

# **Workshop Manual for 4.165 Diesel Engine**

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**Perkins Engines Ltd.**

Peterborough England  
1980

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This publication is written for world wide use. In territories where legal requirements govern engine smoke emission, safety factors etc., then all instructions, data and dimensions given must be applied in such a way that, after servicing (preventive Maintenance) or repairing the engine, it does not contravene the local regulations when in use.

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## FOREWORD

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This Workshop Manual has been compiled for use in conjunction with normal workshop practice. Mention of certain accepted practices, therefore, has been purposely omitted in order to avoid repetition.

Throughout this manual, whenever "left" or "right" hand side of the engine is referred to, it is that side of the engine when viewed from the flywheel end.

Reference to renewing joints and cleaning off joint faces, has to a great extent been omitted from the text, it being understood that this will be carried out where applicable.

Similarly, it is understood that in reassembly and inspection, all parts are to be thoroughly cleaned, and where present, burrs and scale are to be removed.

It follows that any open ports of high precision components e.g. fuel injection equipment, exposed by dismantling, will be blanked off until reassembled, to prevent the ingress of foreign matter.

### **RUNNING IN PROCEDURE**

It is not necessary to gradually run-in a new or factory rebuilt engine and any prolonged light load running during the early life of the engine can in fact prove harmful to the bedding in of piston rings and liners.

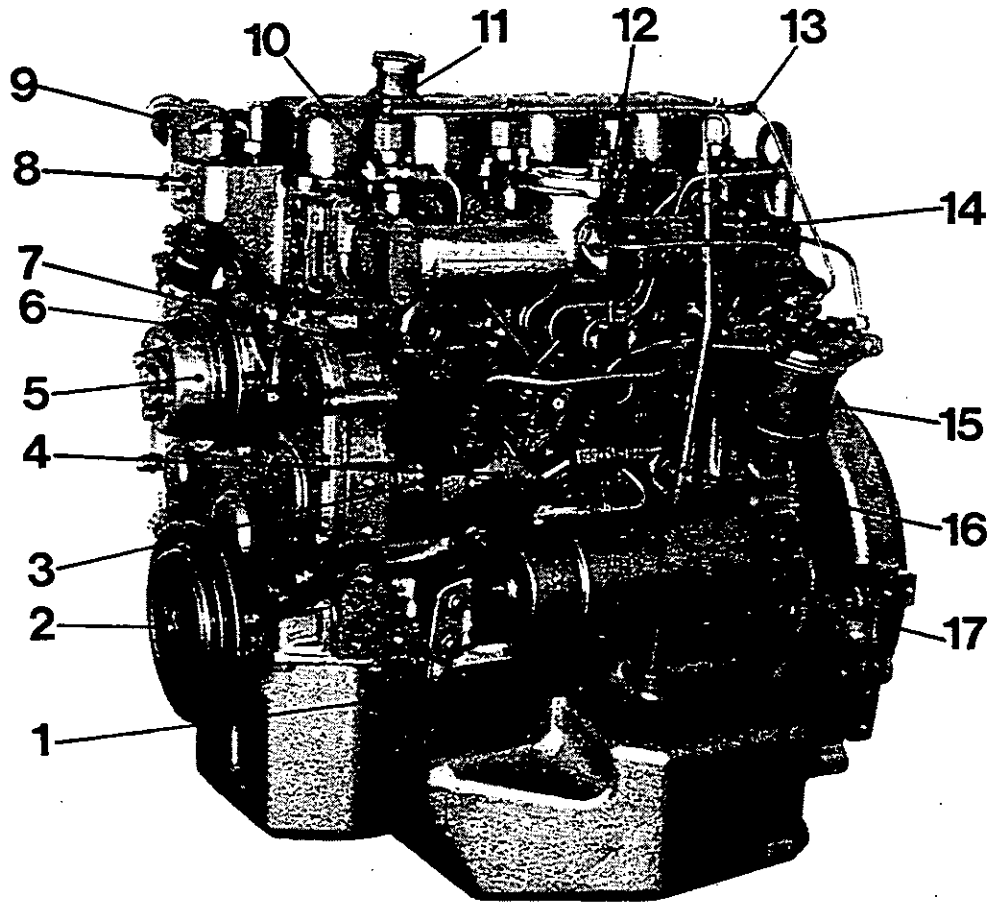
Full load can be applied to a new or factory rebuilt engine as soon as the engine is used, provided that the engine coolant is first allowed to reach a temperature of at least 140°F (60°C).

# SECTION A

## Engine Photographs

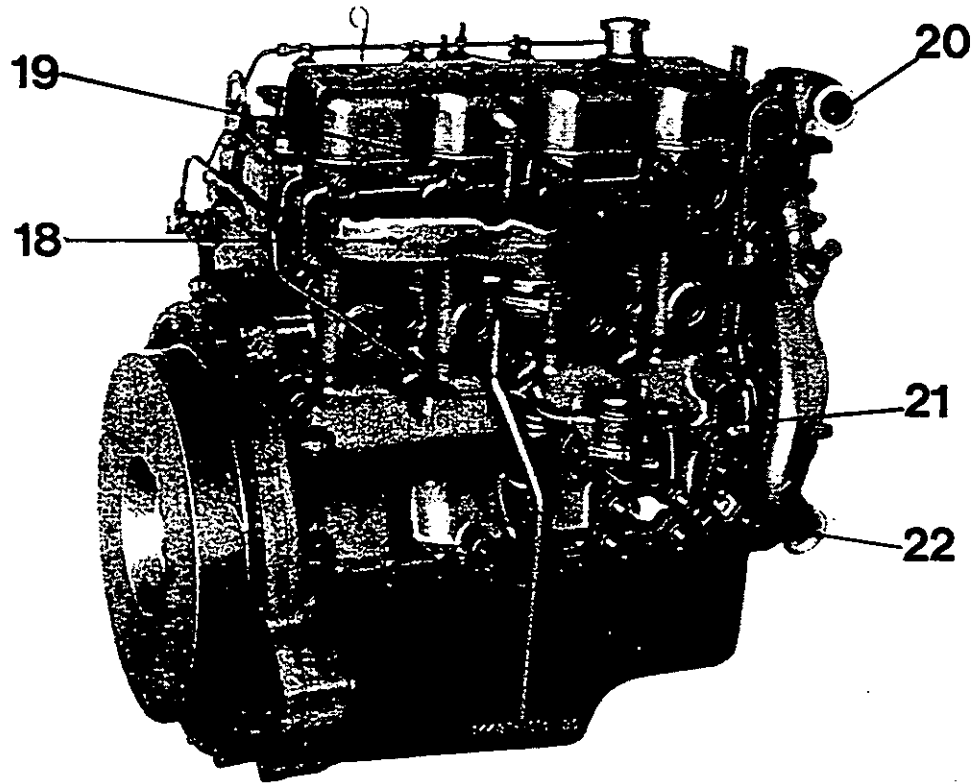
*Perkins Engines are built to individual requirements to suit the applications for which they are intended and the following engine views do not necessarily typify any particular specification.*

## ENGINE VIEWS—A.2



A1 View on fuel pump side of engine.

