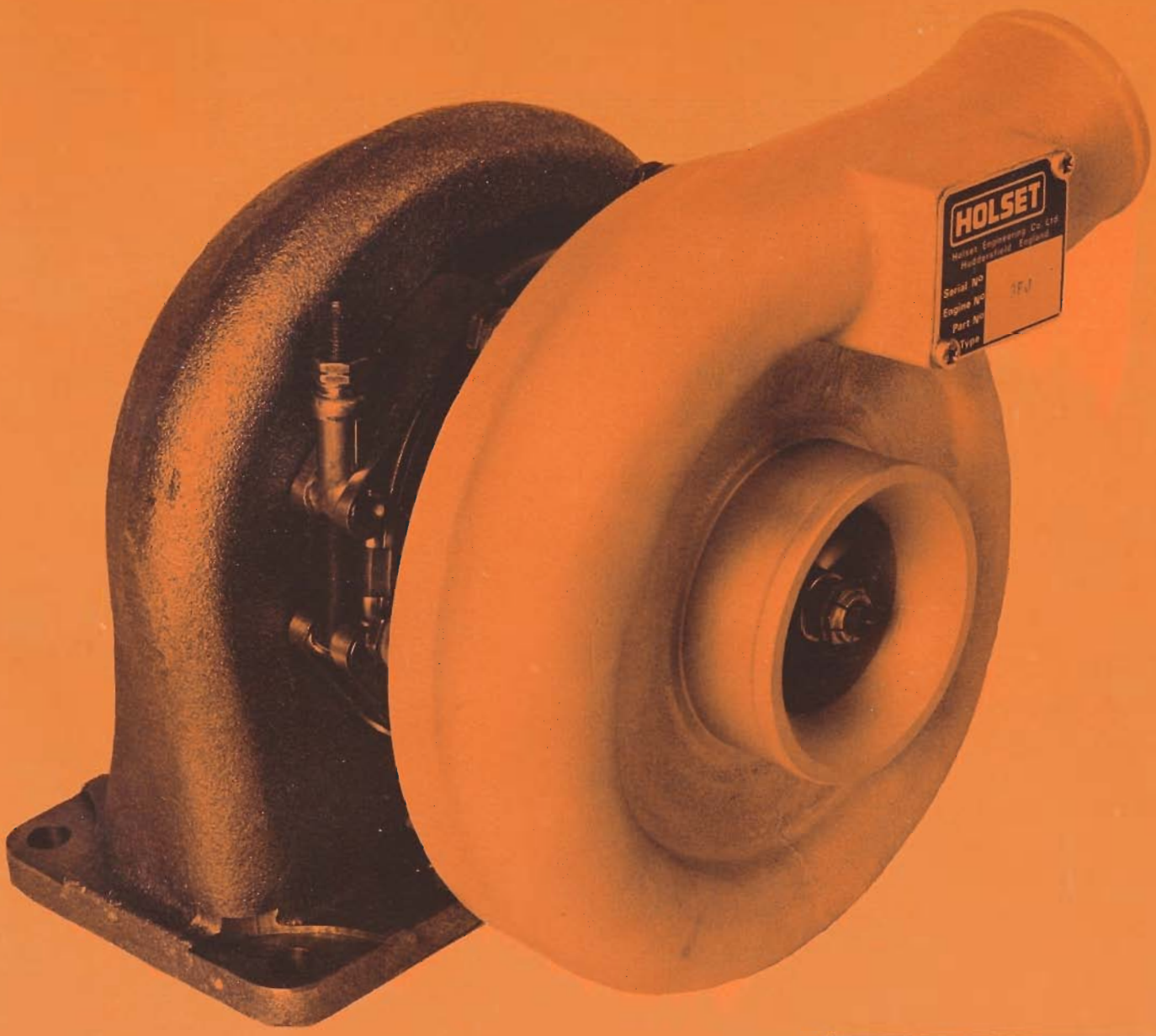
Publication No. 186

Models 3LD/3LE
3FD & 3FJ

TURBOCHARGER

A product of Holset Engineering Co. Ltd., Turnbridge, Huddersfield, England.



