhaust valve :

lift of cup . . . . .	.15 mm (.006")
corresponding to an angle after TDC of	$18^{\circ}30' \pm 1^{\circ}30'$

### ANGLE VALUES OF THE ACTUAL DIAGRAM OF VALVE TIMING SYSTEM WITH COLD ENGINE

(clockwise rotation direction of the crankshaft seen from the front side):

opening of intake valve	before TDC	$36^{\circ}50'$
closing of intake valve	after BDC	$60^{\circ}50'$
opening of exhaust valve	before BDC	$54^{\circ}10'$
closing of exhaust valve	after TDC	$30^{\circ}10'$
Induction stroke . . . . .		$277^{\circ}40'$
exhaust stroke . . . . .		$264^{\circ}20'$



## IGNITION

Firing order : 1 - 3 - 4 - 2 (no. 1 cylinder is that at the fan side)

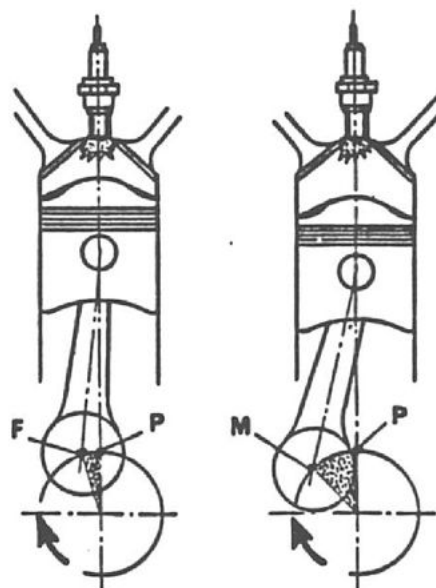
Opening of contact points of ignition distributor

$S = .35$  to  $.40$  mm (.014 to .016")

The distributor is correctly fitted when the oiler is toward the engine.

### VALUES OF ADVANCE OF IGNITION DISTRIBUTOR

Fixed advance F Before TDC	Maximum advance M Before TDC
$3^{\circ} \pm 1^{\circ}$	$43^{\circ} + 0^{\circ} - 3^{\circ}$ at 5000 rpm



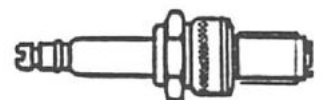
P = T.D.C.

F = Fixed  
advance

M = Maximum  
advance

SPARK PLUGS

Lodge 2HL



## ELECTRIC SYSTEM

Voltage 12 V  
Battery 60 Ah

Generator . . . . .  
Voltage regulator . . . . .  
Starting motor . . . . .  
Coil . . . . .  
Ignition distributor . . . . .  
Windshield wiper . . . . .

BOSCH
EG (R) 14 V 25 A 29
VA 14 V 25 A
EF (R) 12 V 0,7 PS
TK 12 A 19
J F 4
WS 13/11 T3 a

## BULB'S WATTAGE

Headlamps . . . . .	45/ 40 asymmetric
Tail parking and stop lights . . . . .	5/20
Front direction indicators . . . . .	} 20
Tail direction indicators . . . . .	
Back-up light . . . . .	
Front parking lights . . . . .	} 5 globular
Side direction indicators . . . . .	
License plate light . . . . .	
Engine compartment light . . . . .	} 5 cylindrical
Courtesy light (in the rearview mirror) . . . . .	
Instrument panel light . . . . .	} 3 tubular
Tell-tale for generator . . . . .	
Tell-tale for fuel reserve . . . . .	
Tell-tale for blower . . . . .	
Cigar lighter lamp . . . . .	} 1.2 tubular
Tell-tale for parking lights . . . . .	
Tell-tale for direction indicator . . . . .	
Tell-tale for headlamp high beam . . . . .	



## TIGHTENING TORQUE SPECIFICATIONS

### ENGINE/GEARBOX UNIT

Nuts of cylinder head	after repairing, when cold . .	6.2 to 6.4
	when hot . . . . .	6.6 to 6.7
Spark plugs . . . . .		2.5 to 3.5
Nuts of the camshaft caps . . . . .		2 to 2.25
Nuts of the connecting rod caps . . . . .		5 to 5.3
Nuts of main bearing caps . . . . .		4.7 to 5
Screws of flywheel on crankshaft . . . . .		4.2 to 4.5
Nut of generator pulley . . . . .		3 to 3.5
Nut of gearbox main shaft yoke . . . . .		12
Nut of gearbox layshaft . . . . .		5
Nuts of gearbox half-casings . . . . .		1.8
Bolts joining gearbox output shaft yoke to prop. shaft yoke . . . . .		8.5 to 9.5

### REAR FRAME

Screws securing ring gear to differential case . . . . .	4.5 to 5	32.6 to 36.1
Ring nut securing yoke on final drive pinion shaft . . . . .	8 to 14	58 to 101.2
Nuts securing bearing housing to rear axle banjo . . . . .	4.8 to 5.5	34.8 to 39.7
Nuts securing radius rods to body . . . . .	10 to 11.5	72.4 to 83
Nuts securing radius rods to rear axle banjo . . . . .	11.5 to 13	83 to 94
Nuts securing reaction triangle to body . . . . .	4.8 to 5.5	34.8 to 39.7
Nut securing reaction triangle to rear axle . . . . .	11 to 15	79.6 to 108.5
Screws securing brake slave cylinders to axle banjo (Dunlop brakes) . . . . .	.4 to .5	2.9 to 3.6
Screws securing rear brake caliper to support (Dunlop brakes) . . . . .	2.3 to 2.8	16.7 to 20.2
Nuts securing wheels . . . . .	6 to 8	43.4 to 57.8
Bolts joining differential yoke to prop. shaft yoke . . . . .	3.5 to 4	25.3 to 28.9