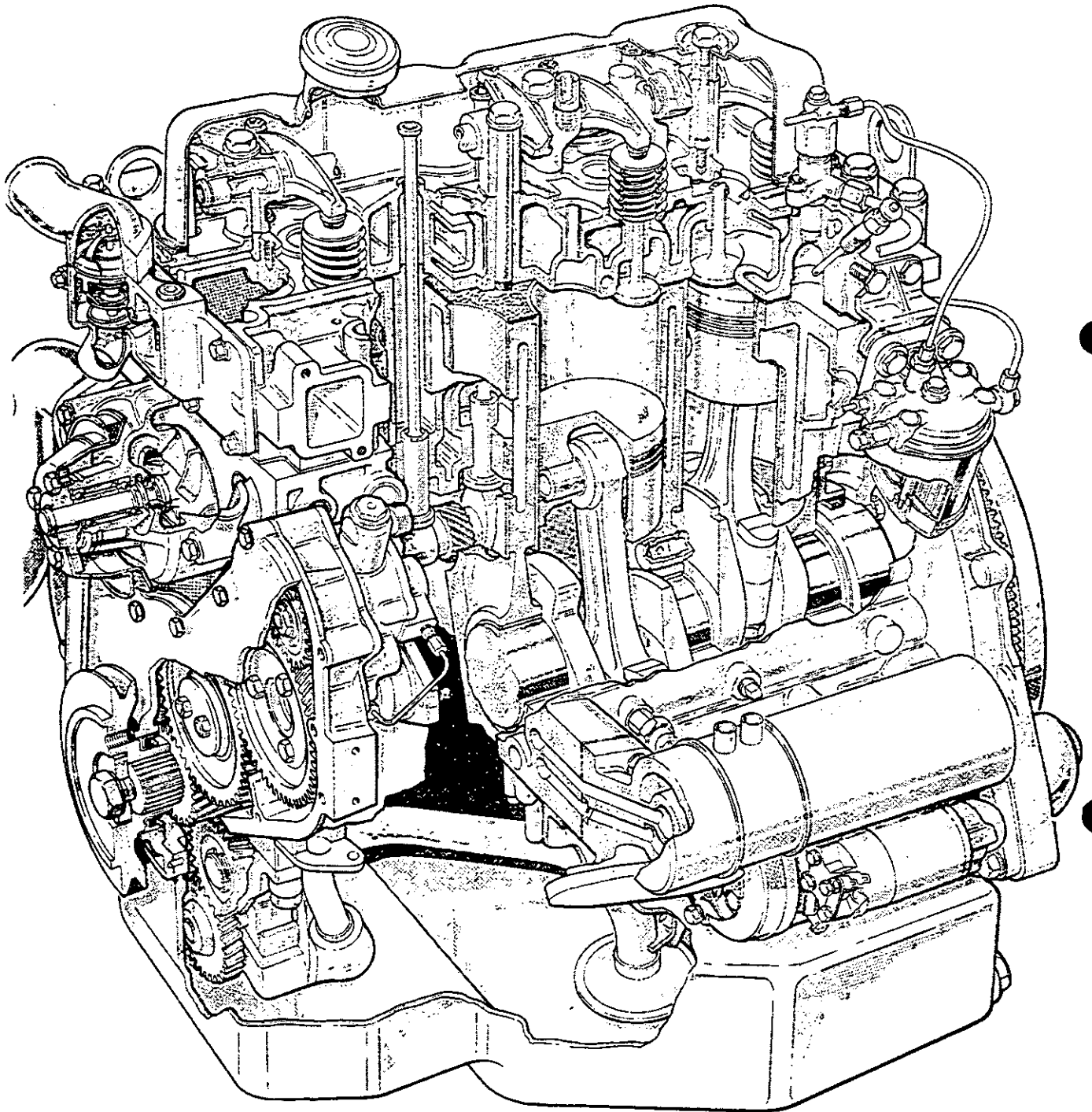
- 
- |                                      |                                     |
|--------------------------------------|-------------------------------------|
| 1 Engine Mounting Bracket.           | 12 Thermostat.                      |
| 2 Crankshaft Front Pulley.           | 13 Leak-off Pipe (Atomisers).       |
| 3 Fuel Injection Pump Drive Adaptor. | 14 Induction Manifold.              |
| 4 Fuel Injection Pump.               | 15 Fuel Filter Canister.            |
| 5 Water Pump Drive Pulley.           | 16 Dipstick Tube.                   |
| 6 Water Pump.                        | 17 Lubricating Oil Filter Canister. |
| 7 Engine Serial Number Location.     |                                     |
| 8 Thermostat Housing.                |                                     |
| 9 Water Outlet.                      |                                     |
| 10 Atomiser.                         |                                     |
| 11. Lubricating Oil Filler.          |                                     |



A2 View on camshaft side of engine.

- 
- 18 Exhaust Manifold.
  - 19 Engine Breather Tube.
  - 20 Water Outlet.
  - 21 Mechanical Fuel Lift Pump.
  - 22 Water Inlet.

ENGINE VIEWS—A.4



A3

Perspective Section of front mounted lubricating oil pump on 4.165 engine.  
(Mid mounted lubricating oil pump engine is also available).

# **SECTION B**

## **Technical data**



## TECHNICAL DATA—B.2

### Engine Data

Type ... ..	Four cylinder, four stroke, in-line.
Bore, nominal ... ..	92 mm
Stroke ... ..	101,6 mm
Capacity ... ..	2,710 litres
Compression ratio ... ..	21 : 1
Combustion system ... ..	Indirect injection, anti-chamber
Firing order ... ..	1 - 3 - 4 - 2
Minimum lubricating oil pressure ... ..	2,07 Bars (30 lbf/in <sup>2</sup> ) at 80°C
Valve tip clearance — Inlet, cold ... ..	0,30 mm (0.012 in)
Valve tip clearance — Exhaust, cold ... ..	0,40 mm (0.016 in)
Lubricating oil sump capacity ... ..	Varies with application. Engine to be filled to dipstick maximum mark and topped up after running for five minutes.
Cooling water capacity, engine only ... ..	6,3 litres

### Rating details

Rated output, Gross ... ..	70 bhp — 52,2 Kw at 3,600 rev/min
Nett to DIN 70020 ... ..	48 Kw (65 PS)
Maximum torque, Gross ... ..	152 Nm at 2,050 rev/min
Nett ... ..	149 Nm
Engine weight, dry, approximately ... ..	201 Kg (441 lb)

### Recommended Torque Tensions

The following figures will apply with the components lightly oiled before assembly.

Component	Screw Size	Nm	lbf ft	kgf m
Cylinder Head Securing Setscrews ... ..	M12 x 1,75	122	90	12,4
Main Bearing Cap Setscrews ... ..	M12 x 1,75	109	80	11,1
Connecting Rod Nuts ... ..	M12 x 1,75	102	75	10,4
Crankshaft Pulley Setscrew ... ..	M20 x 2,5	332	245	33,9
Flywheel Setscrews ... ..	M12 x 1,75	88	65	9,0
Camshaft Gear Setscrew ... ..	M12 x 1,75	70	52	7,2
Idler Gear Hub Nuts ... ..	M8 x 1,25	28	21	3,0
Atomiser Securing Nuts ... ..	M8 x 1,25	16	12	1,7
High Pressure Fuel Pipe Nuts ... ..	M12 x 1,5	20	15	2,1
Adaptor Plate (Housing) Setscrew ... ..	M10 x 1,5	32	24	3,6
Fuel Pump Drive Gear Setscrew ... ..	M8 x 1,25	20	15	2,1

### De-Rating For Altitude

Where engines operate at high altitudes they should be de-rated.

The following table is given as a general guide, to be applied on a percentage basis, where specific figures for a particular engine rating are not available.

### De-Rating For Altitude

Where engines operate at high altitudes they should be de-rated.

