

# S400 TURBOCHARGER SERVICE INSTRUCTIONS

# Schwitzer

## S400 TURBOCHARGER

### Introduction

These Service Instructions cover the recommended procedures for overhauling Schwitzer model S400 turbochargers.

These instructions should be used in conjunction with the latest issue of the "Hundred Series Turbocharger Service Limits and Torque Values" Data Sheet.

Always use a Schwitzer Overhaul Kit when servicing a Schwitzer turbocharger and ensure that any replacement parts used are the correct Original Schwitzer parts as specified in the appropriate Turbocharger Parts List.

Please note that unless specialist dynamic balancing equipment is available no attempt should be made to service the cartridge assembly of the turbocharger.



### WORKSHOP EQUIPMENT

To service a Schwitzer S400 turbocharger it is necessary to have the tools and equipment listed below.

In addition you will need a clean work area and the appropriate Schwitzer Overhaul Kit.



Securely mounted vice

Stiff natural or wire brush

Plastic scraper

A source of clean compressed air

Non-flammable solvent

Squirt can of clean engine oil

Internal circlip pliers (0° tip angle.)

Internal circlip pliers (90° tip angle.)

Snap-action torque spanner

Vee block

Vapour blasting equipment

Sand blasting equipment

Dynamic balancing equipment

Shaft stretch measurement equipment

Long reach socket

11mm (7/16 ins)

T - handle wrench

18mm (3/4 ins)

(prevents bending in the shaft during stretch)

Two standard, flat ended, screw drivers.

305mm length (12 ins)

Plastic tipped mallet

500gms (16oz)

2 x Dial indicator, range: 0-25mm (0-1 ins) and 0-2.5mm (0-0.1 ins)

2 x 12 point socket 20mm (13/16 ins) and 21mm (7/8 ins)

Torque wrench

70 Nm (0-600 lbs/ins)

**SCHWITZER  
HUNDRED SERIES  
TECHNICAL DATA SHEET**

# S400 TURBOCHARGER

Parts List			
1. Compressor cover		8. Insert O ring	1
2. Compressor locknut	1	9. Piston ring (Compressor)	1
3. Compressor wheel		10. Flinger sleeve	
4. V-Clamp (Compressor end)		11. Oil deflector	
5. V-Clamp Locknut (Compressor End)	1	12. Thrust sleeve	1
6. Circlip		13. Thrust bearing	1
7. Insert		14. Journal bearing circlip	4
		15. Journal bearing	2
		16. Bearing housing O ring (optional)	1
		17. Bearing Housing	
		18. Piston ring (Turbine)	1
		19. Turbine backplate	
		20. V-Clamp (Turbine end)	
		21. V-Clamp Locknut (Turbine End)	1
		22. Shaft and Turbine wheel	
		23. Turbine housing	