### FRONT FRAME

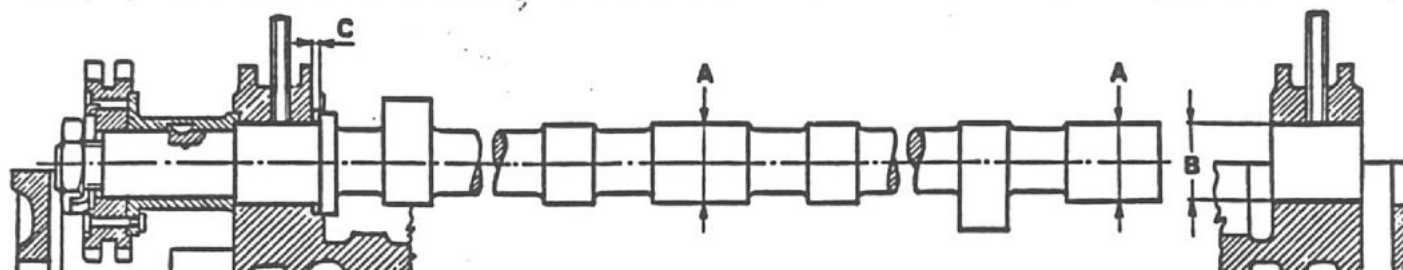
Nut securing steering wheel to column . . . . .	5 to 5.5	36.1 to 39.7
Screws securing Burman steering box cover . . . . .	2.3 to 2.5	16.7 to 18
Screws securing steering box & bellcrank bracket to body . . . . .	4.8 to 5.5	34.8 to 39.7
Nuts of steering linkage ball joints . . . . .	4.8 to 5.5	34.8 to 39.7
Nut securing steering arm to box . . . . .	12.5 to 14	90.5 to 101.2
Screws securing upper attachment of shock absorber to body . . . . .	2.3 to 2.8	16.7 to 20.2
Nut securing shock absorber to suspension arms . . . . .	7.5 to 8.5	54.3 to 61.4
Screws securing upper wishbone front arm to body . . . . .	2.3 to 2.8	16.7 to 20.2
Nut securing upper wishbone front arm to rear arm . . . . .	4.8 to 5.5	34.8 to 39.7
Nut securing upper wishbone rear arm to body . . . . .	11.5 to 13	83 to 94
Nut securing lower wishbone bracket to cross-member . . . . .	13 to 18	94 to 130
Nuts securing steering arm to steering knuckle . . . . .	4.8 to 5.5	34.8 to 39.7
Nut securing upper wishbone rear arm to steering knuckle . . . . .	7.5 to 8.5	54.3 to 61.4
Nut securing lower ball joint to wishbone . . . . .	7.5 to 8.5	54.3 to 61.4
Nut securing lower ball joint to steering knuckle . . . . .	7.5 to 8.5	54.3 to 61.4
Nuts securing caliper support to steering knuckle (Dunlop) . . . . .	4.8 to 5.5	34.8 to 39.7
Screws securing front brake calipers to support (Dunlop) . . . . .	7.5 to 8.5	54.3 to 61.4
Screws securing front brake discs (Dunlop) . . . . .	7.5 to 8.5	54.3 to 61.4
Nuts securing wheels . . . . .	6 to 8	43.4 to 57.8

Kgm	lb. ft	Manner of tightening
6.2 to 6.4	44.8 to 46.3	Slacken and re-tighten without lubricating Lock without slackening the nut With graphite grease, when cold
6.6 to 6.7	47.7 to 48.4	
2.5 to 3.5	18.1 to 25.3	
2 to 2.25	14.5 to 16.3	
5 to 5.3	36.2 to 38.3	in oil
4.7 to 5	33.9 to 36.1	in oil
4.2 to 4.5	30.4 to 32.5	in oil
3 to 3.5	21.7 to 25.3	dry
12	86.8	dry
5	36.1	dry
1.8	13	dry
8.5 to 9.5	61.5 to 68.7	dry
4.5 to 5	32.6 to 36.1	dry
8 to 14	58 to 101.2	dry
4.8 to 5.5	34.8 to 39.7	dry
10 to 11.5	72.4 to 83	dry
11.5 to 13	83 to 94	dry
4.8 to 5.5	34.8 to 39.7	dry
11 to 15	79.6 to 108.5	dry
.4 to .5	2.9 to 3.6	dry
2.3 to 2.8	16.7 to 20.2	dry
6 to 8	43.4 to 57.8	dry
3.5 to 4	25.3 to 28.9	dry
5 to 5.5	36.1 to 39.7	dry
2.3 to 2.5	16.7 to 18	dry
4.8 to 5.5	34.8 to 39.7	dry
4.8 to 5.5	34.8 to 39.7	dry
12.5 to 14	90.5 to 101.2	dry
2.3 to 2.8	16.7 to 20.2	dry
7.5 to 8.5	54.3 to 61.4	dry
2.3 to 2.8	16.7 to 20.2	dry
4.8 to 5.5	34.8 to 39.7	dry
11.5 to 13	83 to 94	dry
13 to 18	94 to 130	dry
4.8 to 5.5	34.8 to 39.7	dry
7.5 to 8.5	54.3 to 61.4	dry
7.5 to 8.5	54.3 to 61.4	dry
7.5 to 8.5	54.3 to 61.4	dry
4.8 to 5.5	34.8 to 39.7	dry
7.5 to 8.5	54.3 to 61.4	dry
7.5 to 8.5	54.3 to 61.4	dry
6 to 8	43.4 to 57.8	dry

## MAJOR INSPECTION SPECIFICATIONS

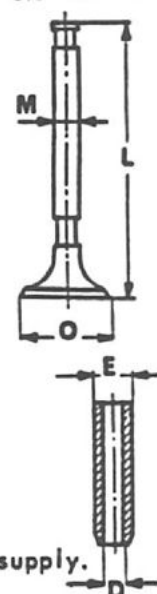
### Camshafts

Diameter of journals . . . . .	A = 26.959 to 26.980 mm (1.0614 to 1.0622")
Diameter of journal bearings . . . . .	B = 27.000 to 27.033 mm (1.0630 to 1.0642")
Radial clearance between journals and bearings . .	= .020 to .074 mm (.0008 to .0029")
End play of camshaft in thrust bearing . . . . .	C = .065 to .182 mm (.0026 to .0071")



### VALVES AND VALVE GUIDES

	INTAKE			EXHAUST (sodium cooled)	
	LIVIA H	ATE	GARRONE	ATE	LIVIA C
Diameter of valve poppet O	41.000 to 41.150 mm (1.614 to 1.620")	41.000 to 41.200 mm (1.614 to 1.620")	41.000 to 41.150 mm (1.614 to 1.620")	37.000 to 37.200 mm (1.4567 to 1.4645")	37.000 to 37.150 mm (1.4567 to 1.4625")
Diameter of valve stem M	8.962 to 8.987 mm (.3528 to .3538")	8.962 to 8.987 mm (.3528 to .3538")	8.962 to 8.987 mm (.3528 to .3538")	8.935 to 8.960 mm (.3518 to .3527")	
Total length L	106.900 to 107.150 mm (4.2087 to 4.2186")	106.800 mm (4.2047")	107.000 mm (4.2126")	106.050 to 106.150 mm (4.1753 to 4.1791")	106.300 mm (4.1850")