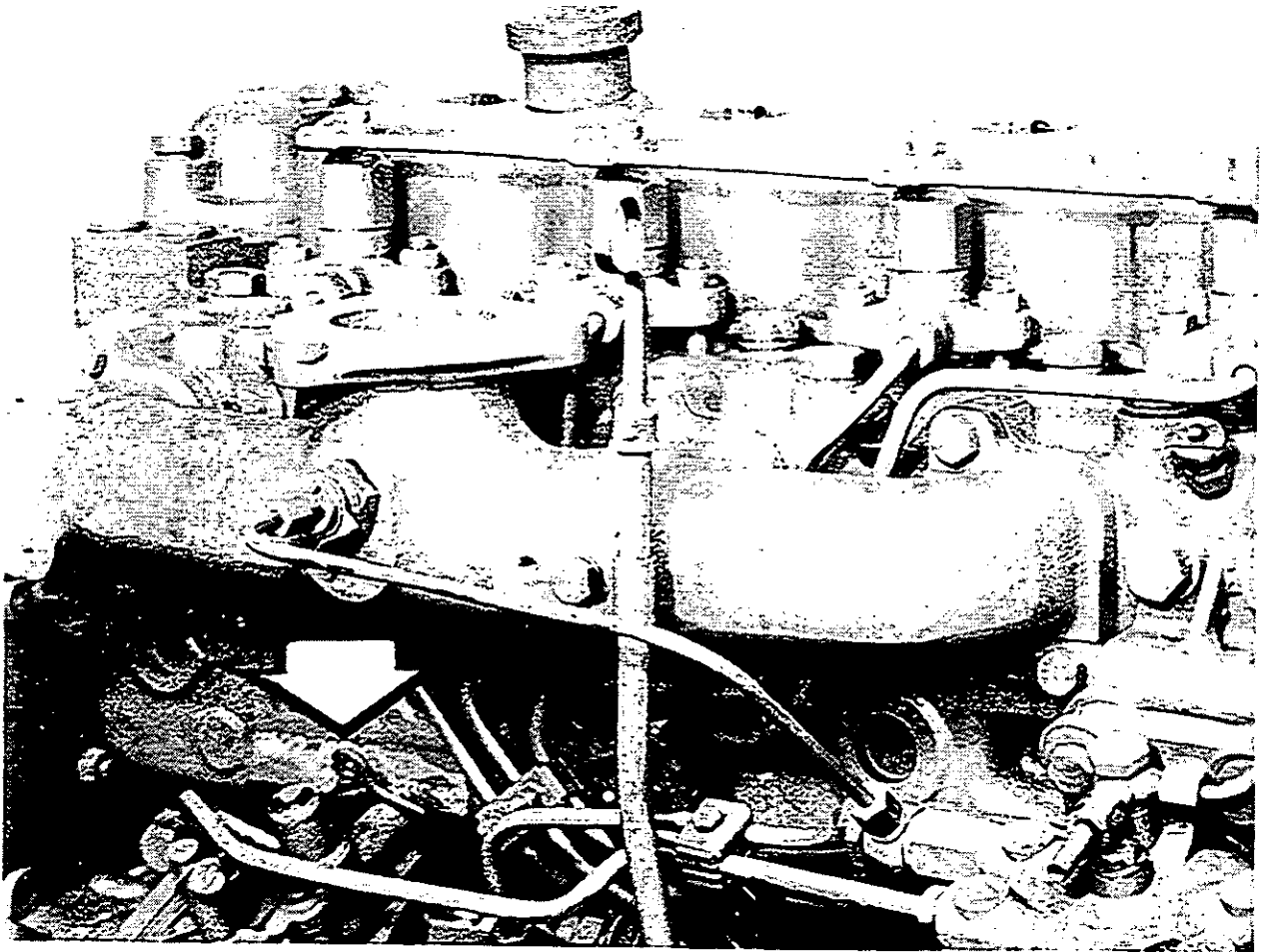
The following table is given as a general guide, to be applied on a percentage basis, where specific figures for a particular engine rating are not available.

Altitude	Maximum fuel delivery de-rating*
0/ 2000 ft ( 600 metre)	No change
2000/ 4000 ft (1200 metre)	6%
4000/ 6000 ft (1800 metre)	12%
6000/ 8000 ft (2400 metre)	18%
8000/10000 ft (3000 metre)	24%
10000/12000 ft (3600 metre)	30%

\*Measured at setting speed given on pump setting code.

**Engine Number Location** See fig. B.1.

The engine number will be found stamped on a machined face of the cylinder block, above the fuel injection pump. This number should be quoted in full when seeking information or ordering parts.



B1

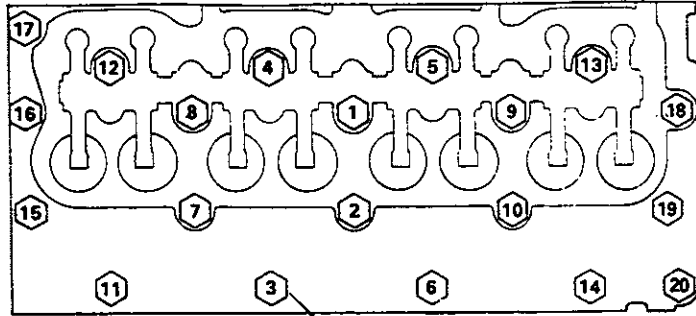
Engine Number Location

**Approved Fuel Oil Specification**

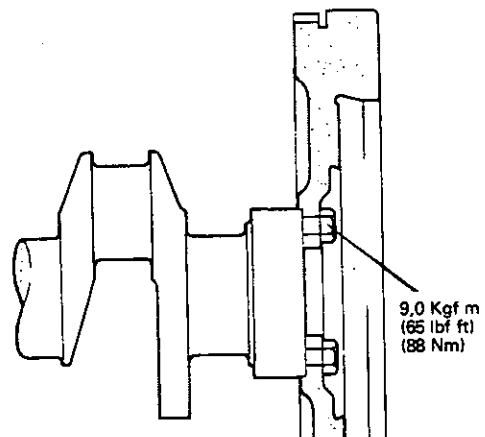
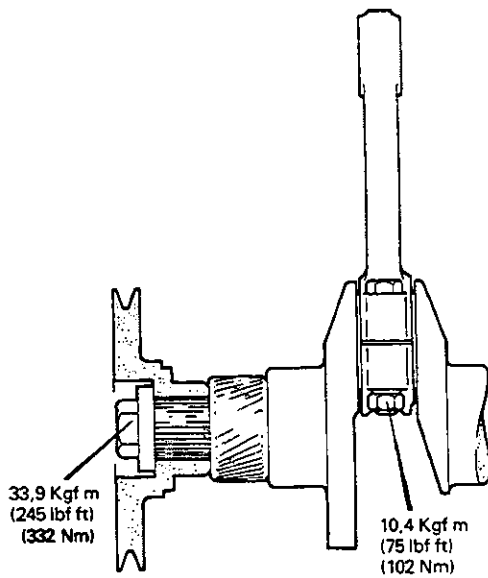
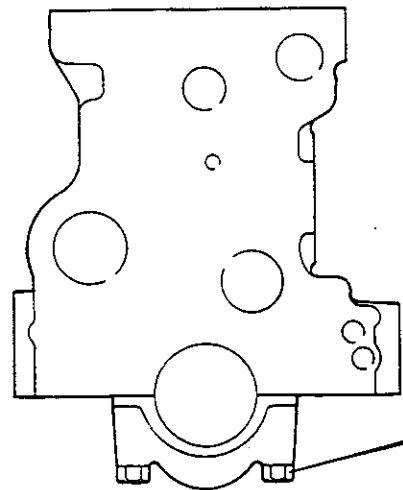
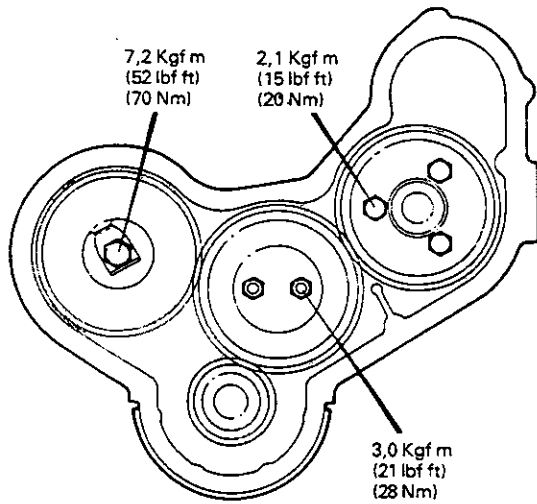
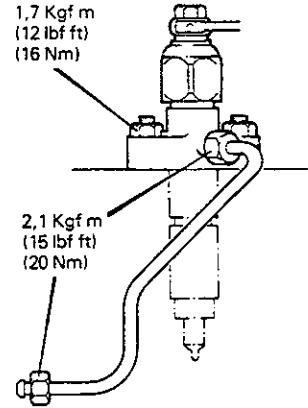
United Kingdom	...	...	...	...	BS.2869 : 1967 — Class A1 and A2
United States	...	...	...	...	A.S.T.M/D.975 — 66T — Nos. 1-D or 2-D
					VV — F — 800a: Grades DF-A, DF-1 or DF-2
Germany	...	...	...	...	DIN-51601 (1967)
France...	...	...	...	...	(J.O. 14/9/57) Gas Oil or Fuel Domestique
Italy	...	...	...	...	CUNA — Gas Oil NC-630-01 (1957)
India	...	...	...	...	IS: 1460/1968 — Grade special or Grade A
Sweden	...	...	...	...	SIS. 15 54 32 (1969)
Switzerland	...	...	...	...	Federal Military Specification 9140-335-1404 (1965)