Parts listed in red are contained in a full S400 Overhaul Kit

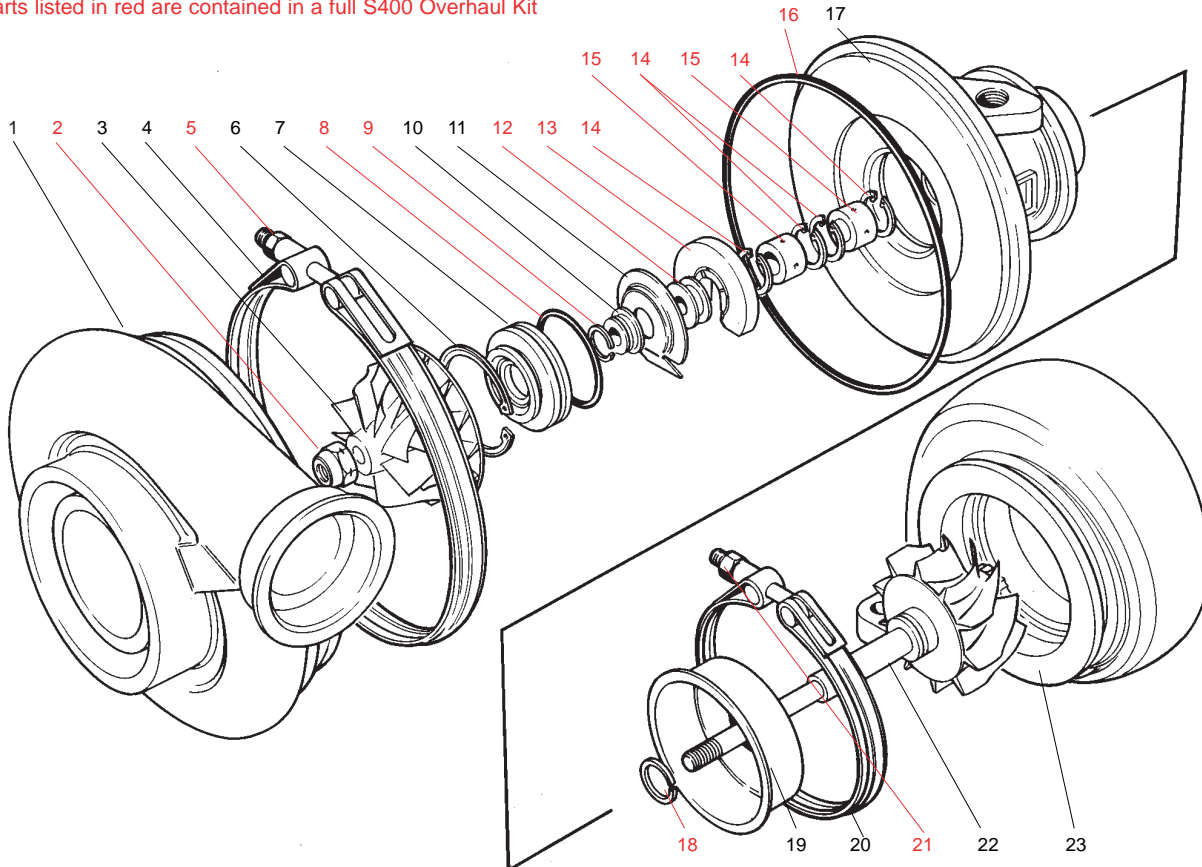


Fig. 1

## DISMANTLING.

**IMPORTANT: Disassembly nullifies Schwitzer warranty responsibility so it is important to check that the turbocharger is no longer under warranty before dismantling.**

1. Mark the relative positions of the turbine housing and compressor cover to the bearing housing.
2. Check the motion of the shaft for excessive radial or axial play. Refer to the 'Service Limits and Torque Values' Data Sheet.
3. Rest the turbocharger on the bench and loosen the turbine housing V-Clamp. Disengage from the bearing housing flange.
4. Lift off the turbine housing.
5. Repeat 3 for the compressor cover and carefully lift the cartridge assembly from the compressor cover.
6. Clamp the 12 point socket wrench in the vice and place the hub of the turbine wheel into the socket so that the shaft is in a vertical position. (Fig. 2)
7. Holding the cartridge in one hand release the compressor locknut.

**NOTE:** Left hand thread. Over tightening the nut may cause yield in the shaft.

8. Remove the nut and slide off the compressor wheel.
9. Carefully remove the shaft from the bearing housing assembly by gently tapping the shaft with a small soft faced hammer.  
TAKE CARE NOT TO BEND OR DAMAGE THE SHAFT.
10. Remove the turbine backplate and sit the bearing housing on the turbine backplate.

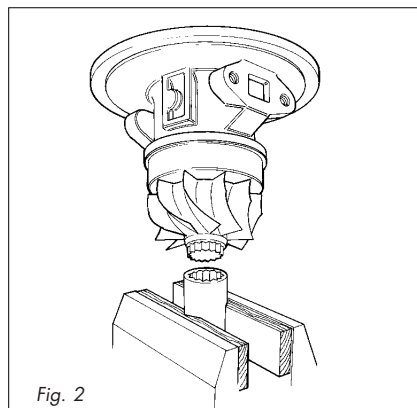
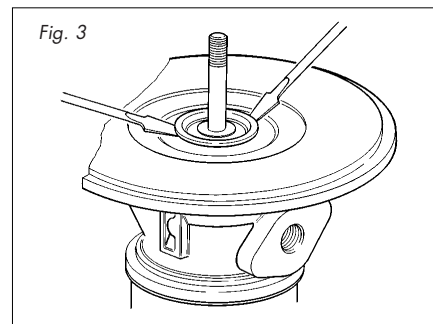


Fig. 2

11. Remove the insert circlip using the circlip pliers. Remove the insert assembly using two levers and remove the flinger sleeve from the insert. (Fig 3).