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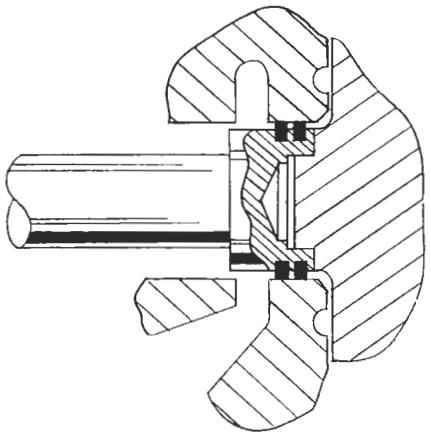
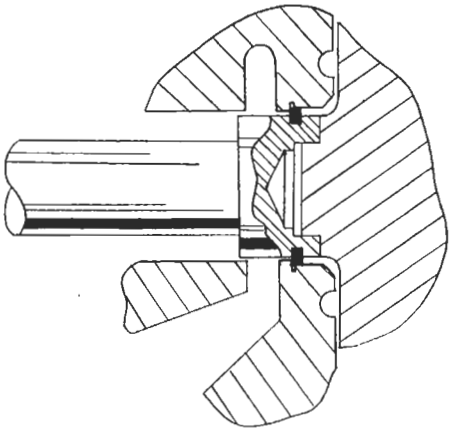
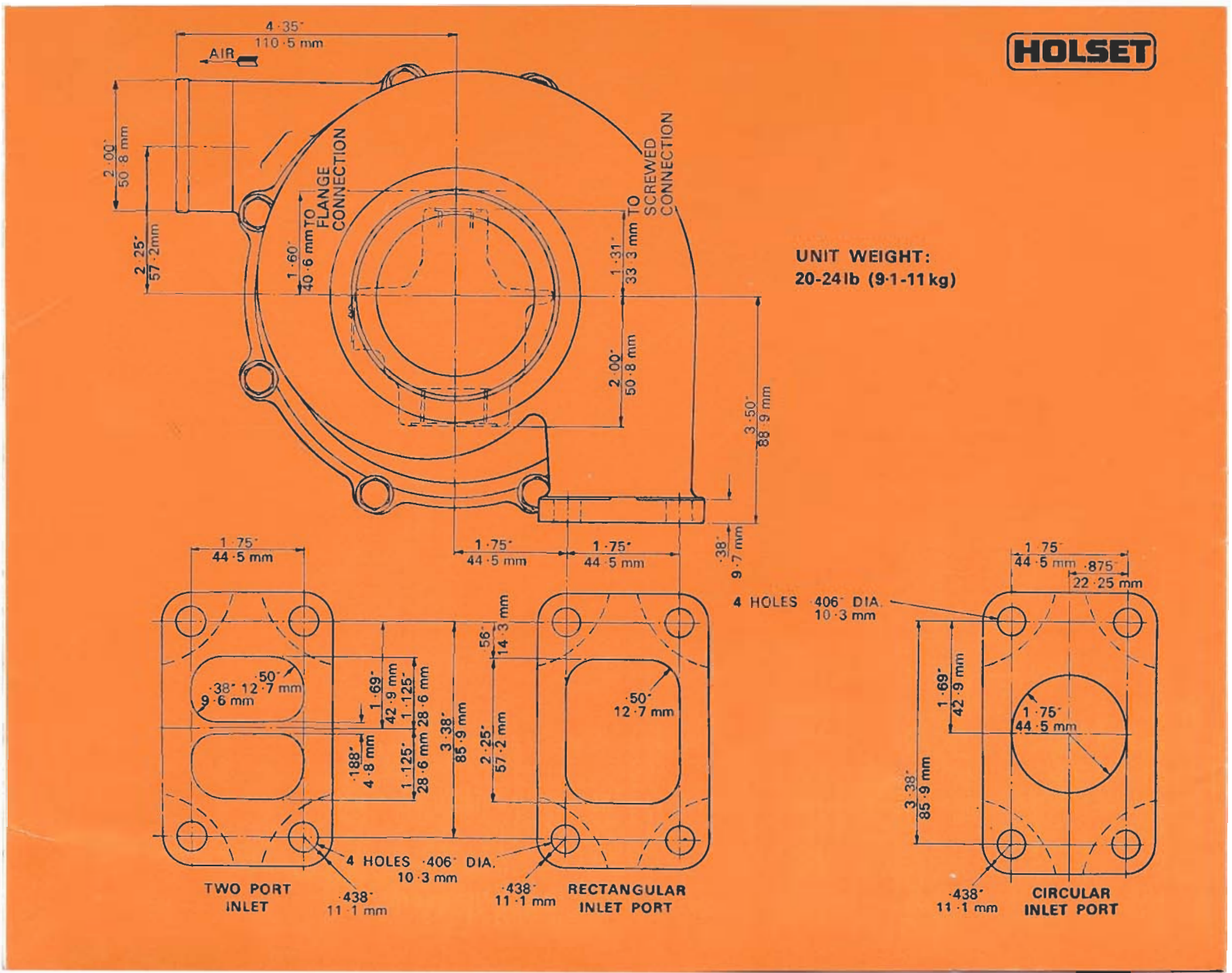
There are two types of turbine end seals available on 3L & 3F models.



