
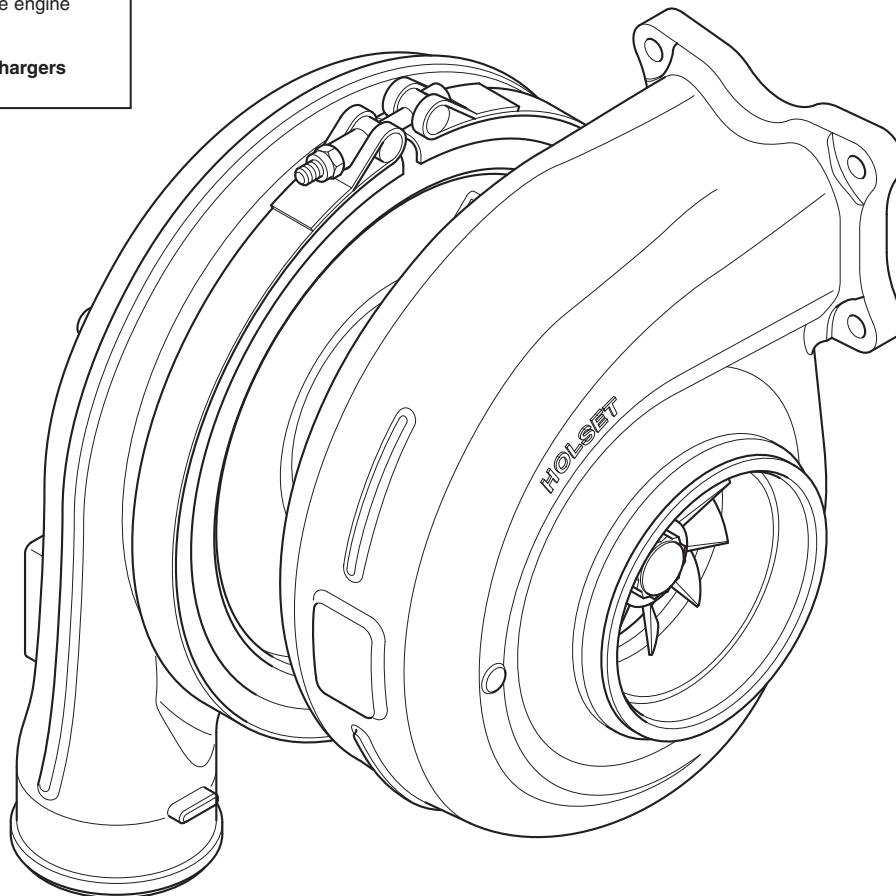


# Holset HC5A/HX80/82/83/85 HT4B/4C/80 Service Repair Manual

**WARNING**

-  Turbochargers can be hazardous when not used as specified by the manufacturer. To prevent damage and personal injury:
- Always use the turbocharger part number specified by the engine manufacturer.
  - Use only in applications approved by the engine manufacturer.
  - Do not touch before checking surface temperatures.
  - Do not work on a running turbocharger or engine.
  - Do not modify the turbocharger in any way.
  - Disassemble and re-assemble using the engine manufacturer's instructions.
  - Use only approved spare parts.
- For advice on the safe use of turbochargers contact [www.holset.com](http://www.holset.com)**



## Foreword

This publication was written to assist with turbocharger installation, maintenance and overhaul. It is not a warranty of any kind expressed or implied.

The specifications and procedures in this manual are based on information in effect at the time of publication. Holset Service reserves the right to make any changes at any time without obligation. If differences are found between your turbocharger and the information in this manual, contact your local Holset approved agent.

The latest technology and the highest quality standards are used in the manufacture of Holset Turbochargers. When replacement parts are needed, we recommend using only genuine Holset parts.

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## About the Manual

The procedures in this manual were developed to instruct in the correct overhaul of the designated turbochargers for optimum performance and minimum maintenance operation.

## How to Use the Manual

The manual is split into sections designed to provide service information in a logical sequence. The manual contains links to help the user navigate between relevant sections. Users who are unfamiliar with navigating in PDF documents are referred to Navigating in PDF documents in the **Adobe® Acrobat® Reader™** help file.



Contents is an interactive page with links to all the sections. It can be accessed from any page in the manual by clicking this icon.

Section 1 defines the layout of the manual, introduces the reader to the operation of the turbocharger and presents important installation guidelines.

Sections 2, 3 and 4 concentrate on Turbocharger Component Identification, Troubleshooting and Diagnosis, Component Testing and Replacement.

Section 5 identifies the Service and Overhaul procedures to be followed in the unlikely event of a major turbocharger malfunction.

Section 6 quantifies build data to ensure the turbocharger will continue to operate to Holset Service standard on completion of overhaul.

Manual sections 1 to 5 where applicable, appear as a **self extracting** compressed file which is organised according to the steps needed to most easily and correctly maintain the operation of the turbocharger. Users are required to download this file to hard disk. Section 6 has its own file identity and resides at [www.holset.co.uk](http://www.holset.co.uk). so that Holset can update the Service Data as changes occur. The links between manual and service data are active only when the user is connected to the Internet.

Chapter 6 has an expiry date to encourage users to discard outdated saved or printed versions and always access the latest information available at [www.holset.co.uk](http://www.holset.co.uk).



When using the manual on-line this icon will link to Holset's website to help find your nearest agent for advice and how to order Holset original parts.

## How to Order Holset Original Parts

To make sure of optimum performance, certain items must be discarded during disassembly and replaced with new for re-assembly. These items are indicated in the Service and Overhaul section with the use of a \* symbol.

All items showing a \* are available in a basic overhaul kit.

To get the correct parts for your turbocharger, refer to the 'component identification' section of this manual to help you find the following information:

- 1) Refer to the exploded view and component list to define the major components to be replaced.
- 2) Refer to the turbocharger's dataplate which will be found on the compressor cover or wastegate actuator to define the identifying information about your turbocharger build standard.
- 3) Contact your local Holset agent with component identification nos. and dataplate assembly no., serial no. and turbocharger type.
- 4) With this information, your local agent can provide you with the optimum kit of parts for re-assembling your turbocharger for continued long life operation.

# Description and Operation of Turbocharger

## General Information

A turbocharger is a mechanical device which uses the engine's exhaust gases to force more air into the engine cylinders. Hot exhaust gas energy is used to turn a turbine wheel and shaft. At the other end of the shaft is the compressor impeller (or compressor wheel), which draws in air and forces it into the engine cylinders.

Supplying increased air mass flow to the engine provides improved engine performance, lower exhaust smoke density, improved operating economy and altitude compensation. The turbocharger has proven to be one of the most beneficial devices for improving engine performance. It performs its job very well, as long as it is properly cared for.

## Introduction to Turbocharger Matching

### The need for optimised matching over the engine speed range

A standard turbocharger can be perfectly matched to only one particular engine condition, eg maximum torque speed or maximum load speed. At this engine speed, the turbocharger supplies the optimum mass of air to give the required air/fuel ratio. At other speeds the air/fuel ratio cannot be held at the optimum hence fuel consumption and emission levels worsen.

Engine emission legislations have forced manufacturers to improve their engine efficiencies, particularly at low speeds where low air/fuel ratios cause high smoke levels.

The Holset turbocharger is carefully matched to meet the required engine characteristics during application engineering. It is important that this match is maintained by using only Holset original turbine and compressor parts.

### The importance of correctly servicing the turbocharger

A turbocharger requires accurate assembly at point of manufacture. It is very important to adhere to setting limits when servicing the turbocharger, as failure to do so could result in turbocharger or engine failure.

### Effects of wrong match

Possible consequences if turbocharger boost pressure is too low:-

- Engine runs fuel rich
- Exhaust temperature increase
- Hydrocarbon levels increase
- High cylinder temperature risks damage to engine pistons
- Fuel consumption increase
- Smoke levels increase
- Risks of failing emissions tests

Possible consequences if turbocharger boost pressure is too high:-

- Engine runs fuel weak (lean)
- Excessive boost overspeeds turbocharger
- Increased cylinder pressure risks damage to engine head gasket, pistons and valves
- Nitrous oxide levels increase
- Turbocharger bearing failure and wheel fatigue problems
- Intercooler load increases causing engine to overheat, risking piston damage

## Notes, Cautions and Warnings

**Notes, Cautions and Warnings** are used in this manual to emphasise important or critical instructions.

### Note

Information which is essential to highlight.

### Caution

Maintenance or Service procedures which if not strictly followed, will result in damage or destruction of the turbocharger.

### Warning

Maintenance or Service procedures which if not correctly followed will result in personal injury or loss of life.

### Note

Holset turbochargers can be remanufactured using recovered parts. Where it is necessary to dispose of components or whole turbochargers, an environmentally responsible process such as recycling should be used, with due regard to local laws.

### Note

Holset Service receives many turbocharger returns that are no fault found. Before assuming the turbocharger is not performing to specification always refer to the engine diagnostic system and the troubleshooting diagnostic procedures of this manual.

### Warning

Turbocharger surface temperature during operation can achieve 700°C (1300°F). The HC5A/HX80/82/83/85/HT4B/4C/80 turbochargers weigh up to 60 kg (132 lb) and turbine housing weight is greater than 20 kg (45 lb).

### Caution

This turbocharger has been manufactured using piece part and rotor balance processes and **MUST** be check balanced on rebuild.

If you intend to overhaul/repair a rotor balanced turbocharger, ensure that all the rotor parts have co-relation marks prior to disassembly so that they can be reassembled in the same relative positions.

Balance limits for turbocharger rebuild are shown on Holset's Service Data Sheet. with the exception of HX83 which requires a unique balancing process available through an approved Holset agent.

It is important to note that operating a turbocharger with a rotor or core balance level greater than the published limits could cause turbocharger or engine failure. If you are in any doubt regarding the balancing process, please contact an approved Holset agent for assistance.

### Warning

Some parts are manufactured in fluoroelastomers (e.g. Viton) or similar that requires special treatment in the case of repair and service after fire.

## Installation Data

1. Holset Service receives many turbocharger returns that are no fault found. Before assuming the turbocharger is not performing to specification always refer to the engine diagnostic system and the fault finding chart of this manual to make all the recommended health checks.
2. It is important that intake and exhaust systems are fitted in accordance with the recommendations of the Equipment and Engine manufacturers. Limiting mass inertia loading is critical to turbocharger wholelife operation. Maximum engine vibration input must not exceed 8g.
3. The air filter must remove particles greater than 5µm at an efficiency of 95% and be of sufficient capacity to match the air consumption of the engine. Recommended filters should always be used with a pressure drop indicator. Intake systems must be capable of withstanding depressions up to 6.9 kPa (1.0 lbf/in<sup>2</sup>).
4. Hose and clip connections of intake manifold systems must be capable of withstanding the turbocharger pressure ratio. V band clamps are preferred and must be used above 3:1 pressure ratio.
5. Exhaust systems must be capable of operating at exhaust back pressures of up to 10 kPa (1.5 lbf/in<sup>2</sup>). This limit is increased to 13.4 kPa (2.0 lbf/in<sup>2</sup>) if a catalytic converter is fitted. Exhaust brake applications are permitted to impose 450 kPa (65.3 lbf/in<sup>2</sup>) back pressure.
6. Oil should be filtered to 10µm with efficiency of 60% TWA (Time Weighted Average) /20 µm with efficiency of 85% TWA. Efficiency assessed using ISO Standard 4572/SAE J 1858.
7. The oil quality must be as specified by the engine manufacturer and will be a minimum API SE - CD (MIL - L - 2104C) specification. Improved life can be obtained by using super high performance diesel (SHPD) oils, particularly in industrial applications which use extended oil drain periods.
8. Normal oil temperature is 95+/-5°C (203+/-9° F). It should not exceed 120°C (248° F) under any operating condition.
9. Any pre-lube oil must be clean and meet the minimum CD classification.
10. The orientation of turbine housing, bearing housing and compressor cover is fixed according to application. During installation, do not attempt to rotate these components. Inclined turbocharger installation is not recommended. If an installed angle is necessary, oil inlet centreline must be +/- 10 degrees from vertical and rotor centreline +/- 5 degrees from horizontal.
11. Holset permits oil return pipes to decline at an overall angle of not less than 30 degrees below horizontal. All turbocharger applications require a pipe of internal diameter greater than 25 mm which has integrated connectors. To ensure oil returns into the engine under all operating conditions, the return connection into the engine sump must not be submerged and the outlet flange of the turbocharger must be 50 mm above the maximum oil level of the engine sump pan. Crankcase pressure should be limited ideally to 0.8 kPa (0.12 lbf/in<sup>2</sup>) but 1.4 kPa (0.20 lbf/in<sup>2</sup>) can be accepted by reference to Holset.
12. Oil pressure of 150 kPa (20 lbf/in<sup>2</sup>) must show at the oil inlet within 3 - 4 seconds of engine firing to prevent damage to turbocharger bearing system. A flexible supply pipe is recommended. Recommended oil pressure at full load/ rated speed is 300 kPa (44 lbf/in<sup>2</sup>) although 600 kPa (88 lbf/in<sup>2</sup>) is permitted during cold start up. Under idling conditions pressure should not fall below 70 kPa (10 lbf/in<sup>2</sup>).
14. Recommended oil flows for the turbochargers are 3.5 litre/min at idle and a minimum of 6 litre/min above maximum torque speed.
15. Do not use liquid gasket substances or thread sealant as any excess can enter the turbocharger oil system to obstruct flow.
16. Recommended coolant flows for the turbochargers are 6 litre/min at idle and 13 - 19 litre/min above maximum torque speed.

**Note:**

100 kPa = 1 bar (14.5037 lbf/in<sup>2</sup> =psi).

## Installation Checklist

1. Always understand why the original turbocharger needs replacing before fitting another unit.
2. Check the turbocharger dataplate to ensure the Part No. is correct for the engine/application.
3. Check the engine exhaust, intake and aftercooler systems are clean and without obstruction i.e. free from oil, gasket pieces, dust/dirt/carbon or foreign objects.
4. Replace the oil and air filters using replacement parts specified by the equipment manufacturer.
5. Change the engine oil using the type specified by the engine manufacturer.
6. Check that the turbocharger oil inlet and drain pipes and connectors are clean, free from obstruction and will not leak under pressure. Before re-installing flexible pipes always ensure any burnt -on lacquer or other adhered material is removed from internal bores. If in doubt, fit new pipes.
7. Check that the coolant pipes of water cooled bearing housing applications and connectors are clean, free from obstruction and will not leak under pressure.
8. To pre-lube the turbocharger bearings, pour some clean engine oil into the oil inlet and rotate the turbocharger rotor assembly by hand.
9. Check that the exhaust manifold flange is flat and undamaged. Mount the turbocharger on the flange and check that the turbine inlet gasket fits properly without obstructing the gas passages.
10. Assemble the air intake and boost outlet connections. Check that the connections are well made and will not leak in use.
11. Check the exhaust system is fitted using the original mounting arrangement provided by the equipment manufacturer. Always re-fit any supports/brackets back in position to ensure the system is correctly supported.
12. Assemble the exhaust system to the turbine housing outlet. Check that the gasket/connection is well made and will not leak in use.
13. Assemble any coolant pipes and check that the connections are well made, without obstruction and will not leak in use.
14. Assemble the turbocharger oil inlet pipe and check that the connection is clean, well made and will not leak in use.
15. Check all clamps and fasteners are correctly tightened to the torque recommended by the equipment manufacturer.
16. Make any ECU checks recommended by the engine manufacturer.
17. Crank the engine WITHOUT firing until engine oil flows out of the turbocharger drain flange.
18. Assemble the oil drain pipe and check that the connection is well made, without obstruction and will not leak in use.
19. Start the engine and run at idle speed for approximately 1 minute so that the oil supply system is fully operational.
20. Accelerate the engine and check that there are no leaks/obstructions of air/oil/coolant/gas under pressure.
21. Check that no hose or connection deforms under normal operation.
22. Before switching off the engine, leave it running at idle speed for at least 1 minute to cool the turbine.



# Symbols

## Symbole - Deutsch

In diesem Handbuch werden die folgenden Symbole verwendet, die wesentliche Funktionen hervorheben. Die Symbole haben folgende Bedeutung:



**WARNUNG** - Unterhaltungs und Wartungsverfahren müssen genau befolgt werden, da ein Nichtbeachten zu Personenschäden oder tödlichen Verletzungen führt.



**ACHTUNG** - Falls Unterhaltungs und Wartungsverfahren nicht genau beachtet werden, kann der Turbolader dadurch beschädigt oder zerstört werden.



**AUSBAU** bzw. **ZERLEGEN**.



**EINBAU** bzw. **ZUSAMMENBAU**.



**INSPEKTION** erforderlich.



Teil oder Baugruppe **REINIGEN**.



**DIMENSION** - oder **ZEITMESSUNG**.



Teil oder Baugruppe **ÖLEN**.



**WERKZEUGGRÖSSE** wird angegeben.



**ANZUG** auf vorgeschriebenes Drehmoment erforderlich.



Sicherstellen, daß die **AUSWUCHTMARKEN** an der Rotor-Baugruppe richtig ausgerichtet sind.



Elektrische **MESSUNG DURCHFÜHREN**.



Weitere Informationen an anderer Stelle bzw. in anderen Handbüchern.



Schutzkleidung muß immer getragen werden.



Deutet an, daß Teile schwer sein können.



Website-Verzeichnis mit Ihrem nächsten Holset-Händler.



Gehe zu Inhalt

## Symbols - English

The following group of symbols have been used in this manual to help communicate the intent of the instructions. When one of the symbols appears, it conveys the meaning defined below.



**WARNING** - Serious personal injury or extensive property damage can result if the warning instructions are not followed.



**CAUTION** - Minor personal injury can result or a part, an assembly or the engine can be damaged if the caution instructions are not followed.



Indicates a **REMOVAL** or **DISASSEMBLY** step.



Indicates an **INSTALLATION** or **ASSEMBLY** step.



**INSPECTION** is required.



**CLEAN** the part or assembly.



**PERFORM** a mechanical or time **MEASUREMENT**.



**LUBRICATE** the part or assembly.



Indicates that a **WRENCH** or **TOOL SIZE** will be given.



**TIGHTEN** to a specific torque.



Ensure that the **BALANCE MARKS** on the rotor assembly are in alignment



**PERFORM** an electrical **MEASUREMENT**.



Refer to another location in this manual or another publication for additional information.



Please wear protective clothing at all times.



Indicates components may be heavy.



Website access to find your nearest Holset Agent.



Go to contents

## Simbolos - Español

Los simbolos siguientes son usados en este manual para clarificar el proceso de las instrucciones. Cuando aparece uno de estos simbolos, su significado se especifica en la parte inferior.



**ADVERTENCIA** – Procedimientos de Mantenimiento o Servicio que al no seguirse resultarán en daños personales o pérdida de vida.



**ATENCION** – Procedimientos de Mantenimiento o Servicio que al no seguirse al pie de la letra, resultarán en el daño o la destrucción del turbosobrealimentador.



Indica un paso de **REMOCION** o **DESMONTAJE**.



Indica un paso de **INSTALACION** o **MONTAJE**.



Se requiere **INSPECCION**.



**LIMPIESE** la pieza o el montaje.



Ejecutese una **MEDICION** mecánica o del tiempo.



**LUBRIQUESE** la pieza o el montaje.



Indica que se dar una **LLAVE DE TUERCAS** o el **TAMAÑO DE HERRAMIENTA**.



**APRIETESE** hasta un par torsor específico.



Ceriórese de que estén alineadas las marcas de balance en el rotor.



**EJECUTESE** una **MEDICION** eléctrica.



Para información adicional refiérase a otro emplazamiento de este manual o a otra publicación anterior.



Favor de siempre llevar ropa protectora.



Indica que los componentes pueden ser pesados.



Acceso a Sitio Web para localizar su agente Holset más cercano.



Ir a la tabla de materias

## Symboles - Français

Les symboles suivants sont utilisés dans ce manuel pour aider à communiquer le but des instructions. Quand l'un de ces symboles apparaît, il évoque le sens défini ci-dessous:



**ATTENTION DANGER** - Procédures de maintenance ou d'entretien qui, si elles ne pas observées correctement, auront pour résultat des lésions corporelles ou un décès.



**MISE EN GARDE** - Procédures de maintenance ou d'entretien qui, si elles ne sont pas observées strictement, auront pour résultat de causer des dégâts au turbocompresseur ou de conduire à sa destruction.



Indique une opération de **DEPOSE**.



Indique une opération de **MONTAGE**.



**L'INSPECTION** est nécessaire.



**NETTOYER** la pièce ou l'ensemble.



**EFFECTUER** une **MESURE** mécanique ou de temps.



**GRAISSER** la pièce ou l'ensemble.



Indique qu'une **DIMENSION DE CLE** ou **D'OUTIL** sera donnée.



**SERRER** à un couple spécifique.



S'assurer que les repères d'équilibrage sur l'ensemble de rotor sont alignés.



**EFFECTUER** une **MEASURE** électrique.



Se reporter à un autre endroit dans ce manuel ou à une autre publication pour obtenir des information plus complètes.



Il faut toujours mettre vêtements de protection.



Indique que les composants peuvent être lourds.



Accès au site Web pour trouver l'agent Holset le plus proche.



Aller au sommaire

## Símbolos - Português

Os símbolos a seguir serão utilizados neste manual para facilitar a comunicação das instruções e seus significados estão descritos abaixo.



**ATENÇÃO** - Os procedimentos de Manutenção ou Serviços que não forem seguidos corretamente resultarão em ferimentos pessoais ou riscos de vida.



**AVISO** - Os procedimentos de Manutenção ou Serviço que não forem rigorosamente seguidos resultarão em danos ou destruição do carregador turbo.



Indica um passo de **DESMONTAGEM**.



Indica um passo de **MONTAGEM**.



Requer inspeção.



**LIMPE** a peça ou conjunto.



Requer Medição mecânica ou de tempo.



**LUBRIFIQUE** a peça ou o conjunto.



Indica necessidade de **APERTO**.



**TORQUEAR** de acordo com o especificado.



Assegure-se de que as **MARCAS DE BALANCEAMENTO** do conjunto eixo rotor estejam alinhadas.



Requer medição **ELÉTRICA**.



Procure em outra seção deste manual ou em publicação para obter informações adicionais



Por favor, sempre utilize EPI (Equipamento de Proteção Individual)



Indica que os componentes podem estar pesados.



Visite o Website para encontrar o seu Agente Holset mais perto.



Vá para Conteúdo

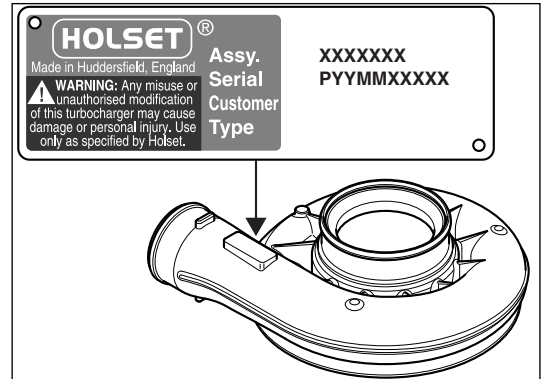
# Turbocharger Identification



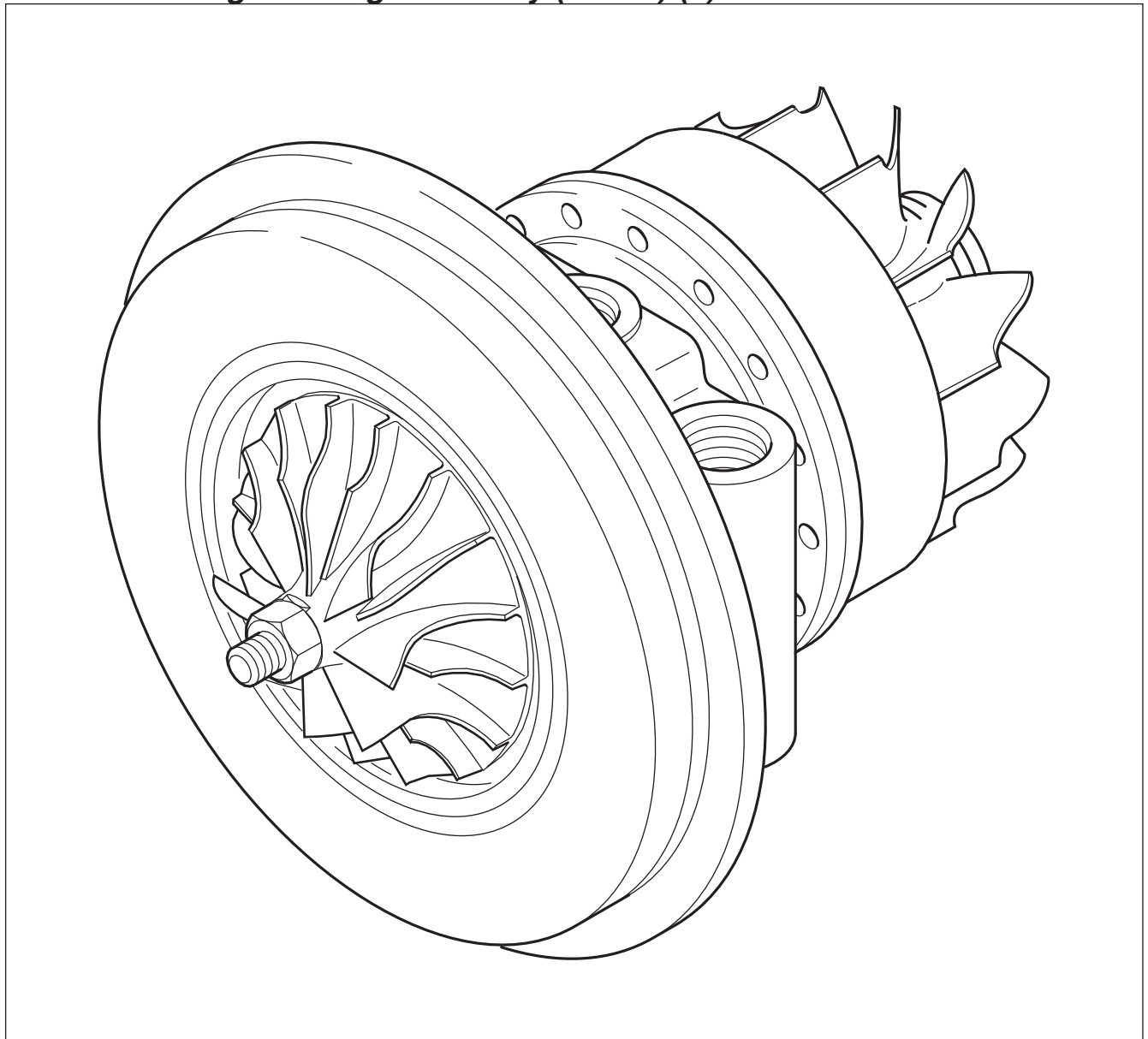
## Dataplate

### Note

Dataplates will be fitted to the compressor housing (8). The information from the dataplate must be quoted for service and parts support.