12. Remove the oil deflector, thrust bearing and thrust sleeve from the bearing housing.
  13. Using circlip pliers, remove the outer circlip from both ends of the bearing housing.
  14. Remove the journal bearings.
- NOTE:** New bearings should be fitted on re-assembly.
15. Remove inner circlips.

## PARTS CLEAN-UP PROCEDURE

Cleaning is generally done by soaking the components in commercially available non-caustic solvent, wiping, brushing or scraping any residue off and then blow drying with clean compressed air. However, vapour blasting is a good alternative if available, providing the vapour blasting equipment manufacturers instructions are carefully followed and critical surfaces are appropriately protected (see details below).

If parts are to be stored for any length of time after cleaning then they should be stored in clean, dry plastic bags and the surfaces of all potentially rusting parts should be oiled prior to storage.

### 1. Bearing Housing

- Scrape, brush or wipe as appropriate, to remove accumulations of residue from the exterior surfaces.
- Immerse briefly in safety solvent to remove any oily residue.
- Blow dry with compressed air.

N.B. If vapour blasting is used mask the bore with corks or rubber stoppers.

### 2. Compressor Wheel

- Immerse briefly in safety solvent to remove any traces of oily residue.
- Blow dry with compressed air.

N.B. If vapour blasting then take care to mask the bore with corks or rubber stoppers.

### 3. Shaft and Wheel

- Immerse briefly in safety solvent to remove any traces of oily residue.
- Blow dry with compressed air.

N.B. If vapour blasting then take care to mask the entire shaft section with either appropriately sized rubber hose or adhesive backed cloth tape.

- After cleaning mount the shaft and wheel between centres in a lathe and lightly polish the journal section of the shaft at 300 to 600 rpm with 400 grit abrasive paper and clean oil.

NOTE: If the shaft and wheel shows any evidence of imbalance (bearing material smeared on only one side of the shaft) - do not attempt to reuse.

- After polishing re-immerses briefly in safety solvent and blow dry with compressed air.

### 4. Compressor cover

- Scrape, brush or wipe, as appropriate, to remove accumulations of residue from the exterior surfaces.
- Immerse briefly in safety solvent to remove any oily residue.
- Blow dry with compressed air.

N.B. No masking necessary if vapour blasting.

### 5. Turbine Housing and Backplate

- Blast with coarse sand or steel grit to obtain total interior and exterior cleanliness.
- Immerse briefly in safety solvent to remove residues.
- Blow dry with compressed air.

### 6. V Clamps

- Immerse in safety solvent agitating moderately until foreign material deposits have been softened or dissolved.
- Blow dry with compressed air.

### 7. Small Internal Parts

- Immerse briefly in clean safety solvent to remove oily residues.
- Wipe dry with a clean cloth.

- Dynamically balance the shaft and wheel assembly, referring to the 'Service Limits Tables'. Do not attempt to straighten a bent shaft.

### 4. Compressor Cover

Inspect visually for evidence of contour damage (as from high speed wheel contact). Reject and replace if damage is excessive. It is permissible to polish out minor surface damage in the contour.

### 5. Turbine Housing and Backplate

Inspect visually for evidence of contour damage (as from high speed wheel contact) and for evidence of overtemperature damage such as cracking, pitting, distortion or erosion. Reject and replace if damage is excessive.

### 6. Insert

Inspect the insert bore for evidence of surface damage. If there is evidence of contact with rotating components or if the piston ring wear has created a ridge the insert should be rejected and replaced.

### 7. Flinger Sleeve

Inspect visually for evidence of surface damage from contact with stationary parts. If piston ring wear has caused the ring groove to deteriorate from its original rectangular configuration reject and replace the flinger sleeve.

### 8. V Clamps

Inspect visually for evidence of cracks or distortion of the clamp and T-bolt threads. Reject and replace if damage is excessive.