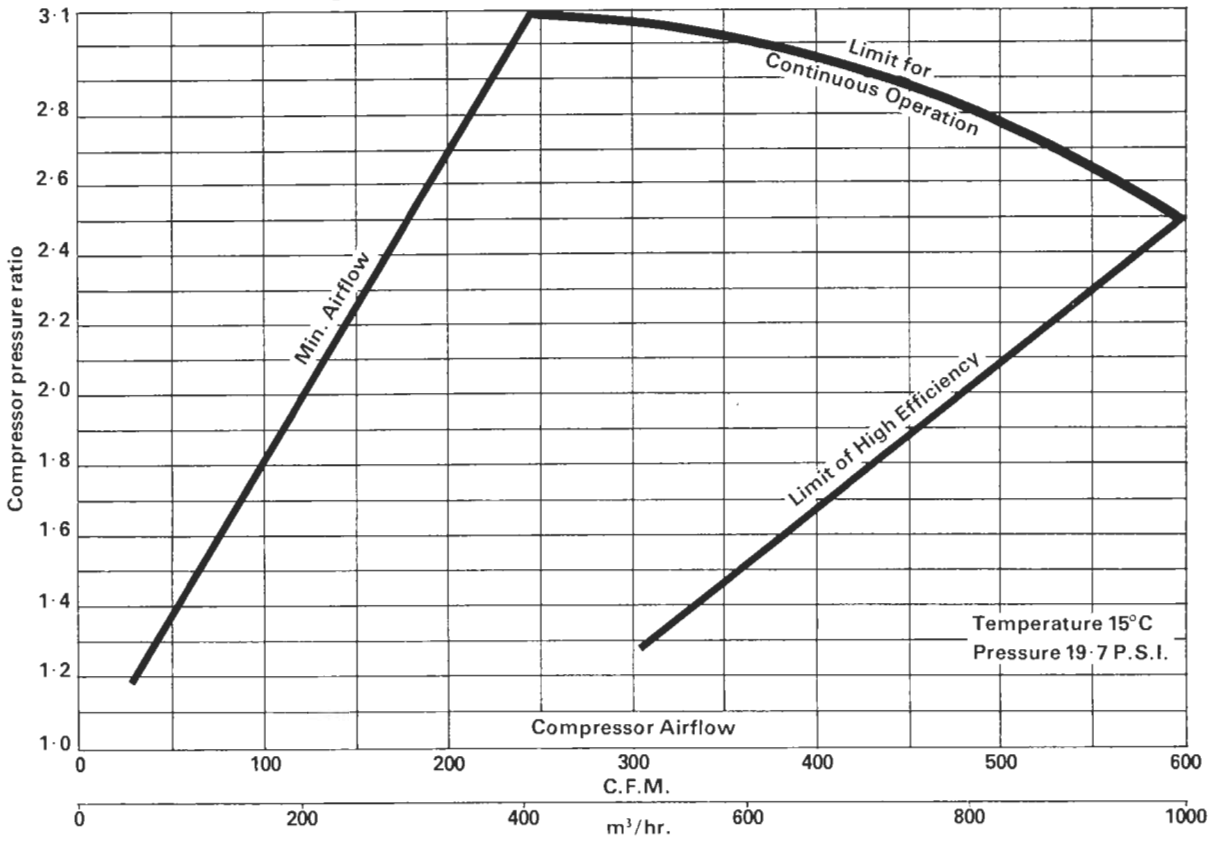
Two piston rings seal against the straight bore of the bearing housing.