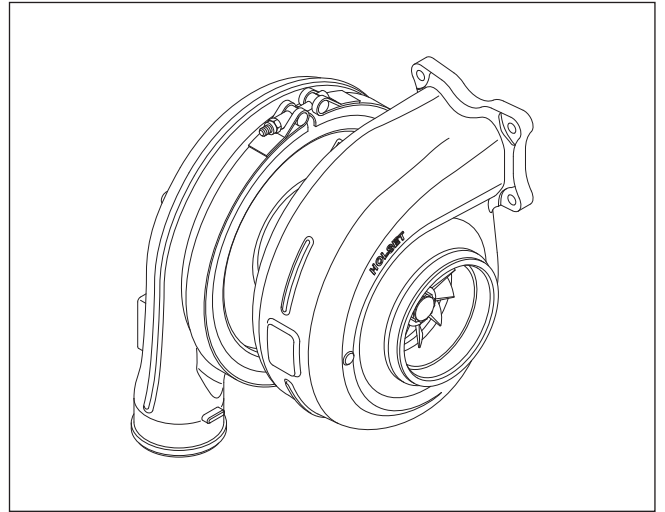
## Center Housing Rotating Assembly (CHRA) (2)



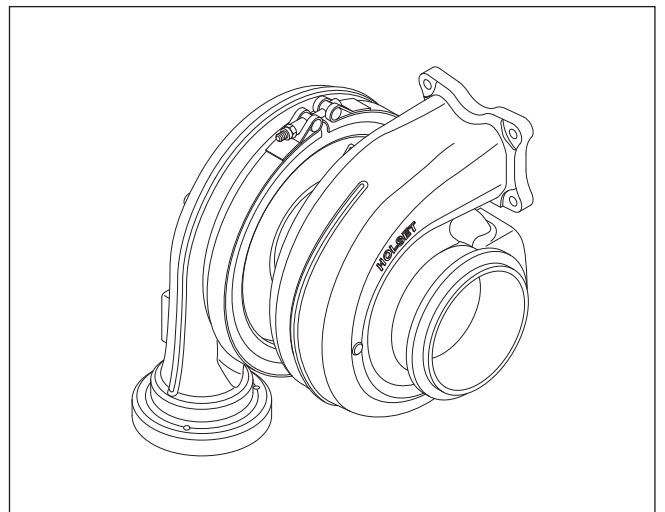


## Installation Options

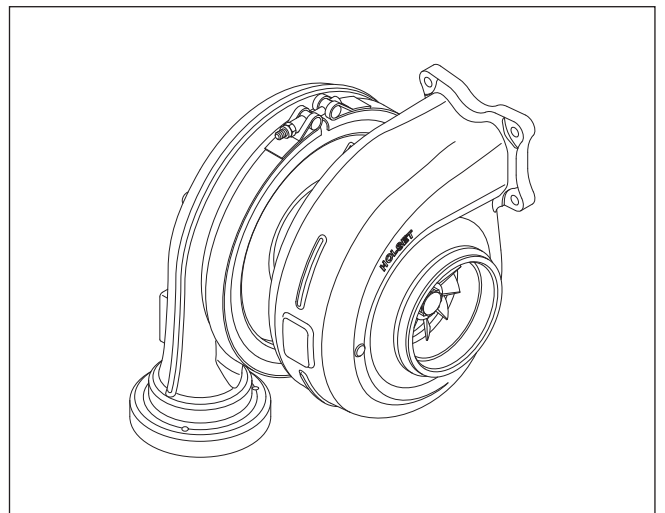
Type A



Type B



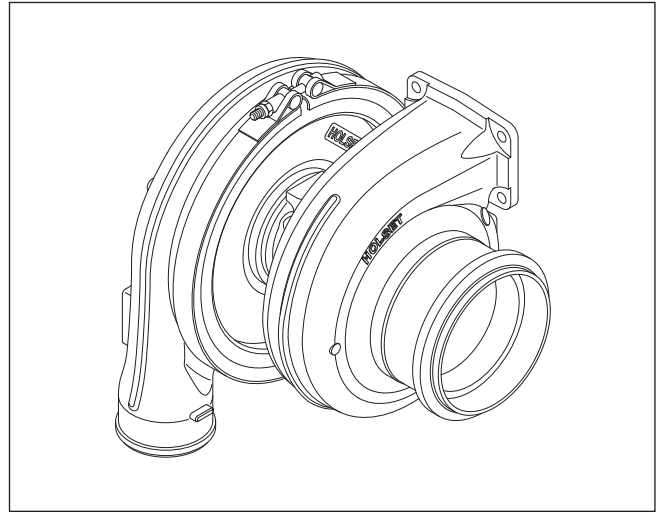
Type C



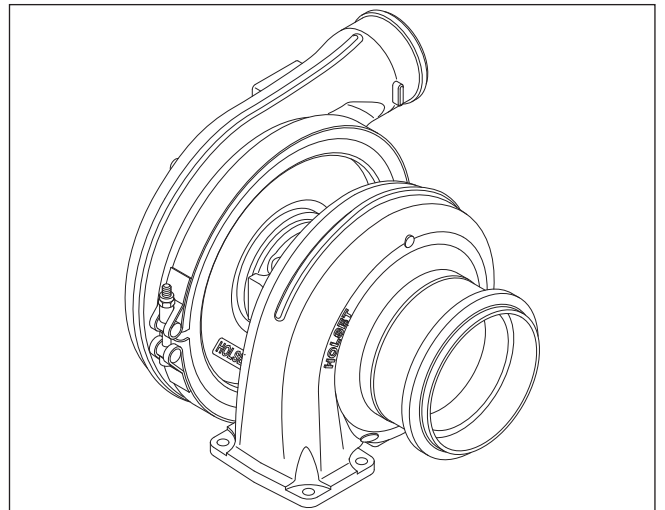


## Installation Options

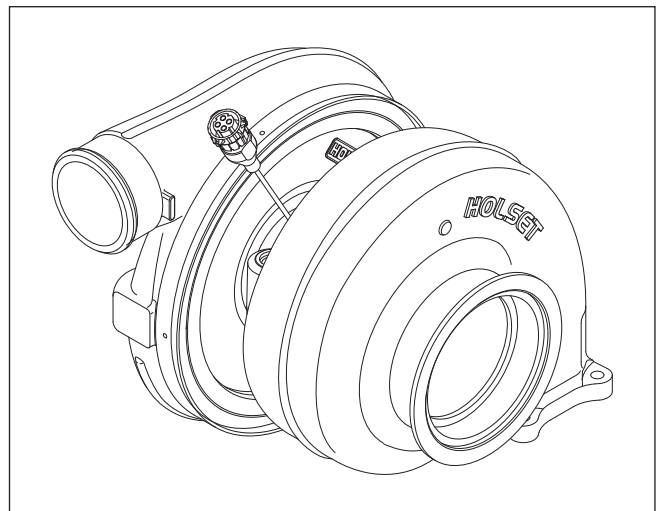
Type D



Type E HT4B/HT4C/HT80

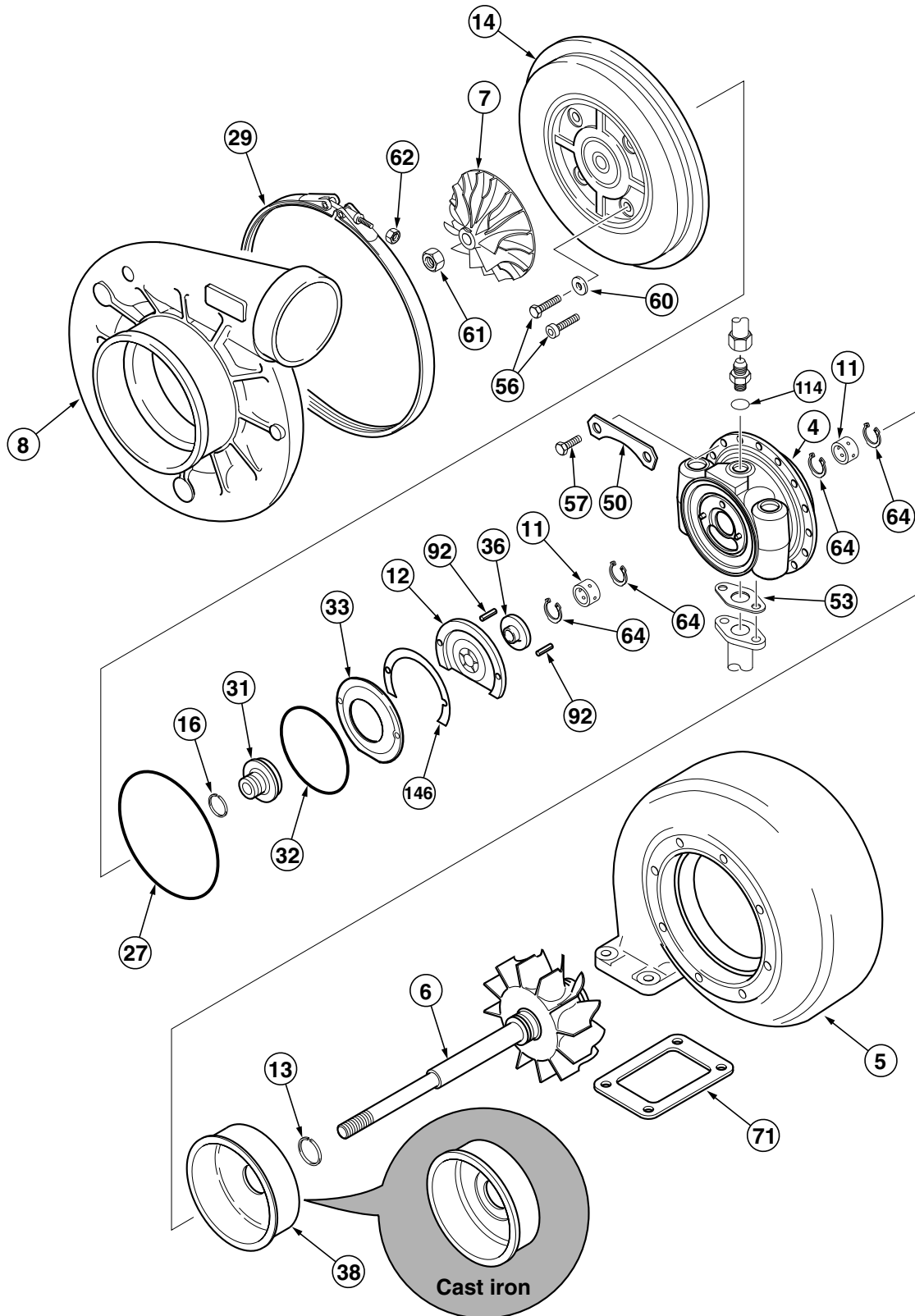


Type F HX83 with speed sensor





# Exploded View - HC5A/HX80/82/85

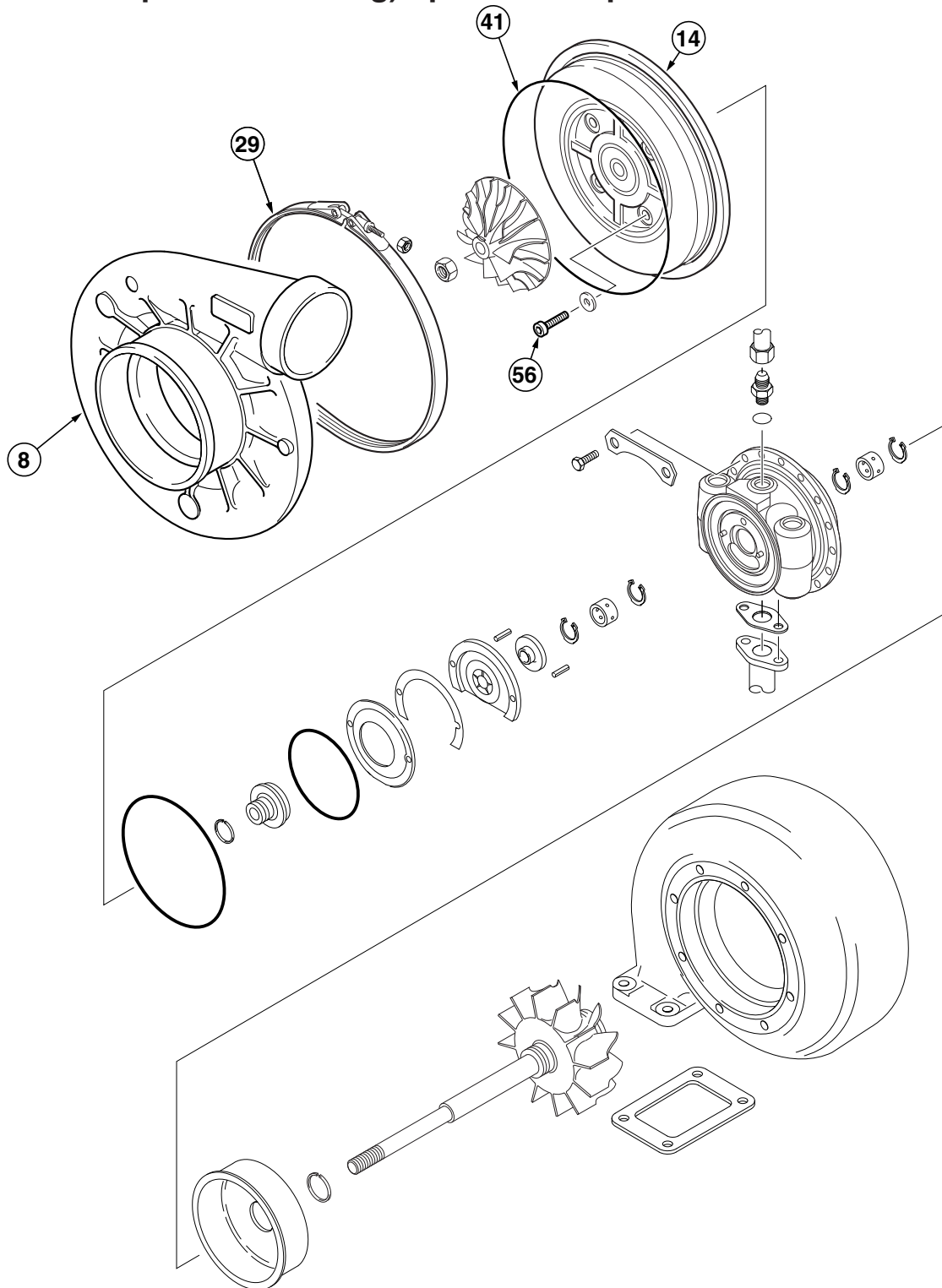


**Note**

Cast iron and Stainless steel heat shield options are not interchangeable.  
Exploded views represent a generic build standard. Parts may be added or subtracted in specific applications.

# Exploded View - HX82

(Cast iron compressor housing) optional components

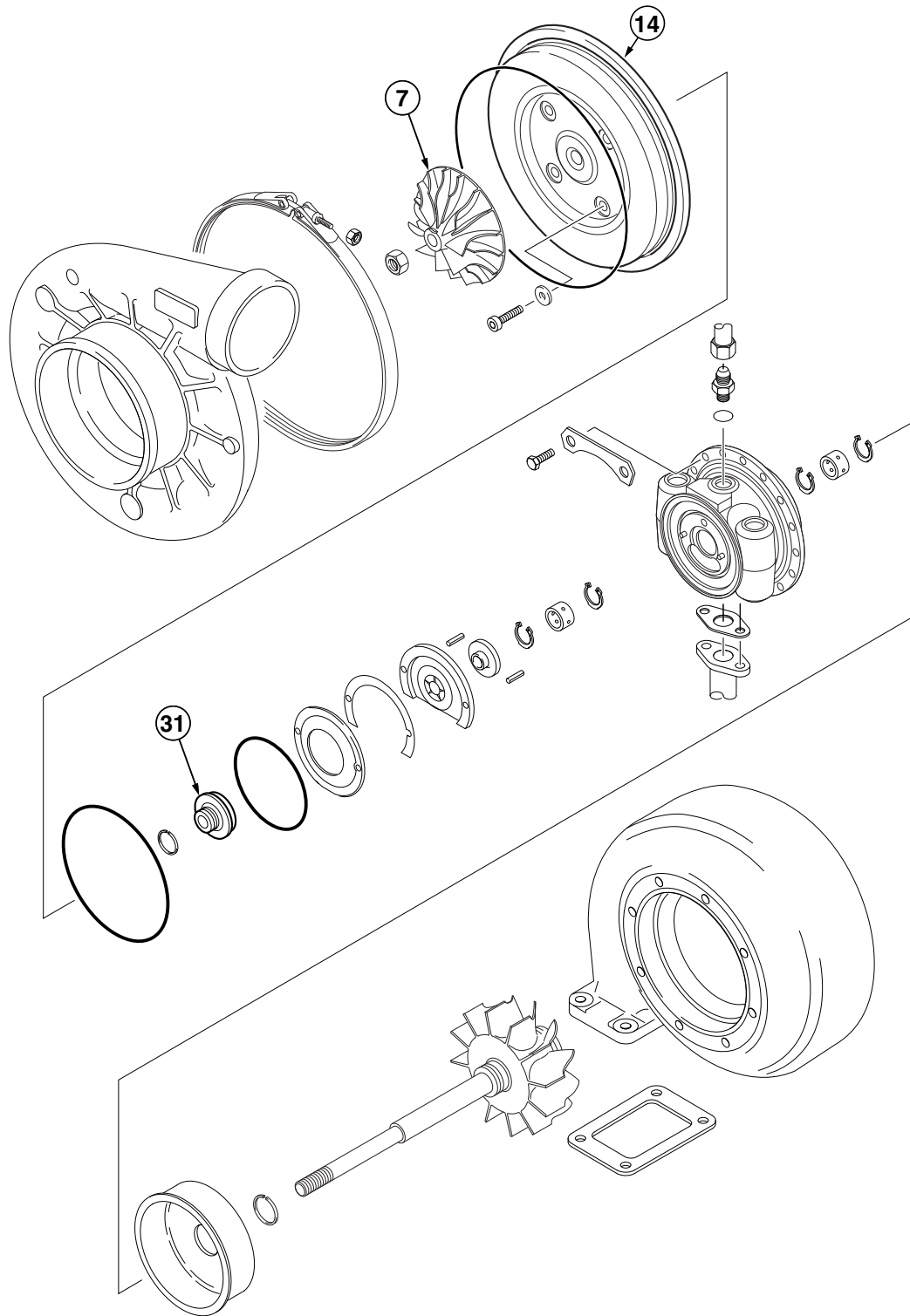


**Note**

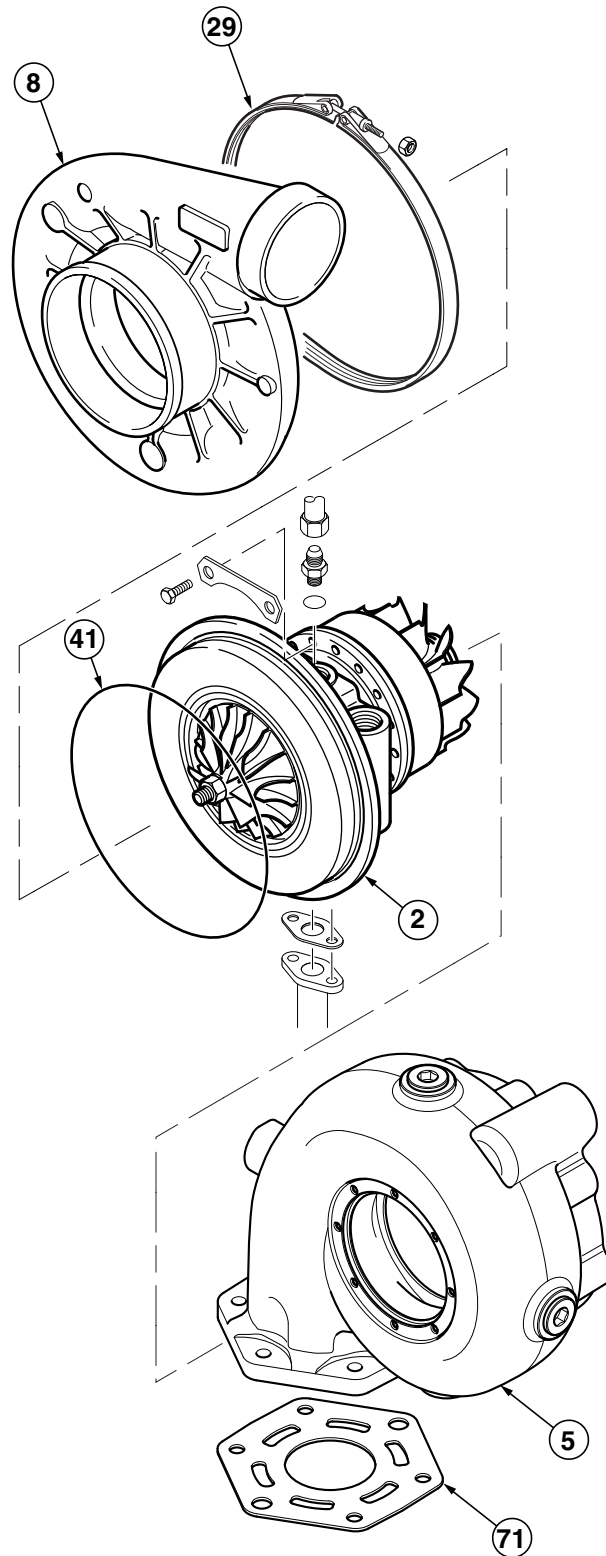
Cast iron and Stainless steel heat shield options are not interchangeable.  
Exploded views represent a generic build standard. Parts may be added or subtracted in specific applications.