Fuel oils available in territories other than those listed above which are to an equivalent specification may be used.

# Torque Tensions



12,4 Kgf m  
(90 lbf ft)  
(122 Nm)

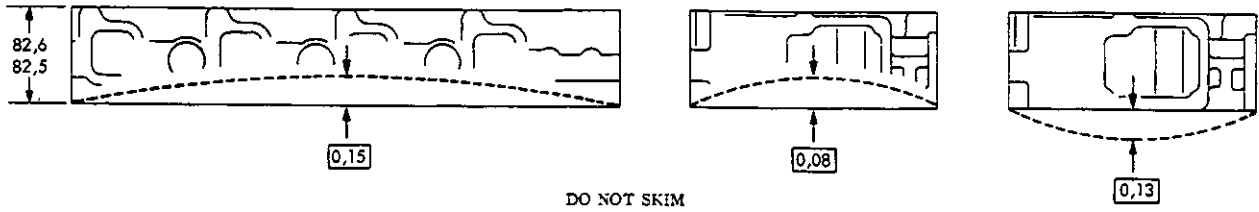


# Fits and Tolerances

## Cylinder Head Dimensions

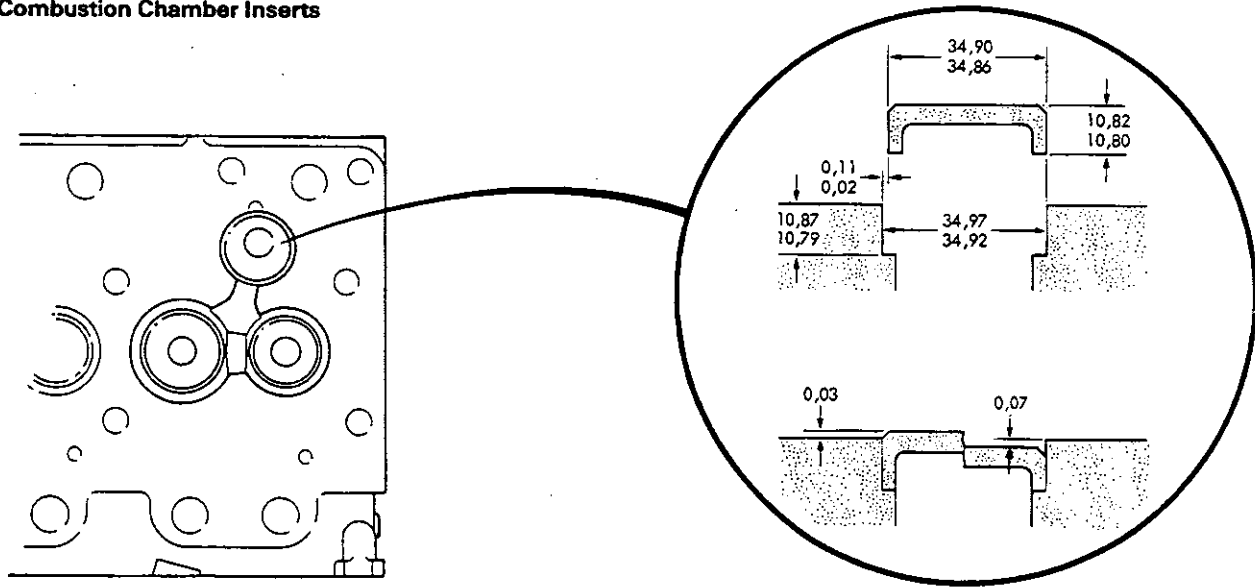
Millimetres

Service limits shown thus —  

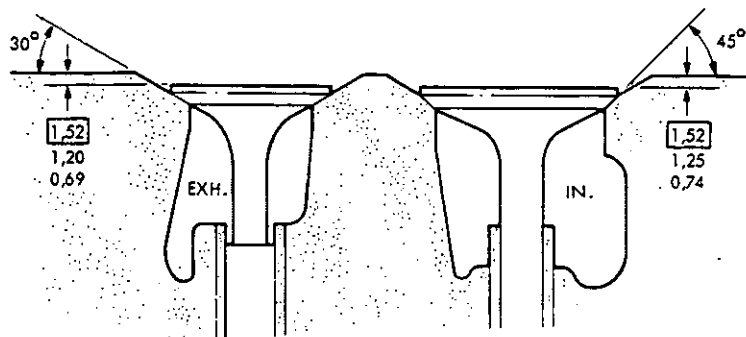


Pressure for Water Leak Test ... .. 2,07 Bars (30 lbf/in<sup>2</sup>)