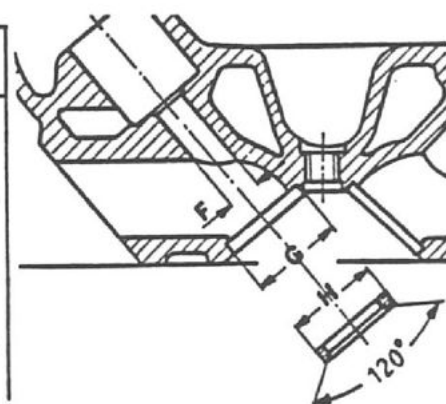
N.B. : ATE - LIVIA - GARRONE intake valves and ATE - LIVIA exhaust valves are alternate supply.

Valve guide	Outside diameter with guide removed	E = 14.033 to 14.044 mm (.5528 to .5529")
	Inside diameter with guide assembled in cylinder head . . . . .	D = 9.000 to 9.015 mm (.3544 to .3549")
Clearance between guide assembled in	intake	= .013 to .053 mm (.0005 to .0020")
	exhaust	= .040 to .080 mm (.0016 to .0031")
Projection of valve guides from their recesses in the cylinder head . . . . .		= 16.800 to 17.000 mm (.662 to .669")

### VALVE SEATS

Diameter of valve guide seat on cylinder head . . . . .	= 13.990 to 14.018 mm (.5508 to .5518")
Interference between seat and valve guide . . . . .	= .015 to .054 mm (.0006 to .0021")

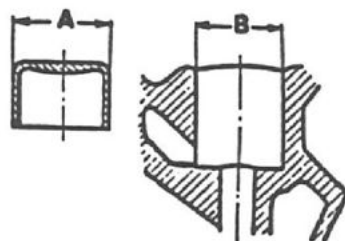
		INTAKE	EXHAUST
Outer diameter of the valve seat . .	standard	42.597 to 42.632 mm (1.6771 to 1.6784")	38.597 to 38.632 mm (1.5196 to 1.5209")
	oversized	42.897 to 42.932 mm (1.6889 to 1.6902")	38.897 to 38.932 mm (1.5314 to 1.5327")
Diameter of recess in the cylinder head for valve seat	standard	42.532 to 42.557 mm (1.6744 to 1.6754")	38.532 to 38.557 mm (1.5169 to 1.5179")
	oversized	42.832 to 42.857 mm (1.6862 to 1.6872")	38.832 to 38.857 mm (1.5288 to 1.5298")



Interference between valve seat and recess in cylinder head . . . . .100 to .040 mm (.0039 to .0016")

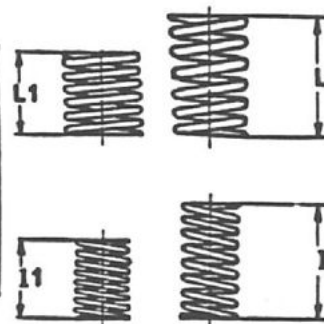
## VALVE CUPS

Diameter of cup A =	{ standard = 34.973 to 34.989 mm (1.3773 to 1.3775") oversized = 35.173 to 35.189 mm (1.3848 to 1.3853")
Diameter of cup seat in cylinder B =	{ standard = 35.000 to 35.025 mm (1.3779 to 1.3789") oversized = 35.200 to 35.225 mm (1.3859 to 1.3868")
head . . . . .	
Clearance between seat and cup =	.011 to .052 mm ( .0005 to .0020")



## VALVE SPRINGS

	Free length	Length under test load	Test load
Inner spring I	{ red mark 47.3 mm (1.87") green mark 46.5 mm (1.83")	L <sub>1</sub> 26 mm (1.02")	22.2 to 23.1 Kg 48.9 to 51.1 lbs.
Outer spring S	{ red mark 52.8 mm (2.08") green mark 51.3 mm (2.03")	L <sub>1</sub> 27.5 mm (1.08")	35.7 to 37.1 Kg 78.6 to 81.8 lbs



Note : The red-marked valve springs should be fitted with the color marked coil downward.

## CONNECTING RODS

Length between center line of big end and center line of small end of connecting rod . . . . .	D = 147.955 to 148.045 mm (5.8250 to 5.8285")
Inner diameter of the big end of connecting rod . . .	E = 53.695 to 53.708 mm (2.1140 to 2.1144")
Inner diameter of bushing in the small end of rod . .	C = 22.005 to 22.015 mm ( .8664 to .8667")
Thickness of connecting rod bearings F	{ standard . . . = 1.829 to 1.835 mm ( .0720 to .0722") 1st oversize = 1.956 to 1.962 mm ( .0770 to .0772") 2nd oversize = 2.083 to 2.089 mm ( .0820 to .0824")
Radial clearance between crankpins and bearings for big end of connecting rod . . . . .	= .025 to .063 mm ( .0010 to .0024")
Maximum out of parallelism between center line of big end hole and center line of small end hole . . . . .	= ( .074 mm (.0029")

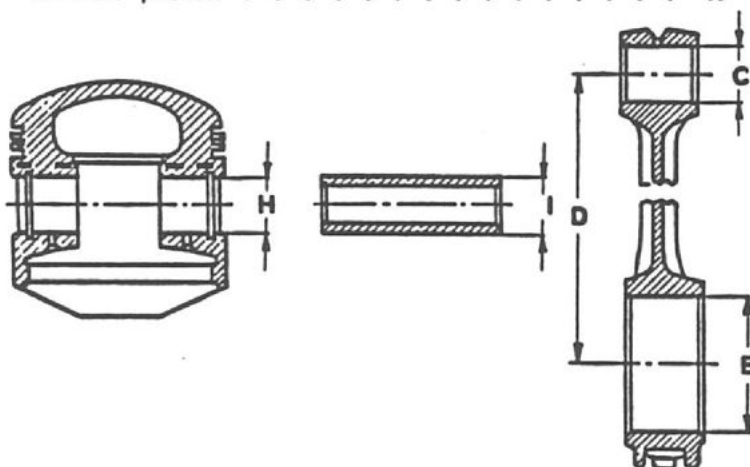
## PISTON PIN

O.D. of pin . . . . .	{ Black color = 21.994 to 21.997 mm (.86590 to .86602") White color = 21.998 to 22.000 mm (.86606 to .86614")
Clearance between small end bushing and piston pin . . . . .	{ Black color = .008 to .021 mm ( .0003 to .0008") White color = .005 to .017 mm ( .0002 to .0007")