# Exploded View - HX82

(Superback impeller) non-interchangeable components



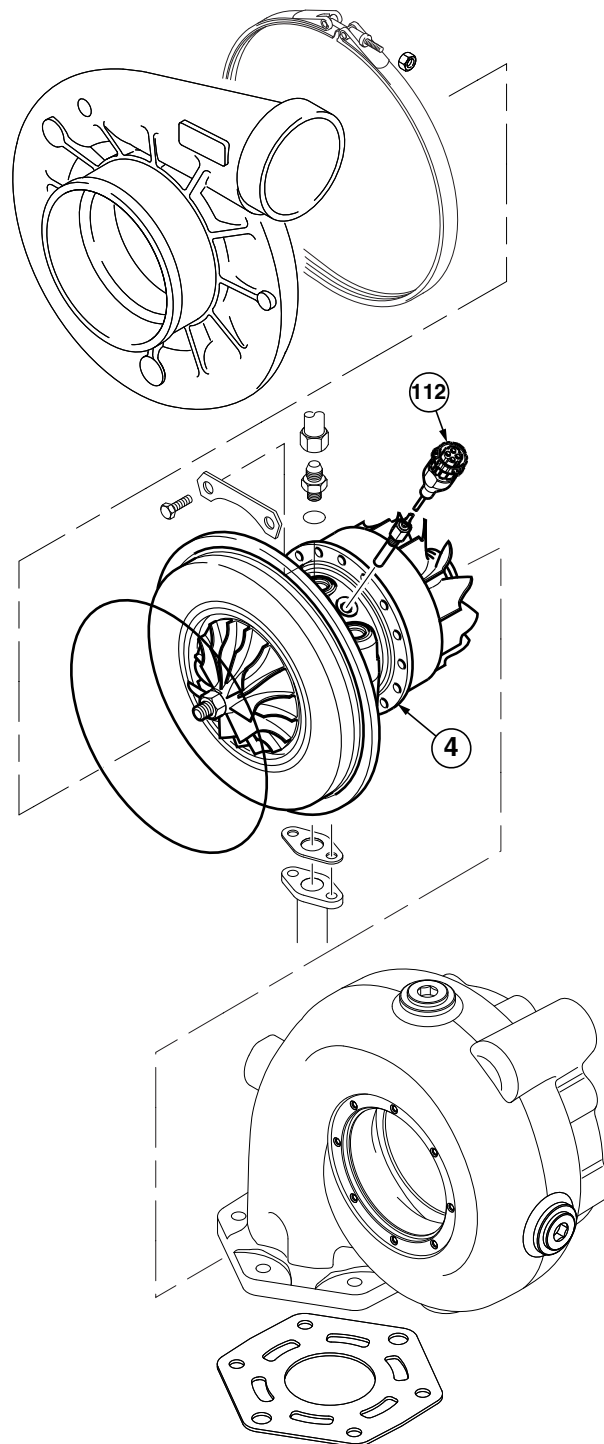
# Exploded View - HX83 HPRC (High Pressure Ratio Compressor) unique components



**Note**

Compressor housing, wheel, diffuser and V-band are manufactured utilising special materials. Exploded views represent a generic build standard. Parts may be added or subtracted in specific applications.

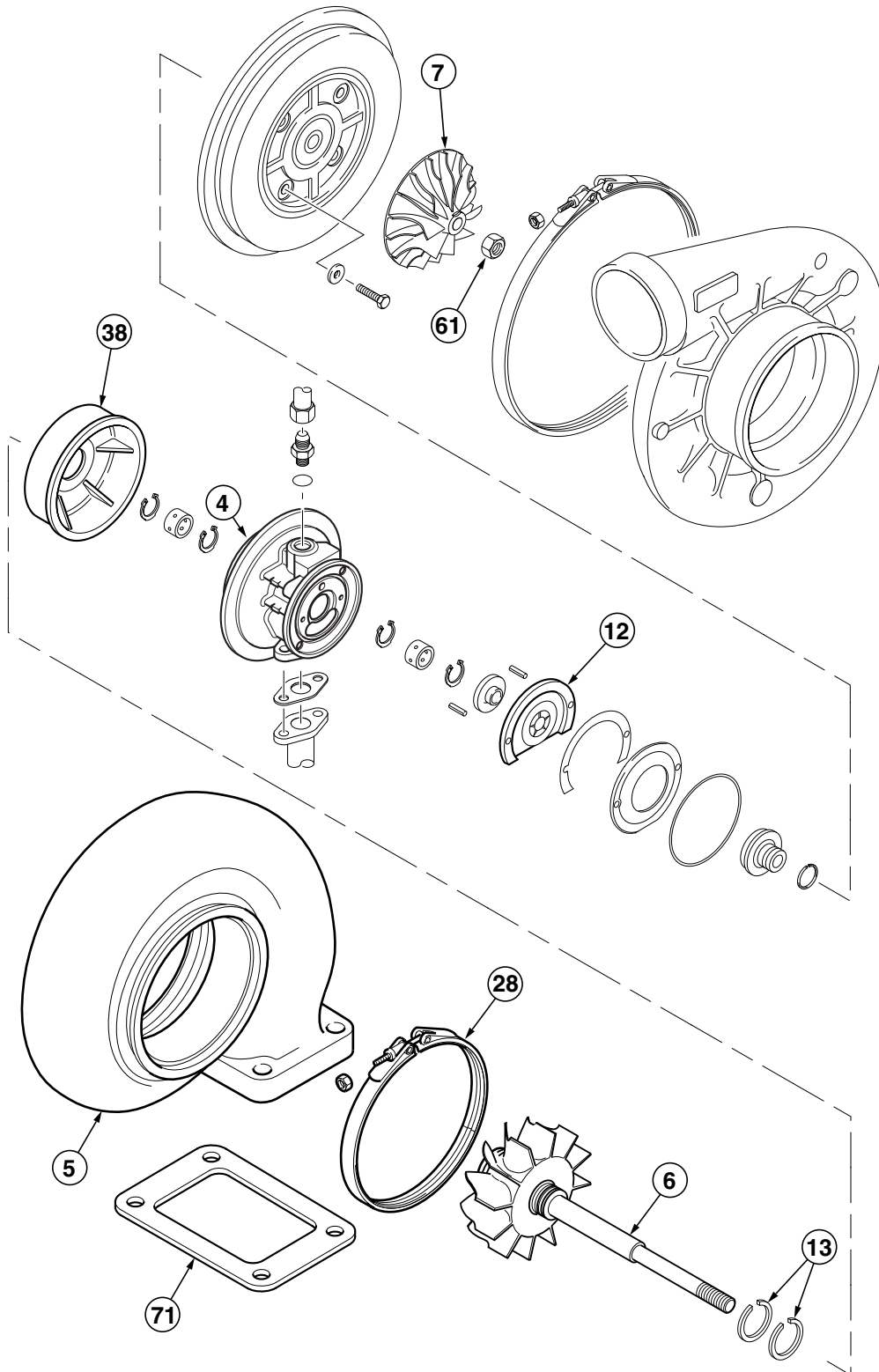
# Exploded View - HX83 HPRC (Speed sensor) unique CHRA (Core)



**Note**

Compressor housing, wheel, diffuser and V-band are manufactured utilising special materials. Exploded views represent a generic build standard. Parts may be added or subtracted in specific applications.

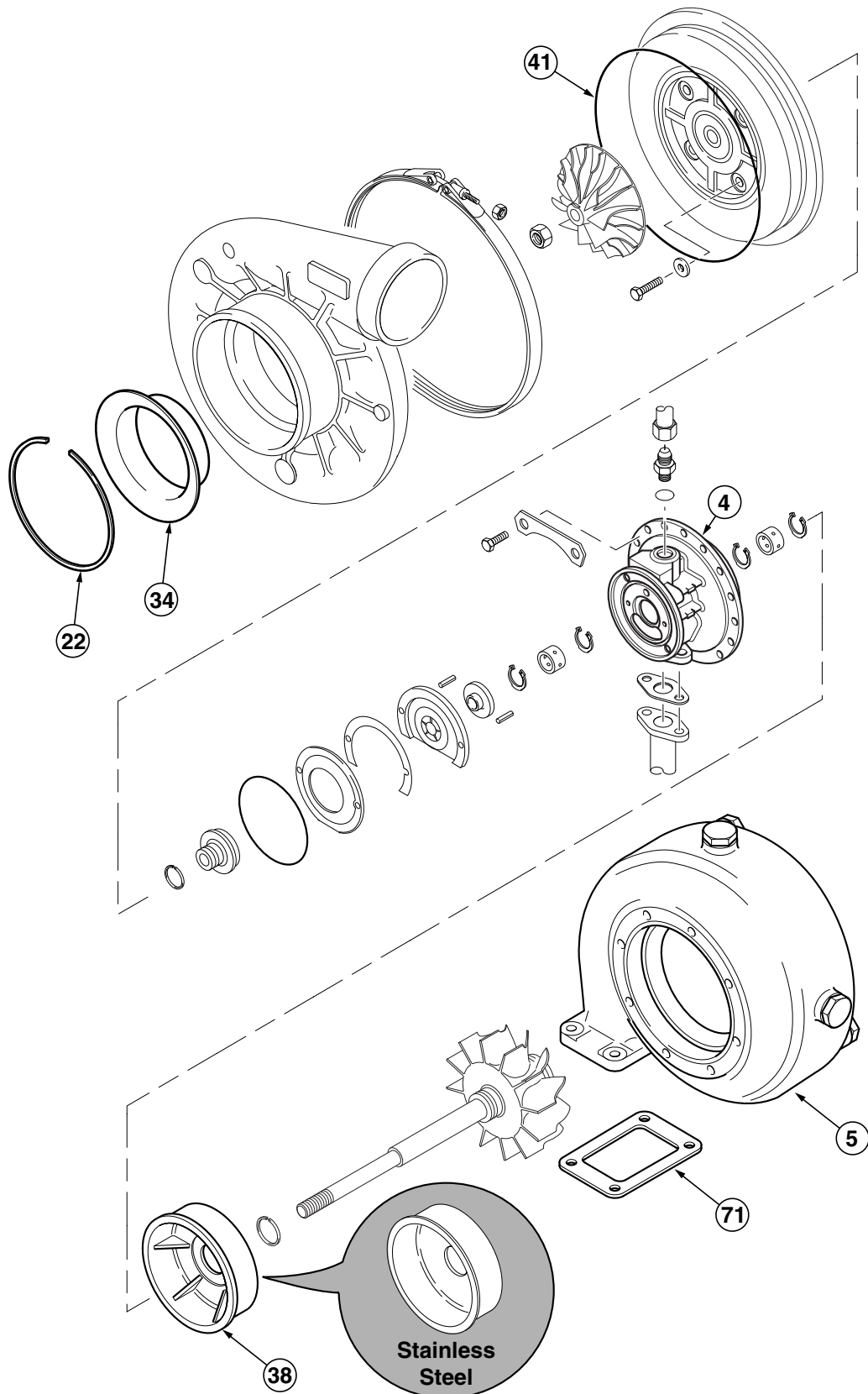
# Exploded View - HT4B/HT80 unique components



**Note**

HT4B/HT4C/HT80 rotate in the opposite direction to HC/HX type turbochargers. Do not mix the turbine or compressor wheels of HC/HX and HT turbochargers. Exploded views represent a generic build standard. Parts may be added or subtracted in specific applications.

# Exploded View - Optional Parts



**Component List - HC5A/HX80/82/83/85/HT4B/4C/80**

Item No.	Description	Quantity
1	Repair Kit CHRA (Core)*	1
2	CHRA (Core)	1
4	Bearing Housing	1
5	Turbine Housing	1
6	Assembly, Turbine Wheel	1
7	Compressor Wheel	1
8	Compressor Housing	1
11	Journal Bearing*	2
12	Thrust Bearing*	1
13	Split Ring Seal, Turbine*	1/2
14	Diffuser	1
16	Split Ring Seal, Compressor*	1
22	Retaining Ring, Inlet Baffle	0/1
27	O-Ring Seal*	0/1
28	V-band Clamp, Turbine	0/1
29	V-band Clamp, Compressor	1
31	Oil Slinger*	1
32	O-Ring Seal, Bearing Housing*	1
33	Oil Baffle*	1
34	Inlet Baffle	0/1
36	Thrust Collar	1
38	Heat Shield	1
41	O-Ring Seal, Compressor Housing*	0/1
50	Lockplate, Turbine Housing*	4
53	Gasket, Oil Outlet*	1
56	Screw, Diffuser*	4
57	Bolt, Turbine Housing*	8
60	Plain Washer*	4

**Note**

Exploded views may not contain all listed components.



**Component List - HC5A/HX80/82/83/85/HT4B/4C/80**

Item No.	Description	Quantity
61	Locknut, Compressor Wheel	1
62	Locknut, V-band*	2
64	Retaining Ring, Bearing*	4
71	Gasket, Turbine Housing	1
92	Roll Pin	2
103	Blanking Plug	0/2
105	Connector Male, Water	0/2
112	Speed Sensor*	0/1
114	O-Ring Seal, Oil Inlet	1
115	O-Ring Seal, Water	0/4
146	Shim	1

**Note**

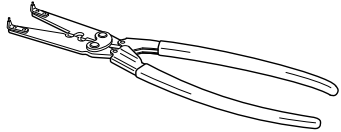
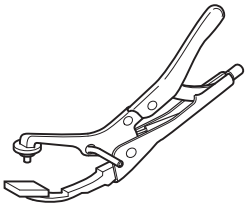
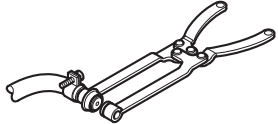
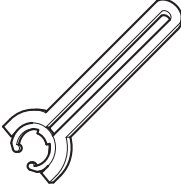
Exploded views may not contain all listed components.

# Purchasable Service Tools



## Service Tools

The following special tools can be purchased from your local Authorised Repair Location. The use of these tools is recommended and where necessary they are shown in the appropriate service procedure.

Part No.	Tool Description	Tool Illustration
3575186	Circlip Pliers	
4027202	Wastegate Air Feed Adapter	
4027203	Wastegate Air Feed Adapter	
4027204	E-Clip Tool	

**Caution** 

All Service and Maintenance settings are shown in Holset's Service Data Sheet. It is essential that these settings are used. Common tools found in mechanic's tool box not included.

# Fault Finding chart - All Applications



	Engine Running Hot	Poor Transient Response	Smoke	Engine Lacks Power	Black Exhaust Smoke	Blue Exhaust Smoke	High Oil Consumption	Turbocharger Noisy	Cyclic Sound from the Turbocharger	Oil Leak from Compressor Seal	Oil Leak from Turbine Seal
<b>Dirty air cleaner</b> Clean or replace element according to manufacturer s recommendations	●	●	●	●	●	●	●			●	
<b>Restricted compressor intake duct</b> Remove restriction or replace damaged parts as required	●	●	●		●	●	●	●	●	●	
<b>Restricted air duct from compressor to intake manifold</b> Remove restriction or replace damaged parts as required	●	●		●	●			●			
<b>Restricted intake manifold</b> Refer to engine manufacturer s manual and remove restriction	●	●		●	●			●			
<b>Air leak in feed from air cleaner to compressor</b> Replace seals, gaskets or tighten fasteners as required								●			
<b>Air leak in feed from compressor to intake manifold</b> Replace seals, gaskets or tighten fasteners as required	●	●	●	●	●	●	●	●			
<b>Air leak between intake manifold and engine</b> Refer to engine manufacturer s manual and replace gaskets or tighten fasteners as required	●		●	●	●	●	●	●			
<b>Foreign object in exhaust manifold (from engine)</b> Refer to engine manufacturer s manual and remove obstruction				●	●	●	●	●		●	
<b>Restricted exhaust system</b> Remove restriction or replace damaged parts as required	●			●	●					●	
<b>Exhaust manifold cracked, gaskets blown or missing</b> Refer to engine manufacturer s manual and replace gaskets or damaged parts as required		●	●	●	●			●			
<b>Gas leak at turbine inlet/exhaust manifold joint</b> Replace gasket or tighten fasteners as required		●	●	●	●			●			
<b>Gas leak in ducting after turbine outlet</b> Refer to engine manufacturer s manual and repair leak		●						●			
<b>Restricted turbocharger oil drain line</b> Remove restriction or replace damaged parts as required						●	●			●	●
<b>Restricted engine crankcase breather</b> Refer to engine manufacturer s manual, clear restriction						●	●			●	●
<b>Turbocharger bearing housing sludged or coked</b> Change engine oil and oil filter, overhaul or replace turbocharger as required						●	●			●	●
<b>Fuel injection pump or fuel injectors incorrectly set</b> Refer to engine manufacturer s manual and replace or adjust faulty components as required		●	●	●	●						
<b>Engine valve timing incorrect</b> Refer to engine manufacturer s manual for correct settings and adjust as required				●	●						
<b>Worn engine piston rings or liners</b> Refer to engine manufacturer s manual and repair as required				●	●	●	●			●	●
<b>Burnt valves and/or pistons</b> Refer to engine manufacturer s manual and repair as required				●	●	●	●			●	●
<b>Excessive dirt build up on compressor wheel and/or diffuser vanes</b> Clean in accordance with details in the appropriate Holset publication				●	●	●	●	●	●	●	●
<b>Turbocharger damaged</b> Find and correct cause of failure, repair or replace turbocharger as necessary				●	●	●	●	●		●	●

# Fault Finding chart - Speed Sensor



**No speed signal**

Check sensor connections. If pin resistance measurement is incorrect replace sensor. Where sensor may have been overheated check ECU diagnostic fault codes and if necessary replace sensor.

**Intermittent or noisy speed signal**

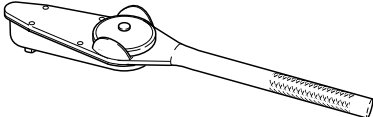
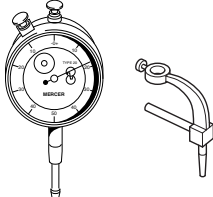
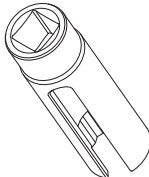
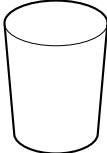
Check sensor with multimeter. If either resistance measurement is incorrect replace sensor. Where sensor may have been overheated check ECU diagnostic fault codes and if necessary replace sensor.

	Engine Lacks Power	Engine Overheats	Intermittent engine braking	Intermittent low power	Engine does not run smoothly	Low power at low engine speed	Turbocharger noisy	Poor acceleration	Reduced braking	Coolant leak	Oil leak
No speed signal	●				●	●		●		●	
Intermittent or noisy speed signal			●	●	●					●	

# Service Tools



The following special tools are recommended to perform procedures in this manual. The use of these tools is shown in the appropriate procedure.

Part No.	Tool Description	Tool Illustration
	Torque Wrench	
	Dial Gauge and Dial Gauge Adaptor	
	Speed Sensor Socket	
	Rubber Bung	

**Caution** 

All Service and Maintenance settings are shown in Holset's Service Data Sheet. It is essential that these settings are used. Common tools found in mechanic's tool box not included.

# On Engine Checks



## Oil Leakage

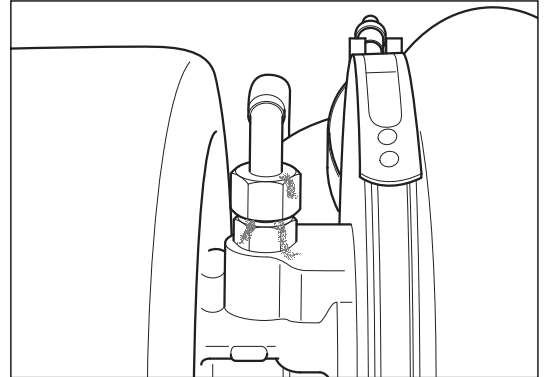
Oil Adapter M16 x 1.5 or 9/16 18 UNF 28 tpi

### Warning

The oil inlet is pressurised and no service action should be taken with the engine running.

Replacement gaskets, seals and adapters should be fitted without sealant as this can contaminate the oil. Torque tighten adapter to value shown in **Service Data Sheet**.

It is important to avoid kinked pipes during servicing and subsequent operation.



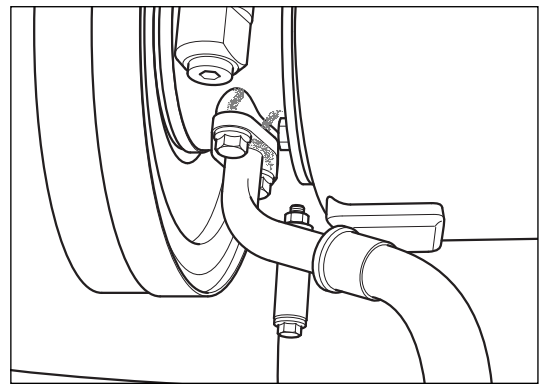
Oil Flanges M10 x 1.5 or 3/8-16 UNC 28 tpi

### Warning

Outlet oil is hot and no service action should be taken with the engine running.

Replacement gaskets and flange fasteners should be fitted without sealant as this can contaminate the oil. Torque tighten fasteners to value specified by engine manufacturer.

All outlet pipes should be free flowing without kinks and sharp bends and decline at an overall angle not less than 30° below the horizontal.

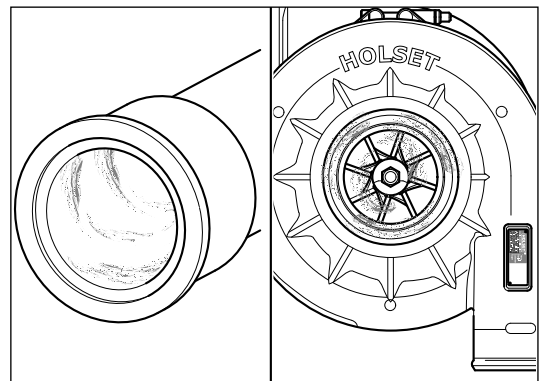


### Warning

Turbochargers and installation parts are heavy. Always use safe lifting methods.

Closed crankcase ventilation systems have a tendency to deposit oil in the compressor housing. Where practical remove intake system pipework every 2000 hours to check housing, compressor wheel and inlet baffle condition.

Always refer to **Cleaning of Housings** to clean housing. Rotor components can be cleaned using a non metallic bristle brush. Rotor components can be cleaned using a non metallic bristle brush.

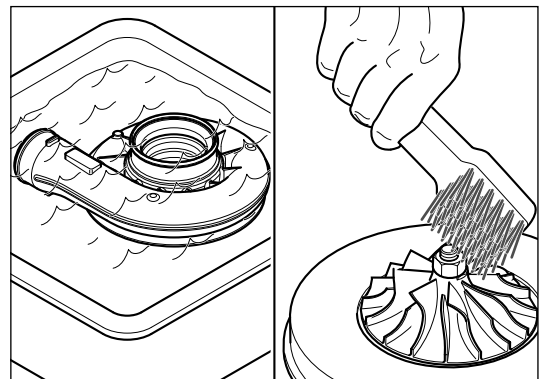


### Warning


Always wear safety glasses during cleaning.


### Warning

HX83 titanium compressor wheel edges are sharp. Handle with care.

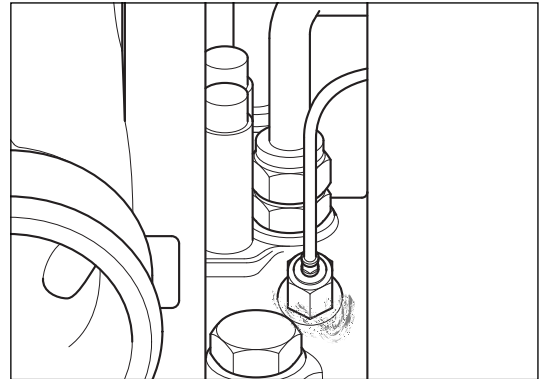




**Warning**  Always wear safety glasses.

**Caution**  Use special socket to tighten speed sensor to the torque specified in Service Data Sheet.


In the event of an oil leak, refer to *Speed Sensor* for all maintenance procedures.

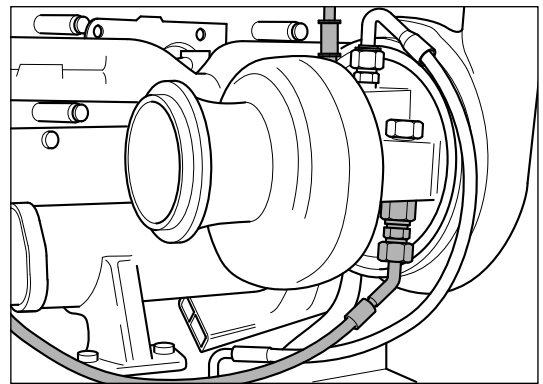



### Coolant Leakage

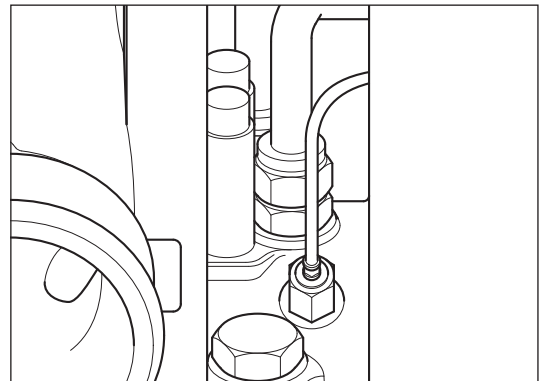
Coolant Adapter M18 x 1.5 and 3/4 UNC 28 tpi

Repair by replacement of coolant inlet and outlet fittings. Where housing threads are damaged replace turbocharger. Torque tighten adapters to value specified by engine manufacturerer.