### Combustion Chamber Inserts

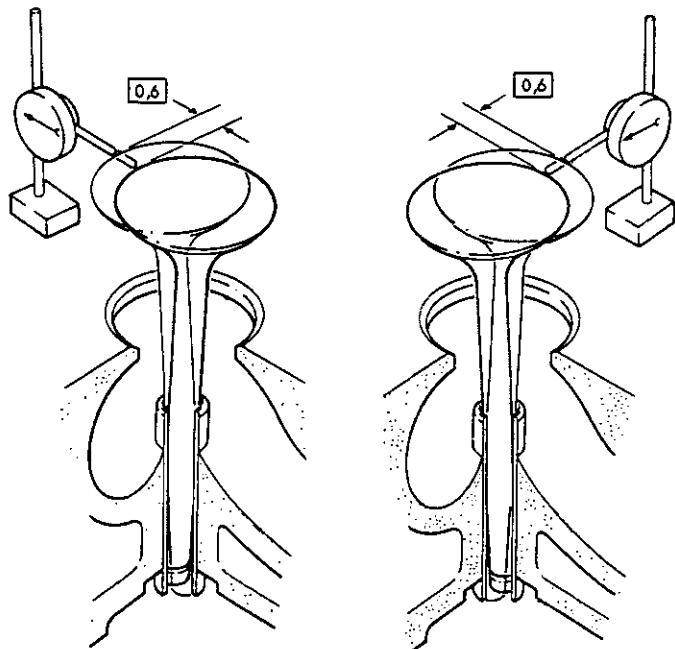
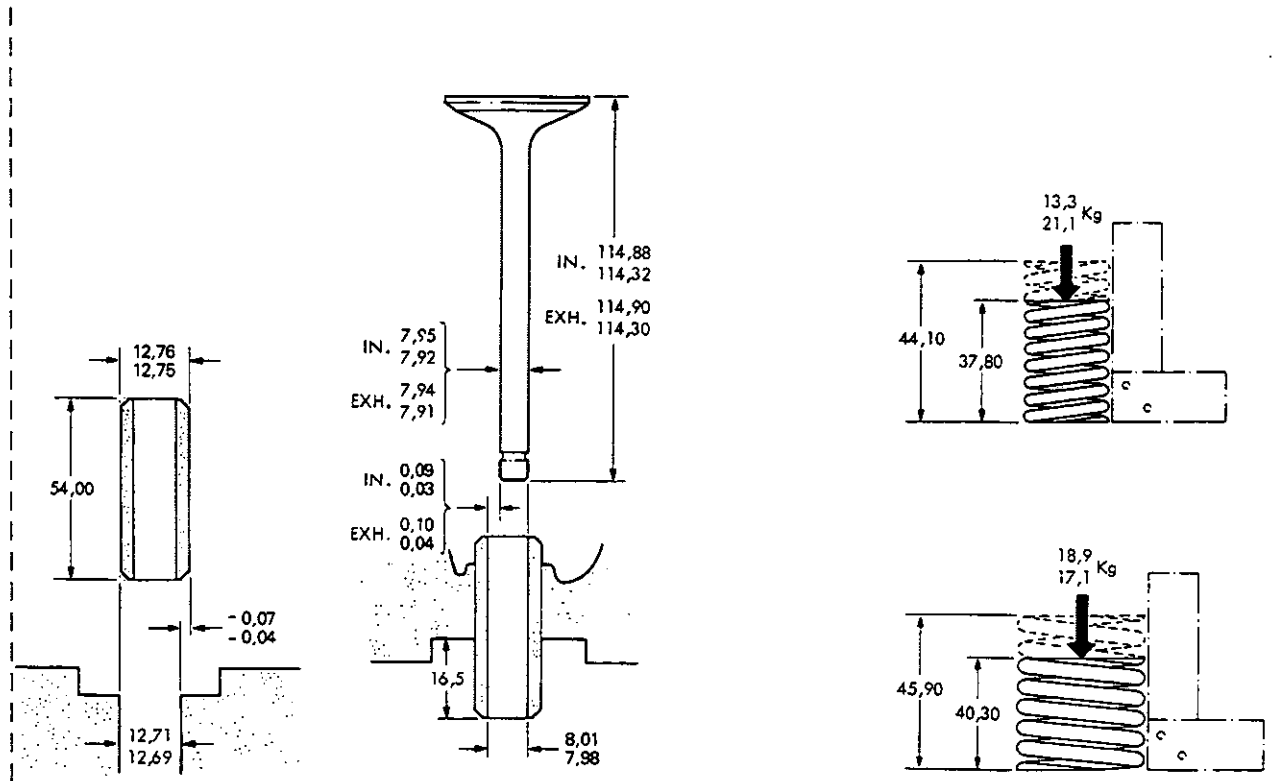


### Valve Seat Angle and Depth



Millimetres

Valves, Valve Guides, Inlet and Exhaust, Valve Springs, Outer and Inner



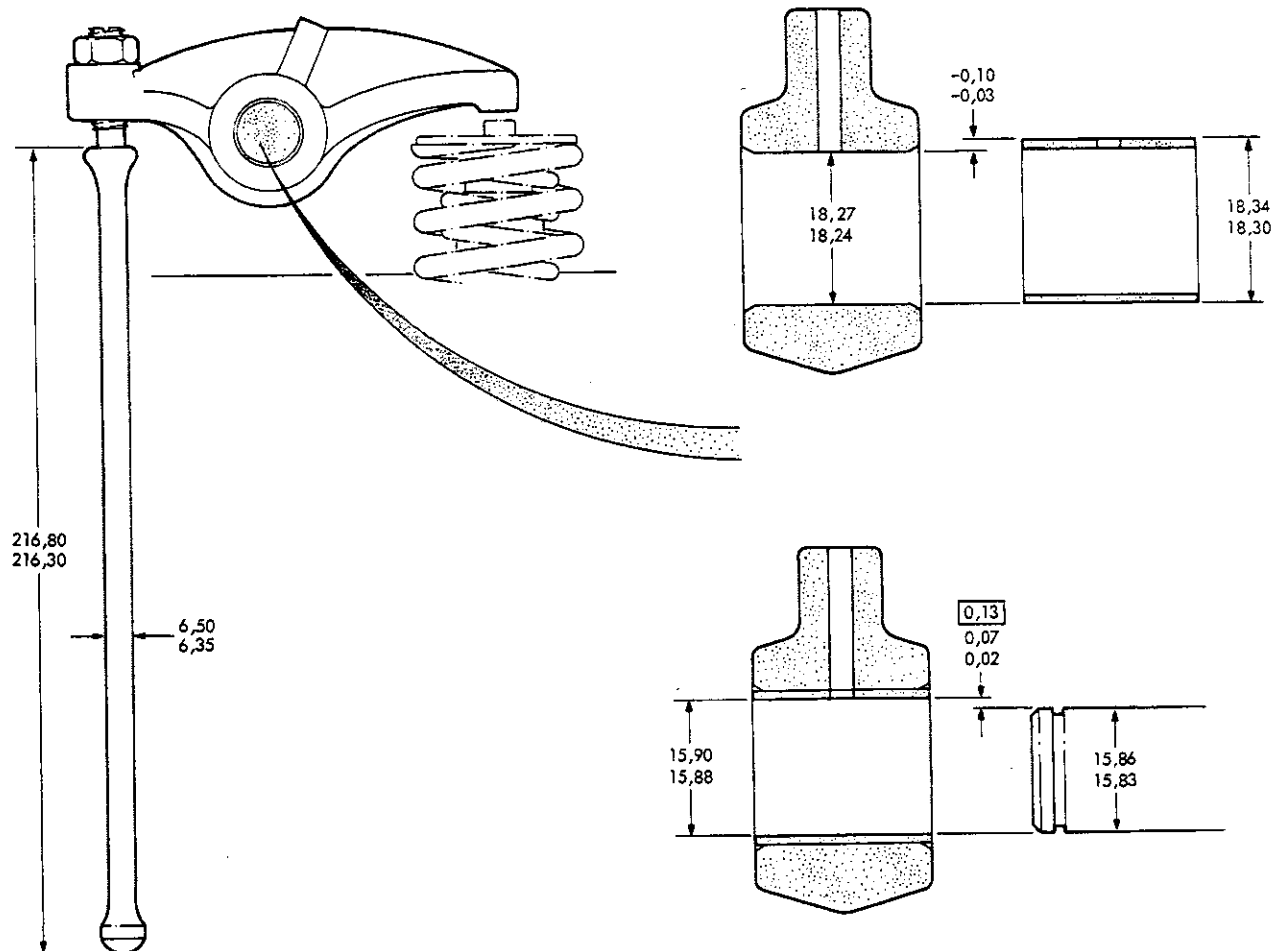
Sealing arrangement ... ..