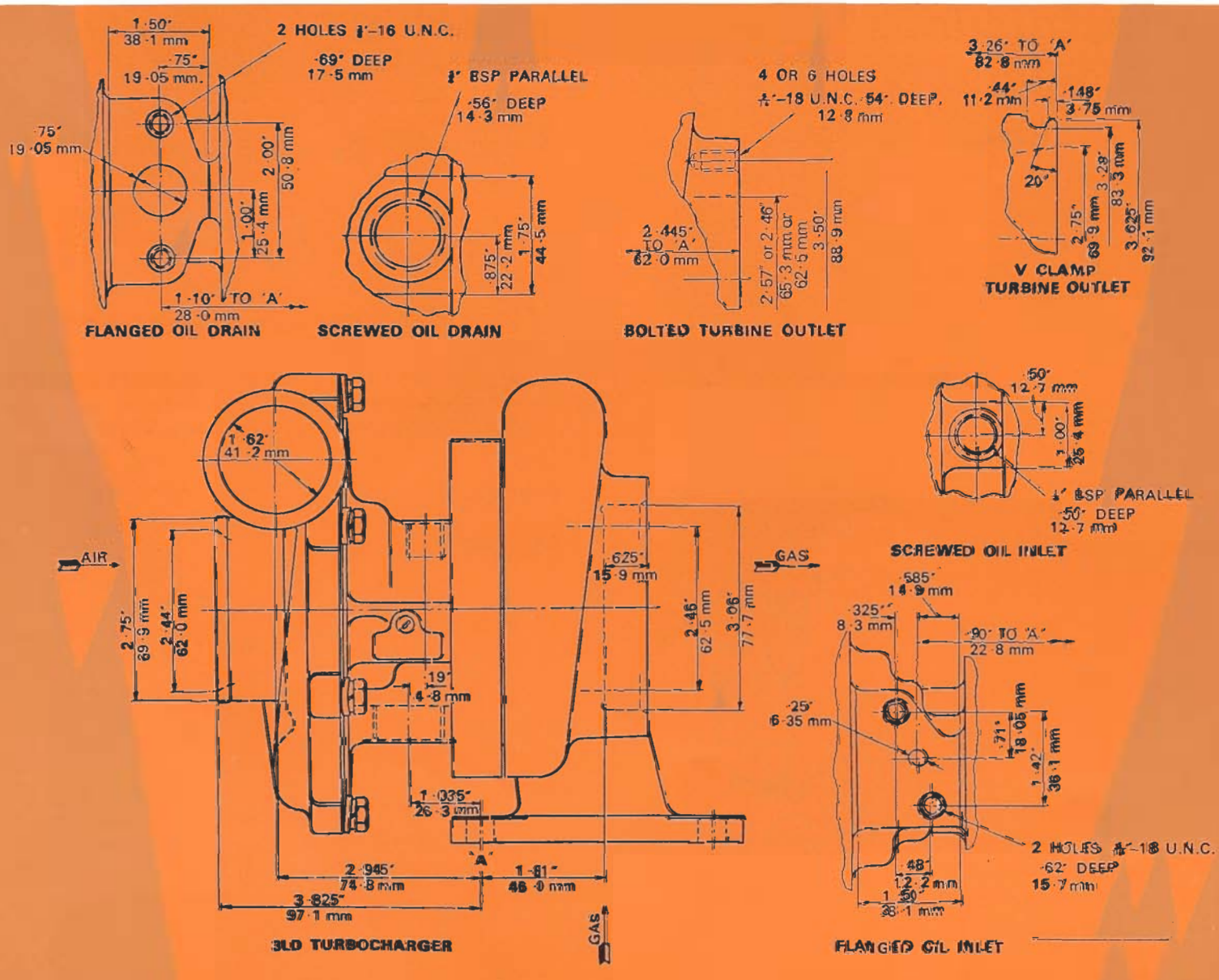


A single piston ring locates in a stepped bore bearing housing.



Models 3L & 3F Air Flow Range





Installation Data

1. Mount the turbocharger on the turbine inlet flange. All other connections must be flexible and heavy pipework should be separately supported.
2. Always position the bearing housing so that the oil drain is at the bottom.
3. Oil should be filtered below 15 microns. The oil quality must be as specified by the engine manufacturer.
4. The minimum oil pressure, when the engine is on load must be 30 lb/in² (2.0 kg/cm²) and pressures up to 60 lb/in² (4.0 kg/cm²) are satisfactory. Under idling conditions the pressure should not fall below 10 lb/in² (0.703 kg/cm²).
   Oil pressure must show at the turbocharger inlet within 3-4 seconds of the engine firing.
5. Air cleaner pressure drop should not exceed 20 in (500 mm) of water.
6. The exhaust back pressure after turbocharger should not exceed 20 in (500 mm) of water.