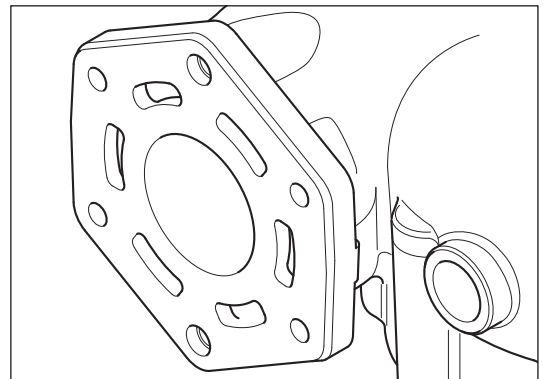
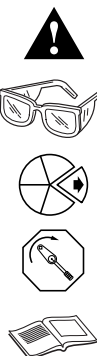
**Caution**  Do not use sealant as this may affect performance of o-ring seals.



**Caution**  Where fitted, ensure speed sensor and cable are not damaged when correcting coolant or oil inlet leak.



In the event of suspected coolant leakage of a flange fed turbine housing always refer to engine manufacturer's service instructions.





**Warning** ⚠

Always wear safety glasses.

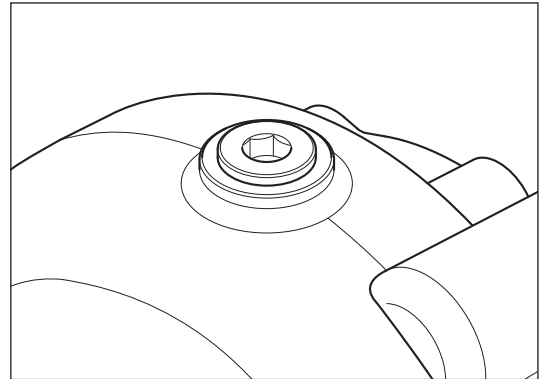
**Warning** ⚠

If there is any possibility that an o ring seal has been subject to fire, always wear neoprene gloves when handling.

**Caution** ⚠

Turbine Housings have been supplied with tapered and straight threaded adapters and plugs of varying thread and spanner sizes. Copper washers, o rings and sealants have been used. Check components and thread details on removal and always use parts recommended by engine manufacturer or Holset.

In the event of coolant leakage from plug or adapter, retighten to values specified in Service Data Sheet. If leak persists change fitting.



**Gas Leakage**

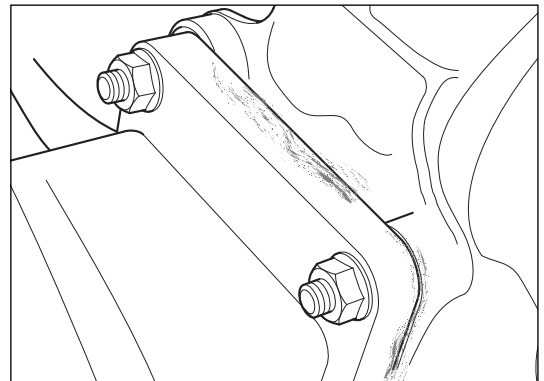
Turbine housing flange leakage will cause soot formation on the flange. Check exhaust manifold to flange gasket seal ensuring fastener torque meets engine manufacturer's recommendation.

Check flange for cracks.

Check Marmon and half Marmon connections (turbine outlet to exhaust system) for fretting damage. Where turbine housing damage is visible refer to ***Turbine and Compressor Housings*** for disassembly and reassembly instructions.

**Warning** ⚠

Turbochargers and installation parts are heavy. Always use safe lifting methods.





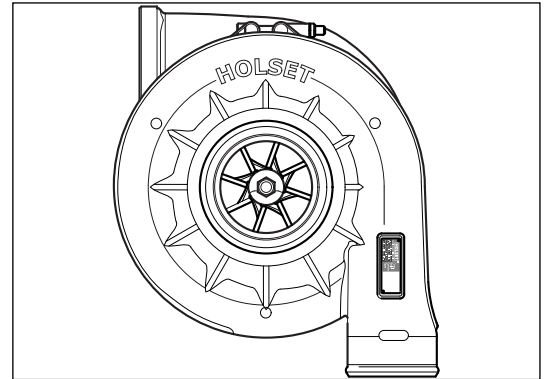


### Visual Checks

Check for cracked, bent or damaged compressor wheel blades.

**Warning**

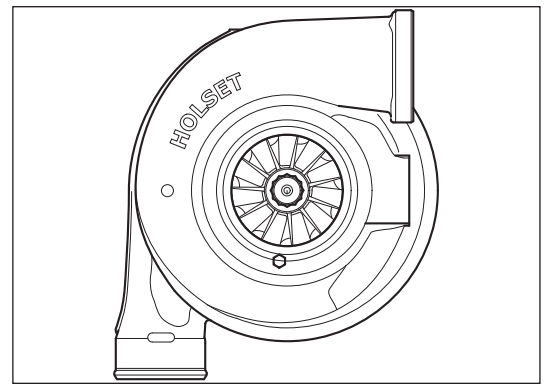
HX83 titanium compressor wheel edges are sharp. Handle with care.



Where practical, check for cracked, bent or damaged turbine wheel blades.

**Caution**

Never attempt to straighten blades.

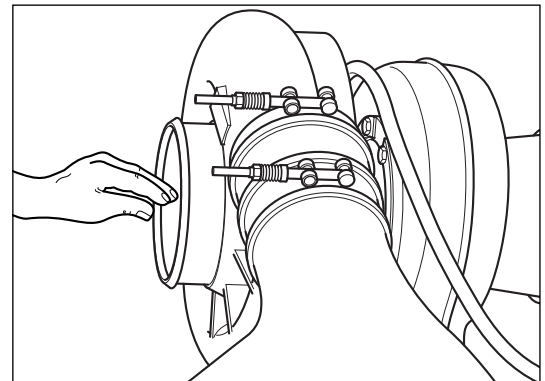


With intake system disconnected from compressor housing, it may be possible to check visually for excess bearing axial and radial clearances.

If in doubt, the turbocharger must be removed from engine to check bearing clearance against recommended values shown in *Service Data Sheet*.

**Warning**

Turbochargers and installation parts are heavy. Always use safe lifting methods.



**Warning**

HX83 titanium compressor wheel edges are sharp. Handle with care.

**Caution**

Air, oil and coolant hoses are specified by engine manufacturers to perform critical functions at pressure and temperature. To avoid leakage and potential turbocharger and engine failures, always use recommended components.

# Bearing Clearance



Secure the turbine housing and check the axial clearance using a dial gauge.

Ensure clearance is within MIN/MAX values shown on **Service Data Sheet**.

If axial clearance does not meet specification refer to turbocharger **Service and Overhaul** to strip and rebuild the CHRA (core).

**Warning**

Turbochargers and installation parts are heavy. Always use safe lifting methods.

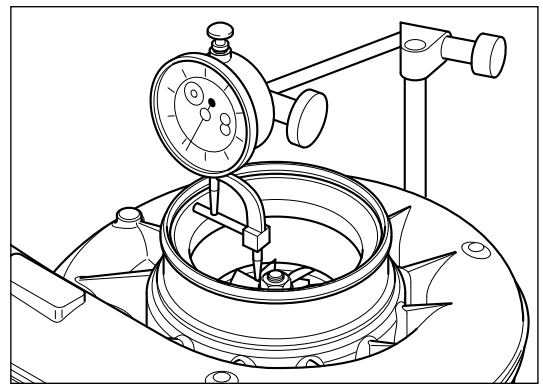
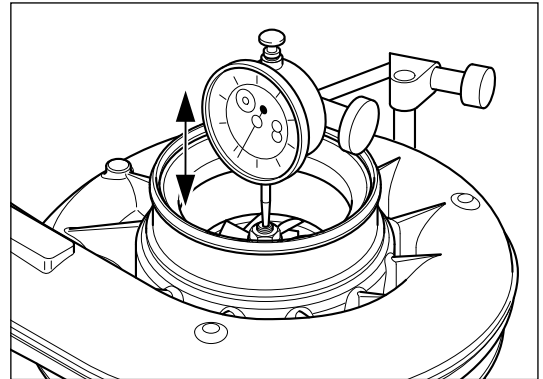
**Warning**

HX83 titanium compressor wheel edges are sharp. Handle with care.

Check the radial movement at compressor impeller nose using a dial gauge.

Ensure movement is within MIN/MAX TIR (Total Indicator Reading) values shown on **Service Data Sheet**.

If radial movement does not meet specification refer to turbocharger **Service and Overhaul** to strip and rebuild the CHRA (core).



# Turbine and Compressor Housings

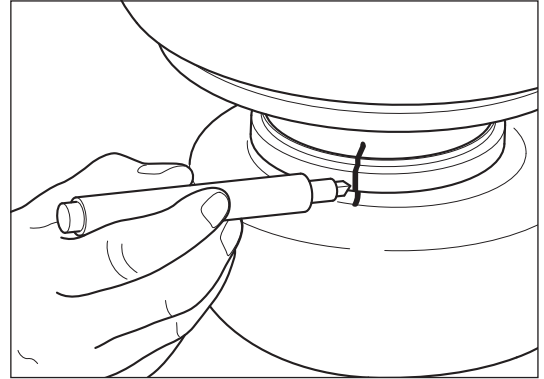


## Turbine Housing

Place turbine outlet on a clean flat surface. Mark turbine housing, bearing housing and V-band clamp, turbine (where fitted). This action assists in the re-assembly process defining correct component orientation.

### Warning

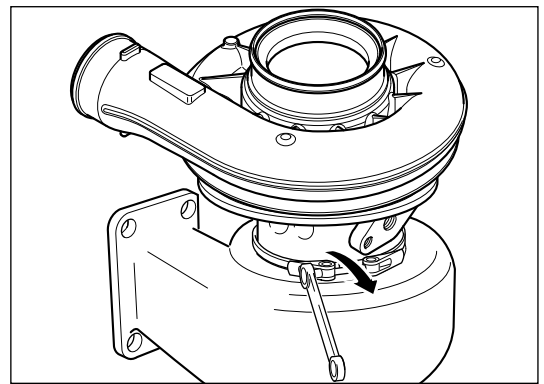
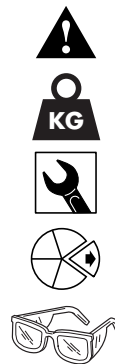
Turbine housings and CHRA assemblies are heavy. Always use safe lifting methods.



## V-band Option HT4B/HT4C/HT80

1/4 UNF 28 tpi (7/16 in)

Loosen locknut, V-band clamp (62) and discard.



## Lockplate Option HC5A/HX80/82/83/85

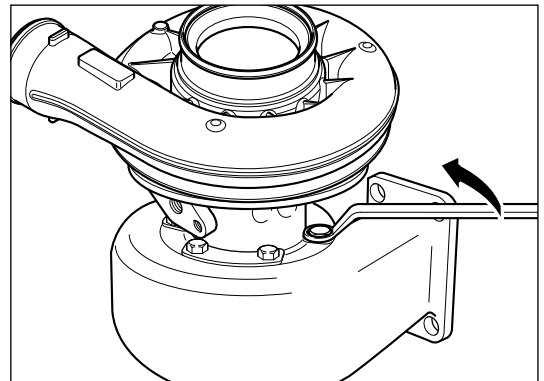
M8 x 1.25 (13 mm)

Secure turbine housing flange in vice. Use a hammer and chisel to knock lockplate tabs away from turbine housing bolts. Loosen remove and discard the 8 bolts (57) and 4 lockplates, (50).

### Caution

Take care not to shear the clamp plate bolts.

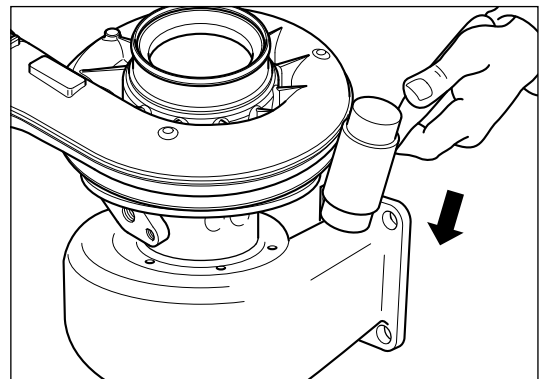
Seized bolts may be freed by spraying with penetrating oil and soaking for twenty minutes or a period of time recommended by the oil manufacturer.



Check bearing housing and compressor housing assembly rotates freely in turbine housing. If not, gently tap turbine housing with soft hammer. When assembly comes loose, safely lift it out of turbine housing engagement.

### Caution

Turbine blades can be damaged easily when the turbine housing is removed.





**Warning**

Turbine housings and CHRA assemblies are heavy. Always use safe lifting methods.

**Caution**

Where a crack will cause leakage to atmosphere the turbine housing must be replaced.

Cracking of the internal wall at the entry to the turbine wheel (tongue) is an acceptable service condition and the turbine housing may be re-used.

Always clean the turbine housing before re-assembly paying particular attention to surfaces close to the turbine wheel and the bearing housing location. Refer to **cleaning of housings** for details.

**Caution**

Turbine housings can exhibit cracking when subject to excessive thermal and mechanical loads.

Cracking of the turbine housing inlet flange and inlet duct generally requires turbine housing replacement. Acceptance and rejection guidelines are shown in these illustrations. If an exhaust gasket is available, always ensure that any cracks lie within its sealing area.

Check turbine housing inlet flange flatness is within 0.1 mm (0.004 in) before retaining component for re-use.

**Flange Fasteners - Clearance Holes**

Check fastener hole diameter is not more than 1.5 mm larger than the max. thread diameter of the fastener.

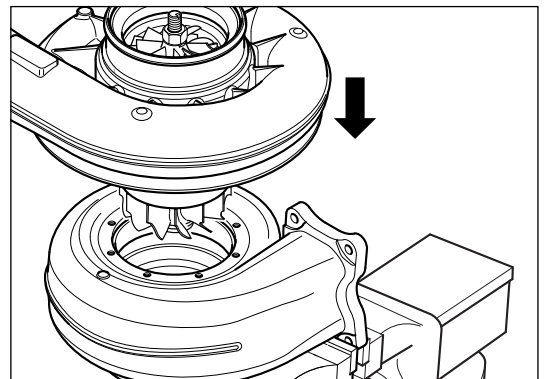
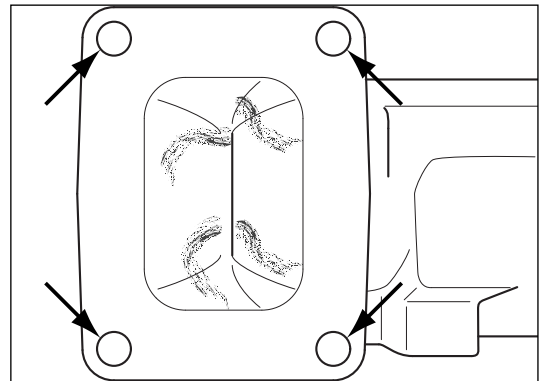
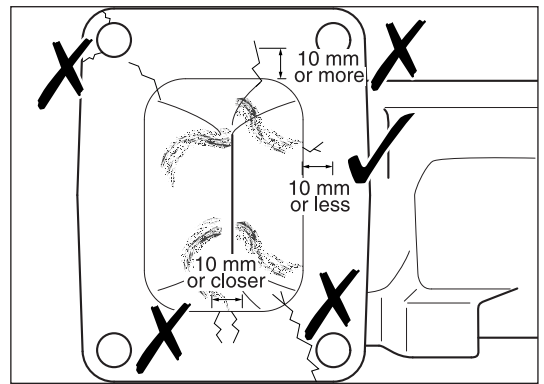
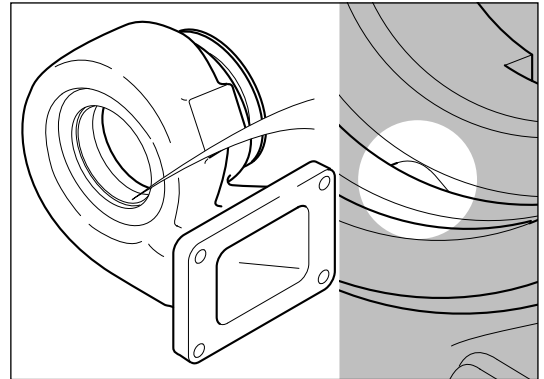
To replace turbine housing secure housing in a vice. Position V-band clamp (where fitted) over the bearing housing.

Apply anti seize compound to bearing housing bore location of the turbine housing.


Safely slide bearing and compressor housing assembly into turbine housing. Use ink alignment mark to locate housing assembly in correct orientation with the turbine housing.

**Caution**

The turbine blades can be easily damaged when installing in the turbine housing.



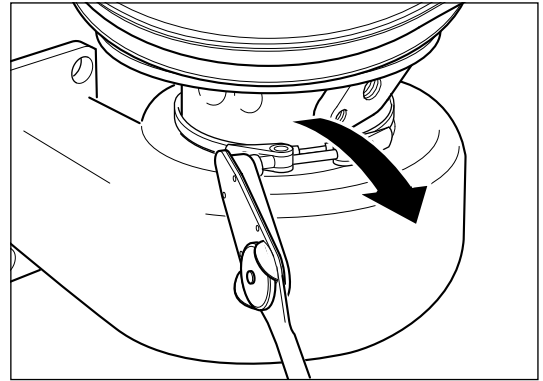


**Warning**   
 Turbine housings and CHRA assemblies are heavy.  
 Always use safe lifting methods.

**V-band Option HT4B/HT4C/HT80**

1/4 UNF 28 tpi (7/16 in)

Place V-band clamp in correct orientation and torque tighten new locknut (62) to value specified in **Service Data Sheet**.



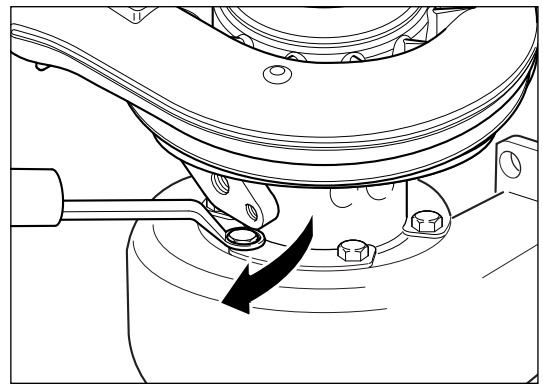
**Lockplate Option HC5A/HX80/82/83/85**

M8 x 1.25 (13 mm)

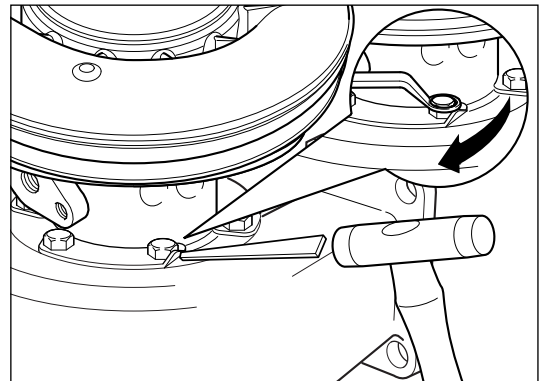
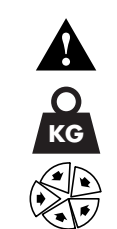
Secure turbine housing flange in vice.


Install the four new lockplates (50) and torque tighten eight new bolts, turbine housing (57) to value specified in **Service Data Sheet**.

Depending on housing orientation, some lockplate bolts may have restricted access. In these cases, use a suitable torque wrench adapter attached to a specially calibrated torque wrench.



Following torque tightening it may be necessary to turn lockplate bolts in the tightening direction until a flat aligns with the lock tab. Use a hammer and drift to knock lockplate tabs into position against the turbine housing bolts.



**Warning**   
 HX83 titanium compressor wheel edges are sharp.  
 Handle with care.

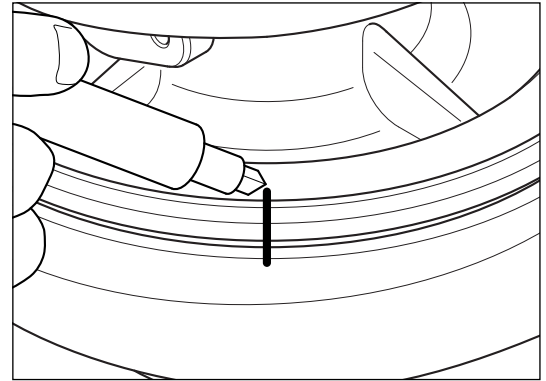


## Compressor Housing

Place compressor inlet on a clean flat surface. Mark compressor housing, bearing housing and V-band clamp to record correct orientation. This action assists in housing orientation during re-assembly.

### Warning

CHRA assemblies are heavy. Always use safe lifting methods.

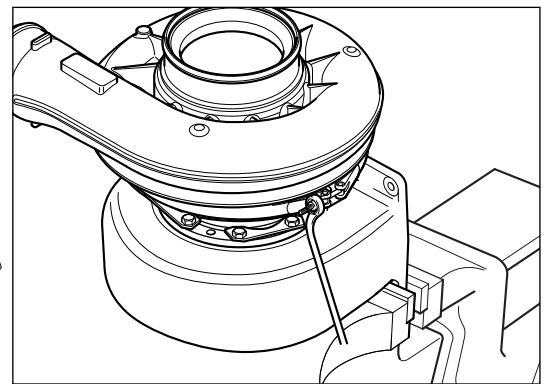
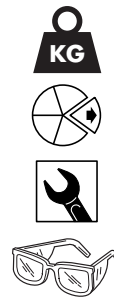


M8 (11 mm) HX83 only

1/4 UNF (7/16 in)

Secure the turbine housing (5) in a vice.

Loosen and remove the compressor housing V-band locknut (62).



### Warning

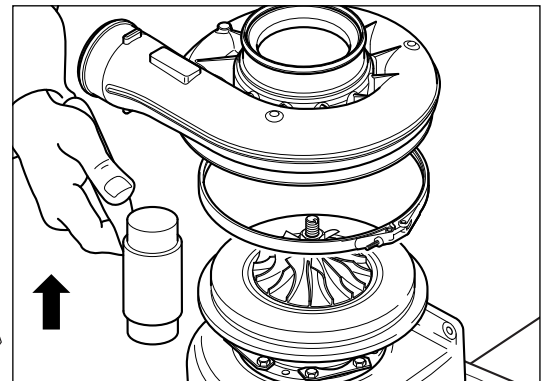
HX83 titanium compressor wheel edges are sharp. Handle with care.

Use a soft hammer to gently tap the compressor housing off the bearing housing.

Remove V-band clamp and retain.

### Caution

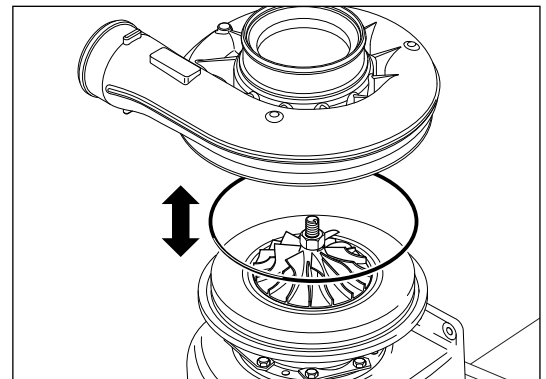
Compressor blades can be damaged easily when the compressor housing is removed.



On some models, removal of compressor housing will expose an o-ring seal. It might be found on diffuser spigot diameter or in compressor housing groove.

### Warning

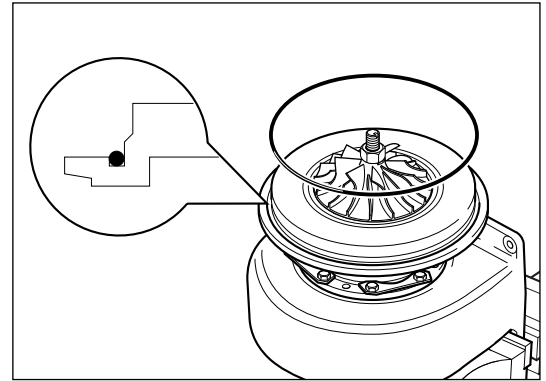
If there is any possibility that the seal has been subject to fire, always wear neoprene gloves when handling.



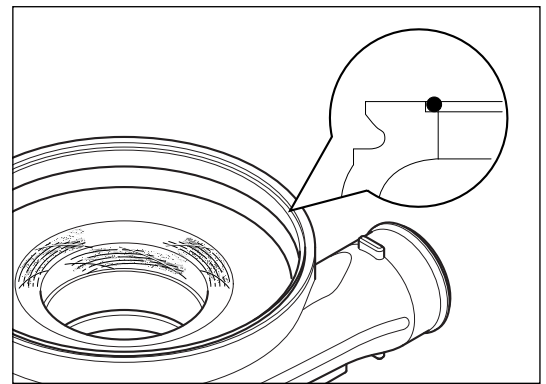


O-ring seal, compressor housing – HX82/HX83

Where fitted with an o-ring seal, for example gas applications, HX82 with cast iron compressor housing and all HX83 turbochargers feature an o-ring groove in the diffuser flange.