Synthetic Rubber Deflector Inlet Valves

# TECHNICAL DATA—B.8

Millimetres

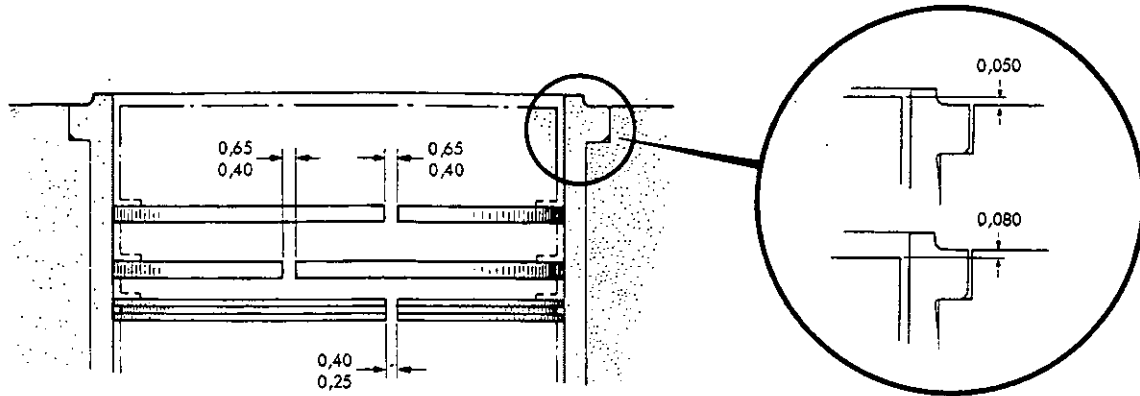
## Rocker Shaft, Rocker Levers, Push Rods



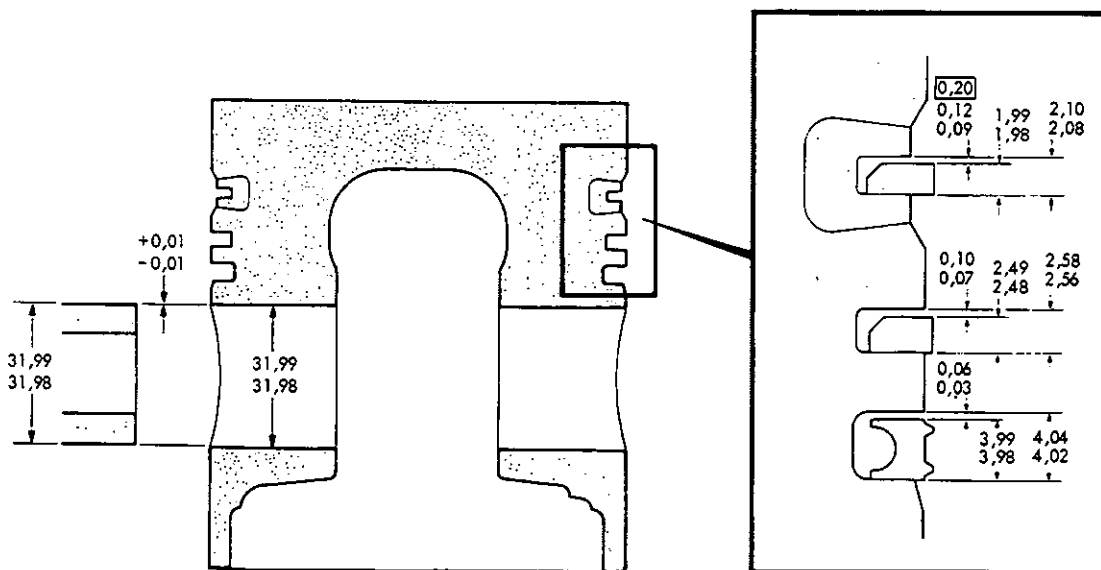
# Piston and Rod Dimensions

Millimetres

Service limits shown thus — □



Ring gaps quoted are for a 92,04 mm bore.  
 Larger bores:— for every 0,03 mm increase above 92,04 mm, add 0,08 mm to figures given



# TECHNICAL DATA—B.10

Millimetres

## Connecting Rods and Gudgeon Pins

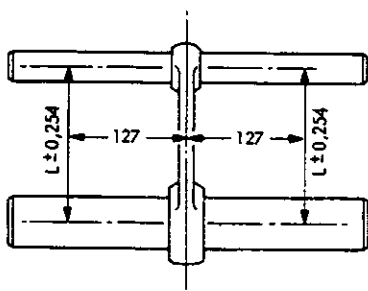
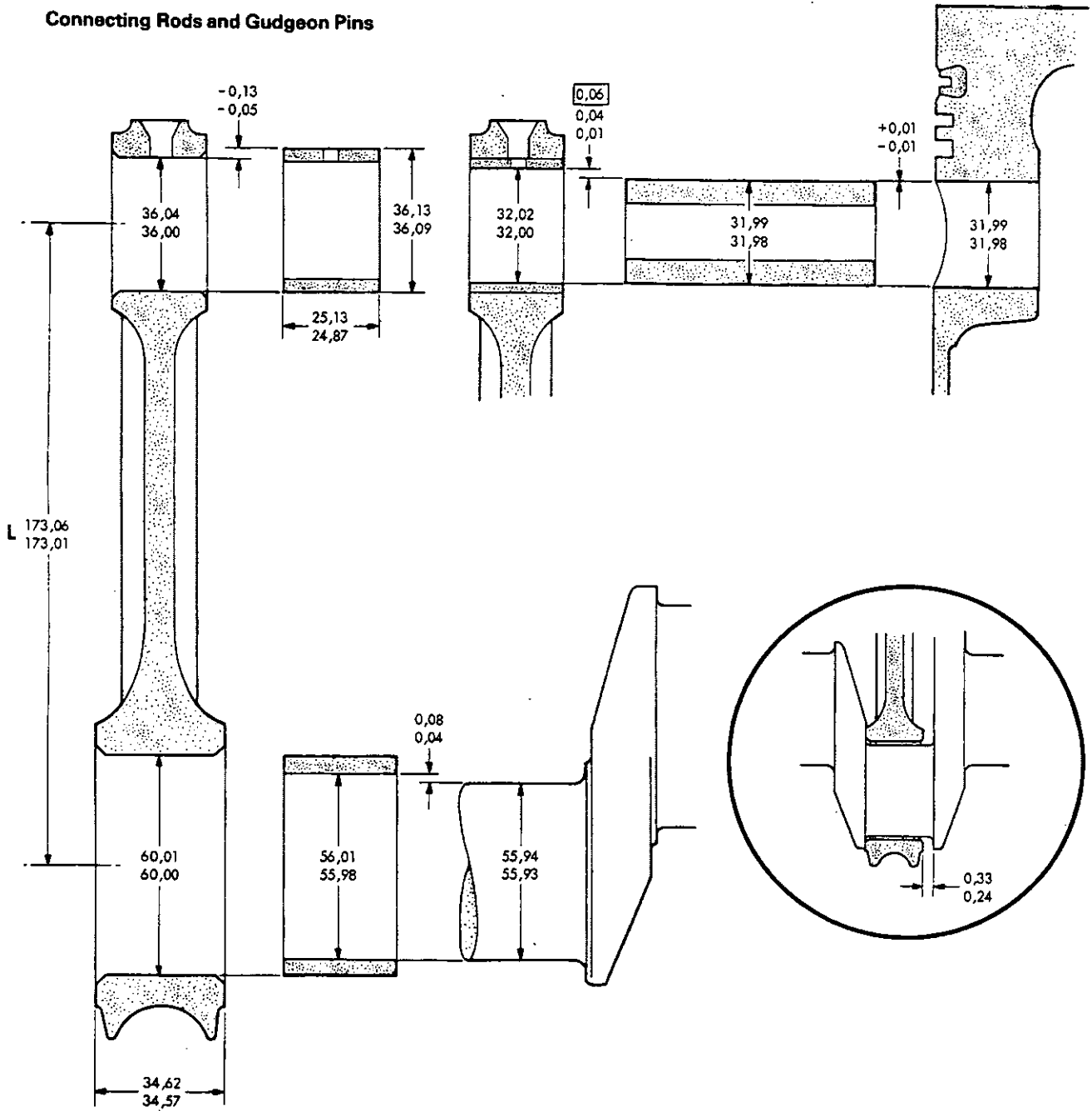