Instructions for Dismantling Turbochargers

Refer to sectional view for itemised parts.

1. Clamp unit upright in vice on turbine inlet flange.
2. Mark relative positions of turbine housing (22) bearing housing (8) compressor cover (18) and 'V' clamp (23).
3. Remove the eight bolts (21) and associated lockwashers (19) fastening compressor cover (18) to bearing housing (8) and lift off cover.
4. Remove the 'V' clamp locknut and spring the 'V' clamp (23) back on to the bearing housing (8). Lift the core assembly clear of the turbine housing (22).
5. Holding the turbine wheel at the hub with a $\frac{5}{8}$ in A/F ring spanner, remove the compressor locknut (7) with a $\frac{1}{2}$ in A/F spanner.
6. Slide the compressor wheel (6) off the shaft.
7. Using Circlip pliers Seeger J/31 remove the large retaining ring (14) which retains compressor insert (13). Two screw drivers should be used to lift insert (13) from bearing housing (8). Remove 'O' ring (12) from insert.
8. The individual parts of the thrust assembly can now be lifted out:-
   (a) Spacer sleeve (5) can now be pushed out of insert (13).
   (b) Oil deflector (11) can be lifted from the two groove pins.
   (c) Remove thrust ring (4).
   (d) Remove thrust plate/bearing.
   (e) The thrust ring (17) on 3FD/FJ and some 3LD models will generally remain adhered to the bearing by a residual oil film, and hence is removed with the bearing.

   NOTE: The groove pins are a press fit in the bearing housing (8) and should not be removed.
9. Remove the shaft and turbine wheel assembly (2) together with piston ring(s) (3).
10. Insert finger tip into bore of bearing (9) and remove (with thrust washer (17) on 3FD/FJ models).
11. Carefully expand and remove piston rings (3) from both the spacer sleeve and turbine wheel and shaft assembly.

CAUTION: Over-expansion of piston ring will cause a permanent set or break the ring.

Cleaning Procedure

1. Use a commercially approved cleaner only. Caustic solutions will damage certain parts and should **NOT** be used.
2. Soak parts in cleaner until all deposits have been loosened.
3. Use a plastic or bristle type brush on aluminium parts. Vapour blast may also be used providing the shaft and other bearing surfaces are protected.
4. Clean all drilled passages with compressed air jet.
5. Make certain that surfaces adjacent to wheels on stationary housings are free of deposits and are clean and smooth.

Internal Parts Inspection

1. Shaft and turbine wheel assembly.
   (a) Inspect bearing journals for excessive scratches and wear. Minor scratches may be tolerable.
   (b) Inspect piston ring groove walls for scoring. Minor scratches are acceptable.
   (c) Check carefully for cracked, bent or damaged blades but **DO NOT ATTEMPT TO STRAIGHTEN BLADES.**
2. Thrust Parts.
   (a) Replace if thrust faces are mutilated. Minor scratches are acceptable.

(b) Replace thrust plate/bearing if faces are worn excessively, unevenly or are severely scratched and otherwise mutilated.
(c) The small feed grooves in the thrust plate/bearing must be clean and free of obstruction.

3. Compressor wheel.
   Check carefully for cracked, bent or damaged blades, but **DO NOT ATTEMPT TO STRAIGHTEN BLADES.**

NOTE: It is imperative that the rotor (items 2, 4, 5, 6 and 7 Fig. 1) is check balanced on all 3F models. Ensure that the factory markings on rotor parts are in alignment when checking balance and when assembling the turbocharger. Excessive imbalance must be corrected by a specialist. (See Holset publication 'Balancing Turbochargers' for details.)