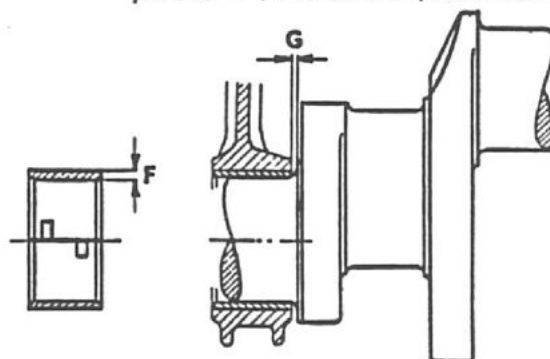
## PISTON PIN HOLE

Black color	White color
22.000 to 22.002 mm (.86614 to .86621")	22.003 to 22.005 mm (.86626 to .86633")

BORG piston . . . . . H



End play of con. rods on crankpins G = .2 to .3 mm (.008 to .012")

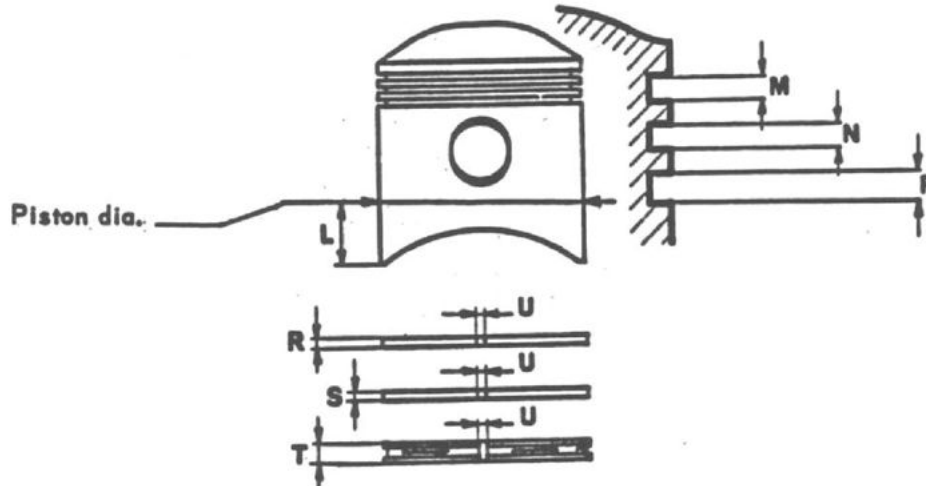




## PISTONS AND PISTON RINGS

Diameter of pistons to be measured to square with the hole for piston pin and at a distance of  $L = 12 \text{ mm}$  (.472") from the lower border of skirt.

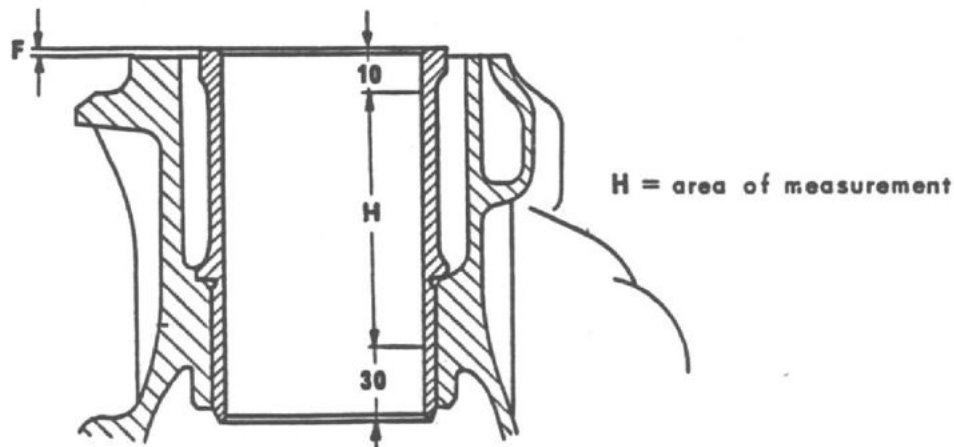
	CLASS A (BLUE)	CLASS B (PINK)	CLASS C (GREEN)
BORG piston diameter	77.920 to 77.930 mm (3.0677 to 3.0681")	77.931 to 77.940 mm (3.0682 to 3.0685")	77.941 to 77.950 mm (3.0686 to 3.0688")



Height of grooves in piston for compression rings . . . . .	{ normal chromium-plated	N = 1.775 to 1.790 mm (.0699 to .0704") M = 1.535 to 1.550 mm (.0605 to .0612")
Height of groove in piston for oil scraper ring . . . . .		P = 4.015 to 4.030 mm (.1581 to .1586")
Thickness of compression rings . . . . .	{ normal . . . . . chromium-plated	S = 1.728 to 1.740 mm (.0681 to .0685") R = 1.478 to 1.490 mm (.0582 to .0586")
Thickness of oil scraper ring . . . . .		T = 3.978 to 3.990 mm (.1567 to .1571")
End play of rings in grooves . . . . .	{ compression rings { normal . . . . . oil scraper rings { chromium-plated	- .035 to .062 mm (.0014 to .0024") - .045 to .072 mm (.0018 to .0028") - .025 to .052 mm (.0010 to .0020")
Gap of rings to be inspected in ring gauge or in cylinder barrels . . . . .		U = .300 to .450 mm (.0012 to .0017")