Fig.2

### Connecting Rod Alignment

Large and small Connecting Rod bores must be square and parallel with each other within the limits  $\pm 0,25$  mm measured 127 mm each side of the axis of the rod on the test mandrel as shown in Fig. 2. With the small end bush fitted, the limit of  $\pm 0,25$  mm is reduced to  $\pm 0,06$  mm.

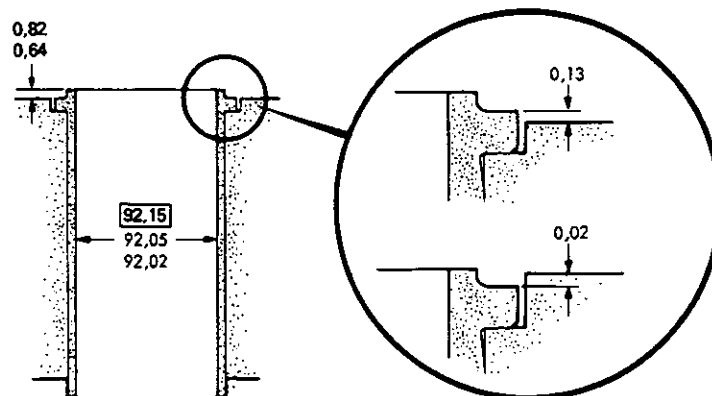
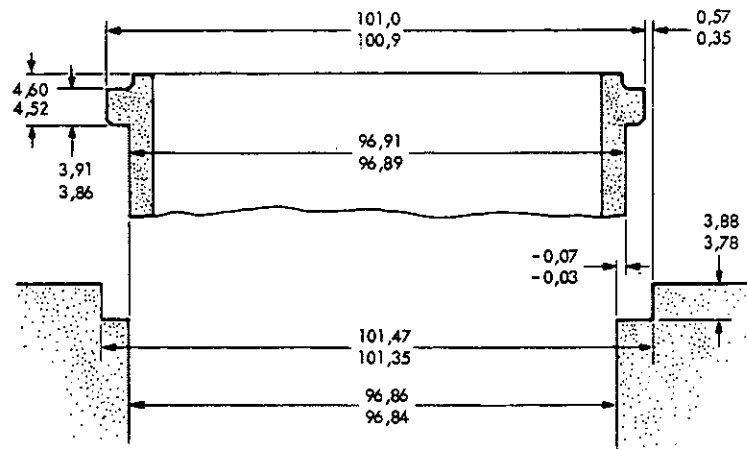
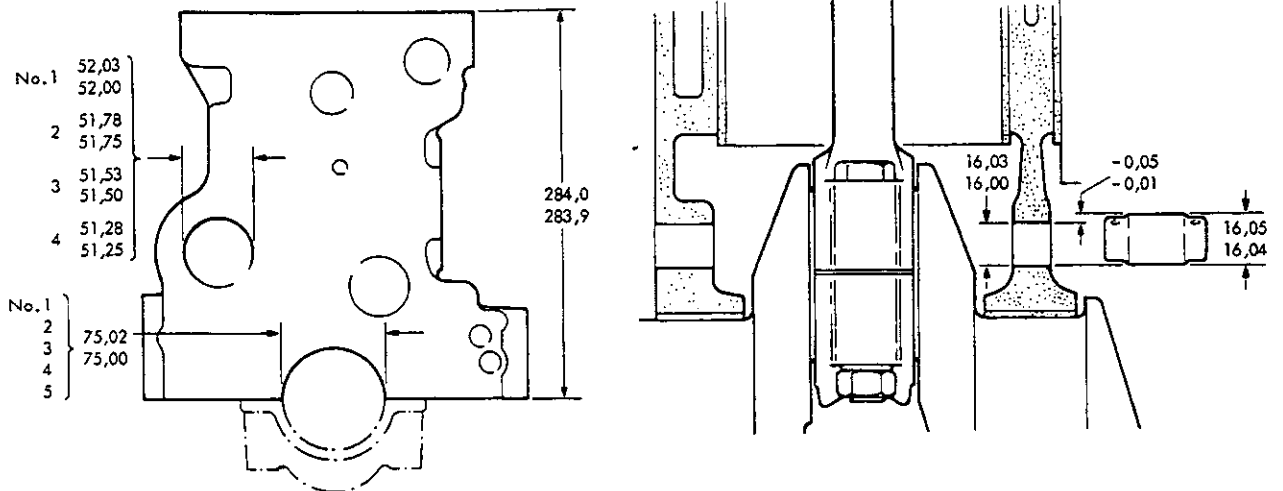