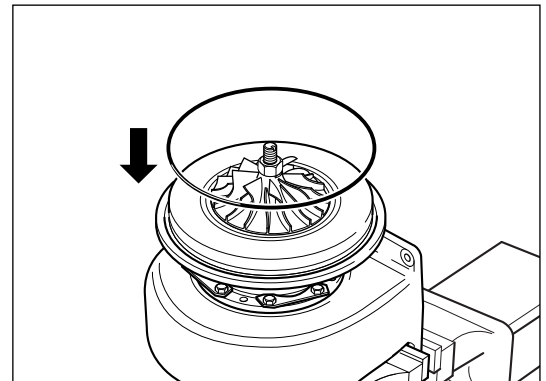


HX82 options with aluminium compressor housing may have an o-ring fitted. Where fitted, the o-ring groove will be machined in the compressor housing.



**Warning** ⚠

HX83 titanium compressor wheel edges are sharp. Handle with care.



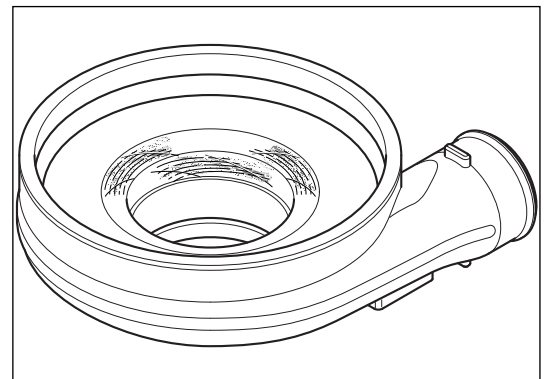
**Caution** ⚠

Always locate new o-ring, where fitted, on the diffuser spigot irrespective of ring groove location.

Inspect internal profile of compressor housing for scoring damage due to possible contact with compressor wheel. Move to [Cleaning of Housings](#) if deposits remain.

Replace with new if profile damage is visible.

To clean compressor housings fitted with an inlet baffle move to [Inlet Baffle Option](#).





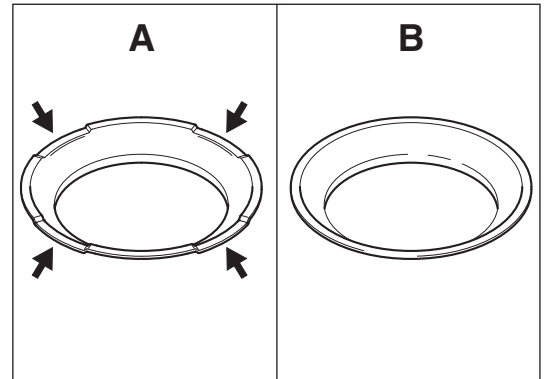
### Inlet Baffle Option HX82/83

To clean compressor housings fitted with an inlet baffle it is necessary to remove baffle.

Inlet baffle (A) is the old type; inlet baffle (B) is the new type. Baffle (B) has been improved and no longer incorporates the four stepped areas. This gives the new baffle increased service life.

**Caution**

Always fit the new type of baffle (B) on re-assembly.



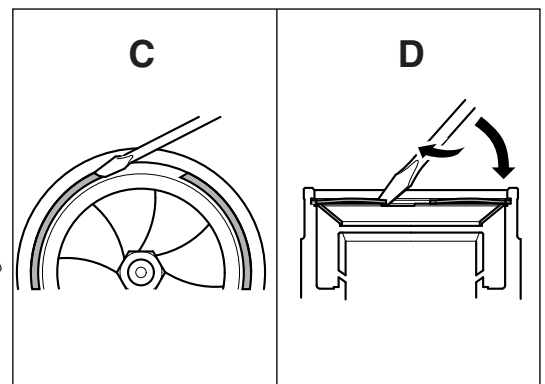
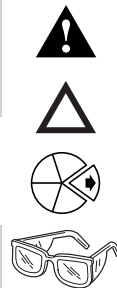
**Warning**

Always wear safety glasses.

Using a flat screw driver, carefully apply force in the area shown (C) as the retaining ring starts to move, force the screwdriver under the ring as shown in (D).

**Caution**

When removing the inlet baffle retaining ring, be careful not to damage the compressor wheel with the screw driver. Use a rag or rubber bung to protect the wheel.

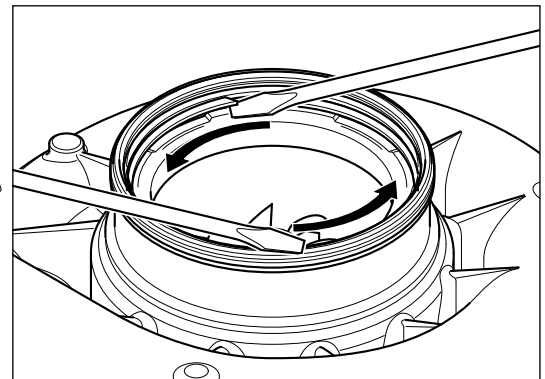


Push the screwdriver in an anti-clockwise (counter-clockwise) direction to force the retaining ring out of the groove. Remove the retaining ring.

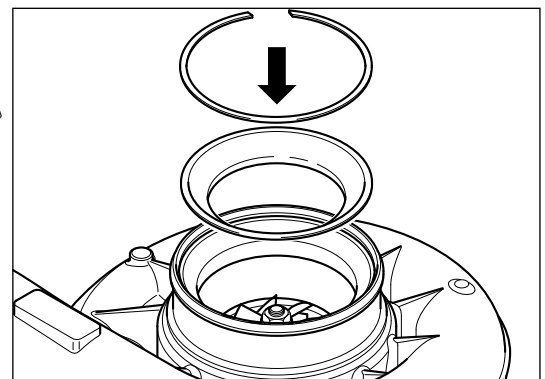
Remove the inlet baffle.

**Warning**

Use free hand to contain disassembled ring within compressor inlet.



Following cleaning of the compressor housing, locate a new type of inlet baffle onto the location ledge of the compressor housing inlet.





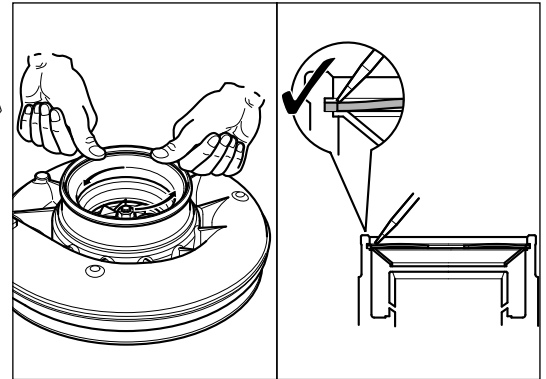


**Warning** ⚠️

Always wear safety glasses and take care not to pinch fingers during assembly.

Hold one end of the retaining ring in position in its compressor cover groove. Press the remainder of the retaining ring into position using free hand.

Use a flat screw driver to make sure the retaining ring is correctly seated in the compressor cover groove.



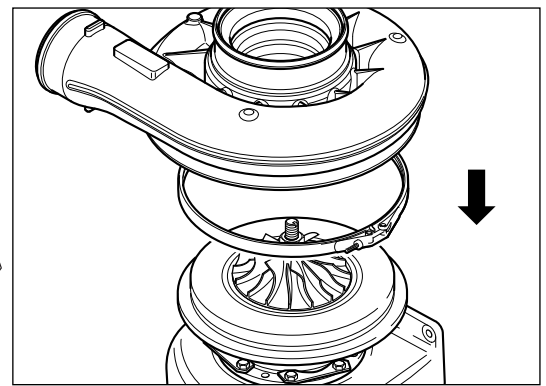
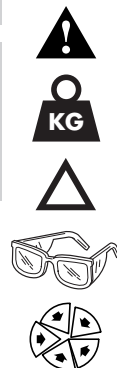
**Warning** ⚠️

Turbine housings and CHRA assemblies are heavy. Always use safe lifting methods.

**Warning** ⚠️

HX83 titanium compressor wheel edges are sharp. Handle with care.

Ensure o ring seal is located on diffuser spigot of all HX83 models and HX82 models with cast iron or aluminium housings where an o ring was removed on disassembly. Loosely fit V-band clamp. Carefully locate the compressor housing over the compressor wheel.



**Caution** ⚠️

Do not damage compressor blades during installation.

M8 (11 mm) HX83 and HX82 with cast iron compressor housing

1/4 UNF 28 tpi (7/16 in)

Place V-band clamp in position and torque tighten new locknut (62) to value specified in *Service Data Sheet*.

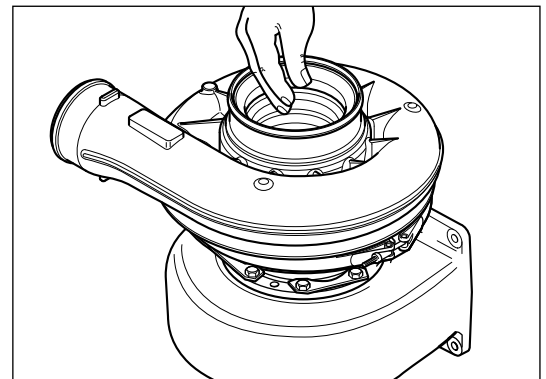
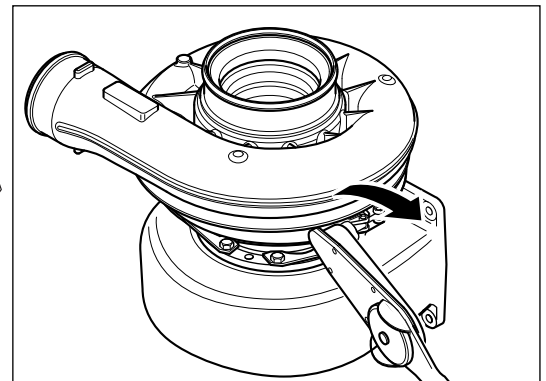
**Caution** ⚠️

All HX83 models and HX82 with cast iron compressor housing use a special V band assembly. Always ensure that correct v-band assembly is used with torque tightening value specified in *Service Data Sheet*.

Ensure rotor assembly freely rotates.

**Warning** ⚠️

Turbochargers and installation parts are heavy. Always use safe lifting methods.



# Cleaning of Housings



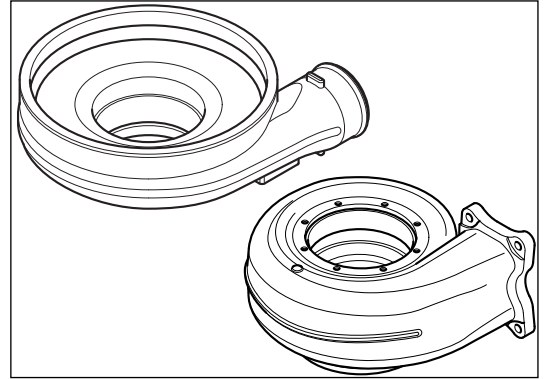
## Warning

Turbine housings are heavy. Always use safe lifting methods.

Visually inspect the parts to detect signs of burning and other conditions in order to obtain as much information as possible before washing.

## Caution

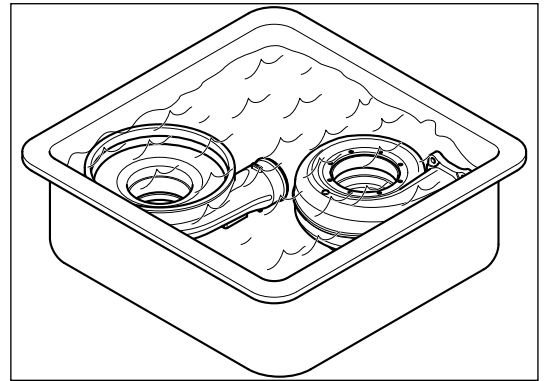
Housing surfaces adjacent to turbine and compressor wheels must be clean, smooth and free from deposits.



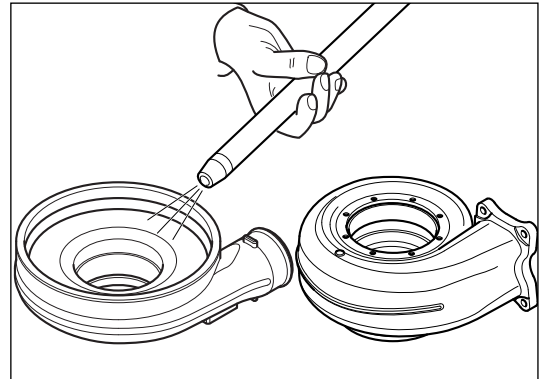
## Warning

Always wear safety glasses during cleaning.

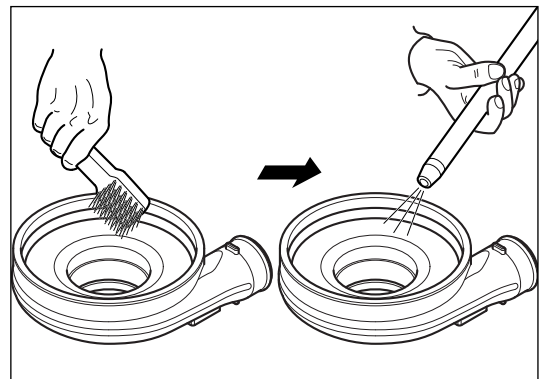
Soak the housings in a non-corrosive low flash point metal cleaner to loosen deposits.




Dry the components using compressed air.



Scale like deposits, if any, must be removed by using a non metallic bristle brush. After removing the deposits, re-wash and dry the components.







**Warning** 

Turbine housings are heavy. Always use safe lifting methods.

It is permissible to bead blast turbine and cast iron compressor housings if chemical and brush cleaning is not effective.

**Warning** 

Always wear safety glasses during cleaning.

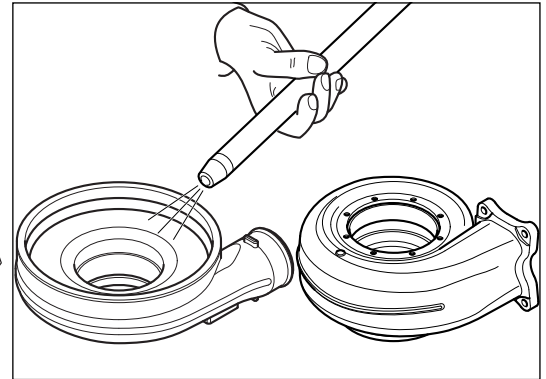
**Warning** 

Do not bead blast Aluminium and Cast Iron components together.

**Caution** 

Prevent the bead spray impinging directly on clamp plate and turbine flange threads by masking or plugging

After removing the deposits, re-wash and dry the components.



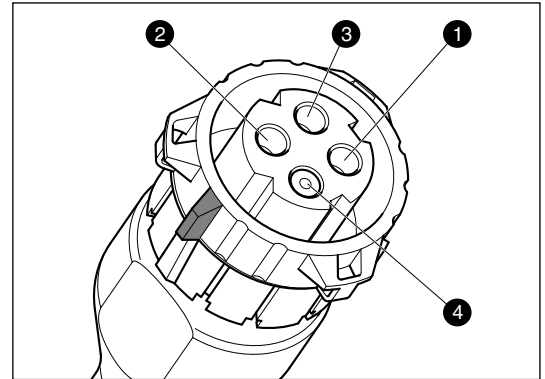
# Speed Sensor



## Sensor Check

Disconnect the sensor at its electrical connector. Using a multi-meter, check the resistance between pins 1 and 2 is in range 600 to 1000 Ohm with the sensor at 20°C.

Pins 1 and 2 can be identified by reference to pin 4 location where no pin is fitted. Where resistance is outside range, replace speed sensor (112)\*

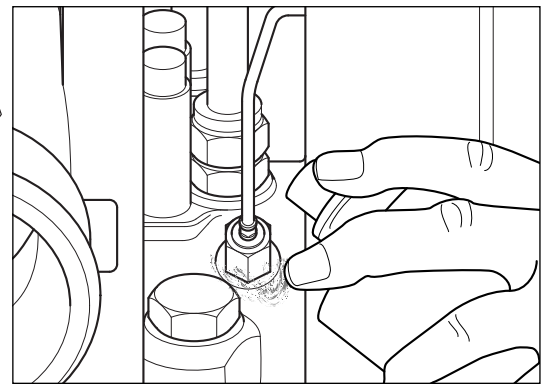


## Sensor Removal

Where road spray, dirt and fluid ingress has caused fouling or corrosion of the speed sensor apply a penetrating oil in accordance with the oil manufacturer's instructions.

### Warning

Always wear safety glasses.

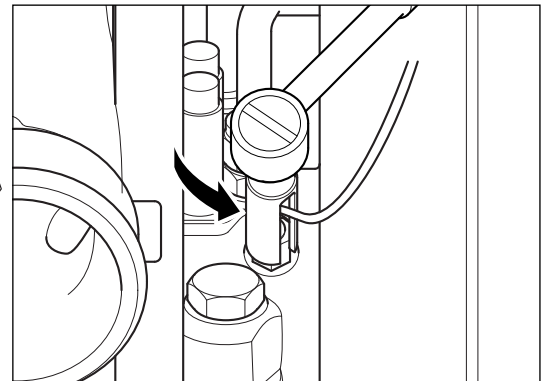


M10 x 1 (13 mm)

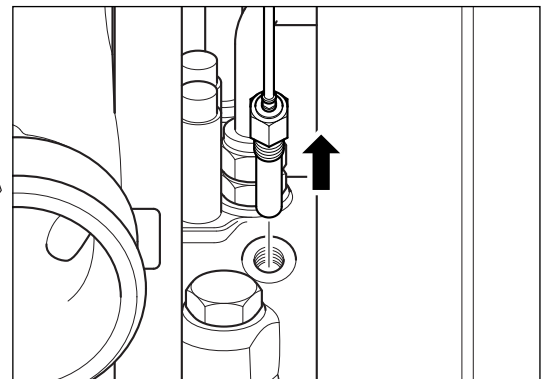
Using the Sensor Socket, loosen the speed sensor.

### Caution

Breaking the sealed joint may require significant torque. It is essential that the sensor socket is properly engaged on the sensor to avoid inadvertent damage to the cable and connector.



Extract the speed sensor and place on a clean surface to avoid collection of unwanted ferrous particles.

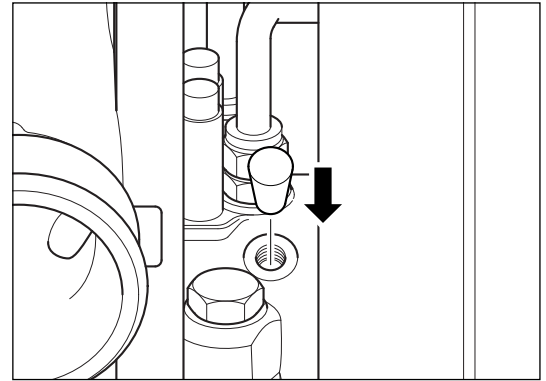




**Caution**

Removal of speed sensor leaves an open access to the bearing housing. It is essential that no dirt or fluids enter the bearing housing cavity during speed sensor replacement.

Insert clean rubber plug.

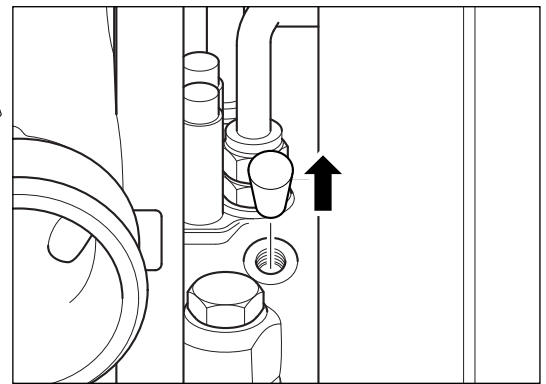


**Sensor Replacement**

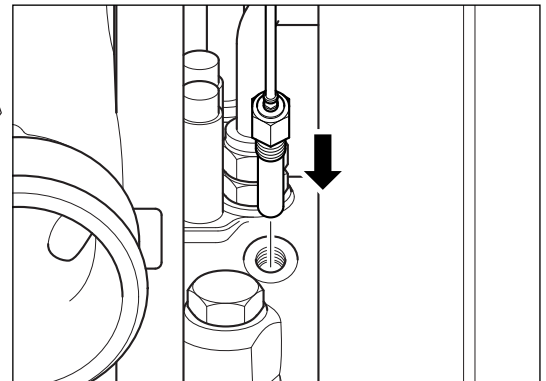
**Warning**

Always wear safety glasses.

Remove clean rubber plug.



Prior to inserting speed sensor ensure it is clean and unable to collect magnetic particles as it is inserted. The sensor is designed to seal directly in the bearing housing without any supplementary sealing. Do not fit an o ring or washer.

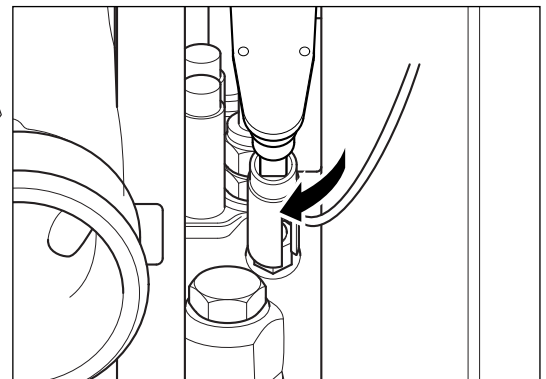


M10 x 1.0 (13 mm)

Torque tighten sensor (112) \* to the value specified in **Service Data Sheet**.

**Caution**

Always use special socket wrench to prevent damage to sensor cable.



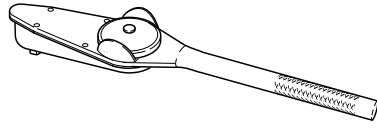
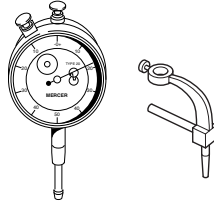
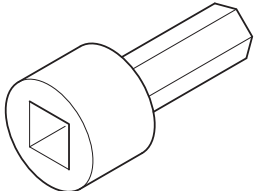
**Caution**

Accurate torque wrench selection and calibration is critical to ensure a leak-proof compression joint between sensor and bearing housing.

# Service Tools



The following special tools are recommended to perform procedures in this manual. The use of these tools is shown in the appropriate procedure. These tools can be purchased from your local Authorised Repair Location.

Part No.	Tool Description	Tool Illustration
	Torque Wrench	
	Dial Gauge and Dial Gauge Adaptor	
	Allen Key	

**Caution** 

All Service and Maintenance settings are shown in Holset's Service Data Sheet. It is essential that these settings are used. Common tools found in mechanic's tool box not included.

# Disassembly



## Note

Before disassembly, check for turbine and compressor blade damage. Measure bearing radial movement and axial clearance to ensure the CHRA (core) is within the MIN/MAX values shown on [Service Data Sheet](#).

## Warning

Turbochargers and CHRA assemblies are heavy. Always use safe lifting methods.

## Warning

HX83 turbochargers must not be disassembled. Refer to Holset approved agent for overhaul and repair.

Locate the CHRA (2) on to a 29 mm 6 point socket located in a suitable fixture.

## Caution

Always make sure the assembly, turbine wheel and compressor wheel have alignment marks before disassembly of the CHRA.

If no marks exist scribe the shaft and compressor wheel before removing the compressor wheel lock nut. The washing process may remove indelible ink so a file mark on the shaft and scribe line on the compressor wheel nose is recommended.

## HC5A/HX80/85 v HT4B/HT4C/HT80 Wheels

M10 (17 mm)

Remove the locknut, compressor wheel (61).