4. Bearings.
   Replace bearings for excessive scratches and wear.
5. Bearing Housing.
   Replace bearing housing if bearing or piston ring bores are excessively scratched or worn.
6. Spacer sleeve.
   Replace if piston ring groove or spacer are damaged.
7. 'O' Ring.
   Replace if section through ring has taken a permanent set indicated by flats on the sides of the ring.
8. Turbine Housing.
   Inspect profile for damage due to contact with rotor, cracks, flaking or signs of overheating. Slight damage may be tolerated otherwise replace the housing.
9. Compressor Cover.
   Inspect profile for damage due to contact with rotor. Slight damage may be tolerated, otherwise replace the cover with a new one.

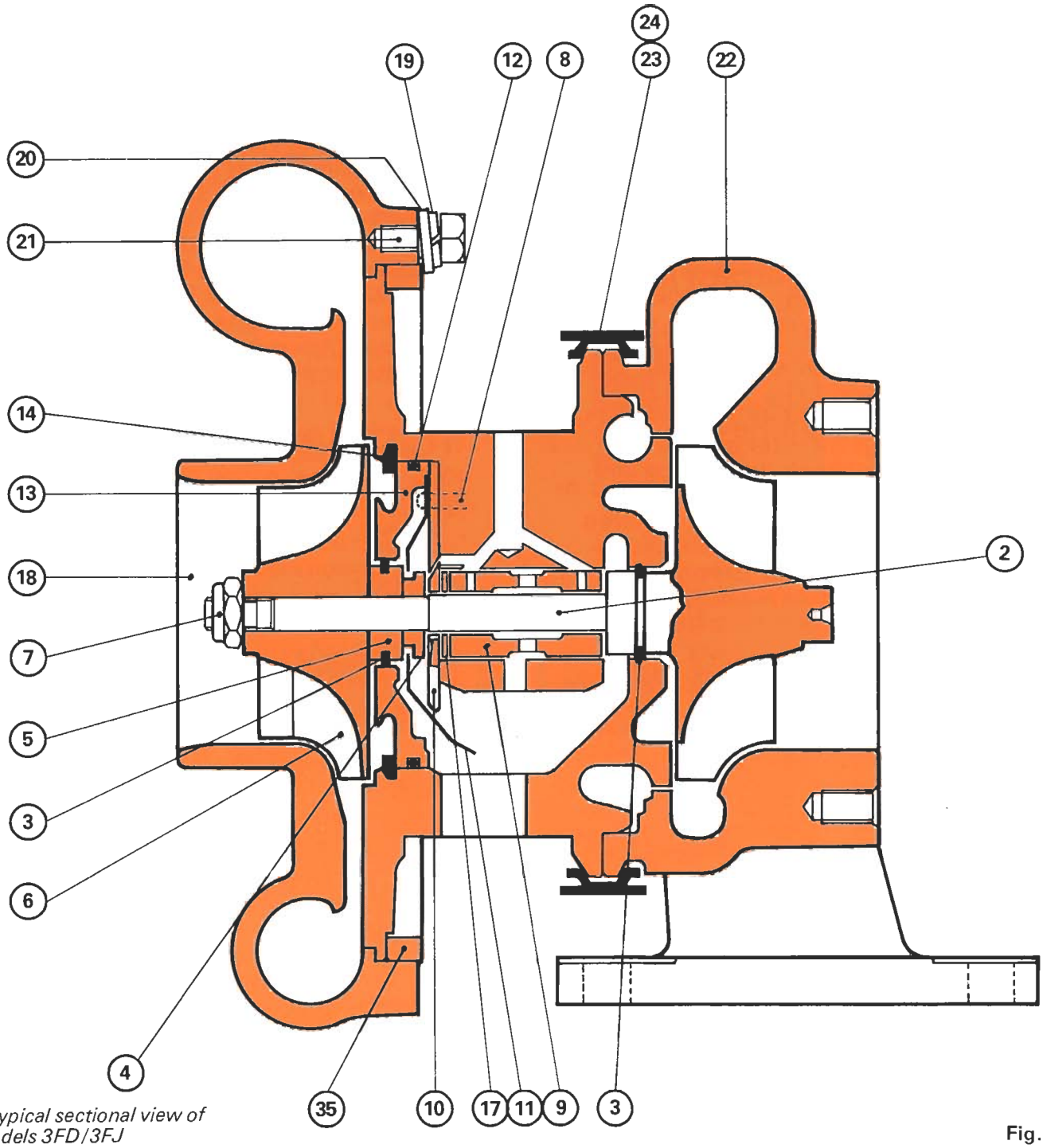
Instructions for Assembling Turbochargers

When the turbocharger has been thoroughly cleaned, inspected and any damaged parts replaced, assembly can commence. Assembly of the unit is the reverse of dismantling, but it is advised that the following points be noted, if a satisfactory re-build is to be obtained.