# Cylinder Block and Liner Dimensions

Millimetres

Service limits shown thus —

## Piston Cooling Jets

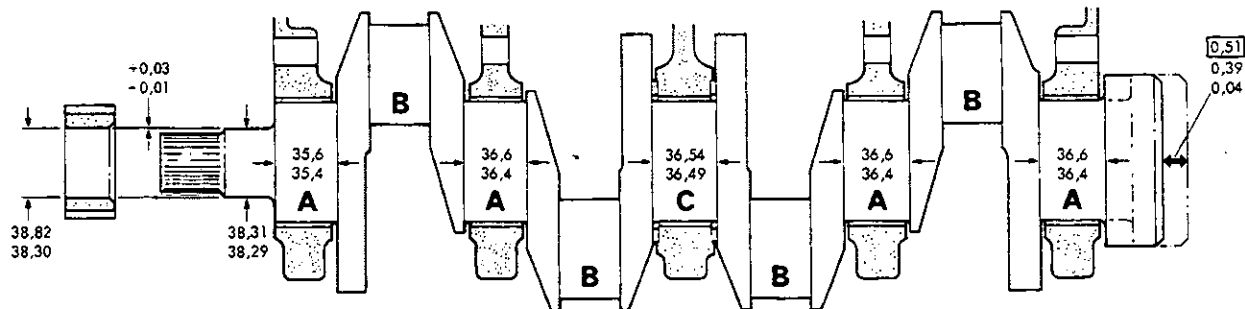


# Crankshaft and Main Bearings

From Engine Number HA005815 inclusive

Millimetres

Service limits shown thus —   



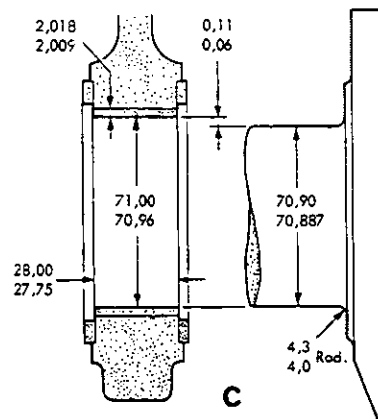
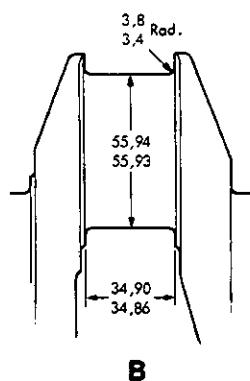
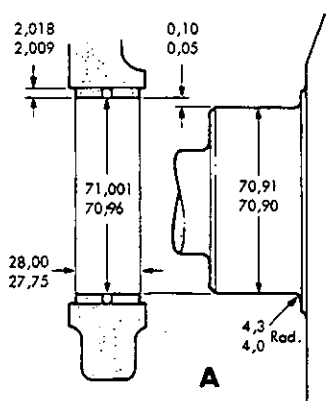
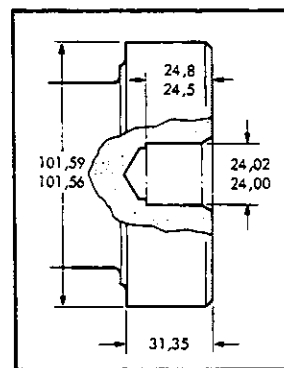
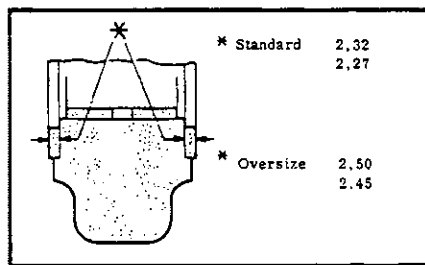
Service limits — all journals.

Ovality 0.01

Wear 0.03

Regrind undersizes — all journals

0.25  
0.50  
0.75



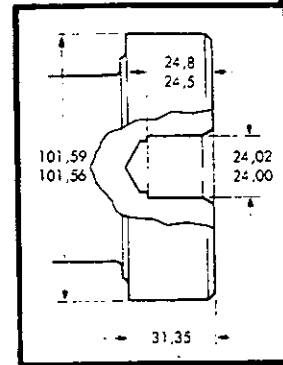
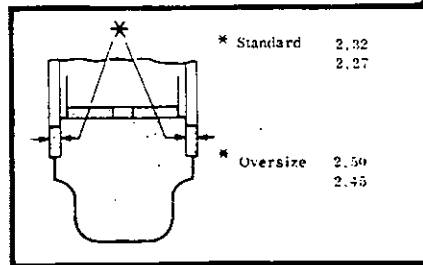
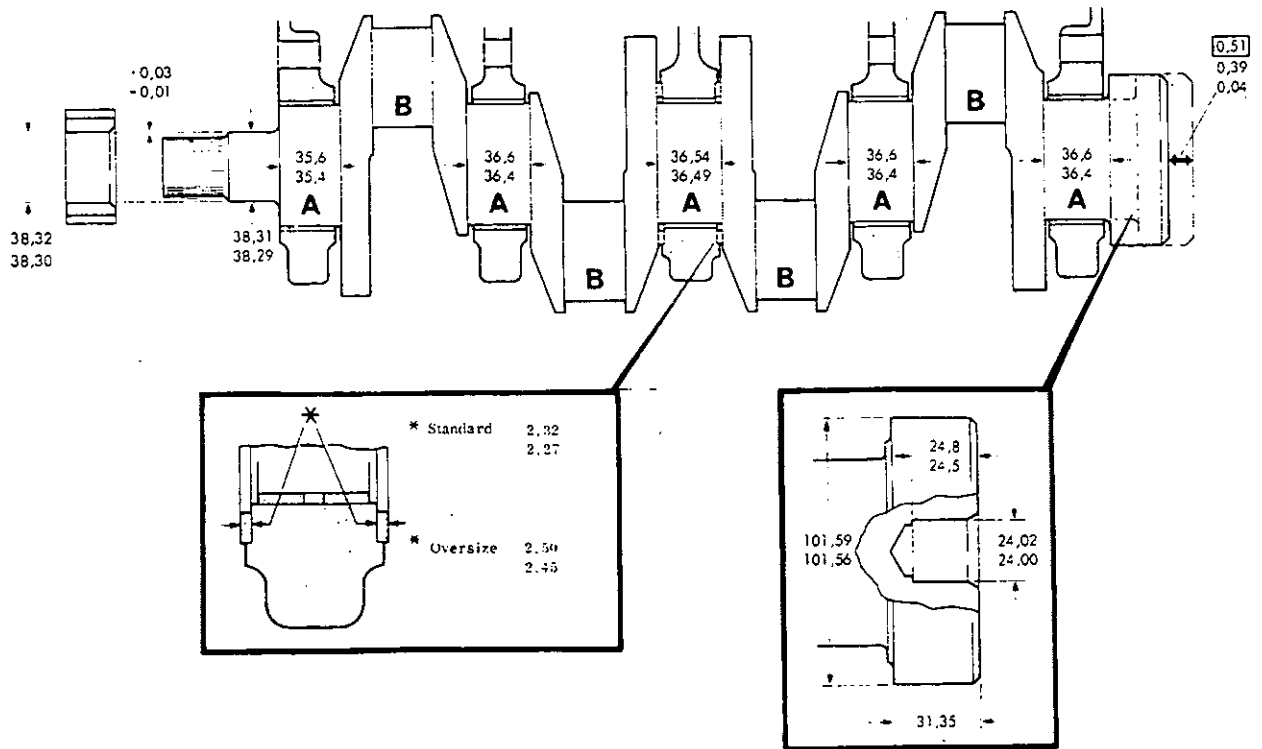
Surface finish — all journals 0,2/0,4 microns C.L.A.  
(Centre line average)

# Crankshaft

Up to Engine Number HA005814 inclusive

Millimetres

Service limits shown thus —  

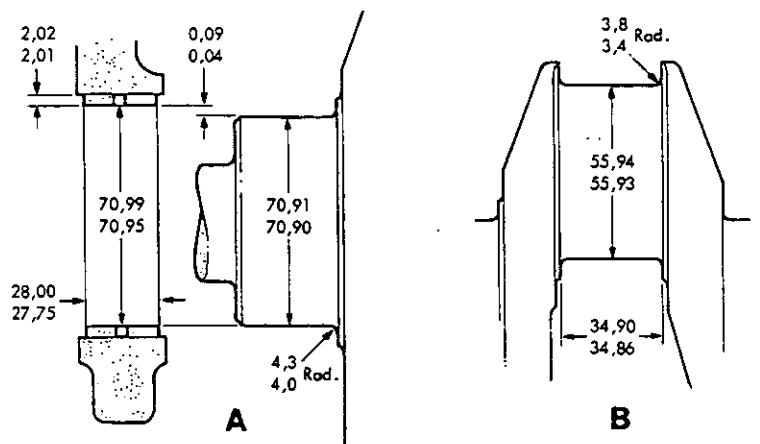


Service limits — all journals.

Ovality 0,01    Wear 0,03

Regrind undersizes — all journals }  
 0,25  
 0,50  
 0,75

Surface finish — all journals 0,2/0,4 microns C.L.A.  
 (Centre line average)





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