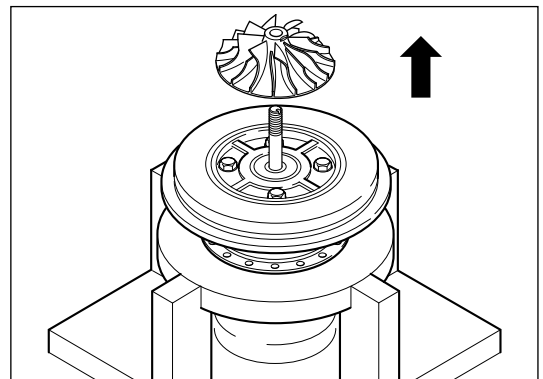
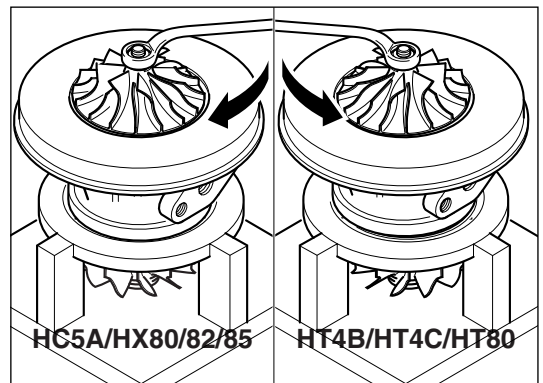
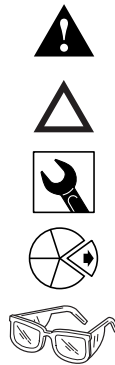
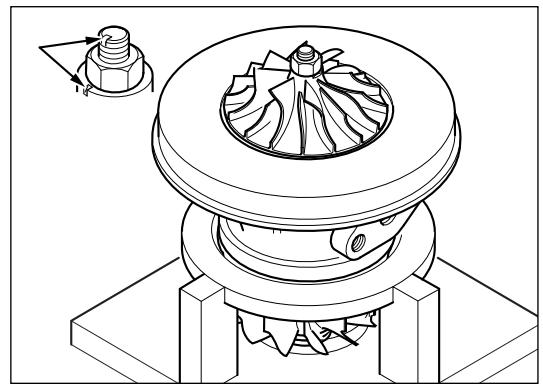
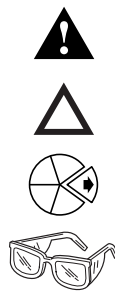
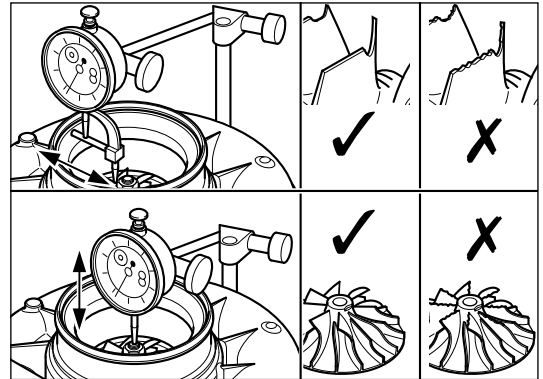
## Note

HC5A/HX80/85 - Left hand thread.  
HT4B/HT80 - Right hand thread.

## Caution

Do not mix the turbine or compressor wheels of HC/HX and HT series of turbochargers

Remove compressor wheel (7).

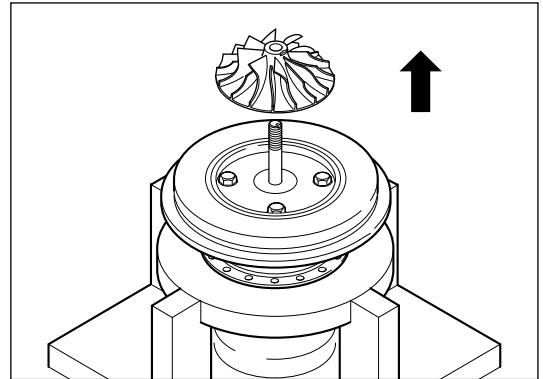




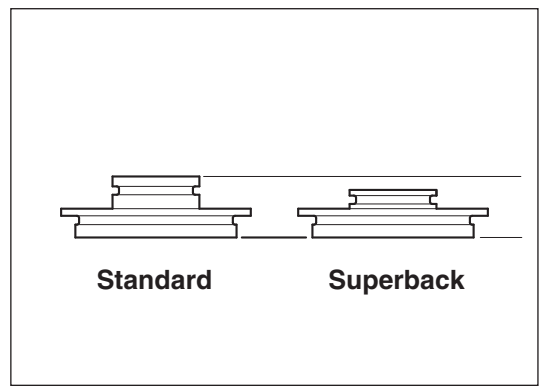
**Non interchangeable HX82 compressor wheels**

At this stage of disassembly of an HX82 turbocharger , it is advisable to note the diffuser detail. A diffuser showing no ribs surrounding the central boss indicates the fitment of a superback compressor wheel.

**Warning** Always wear safety glasses.



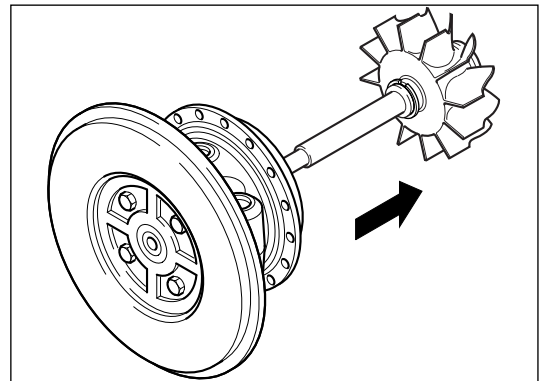
The superback wheel is 2.8 mm longer than standard and must always be fitted with non ribbed diffuser and oil slinger shortened by 2.8 mm.



**Warning** CHRA assemblies are heavy. Always use safe lifting methods.

Remove remaining CHRA from fixture and gently slide bearing housing (4) off the assembly, turbine wheel (6).

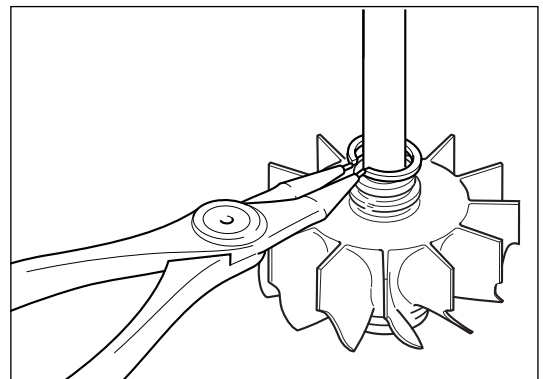
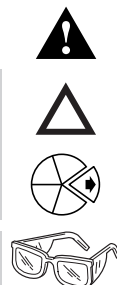
It is permissible to tap the protruding turbine shaft gently with a soft hammer if the split ring seal/s are stuck in their bore.



Carefully remove split ring seal, turbine (13) \* and discard.

**Caution** Care should be taken not to score the turbine wheel shaft assembly.

**Note** HT4B/HT4C/HT80 turbochargers are fitted with twin split ring seals



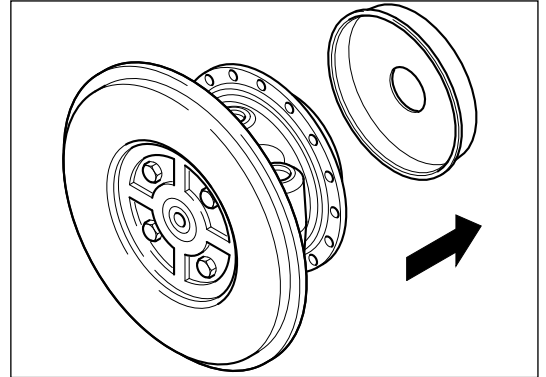




**Warning**

Always wear safety glasses.

Remove heat shield (38)

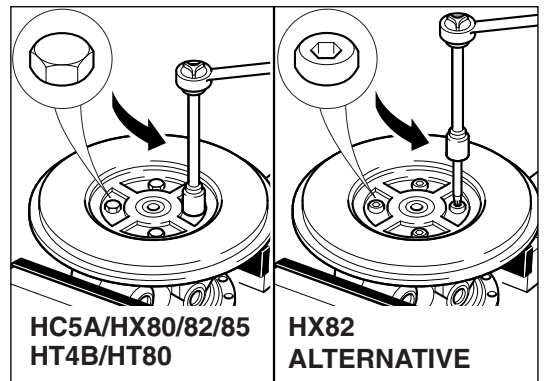


**Warning**

HX83 turbochargers must not be disassembled. Refer to Holset approved agent for overhaul and repair.

8 mm x 1.25 (13 mm) (6 mm)

Secure the bearing housing in a vice using soft jaws. Remove and discard the four diffuser patch screws (56) \* and the four diffuser washers (60).



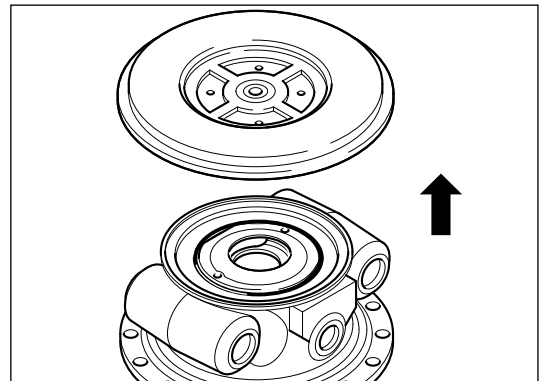
**Note**

Diffuser patch screws may be tight. Apply a small amount of penetrating oil to help free.

**Warning**

CHRA assemblies are heavy. Always use safe lifting methods.

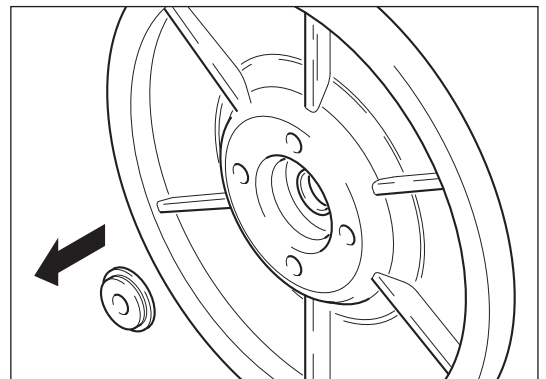
Carefully remove the diffuser (17).



Remove and discard the oil slinger (31) \*.

**Caution**

Some HX82 turbochargers are fitted with non-ribbed diffuser and unique oil slinger to accommodate a superback compressor wheel.

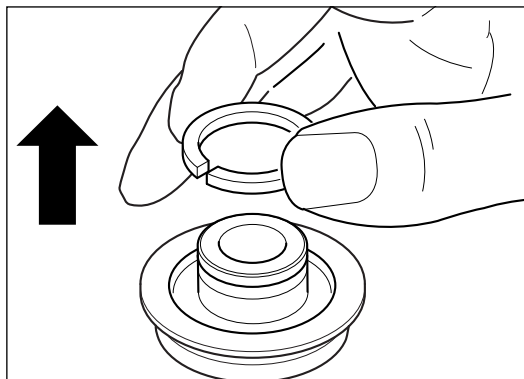
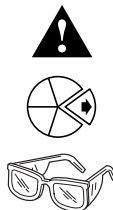




**Warning**

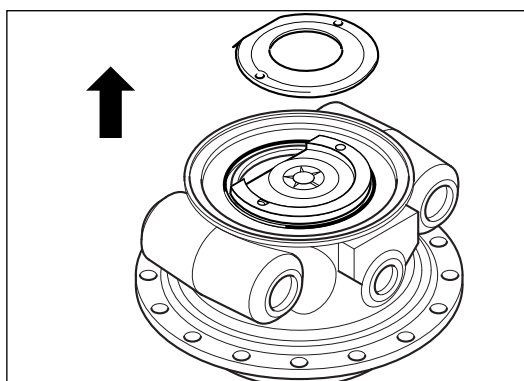
Always wear safety glasses.

Carefully remove and discard the piston ring seal (16) \*.

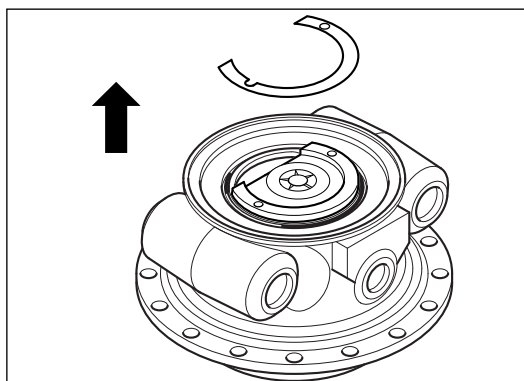


Remove and discard the oil baffle (33) \*.

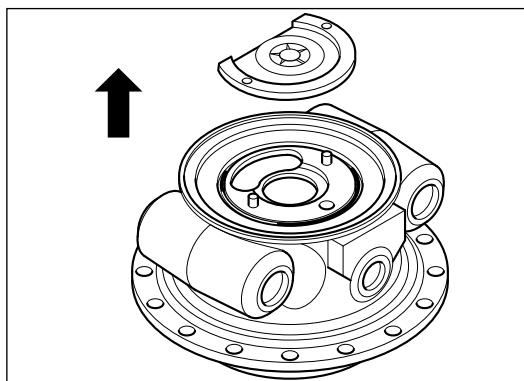
Where core is fitted with water cooled bearing housing, it is necessary to remove o-ring seal (27) \* at this stage.



Remove the shim (146) \* and discard.



Remove the thrust bearing (12) \* and discard.





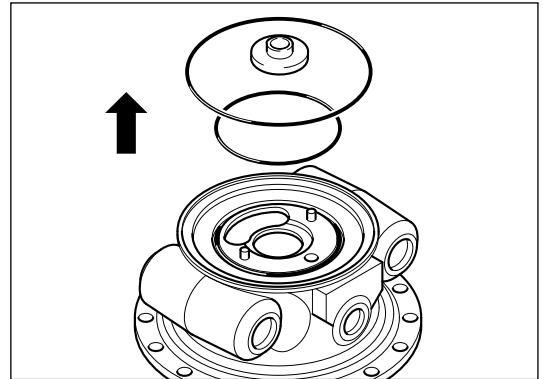
**Warning**

If there is any possibility that the seal/s has been subject to fire, always wear neoprene gloves when handling.

Remove the thrust collar (36) and remove and discard the seal/s (32)\*(27)\*.

**Note**

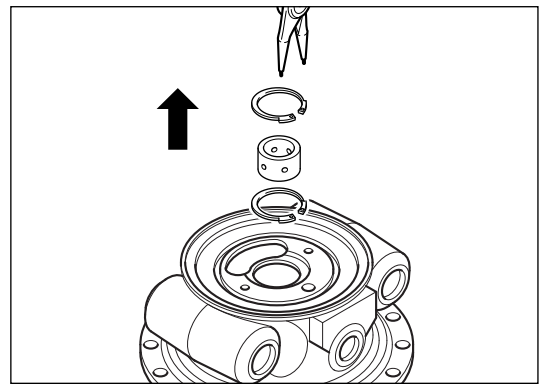
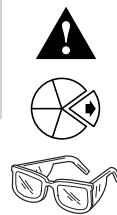
Air cooled bearing housings are fitted with o-ring seal (32) only.



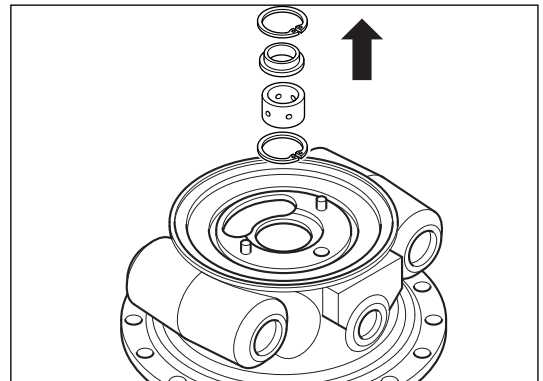
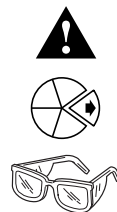
**Warning**

Always wear safety glasses.

Using suitable circlip pliers, remove and discard the two circlips (64) \* and the journal bearing (11) \* from the compressor end.



Turn the bearing housing over and repeat the process of bearing removal at turbine end.

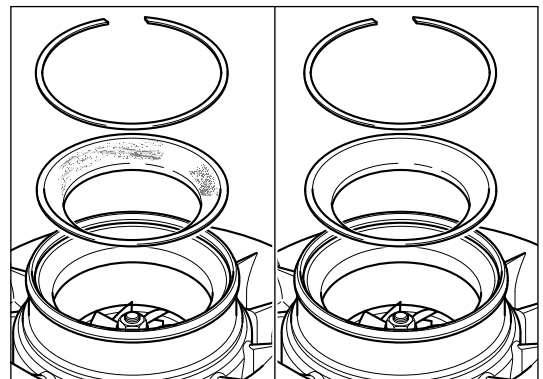
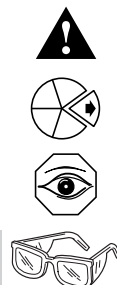


**Inlet Baffle Option HX82/83**

Where specified by the engine manufacturer, certain turbochargers can have a pressed steel baffle fitted into the inlet section.

This item is not serviceable and if damaged, must be replaced, as the geometry of the part is critical to the performance of the baffle.

To clean compressor housings always remove inlet baffle.




**Warning**

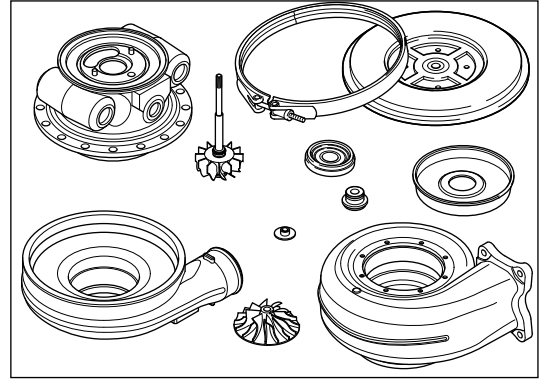
Refer to *Turbine and Compressor Housings* for removal instructions.

# Component Cleaning




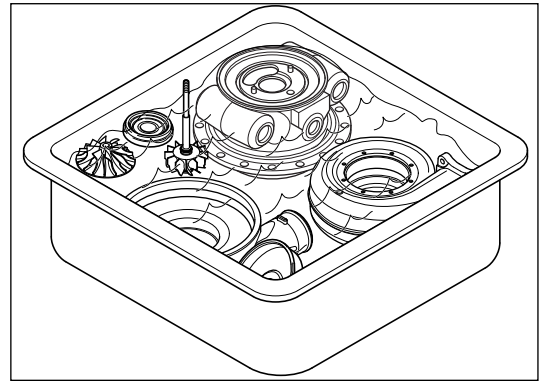
**Warning**  Turbine housings are heavy. Always use safe lifting methods.

Visually inspect all parts to detect signs of burning and other fault conditions in order to obtain as much information as possible before washing.

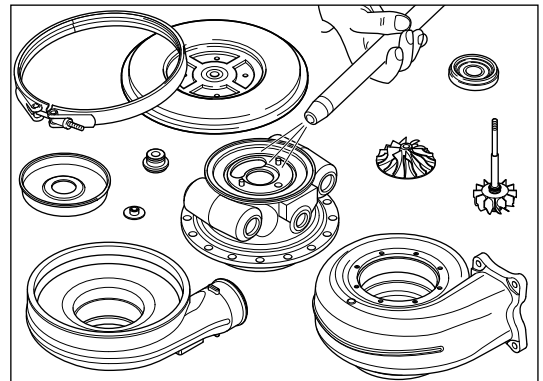


Soak the components in a non-corrosive low flash point metal cleaner to loosen deposits.

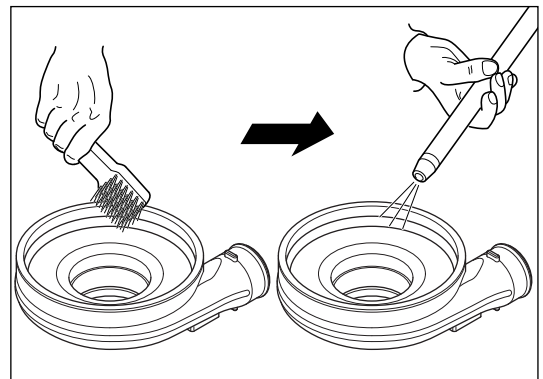
**Warning**  Always wear safety glasses.



Dry the components using compressed air. Protect the sliding surfaces of the cleaned parts against corrosion by applying clean engine oil.



M6 x 1.25  
Scale like deposits, if any, must be removed by using a non metallic bristle brush. After loosening the deposits with the brush, wash and dry components as above.





**Warning** ⚠

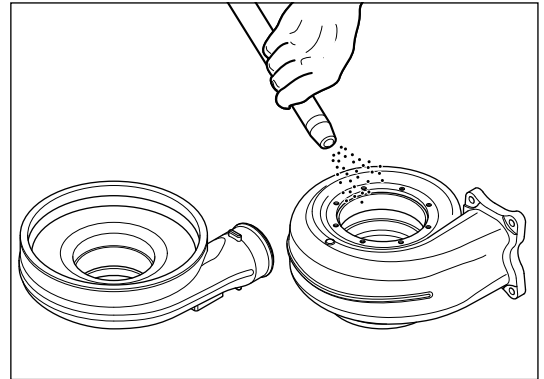
Turbine housings are heavy. Always use safe lifting methods.

Flange M10 x 1.5 - Clamp Plate M8 x 1.25

**Warning** ⚠

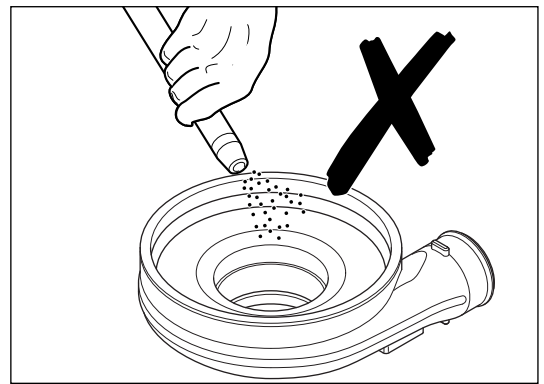
Do not bead blast Aluminium and Cast Iron components together.

It is permissible to bead blast turbine and cast iron compressor housings if chemical and brush cleaning is not effective.



**Caution** ⚠

Housing surfaces adjacent to turbine and compressor wheels must be clean, smooth and free from deposits. Always protect threads during bead blasting and clean with the specified thread tap after blasting.



**Warning** ⚠

Always wear safety glasses.

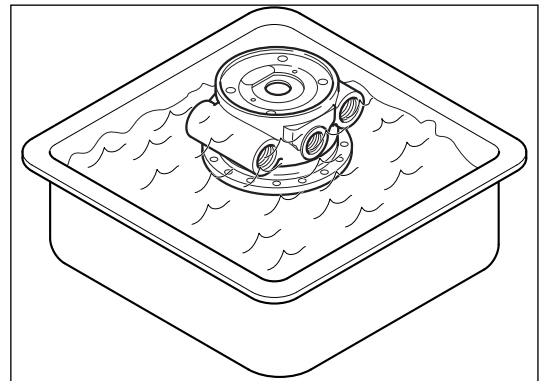
**Caution** ⚠

Do not bead blast Aluminium compressor housing as this may damage critical surfaces.

Oil fittings M16 x 1.5 - M10 x 1.5

Coolant fittings M18 x 1.5

It is important that the oil chamber of the bearing housing is free of carbon before re-building. If heavy deposits persist after repeat washing replace bearing housing (4).



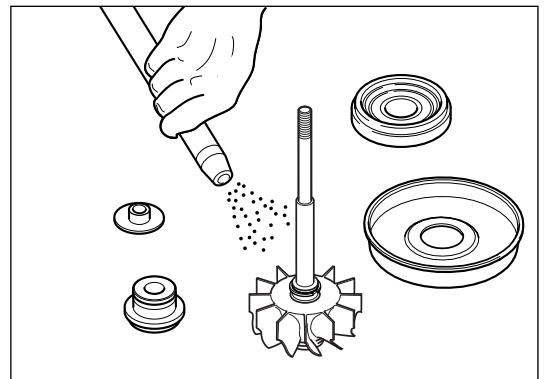
**Caution** ⚠

Do not bead blast the bearing housing as this may damage critical bearing surfaces.

It is permissible to bead blast steel rotating parts.

**Caution** ⚠

Blasting specific areas for long periods of time may affect component balance. Protect thread of turbine wheel assembly.



**Caution** ⚠

Always clean components with compressed air after blasting.

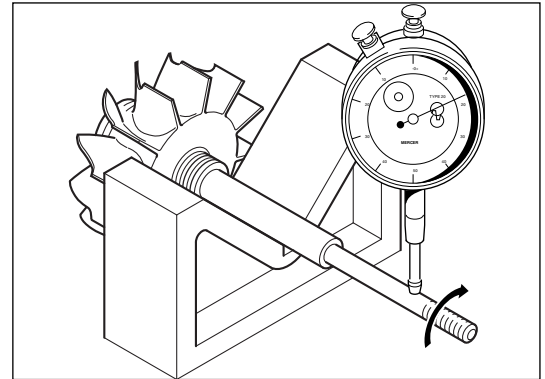
# Inspection and Testing



## Major Components

### Assembly Turbine Wheel

Place assembly, turbine wheel (6) on a vee block. Position a dial gauge on the turned surface of the shaft at the threaded end. Check dial gauge reading. Where shaft bend is greater than the recommended maximum of 0.015 mm (0.0006 in) replace the assembly.