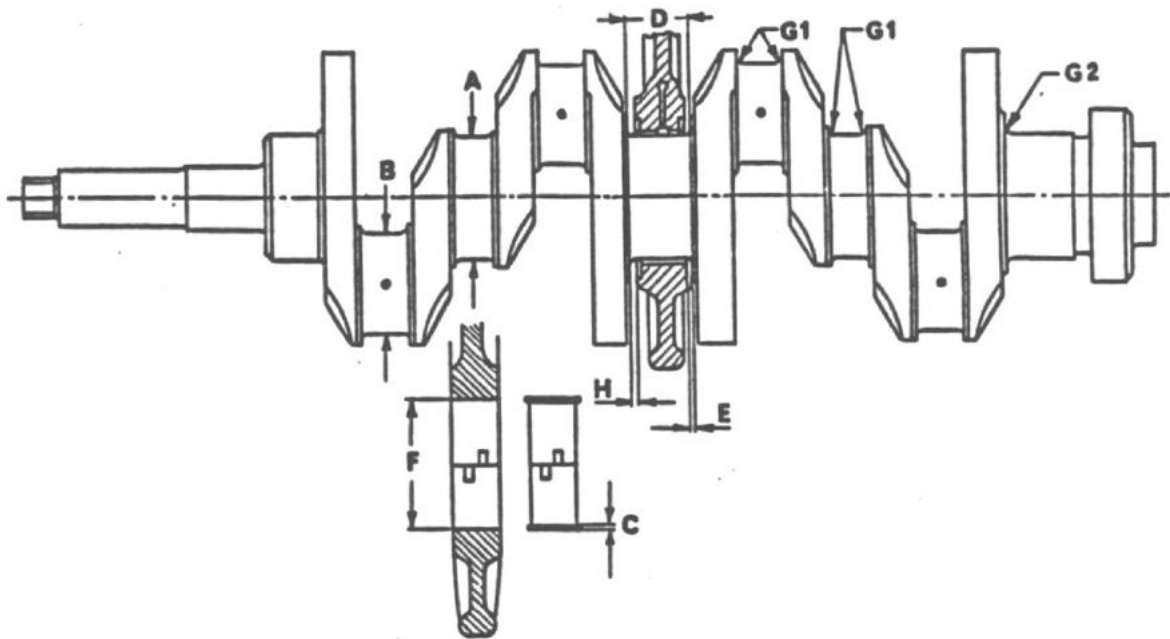
### CYLINDER BARRELS

CYLINDER BARRELS	CLASS A (BLUE)	CLASS B (PINK)	CLASS C (GREEN)
Cylinder barrel bore	77.985 to 77.994 mm (3.0703 to 3.0706")	77.995 to 78.004 mm (3.0707 to 3.0710")	78.005 to 78.014 mm (3.0711 to 3.0714")
Clearance between cylinder barrel and piston . . . . .	.055 to .074 mm (.0022 to .0029")		



Projection of barrels from cylinder block . . . . .	F = .000 to .060 mm (.0000 to .0024")
Surface roughness of barrel bore . . . . .	20 to 40 microinches RMS

# CRANKSHAFT



Diameter of main journals . . . . . A	<div> <div>standard</div> <div>1st undersize</div> <div>2nd undersize</div> </div>	<div> <div>= 59.960 to 59.973 mm (2.3606 to 2.3611")</div> <div>= 59.706 to 59.719 mm (2.3506 to 2.3511")</div> <div>= 59.452 to 59.465 mm (2.3407 to 2.3411")</div> </div>
Diameter of crankpins . . . . . B	<div> <div>standard</div> <div>1st undersize</div> <div>2nd undersize</div> </div>	<div> <div>= 49.987 to 50.000 mm (1.9680 to 1.9685")</div> <div>= 49.733 to 49.746 mm (1.9581 to 1.9585")</div> <div>= 49.479 to 49.492 mm (1.9480 to 1.9485")</div> </div>
Thickness of main bearings . . . . . C	<div> <div>standard</div> <div>1st oversize</div> <div>2nd oversize</div> </div>	<div> <div>= 1.829 to 1.835 mm ( .0720 to .0722")</div> <div>= 1.956 to 1.962 mm ( .0770 to .0772")</div> <div>= 2.083 to 2.089 mm ( .0820 to .0822")</div> </div>
Diameter of seat main bearings in crankcase . . . . . F		= 63.657 to 63.676 mm (2.5062 to 2.5069")
Length of central journal . . . . . D	<div> <div>standard</div> <div>1st oversize</div> <div>2nd oversize</div> </div>	<div> <div>= 30.000 to 30.035 mm (1.1811 to 1.1824")</div> <div>= 30.127 to 30.162 mm (1.1861 to 1.1874")</div> <div>= 30.254 to 30.289 mm (1.1911 to 1.1924")</div> </div>
Thickness of thrust rings for central journal . . . . . E	<div> <div>standard</div> <div>1st oversize</div> <div>2nd oversize</div> </div>	<div> <div>= 2.311 to 2.362 mm ( .0910 to .0929")</div> <div>= 2.374 to 2.425 mm ( .0935 to .0954")</div> <div>= 2.438 to 2.489 mm ( .0960 to .0980")</div> </div>
End play of crankshaft . . . . . H		= .076 to .263 mm ( .003 to .010")
Radial clearance between journals and main bearings . . .		= .014 to .058 mm ( .0005 to .0022")

Note - Radial clearance = main bearing ID - (twice bearing thickness + journal  $\phi$ D).

Fillet radii . . . . .	<div> <div>main journals &amp; crankpins</div> <div>journal on flywheel side</div> </div>	<div> <div>G<sub>1</sub> = 1.7 to 2.1 mm (.07 to .08")</div> <div>G<sub>2</sub> = 3.7 to 4.1 mm (.15 to .16")</div> </div>
Main journals & crankpins surface roughness . . . . .		63 microinches RMS
Maximum elongation of main journals and crankpins . . . . .		.007 mm (.00027")
Maximum taper of main journals and crankpins measured on their full length . . . . .		.01 mm (.00039")
Maximum error of parallelism of main journals and crankpins measured of their full length . . . . .		.015 mm (.00059")
Maximum misalignment allowed between main journals . . . . .		.01 mm (.00039")
Maximum misalignment allowed between $\phi$ of the two pairs of crankpins and $\phi$ of main journals . . . . .		.300 mm (.0118")

## CLUTCH

Pedal free travel . . . . .	23 mm (.9 <sup>1</sup> / <sub>2</sub> )
Distance between thrust ring and the reference sleeve of tool C.6.0104 (red-painted dot) See IS 1.05.080 . . . . .	.75 to 1.25 mm (.03 to .05 <sup>1</sup> / <sub>2</sub> )
Squareness of the clutch driven plate assembled on gearbox direct drive shaft. . . . .	.50 mm (.019 <sup>1</sup> / <sub>2</sub> )
Wear limit of driven plate thickness . . . . .	6 mm (.236 <sup>1</sup> / <sub>2</sub> )
Spring rating: free length . . . . .	43 to 46 mm (1.69 to 1.81 <sup>1</sup> / <sub>2</sub> )
length under test load . . . . .	29.2 mm (1.15 <sup>1</sup> / <sub>2</sub> )
test load . . . . .	44.5 to 49.5 Kgs (98.1 to 109 lbs)