## INSPECTION OF PARTS FOR RE-USE

It is recommended that all visual and dimensional checking of parts for re-use be done after parts have been cleaned as described above. Critical dimensions mentioned below are given in the latest issue of the 'Hundred Series Service Limits and Torque Values' Data Sheet.

### 1. Bearing Housing

- Inspect visually for evidence of cracks and fractures, pitting of gasket and other machined surfaces, or distortion of the turbine end flange. Reject and replace if any of the above conditions are severe.
- Closely inspect the bearing bore visually for signs of damage or wear. The condition of the removed bearings will be a good indicator of the bore condition. Refer to 'Service Limits Tables' for maximum bore diameters. Reject and replace if bore condition is substandard.
- Examine the turbine end seal bore for damage and replace bearing housing if wear is excessive.

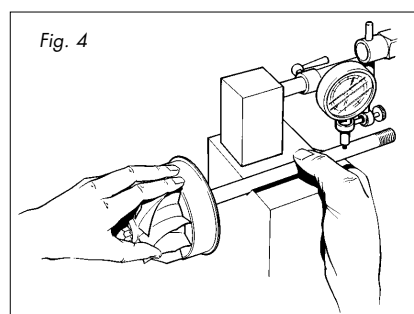
N.B. Do not mistake the machined step and relief groove for a wear ridge.

### 2. Compressor Wheel

Inspect visually for evidence of bent, burred, nicked or eroded blades and for evidence of scuffing on the back face. Dynamically balance the Compressor wheel and reject and replace if any damage has affected wheel balance. Do not attempt to straighten bent blades.

### 3. Shaft and Wheel

- Inspect visually for evidence of bent, burred, nicked or eroded blades and for evidence of scuffing on the back face. Very minor damage is acceptable but reject and replace if the damage appears sufficient to affect wheel balance. Do not attempt to straighten bent blades.
- Inspect hub visually for evidence of smearing (as with high speed contact with the bearing house bore) and for deterioration of the original rectangular configuration of the piston ring groove. Reject and replace if the damage or wear is excessive.
- Inspect journal diameter for wear. If this appears reusable the diameter should be checked with a micrometer referring to the 'Service Limits Tables'.



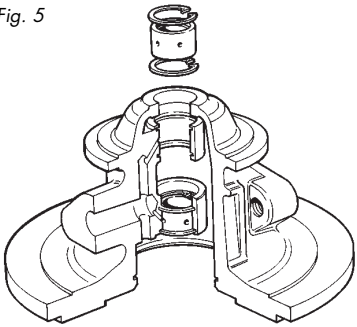
- Measure eccentricity between the large and small shaft diameters with a test dial indicator and vee-block, referring to 'Service Limits Tables'. (Fig. 4).

## S400 ASSEMBLY.

When reassembling the turbocharger a Schwitzer Overhaul Kit should always be used (see Parts List on the S400 Exploded View).

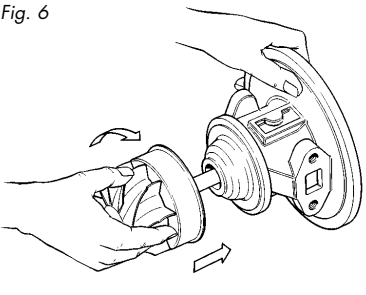
1. Re-use only parts complying with the "Inspection of Parts for re-use" guidelines.
2. Ensure all parts to be re-used have been thoroughly cleaned as described in the "Parts Clean-Up Procedure".
3. Fit inner circlips to the bearing housing with the chamfered edge towards the bearing (Fig. 5).
4. Lubricate the new journal bearings with clean oil and fit into the bearing housing, using the outer circlips with the chamfered edge towards the bearing. (Fig. 5)

Fig. 5



5. Fit the new piston ring into the second groove in the hub of the shaft.
6. Place the bearing housing on the bench turbine end uppermost and fit the backplate.
7. Lubricate both shaft and piston ring with clean oil and fit the shaft and wheel assembly into bearing housing (Fig. 6). TAKE CARE NOT TO DAMAGE THE PISTON RING.