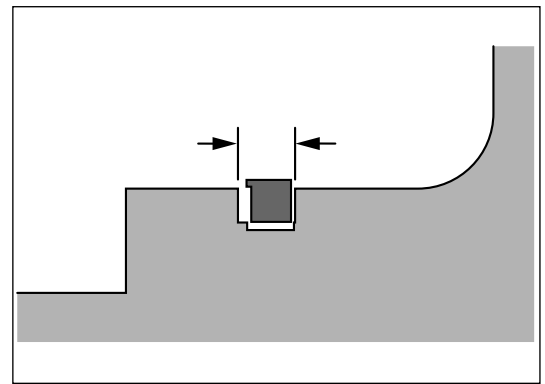
**Caution**

Do not attempt to straighten the turbine shaft.

Inspect split ring seal, turbine (13)\* groove walls for wear. If groove width exceeds recommended maximum of 1.70 mm (0.067 in) replace assembly.

If the wear step on the ring face exceeds 0.102 mm (0.004 in) replace split ring seal, turbine.

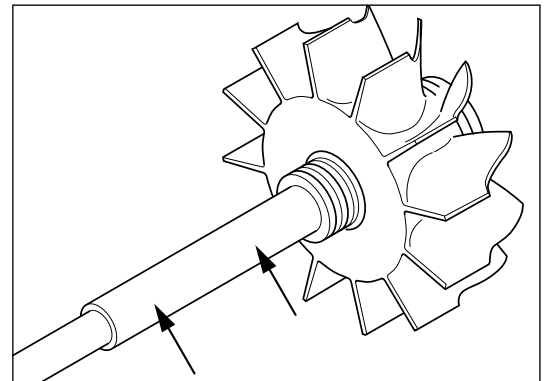
If the free gap of the ring is less than 2.0 mm (0.08 in) replace split ring seal, turbine.



**Note**

HT4B/HT4C/HT80 turbochargers have twin rings of the same dimensions as the single ring variants.

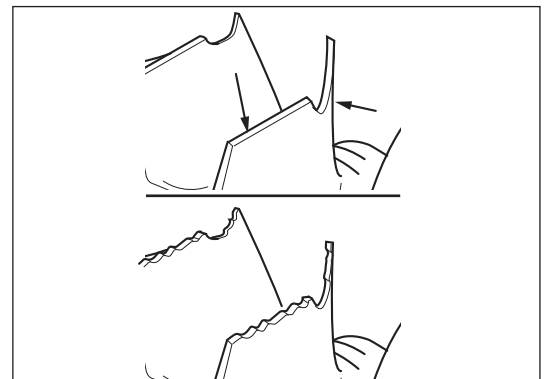
Inspect the bearing journals for excessive scratches and wear. Where scratching is excessive or where either journal diameter is less than the recommended minimum of 15.97 mm (0.629 in) replace the assembly.



Inspect for cracked, bent or damaged blades.

**Caution**

Never attempt to straighten blades.



Replace with new if any damage found.



### Compressor Wheel

Inspect compressor wheel (7), for cracked, bent or damaged blades.

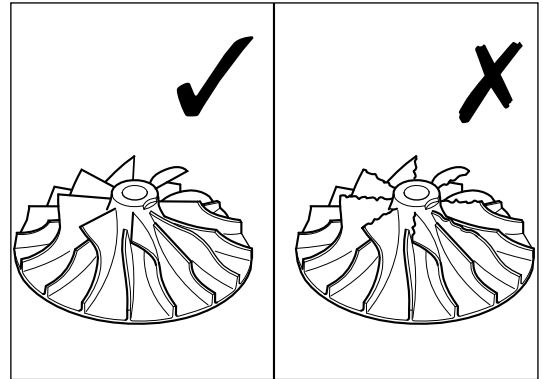
**Caution**

Do not attempt to straighten blades.

Replace with new if any damage found.

**Caution**

HX83 cores with titanium compressor wheels must not be disassembled. Refer to Holset approved agent for overhaul and repair.



### Compressor Housing

Inspect internal profile of compressor housing (8), for scoring damage due to possible contact with compressor wheel.

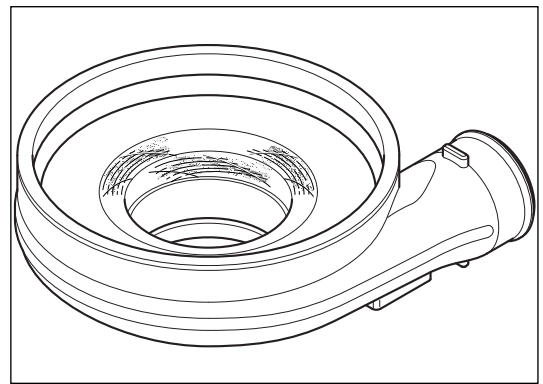
Ensure o-ring groove, where applicable, is clean and undamaged.

Return to **Component Cleaning** if deposits remain.

Replace with new if profile damage is visible.

**Caution**

Cast Iron and aluminium compressor housings are used. Always ensure correct replacement part is fitted.



### Turbine Housing

Inspect the turbine housing (5) profile for damage caused by possible contact with the rotor. Inspect the outer and internal walls for cracks or flaking caused by overheating.

Check turbine housing inlet flange flatness is within 0.1 mm (0.004 in). Check fastener hole diameter is not more than 1.5 mm larger than the max. thread diameter of the fastener.

Replace with new if any of the above features are non compliant.

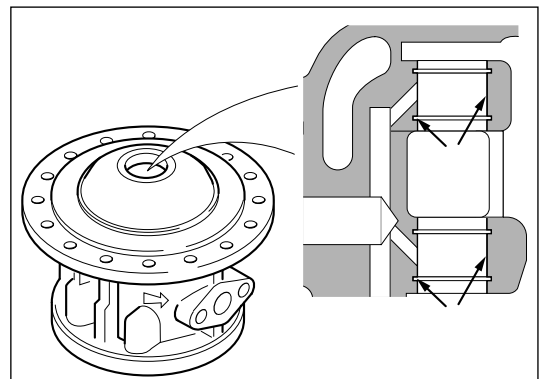
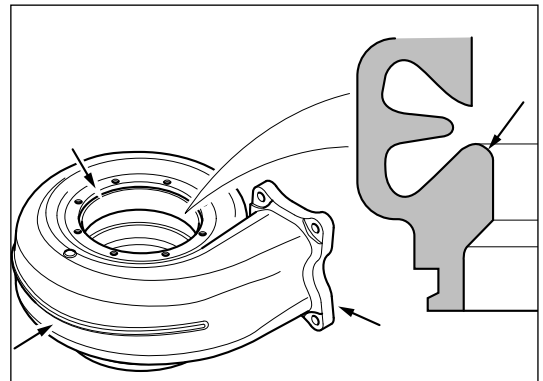
### Air and Liquid Cooled Bearing Housings

Oil Flanges M10 x 1.5 and 3/8-16 UNC 28 tpi  
Oil Adapter M16 x 1.5 or 9/16 18 UNF 28 tpi

Inspect journal bearing bores for wear and score marks. Replace bearing housing (4) if a bore diameter exceeds a maximum of 28.02 mm (1.103 in) or when bore scratching is severe.

Ensure groove locations for retaining rings, bearing (64) are free from deposits and do not exceed width of 1.45 mm (0.057 in)

Check that the oil cavity is free from carbon and any entrained debris that may be the result of a failure. Ensure all oil port threads are clean then check with the appropriate thread gauge.





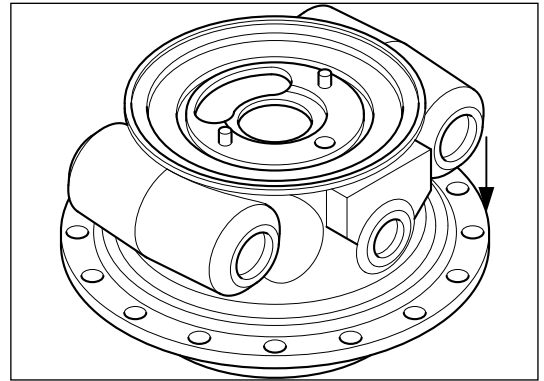
### Liquid Cooled Bearing Housing

Coolant Adapter M18 x 1.5 and 3/4 UNC 28 tp

Ensure all coolant port threads are clean then check with the appropriate thread gauge.

**Caution**

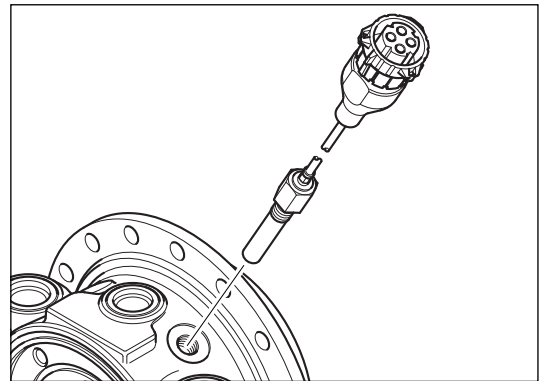
Bearing housing lockplate interface can corrode in high temperature operation. Bearing housings showing corrosion damage must be replaced.



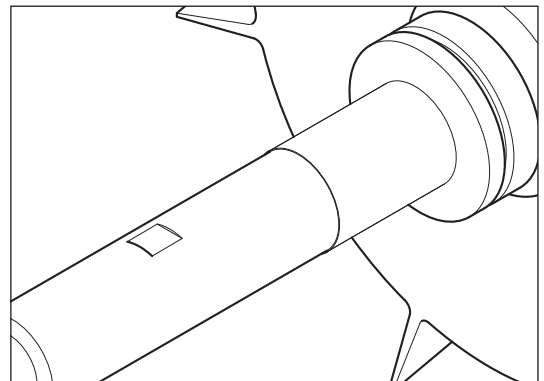
The speed sensor is designed to create an annular indentation in the bearing housing mating face to provide effective gas and oil sealing. With correct torque tightening, this face is re-useable and should appear clean and regular.

Where the face is corroded, it is probable that the speed sensor was not properly torque tightened. Severe corrosion must not be corrected by machining the seal surface as this will affect clearance between sensor and shaft.

If in doubt scrap the housing.



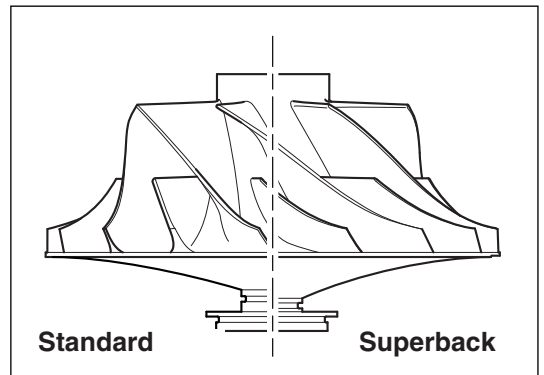
The turbine shaft for turbochargers fitted with speed sensor features a flat machined on the shaft.



**Caution**

HX82 turbochargers feature impellers which are not interchangeable.

Some HX82 turbochargers are fitted with a superback impeller. Axial length is 2.8 mm greater than the standard component. It must be fitted with unique diffuser without ribs and oil slinger shorter by 2.8 mm. Slinger nose diameter is increased to provide full face contact with impeller. Split ring seal, compressor (16) \* is common to both oil slingers.





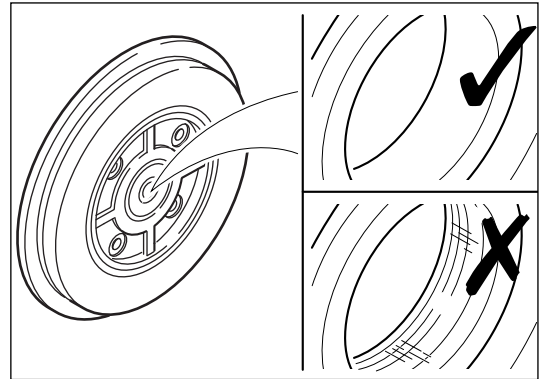


**Diffuser**

Inspect diffuser (14) seal bore. Replace if scored or damaged.

Ensure o-ring groove, where applicable, is clean and undamaged.

**Caution** Ribbed and non ribbed diffusers are not interchangeable. The non-ribbed version is fitted exclusively to turbochargers with superback compressor wheel and shortened oil slinger.



**Small Components**

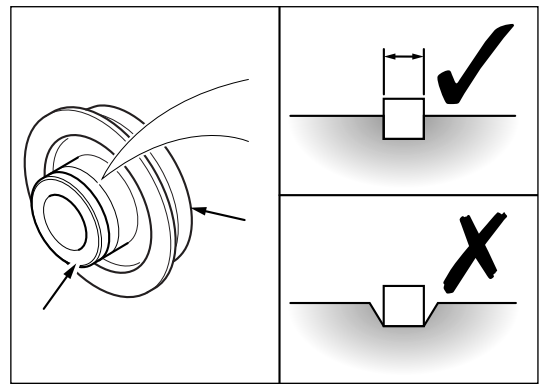
**Oil Slinger**

Inspect and replace oil slinger (31) if the piston ring groove walls are scored or damaged or if groove width exceeds a maximum of 1.70 mm (0.067 in).

Check for signs of rubbing and scoring on the thrust surface and replace where damage is severe.

If the ring faces show any signs of wear replace the split ring seal/seals, compressor (16)\*.

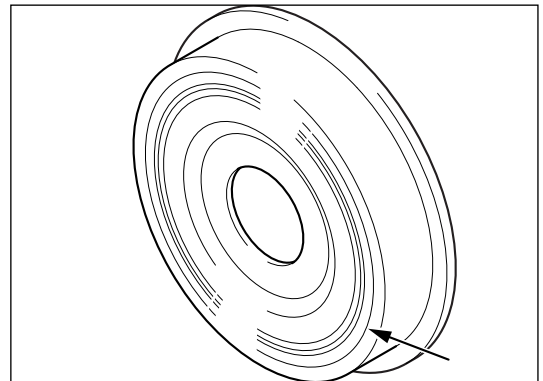
If the free gap of the ring is less than 2.0 mm (0.08 in) replace the split ring seal, compressor (16)\*.



**Heat Shield**

Check and replace if the heat shield (38) is distorted or if signs of rubbing or cracking are visible.

**Caution** Webbed cast iron and stainless steel heat shields are not interchangeable.

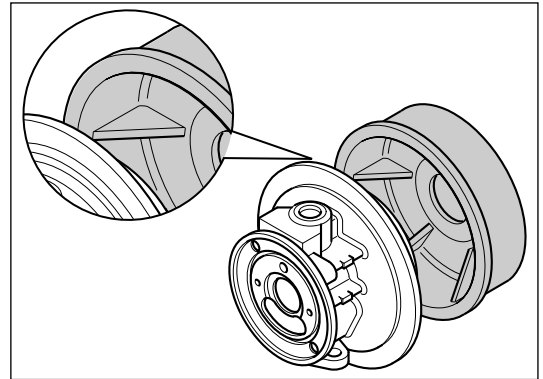




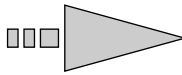
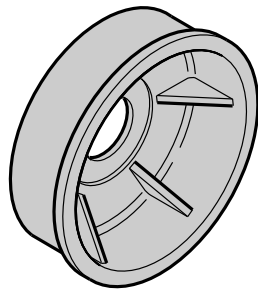
### Cast Iron Heat Shield (with Webs)

**Caution**

Webbed cast iron heat shields are not interchangeable with stainless steel or cast iron shields without webs.



#### Cast Iron Heat Shield (with webs)



Cast Heat Shield

Air Cooled Bearing Hou

28.6mm  
28.5mm

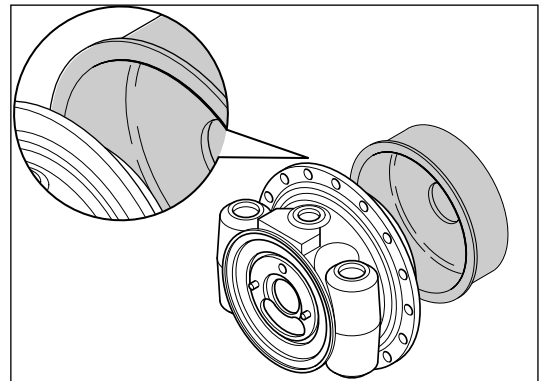
### Stainless Steel or Cast Iron Heat Shield (without webs)

**Caution**

Stainless steel or cast iron shields without webs are not interchangeable with webbed cast iron heat shields.

**Note**

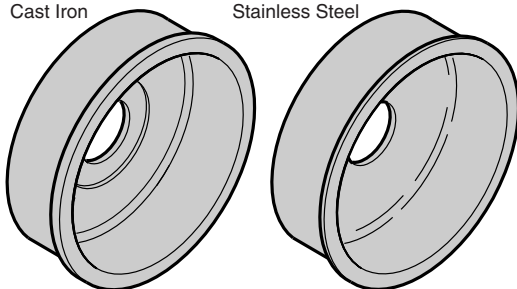
All liquid cooled bearing housings are fitted with heat shields without ribs. Cast iron shields are used in high temperature applications. Always replace with the same component material. The cast iron shield is recognized by the spot face diameter around the bore.



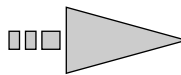
#### Stainless Steel or Cast Iron Heat Shield (without webs)

Cast Iron

Stainless Steel



Stainless Steel Heat Shield



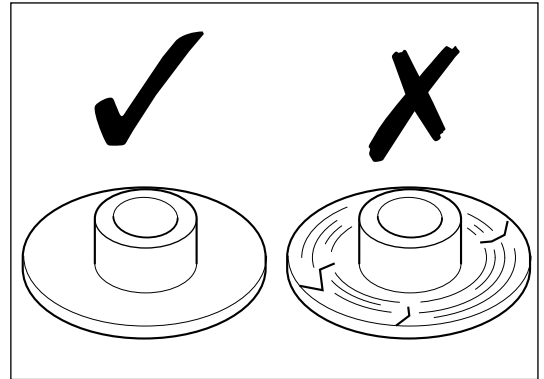
27.3mm  
27.2mm

Liquid Cooled Bearing Hou



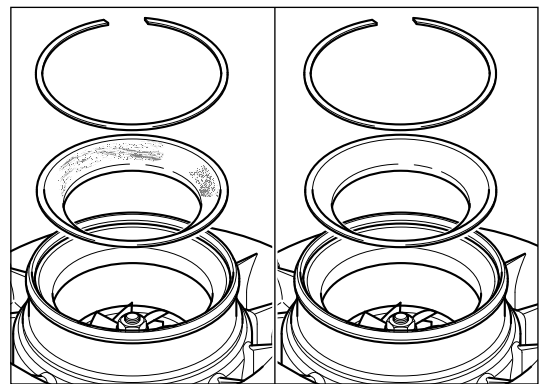
**Thrust Collar**

Check and replace if thrust collar (36) is scored on thrust face or if any cracks are visible.



**Compressor Inlet Baffle Option**

Check baffle for debris entrapment damage. Always fit new type inlet baffle on reassembly.



**Warning** Refer to *Turbine and Compressor Housings* for disassembly and assembly instructions.

# Reassembly



## Rotor Balance

### Caution

This turbocharger will have been manufactured using the separately piece part balanced compressor wheel and assembly, turbine wheel. Rotor balance **MUST** always be checked on re-build.

A turbocharger should always have co-relation marks on the end of the turbine shaft and impeller nose if it has been disassembled according to the process defined in *Disassembly*. The thrust collar and oil slinger will not have co-relation marks.

Components that should be included in rotor balance are:

- Turbine wheel and shaft
- Thrust collar
- Oil slinger
- Compressor wheel
- Nut

Balance is achieved by relative rotation of components as indicated by the balance machine output.

The balance process requires a purpose built rig and compliance with the rig procedure.

### Caution

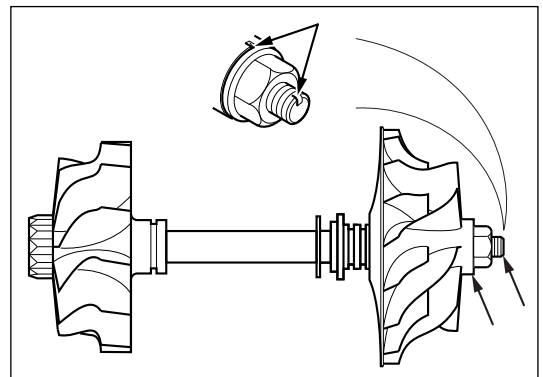
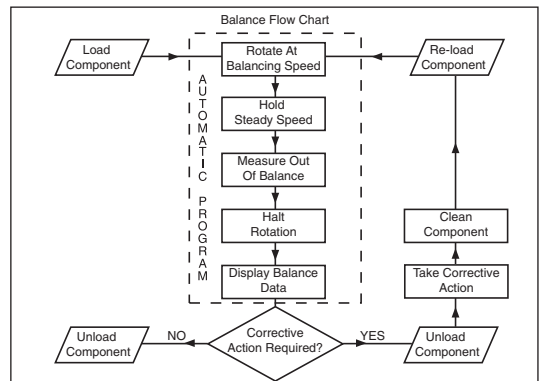
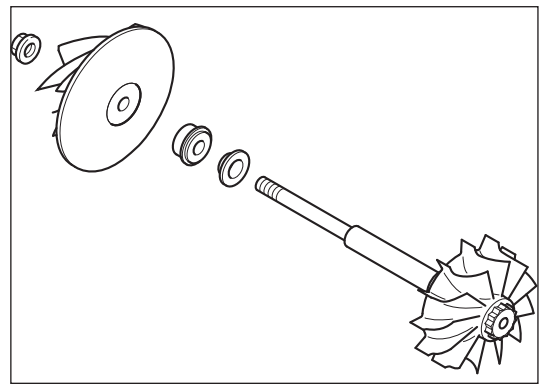
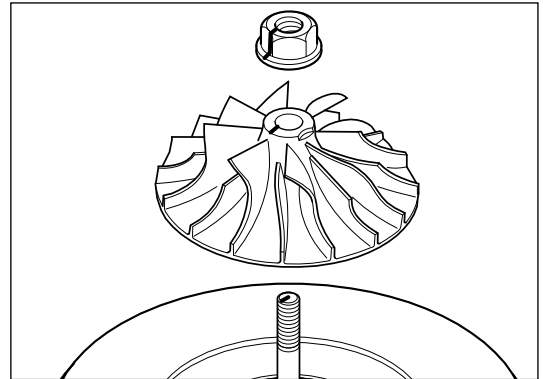
Only use genuine Holset compressor wheels and assembly turbine wheels which are individually check balanced for long life and quiet operation.

Rotor balance limits appear in the *Service Data Sheet*.

### Caution

HX83 cores with titanium compressor wheels must be core balanced using specialist equipment. Refer to Holset approved agent for overhaul and repair.

On achieving balance, parts should be permanently marked for subsequent re-alignment during reassembly.





## Turbocharger Reassembly

### Warning

Always wear safety glasses.

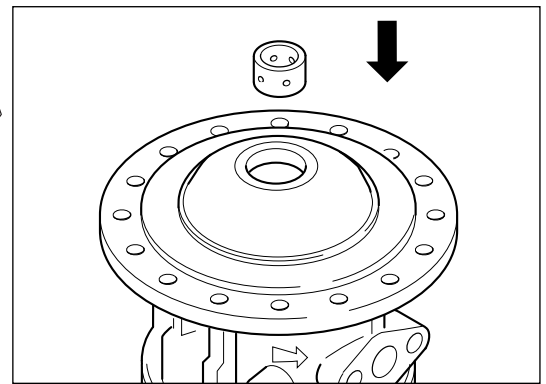
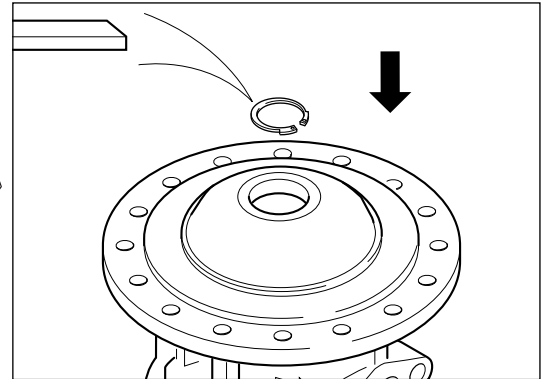
### Caution

Make sure the circlips are always fitted with the bevelled edge facing the journal bearing. Premature failure may result from incorrect fitting.

Place bearing housing compressor mating face on a clean surface.

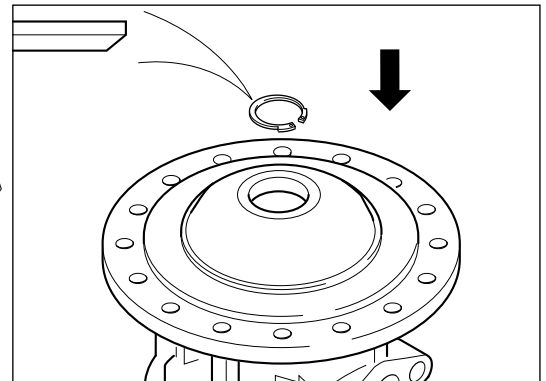
Fit inner turbine end retaining ring, bearing (64) \* using suitable circlip pliers.