## GEARBOX

Transmission ratios . . . . .	<div style="display: flex; align-items: center;"> <div style="font-size: 3em; margin-right: 10px;">{</div> <table> <tr><td>1st gear</td><td>3.304 : 1</td></tr> <tr><td>2nd gear</td><td>1.988 : 1</td></tr> <tr><td>3rd gear</td><td>1.355 : 1</td></tr> <tr><td>4th gear</td><td>1.000 : 1</td></tr> <tr><td>5th gear</td><td>.791 : 1</td></tr> <tr><td>Rev.</td><td>3.010 : 1</td></tr> </table> </div>	1st gear	3.304 : 1	2nd gear	1.988 : 1	3rd gear	1.355 : 1	4th gear	1.000 : 1	5th gear	.791 : 1	Rev.	3.010 : 1
1st gear	3.304 : 1												
2nd gear	1.988 : 1												
3rd gear	1.355 : 1												
4th gear	1.000 : 1												
5th gear	.791 : 1												
Rev.	3.010 : 1												
Maximum eccentricity of main shaft . . . . .	.050 mm (.020 <sup>1</sup> / <sub>2</sub> )												
End play between forks and sleeves . . . . .	<div style="display: flex; align-items: center;"> <div style="font-size: 3em; margin-right: 10px;">{</div> <table> <tr><td>assembly</td><td>.150 to .340 mm (.006 to .013<sup>1</sup>/<sub>2</sub>)</td></tr> <tr><td>wear limit</td><td>.850 mm (.033<sup>1</sup>/<sub>2</sub>)</td></tr> </table> </div>	assembly	.150 to .340 mm (.006 to .013 <sup>1</sup> / <sub>2</sub> )	wear limit	.850 mm (.033 <sup>1</sup> / <sub>2</sub> )								
assembly	.150 to .340 mm (.006 to .013 <sup>1</sup> / <sub>2</sub> )												
wear limit	.850 mm (.033 <sup>1</sup> / <sub>2</sub> )												

		Gear	1st - 2nd - 3rd	5th - Rev.
Calibration of springs for striking rod balls . . . . .	free length		15.2 mm (.60 <sup>1</sup> / <sub>2</sub> )	30.5 mm (1.2 <sup>1</sup> / <sub>2</sub> )
	length under test load		10 mm (.39 <sup>1</sup> / <sub>2</sub> )	20 mm (.78 <sup>1</sup> / <sub>2</sub> )
	test load		2.88 to 3.12 Kg (6.4 to 6.8 lbs)	4.32 to 4.68 Kg (9.5 to 10.3 lbs)
Maximum end play of mainshaft gears	1st speed gear		.170 to .245 mm (.0067 to .0096 <sup>1</sup> / <sub>2</sub> )	
	2nd & 3rd speed gears		.130 to .205 mm (.0052 to .0081 <sup>1</sup> / <sub>2</sub> )	
	5th speed gear & Rev.		.160 to .220 mm (.0063 to .0087 <sup>1</sup> / <sub>2</sub> )	
Radial clearance between gear bushings and mainshaft	1st speed gear		.125 to .170 mm (.0049 to .0067 <sup>1</sup> / <sub>2</sub> )	
	2nd & 3rd speed gears		.095 to .140 mm (.0038 to .0055 <sup>1</sup> / <sub>2</sub> )	
	5th speed gear		.065 to .107 mm (.0026 to .0041 <sup>1</sup> / <sub>2</sub> )	
Distance between outer planes of the engaging teeth of 3rd and 4th gears . . . . .			42.000 to 42.200 mm (1.65 to 1.66 <sup>1</sup> / <sub>2</sub> )	
Distance, in neutral, of the rear band (propeller shaft side) of 5th speed sleeve from the rear edge of gear engaging teeth . .			12.900 mm (.508 <sup>1</sup> / <sub>2</sub> )	



## REAR AXLE AND SUSPENSION

Transmission-axle overall ratios-with 41 : 9 final drive . . . . .	1st gear . . . . .	15.049 : 1
	2nd gear . . . . .	9.055 : 1
	3rd gear . . . . .	6.172 : 1
	4th gear . . . . .	4.555 : 1
	5th gear . . . . .	3.603 : 1
	Reverse . . . . .	13.710 : 1
Maximum eccentricity of axle shafts . . . . .		.10 mm (.004")
Clearance between teeth of planetary gears . . . . .		.05 mm (.002")
Play between teeth of final drive . . . . .		.05 to .10 mm (.002 to .004")
Max factory end play between reaction trunnion and attachment to body . . . . .		1 mm (.04")
Reference dimension on tool C. 6.0101 for pinion-to-ring gear fitting . . . . .		70 ± .0025 mm (2.7559 ± .0001")
Pre-load on pinion bearing . . . . .	11.5 to 15.5 Kgcm (10 to 13.5 in. lbs)	
Total pre-load on final drive bearings . . . . .	16.5 to 24.5 Kgcm (14.4 to 21.3 in. lbs)	

### CHECKING OF SHOCK ABSORBERS ON TEST BENCH - Calibration data (when cold)

BIANCHI - ALLINQUANT		
	Extension	Compression
High speed . . . . .	135 - 190 Kgs (298 - 418 lbs)	50 - 80 Kgs (111-176 lbs)
Low speed . . . . .	19 - 55 Kgs (42 - 121 lbs)	9 - 22 Kgs (20 - 48 lbs)

### CHECKING OF SUSPENSION SPRINGS

Free length . . . . .	429 mm (16.9")
Length under test load . . . . .	252 mm (10")
Test load . . . . .	257 to 273 Kg (565 to 600 lbs)
Colored marks . . . . .	<div style="display: flex; align-items: center;"> <span style="font-size: 3em; margin-right: 10px;">{</span> <div> <div>White-white</div> <div>Blue-white</div> </div> </div>

## FRONT SUSPENSION

### 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 :

- 1) Screw in the castellated nut and lock it to a torque of 2.5 Kgm (18 lb.ft.) while at the same time revolving the wheel hub to set the bearings properly in their seats;
- 2) Unscrew the nut half a turn or more;
- 3) Lightly tap on the stub axle end with a mallet in order to return the outboard bearing in its proper position even in the case a slight interference between bearing cone and stub axle exists;
- 4) Lock the nut in place to 1.5 Kgm (10.8 lb.ft.);
- 5) Unscrew the nut of a quarter turn;
- 6) If the hole in the axle is aligned with a slot in the castellated nut insert the cotter pin; if not, screw in the nut by the minimum angle needed to line up the hole and the next slot;
- 7) Again tap lightly on stub axle end to restore the same condition as under step 3;
- 8) The end play so obtained on stub axle should fall between .02 - .12 mm (.0008 - .0047").