(a) Lubricate bearings, thrust assembly, piston rings and rotor shaft, with clean engine oil.
(b) When replacing turbine wheel and shaft (2) into bearing housing (8) and spacer sleeve (5) into insert (13) do not force piston ring(s) into bore as an off-centred ring will fracture causing the shaft to bind.
(c) The large retaining ring (14) should have bevelled side facing outwards.
(d) Torque locknut (7) to 13 ft/lb (1.8m.kg), bolt (21) to 5 ft/lb (0.7 m.kg), and 'V' clamp locknut (23) to 10 ft/lb (1.4 m.kg).
(e) On completion spin shaft to ensure that it rotates freely.

Installation Check List

1. Inspect air intake system for cleanliness and foreign material.
2. Inspect exhaust manifold for foreign material.
3. Inspect oil drain line. Make certain that line is not blocked.
4. Inspect oil supply line for blockages, deterioration or possibility of leakage under pressure.
5. Inspect the turbocharger mounting pad on the manifold to make certain that all of the old gasket has been removed.
6. Install new gasket between turbo and manifold. Make certain that gasket does not protrude into opening of manifold. Opening in gasket should be preferably $\frac{1}{16}$ in away from edge of opening in manifold.
7. Install and tighten mounting bolts.
8. Connect oil supply line but leave oil drain line disconnected at this time.
9. Connect compressor inlet and outlet piping. Check all joints for possible leaks. Make certain that piping is not producing strain on compressor cover.
10. Crank engine without firing until a steady flow of oil is noted coming from oil drain line.
11. Stop cranking, connect oil drain to crankcase.



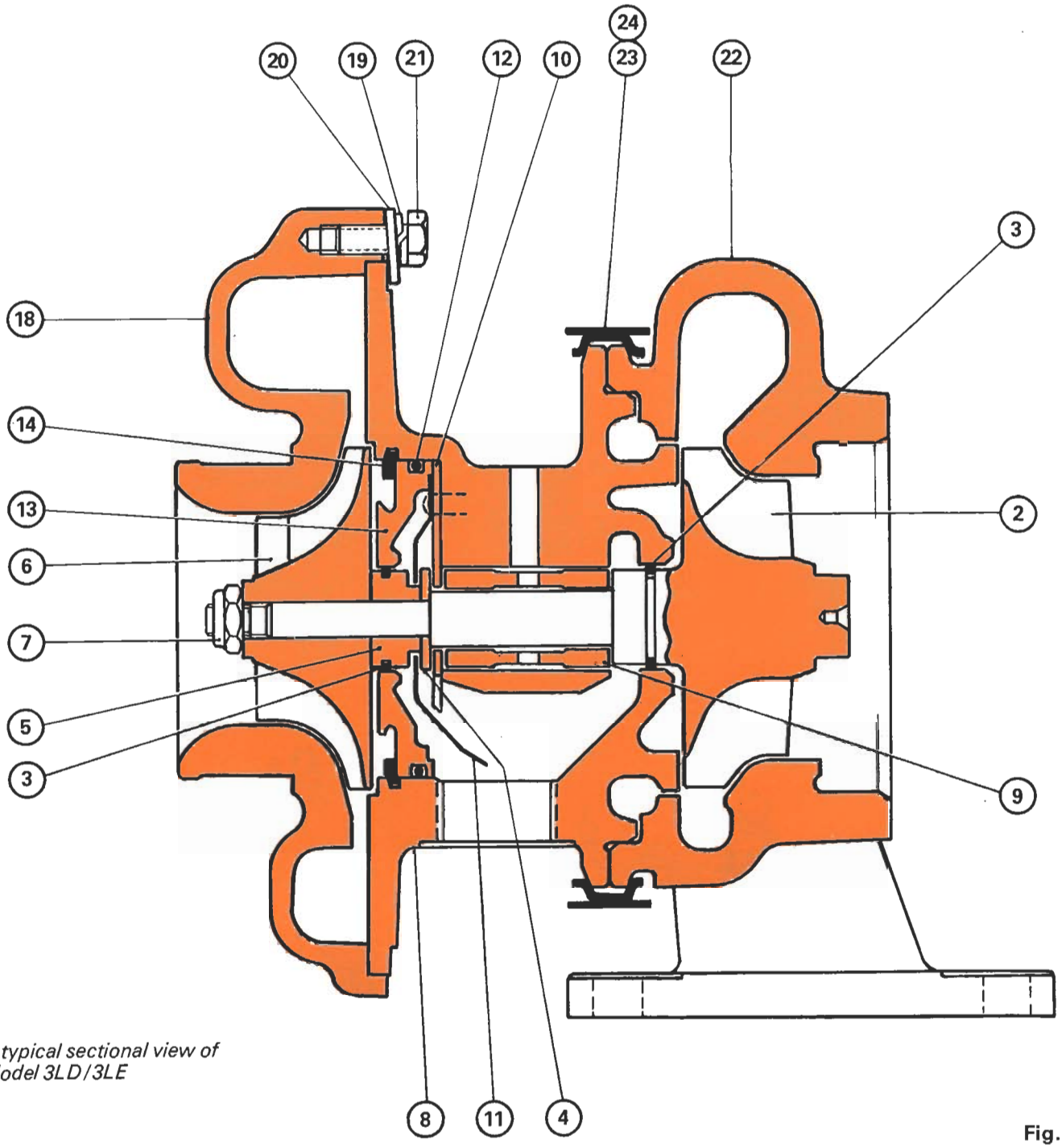
A typical sectional view of Models 3FD/3FJ