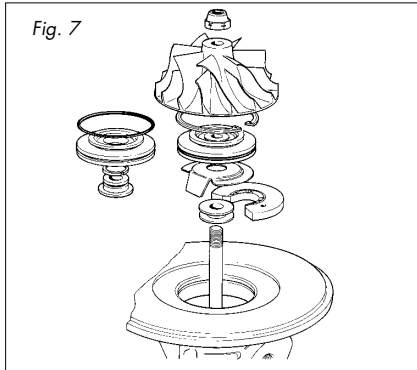
Fig. 6



8. Place the assembly into the turbine housing with the shaft vertically up.
9. Lubricate the new thrust bearing surfaces and fit the new thrust sleeve.

10. Fit the thrust bearing assembly into the bearing housing engaging on the locating pin, then fit the oil deflector with the oil deflector tongue fitting into the cutaway section of the thrust bearing (Fig. 7).

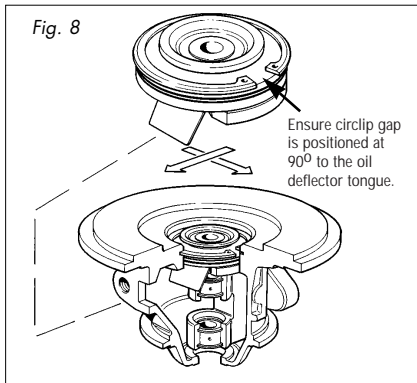
Fig. 7



11. Fit the **new** 'O' ring onto the insert and a new piston ring into the flinger sleeve.
12. Fit the flinger sleeve assembly into the insert. TAKE CARE NOT TO DAMAGE THE PISTON RING.
13. Lubricate the insert 'O' ring and press the insert into the bearing housing. Fit the circlip with the gap at 90 degrees to the cutaway section in the thrust bearing (Fig. 8).

ENSURE THE BEVELLED EDGE IS UPPERMOST AND THE INSERT IS PRESSED HOME FLAT.

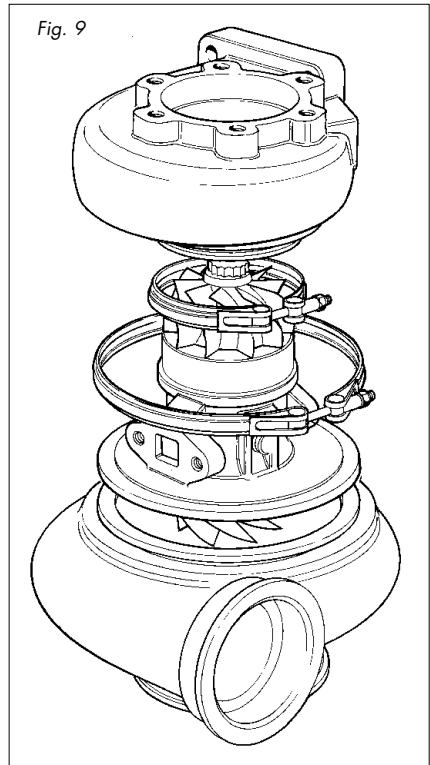
Fig. 8



14. Fit the compressor wheel and new locknut.
15. Using the appropriate equipment tighten the locknut in accordance with the Fastener 'Torque Values' Table.
16. For turbochargers which have a compressor end 'O' ring, (see turbocharger Parts List to check), fit this to the compressor end of the bearing housing and lubricate with clean engine oil.

17. Rest the compressor cover on the bench with the bearing housing flange uppermost. Stretch the relevant V-Clamp and place over the flange (Fig. 9).

Fig. 9



18. Lower the bearing housing into the compressor cover. Stretch and engage the V-Clamp over both flanges.
19. Screw on the V-Clamp locknut.
20. Repeat the procedure when fitting the turbine housing.
21. Orientate the turbine housing and compressor cover to the desired position and tighten the locknuts, tapping the V-Clamps around the circumference to ensure uniform fit. Tighten in accordance with the relevant 'Fastener Torque' table.

*Whilst every care has been taken to provide accurate information in this Data Sheet Schwitzer cannot accept any liability for any inaccuracies. All rights reserved.*

**If you have any questions regarding service of Schwitzer turbochargers please contact your nearest Schwitzer location.**

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