### WHEEL BEARING LUBRICATING INSTRUCTIONS

The quantity of lubricating grease should be about 65 grammes (2½ ozs) 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 (.04")

**Note** - Ball joints require no regular lubrication being provided with special grease seals which retain the grease packed in by factory on assembly. Only if strictly needed (joint squeaking) grease with Shell Retinax A or AGIP F.1 Grease 30 (See I.S. 1.05.097/1).

### CHECKING OF SUSPENSION SPRINGS

Free length . . . . .	317 mm (12.5")
Length under test load . . . . .	200 mm (7.8")
Test load . . . . .	820.6 to 871.4 Kg (1810 to 1920 lbs)
Colored marks . . . . .	{ Blue-white Blue-blue

### CHECKING OF SHOCK ABSORBERS ON TEST BENCH

	GIRLING		BIANCHI - ALLINQUANT	
	Extension	Compression	Extension	Compression
High speed . . . . .	210 to 310 Kgs (470 to 680 lbs)	27 to 52 Kgs (60 to 115 lbs)	150 to 190 Kgs (330 to 420 lbs)	55 to 80 Kgs (121 to 175 lbs)
Low speed . . . . .	30 to 52 Kgs (66 to 115 lbs)	9 to 22 Kgs (20 to 48 lbs)	25 to 55 Kgs (55 to 121 lbs)	9 to 22 Kgs (20 to 48 lbs)

## BRAKES

### Dunlop

Whenever a brake unit is overhauled or replaced check the disc for true rotation with the disc fitted to the car.

Use a dial gauge and check that runout does not exceed .15mm (.006"). Should the reading exceed this value, then the installation of disc on stub axle must be carefully examined; if the run out persists, replace the disc.

If the disc is scored, the grinding of the surfaces is allowed providing not to exceed an undersize of 1 mm (.0394"), equalized on both faces, i.e. .5 mm (.0197") each face; disc wear limit : 8.5 mm (.335") thick.

Inspection specifications after regrinding of disc surfaces :

- Max. out of parallelism with disc mounting plane : .05 mm (.0020");
- Max. out of flat : .025 mm (.0010") and max. difference in thickness : .038 mm (.0015") as measured along any radial line;
- Max. out of flat : .025 mm (.0010") and max. difference in thickness : .015 mm (.0006") as measured along any circular line;
- The surface should show no sign of scoring or porosity.

The surface roughness should be :

- 26 microinches as measured circularly;
- 36 microinches as measured radially

## FRICTION PADS

	Front	Rear
Thickness when new	16 mm (.630")	17.5 mm (.689")
Wear limit	8 mm (.315")	10.0 mm (.394")

## CALIPERS

On replacement of disc or caliper measure the running clearance between caliper and disc on each side; the difference should not exceed .5 mm (.0197").

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 service brake pads.

The adjustment is performed by acting on the nut of control cable located between intermediate levers and calipers. After the adjustment, make sure that levers of rear calipers to which the cable is connected are all the way outward. In such a position the cable must not be tight but slightly slackened. Furthermore the brake pads must not contact the disc.

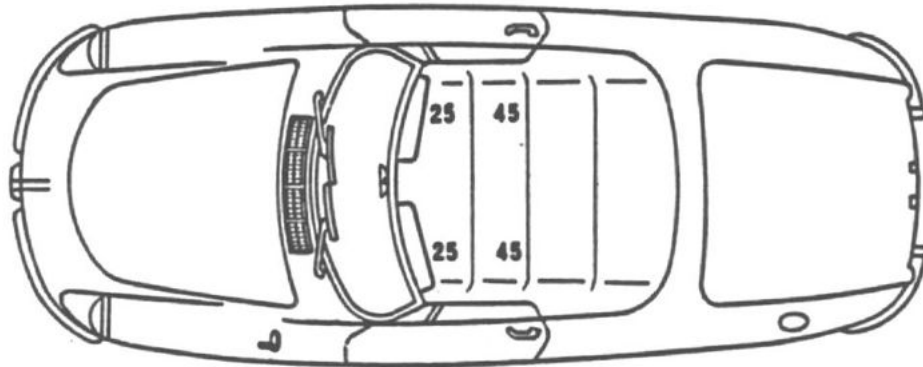
## WHEEL ALIGNMENT

### Checking of wheel angles and car «trim» under static load

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

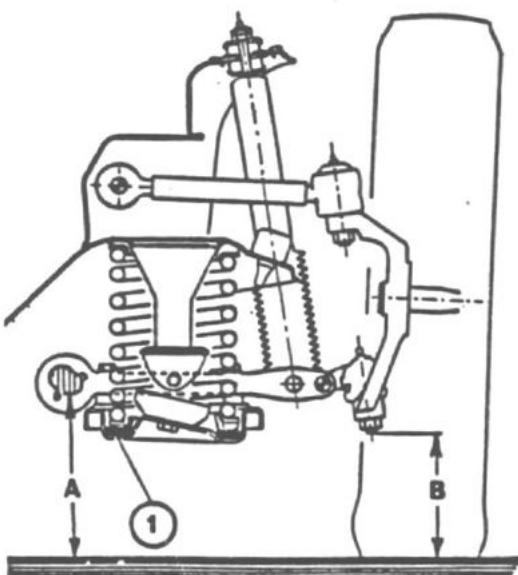
Before checking, slightly jolt the car so as to settle the suspensions.