Fig. 1

Parts list

Item No	Name of Part	Quantity Per Turbo
1	CORE ASSEMBLY	
2	SHAFT & TURBINE WHEEL ASSEMBLY	1
3*	PISTON RING	2 or 3
4*	THRUST RING	1
5	SPACER SLEEVE	1
6	COMPRESSOR WHEEL	1
7*	LOCKNUT	1
8	BEARING HOUSING & PIN ASSEMBLY	1
9*	BEARING	1
10*	THRUST BEARING	1
11	OIL DEFLECTOR	1
12*	'O' RING	1
13	INSERT	1
14	RETAINING RING	1
15	SERIAL NAMEPLATE (Not Shown)	1
16	SELF-TAPPING SCREW (Not Shown)	3
17	THRUST WASHER	1
18	COMPRESSOR COVER	1
19*	LOCKWASHER	8
20*	WASHER	8
21	BOLT	8
22	TURBINE HOUSING	1
23	'V' CLAMP	1
24	LOCKNUT ('V' CLAMP) (Not Shown)	1
25*	TURBINE INLET GASKET (Not Shown)	1
26*	OIL INLET GASKET (Not Shown)	1
27*	OIL DRAIN GASKET (Not Shown)	1
35	CLAMPING RING	1

*Items marked * are supplied in the standard Overhaul Kit.*
The Core Assembly comprises items 2 to 18 inclusive.



A typical sectional view of Model 3LD/3LE

Fig. 2

Parts list

Item No	Name of Part	Quantity Per Turbo
1	CORE ASSEMBLY	
2	SHAFT & TURBINE WHEEL ASSEMBLY	1
3*	PISTON RING	2 or 3
4*	THRUST RING	1
5	SPACER SLEEVE	1
6	COMPRESSOR WHEEL	1
7*	LOCKNUT	1
8	BEARING HOUSING & PIN ASSEMBLY	1
9*	BEARING	1
10*	THRUST PLATE	1
11	OIL DEFLECTOR	1
12*	'O' RING	1
13	INSERT	1
14	RETAINING RING	1
15	SERIAL NAMEPLATE (Not Shown)	1
16	SELF-TAPPING SCREW (Not Shown)	1
18	COMPRESSOR COVER	1
19*	LOCKWASHER	8
20*	WASHER	8
21	BOLT	8
22	TURBINE HOUSING	1
23	'V' CLAMP	1
24	LOCKNUT ('V' CLAMP) (Not Shown)	1
25*	TURBINE INLET GASKET (Not Shown)	1
26*	OIL INLET GASKET (Not Shown)	1
27*	OIL DRAIN GASKET (Not Shown)	1

*Items marked * are supplied in the standard Overhaul Kit.*
The Core Assembly comprises items 2 to 16 inclusive.

HOLSET

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