Static load { 2 weights of 45 Kgs (100 lbs) on front seats  
2 weights of 25 Kgs (55 lbs) on flooring where feet rest



### DISTANCE OF LOWER WISHBONE OF FRONT SUSPENSION FROM A REFERENCE LEVEL

$$A - B = 28 \pm 3 \text{ mm } (1.10 \pm .12")$$



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

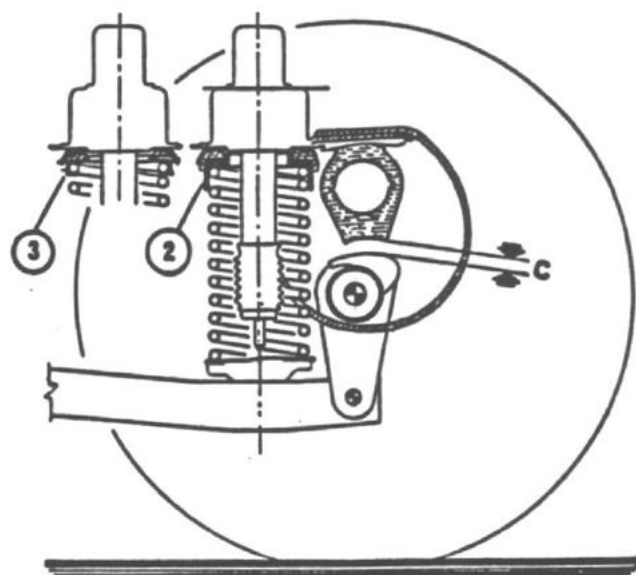
To adjust add shims in (1).



## DISTANCE OF REAR AXLE FROM RUBBER BUFFERS

$$C = 33 \pm 5 \text{ mm } (1.30 \pm .20")$$

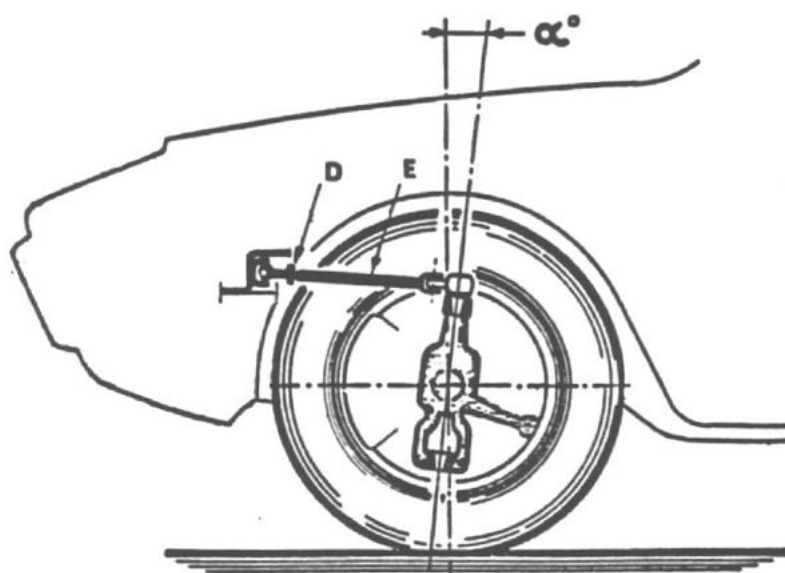
**Note** - To adjust, remove the seat 3 and add shims in 2 as shown.



- In the conditions as specified check the wheel angles.

## CASTER ANGLE

$$\alpha = 1^\circ \pm 30'$$



The difference in caster angle between R.H. and L.H. wheel must not exceed  $0^\circ 20'$ .

To adjust, loosen jam nut D and rotate rod E.

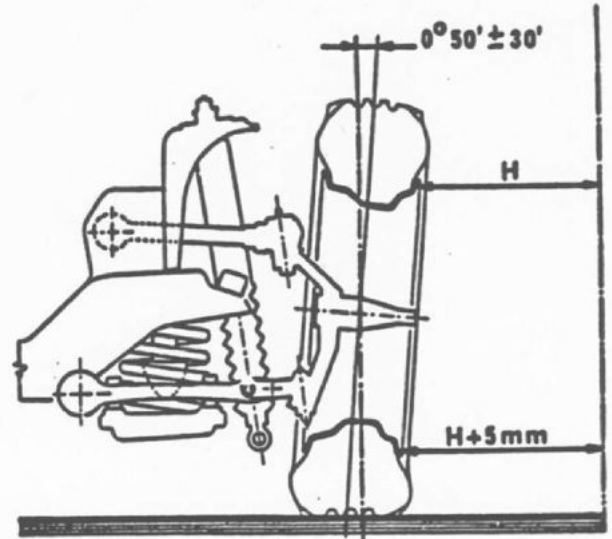
**Note** - Small adjustments of the caster angle allow to correct slight drift tendency of the car.

The caster angle should be checked under static load and alignment conditions as specified and with shock absorbers disconnected at an end.

**N.B.** - Before checking the caster angle shake the front end of car in order to allow the rubber bushing on the front slanting arm to set properly.

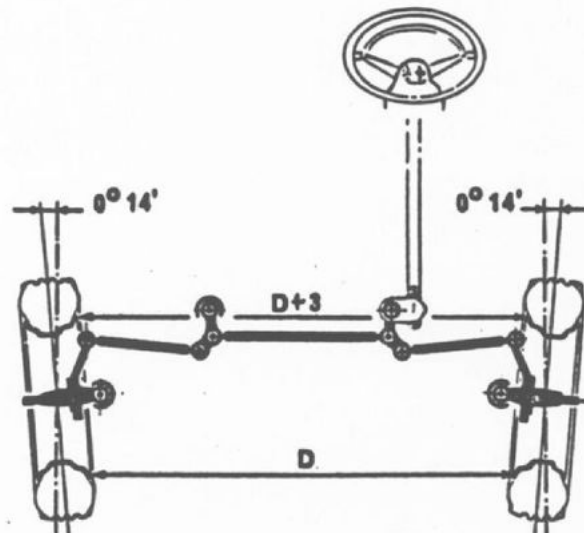
## FRONT WHEEL CAMBER

Difference in camber angle between R.H. and L.H.  
wheel =  $0^{\circ} 40'$



Note • Not adjustable. Check the chassis, if necessary.

## FRONT WHEEL TOE-IN



Rod length :

side . . . . .	272 to 288 mm (10.7 to 11.3")
track . . . . .	530 to 550 mm (20.86 to 21.66")

With the toe-in as specified, the length of rods as measured between ball joint centers should fall within the limits shown. If these values cannot be restored, the cause will probably be attributable to distortion of the body resulting from a collision.

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