Lubricate journal bearing (11) \* with clean engine oil and install.



Fit outer retaining ring (64) \* with bevelled edge facing the bearing.

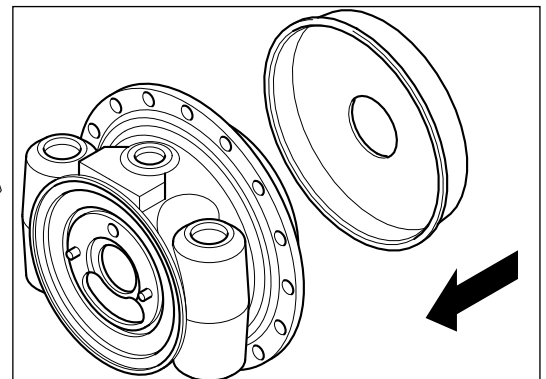
Turn bearing housing over and repeat retaining ring (64)\* and journal bearing (11) \* installation process at compressor end.



Install heat shield (38).

### Caution

Ensure correct cast iron or pressed steel heat shield is fitted.





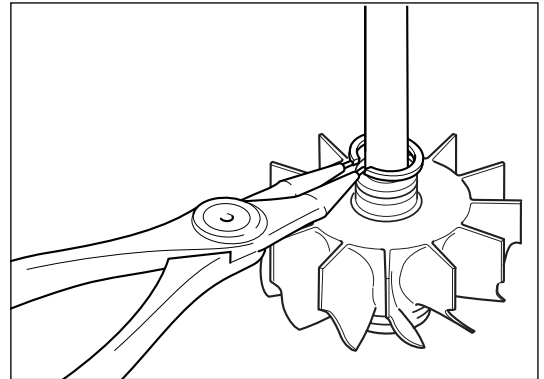
**Warning**

Always wear safety glasses.

Using expander pliers, install new split ring seal/seals, turbine (13) \* to assembly turbine wheel.

**Note**

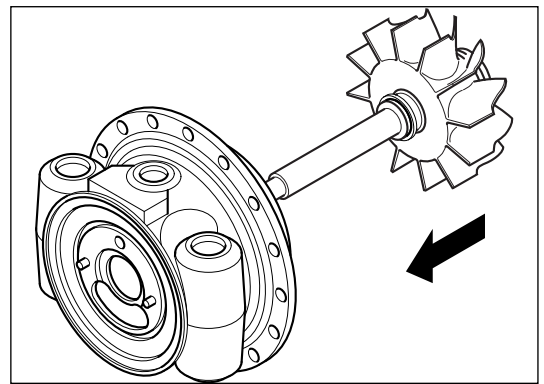
HT4B/HT4C/HT80 turbochargers have twin rings.



**Caution**

Align single split ring seal so that gap is positioned 180 degrees from oil drain flange. Align twin split ring seals so the gaps are positioned 180 degrees apart.

Lubricate shaft with clean engine oil and insert into journal bearings. Positively locate split ring seal/seals (13) \* into position and ensure assembly, turbine wheel rotates freely. Gently press down on turbine wheel. A slight rotation of the wheel will assist in properly locating the split ring seals.

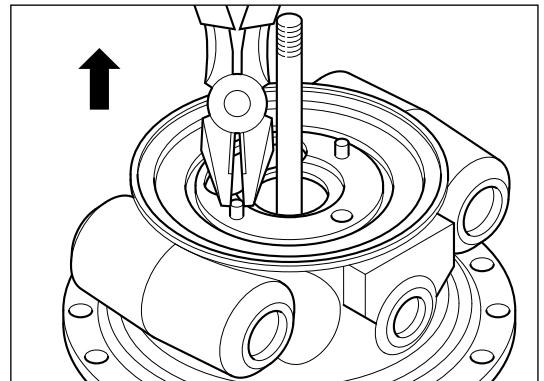


Support the assembly turbine wheel (6) in a suitable fixture.

Use clean pliers to pull two roll pins (92) out 3mm (0.01 in) approximately. Roll pin end contact with diffuser (14) ensures thrust bearing (12) and shim (146) are properly located.

**Caution**

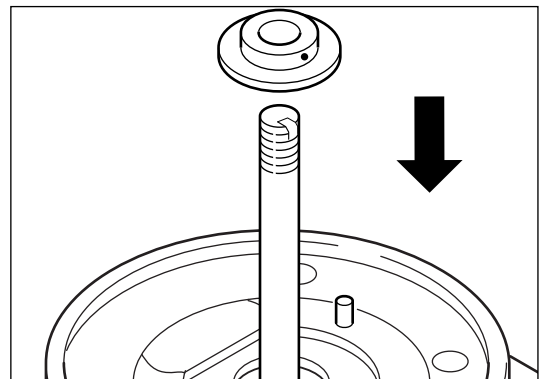
Do not use excessive force on the pliers as the roll pins can collapse. If the roll pins collapse they must be replaced.




**Caution**

Align balance mark on thrust collar with that on shaft.

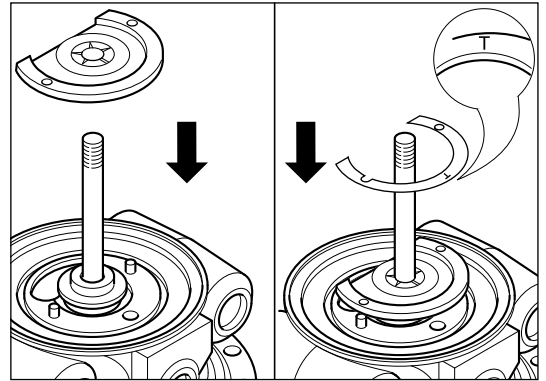
Install thrust collar (36).



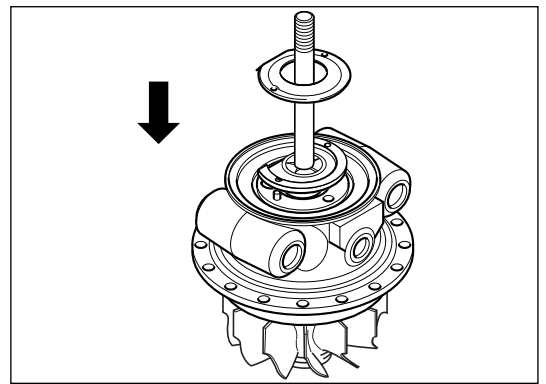


**Warning**   
 Always wear safety glasses.

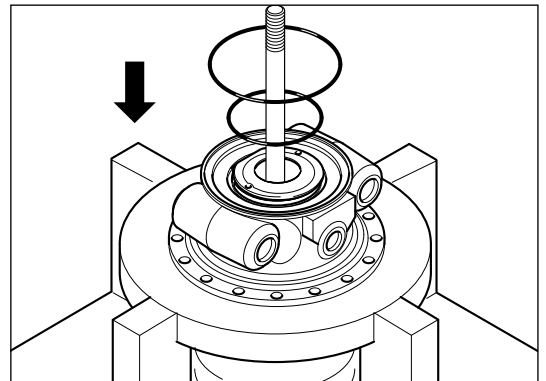
Using clean engine oil, lubricate thrust bearing (12) \*.  
 Install thrust bearing.  
 Install a new shim (146) so that the letter "T" is facing away from the thrust bearing.




Install oil baffle (33) \*.

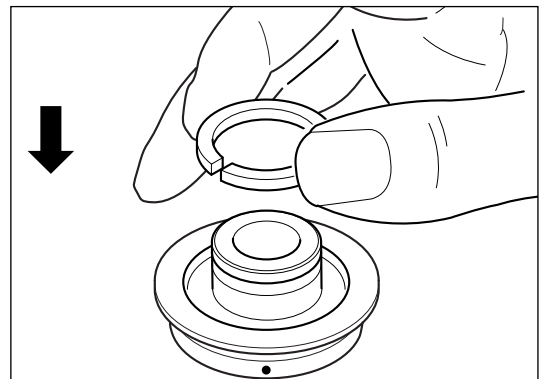


Lubricate and install new o-ring seal, compressor (32) \*.  
 Install new o-ring seal (27) \* to liquid cooled bearing housings at this stage.



Fit the new split ring seal, compressor (16) \* to new oil slinger (31) \*.

**Caution**   
 Some HX82 turbochargers are fitted with unique oil slinger and non-ribbed diffuser to accommodate a superback compressor wheel.



Check the assembly detail to ensure the correct oil slinger has been selected.



**Warning**

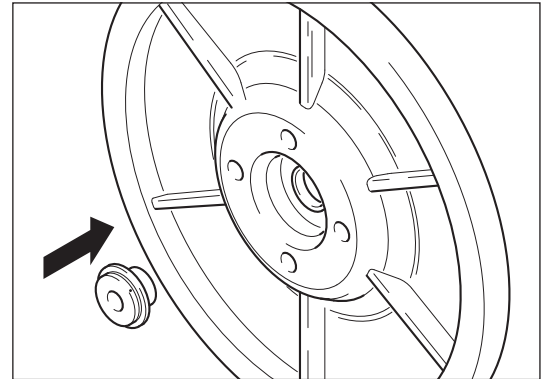
Always wear safety glasses.

Using clean engine oil, lubricate slinger assembly and install into diffuser (14).

**Caution**

Some HX82 turbochargers are fitted with non-ribbed diffuser and unique oil slinger to accommodate a superback compressor wheel.

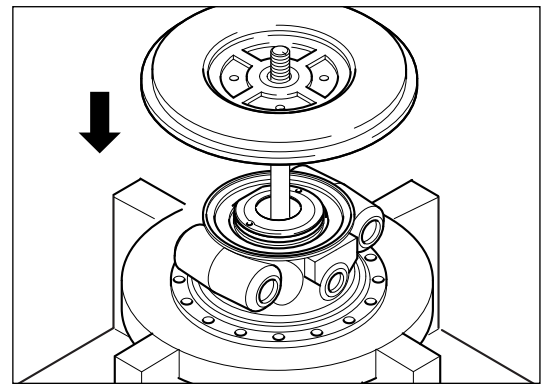
Check the assembly detail to ensure the correct diffuser has been selected.



**Caution**

Align balance marks on oil slinger with that on shaft end.

Install diffuser (14) onto bearing housing (4).



M8 x 1.25 (13 mm)

Install four new diffuser washers (60) \* and four new screws, diffuser (56) \*.

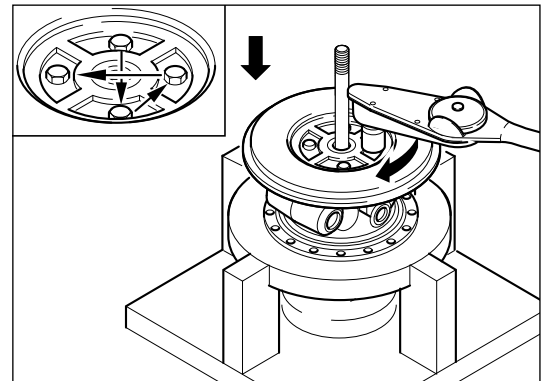
Tighten the diffuser screws in a diagonal pattern to the value specified in the **Service Data Sheet**.

**Note**

Torque the diffuser screws twice in sequence to ensure that all four are tightened equally.

**Caution**

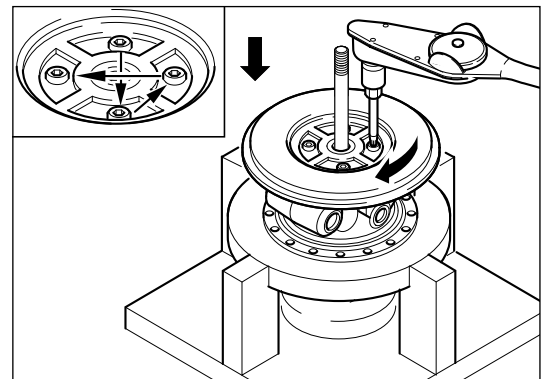
Do not rotate the assembly as this can misalign balanced components.



M8 x 1.25 (6 mm)

Some HX82 models are fitted with socket headed cap screws. These models are recognisable at this stage of assembly by diffuser detail. An o-ring groove is provided in the outer flange to seal with the compressor housing.

Repeat assembly and tightening instructions as for hexagon head screws.







**Warning** ⚠

Always wear safety glasses.

Align balance marks and install compressor wheel (7).

**Caution** ⚠

HX83 cores must be core balanced using specialist equipment. Refer to Holset approved agent for overhaul and repair.

**Caution** ⚠

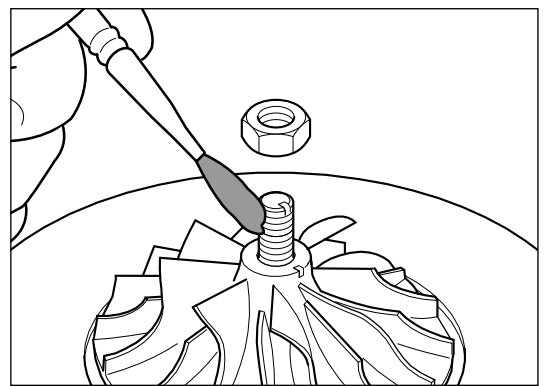
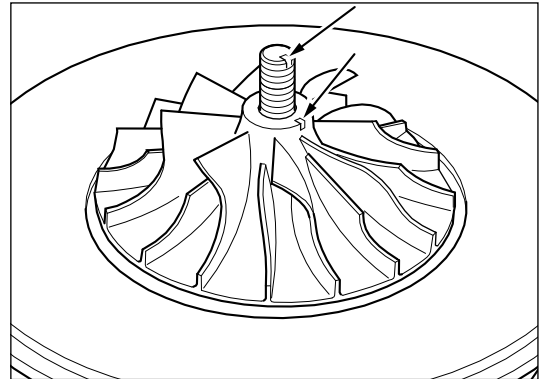
Some HX82 turbochargers are fitted with a unique superback compressor wheel with non-ribbed diffuser and unique oil slinger.

Check the assembly detail to ensure the correct compressor wheel has been selected.

Apply light oil to shaft thread and impeller nose every time nut is fitted to avoid loss of balance alignment during torque tightening.

**Caution** ⚠

The impeller nut must be installed dry with the flat side towards the compressor wheel.



**HC5A/HX80/85 v HT4B/HT4C/HT80 Wheels**

M10 (17 mm)

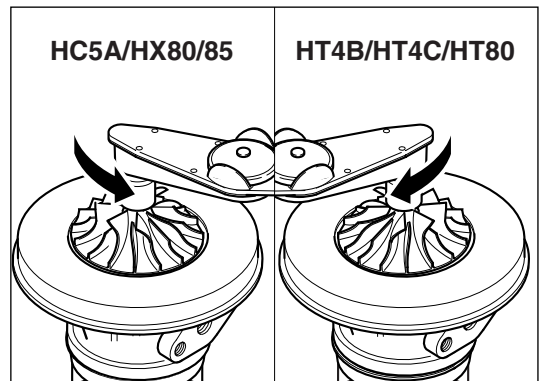
Install the locknut, compressor wheel (61) and tighten to the torque value specified in the [Service Data Sheet](#).

**Caution** ⚠

Do not mix the turbine or compressor wheels of HC/HX and HT series of turbochargers

**Note**

HC5A/HX80/85 - Left hand thread.  
HT4B/HT4C/HT80 - Right hand thread.



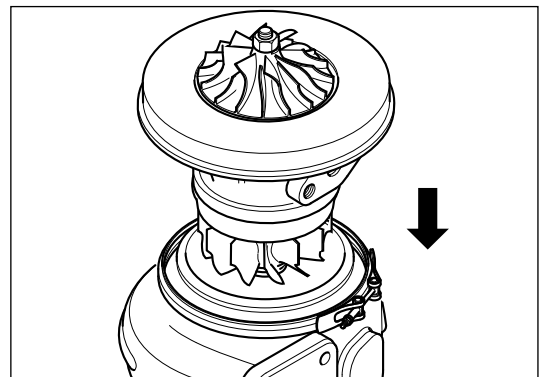
Place turbine housing (5) on a clean surface. Place V-band clamp loosely into position on the turbine housing. Safely slide CHRA (2) assembly into the turbine housing.

**Warning** ⚠

Turbine housings and CHRA assemblies are heavy. Always use safe lifting methods.

**Caution** ⚠

The turbine wheel blades can be easily damaged when the CHRA is installed.





### Lock Plate Option HC5A/HX80/82/83/85

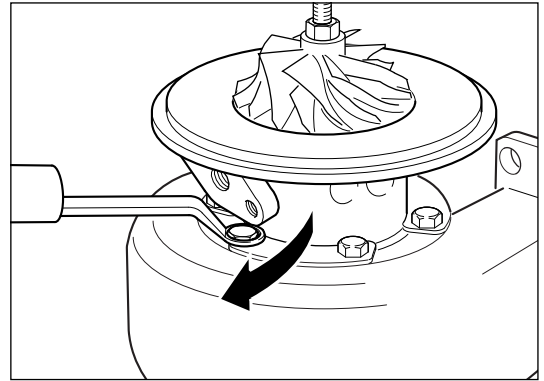
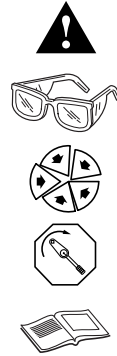
M8 x 1.25 (13 mm)

Secure turbine housing flange in vice.

Locate the CHRA into the turbine housing (5).

Install four lock plates, turbine housing (50) \*, fit eight new bolt, turbine housing (57) \* and tighten to the value specified in the **Service Data Sheet**.

Depending on housing orientation, some clamp plate bolts may have restricted access. In these cases, use a suitable torque wrench adapter attached to a specially calibrated torque wrench.

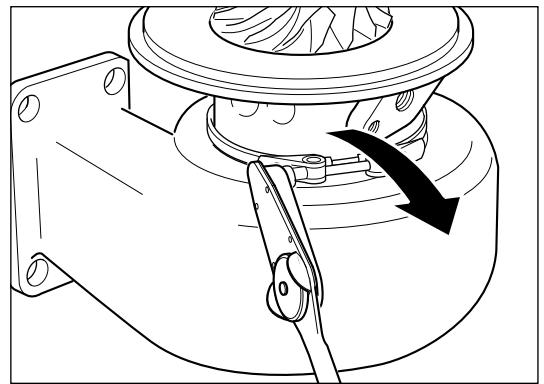
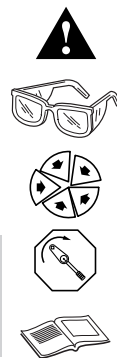


### V-band Option HT4B/HT4C/HT80

M6 (10 mm) 1/4UNF 28tpi (7/16 in)

Place V-band clamp, turbine (28) in position and torque tighten new locknut, V-band (62) \* to value specified in **Service Data Sheet**.

Ensure rotor assembly freely rotates.

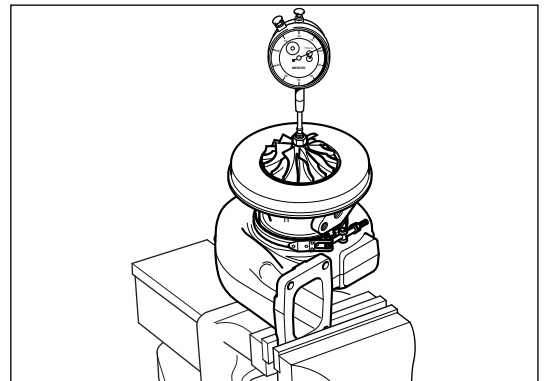


**Warning** Always wear safety glasses.

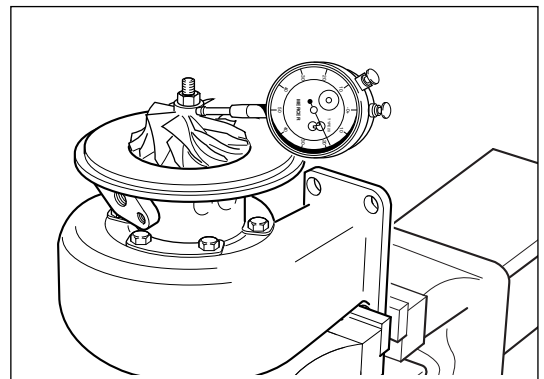
Check compressor end radial movement using a dial gauge. Ensure clearance lies within MIN/MAX TIR (Total Indicator Reading) values shown on **Service Data Sheet**.

**Warning** HX83 titanium compressor wheel edges are sharp. Handle with care.


**Warning** HX80 turbochargers and installation parts are heavy. Always use safe lifting methods.





Check compressor end radial movement using a dial gauge. Ensure clearance lies within MIN/MAX TIR (Total Indicator Reading) values shown on **Service Data Sheet**.






**Warning**  Always wear safety glasses.

**Warning**  HX83 titanium compressor wheel edges are sharp. Handle with care.


**Warning**  HX80 turbochargers and installation parts are heavy. Always use safe lifting methods.

Following torque tightening it may be necessary to turn lockplate bolts in the tightening direction until a flat aligns with the lock tab.

Use a hammer and drift to knock lockplate tabs into position against the turbine housing bolts.

**Caution**  Always locate new o-ring (41) \* on the diffuser spigot irrespective of ring groove location. O ring seals must be fitted to all HX83 models and HX82 models with cast iron or aluminium housings where an o ring was removed on disassembly.


Place the turbine and bearing housing, assembly on clean surface. To refit compressor housing loosely fit V-band clamp, compressor (29). Carefully locate the compressor housing (8) over the compressor wheel.

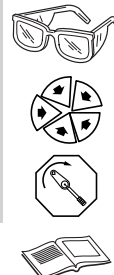
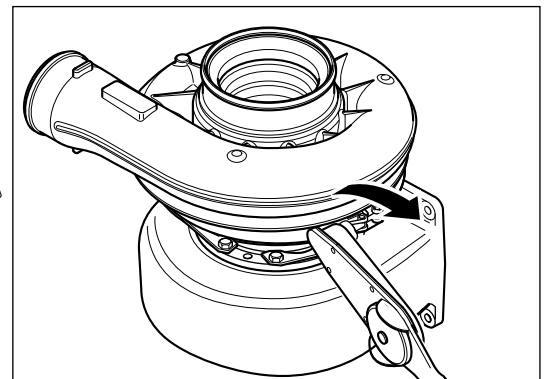
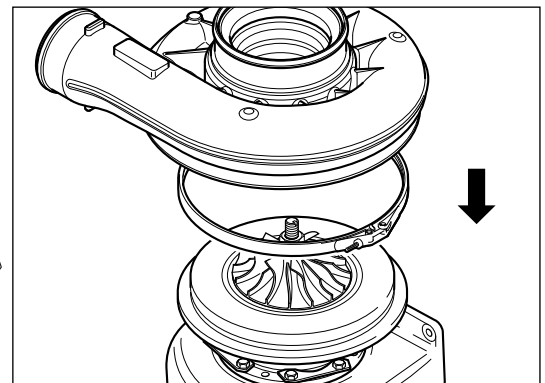
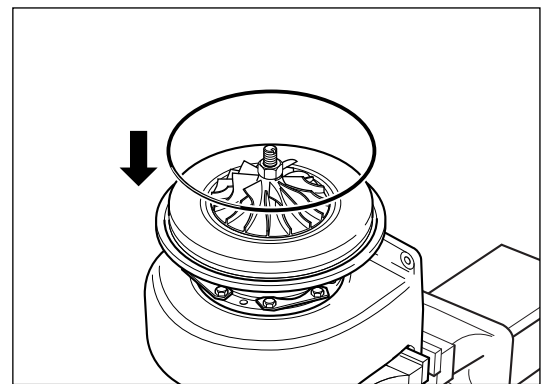
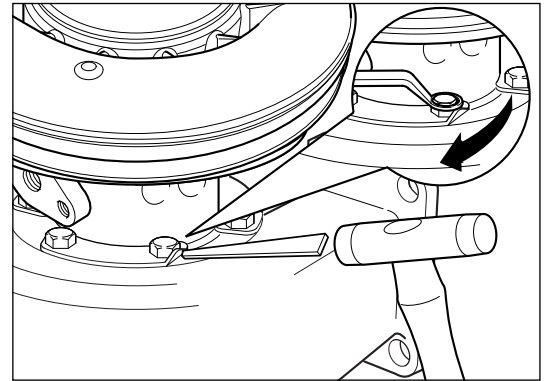
**Caution**  The compressor wheel blades can be easily damaged when the CHRA is installed.

M8 (11 mm) HX83 and HX82 models with cast iron compressor housing.

1/4 UNF 28 tpi (7/16 in)

Place V-band clamp, compressor (29) in position and torque tighten new locknut, V-band (62) \* to value specified in **Service Data Sheet**.

**Caution**  All HX83 models and HX82 with cast iron compressor housing use a special V band assembly. Always ensure that correct v-band assembly is used with torque tightening value specified in **Service Data Sheet**.

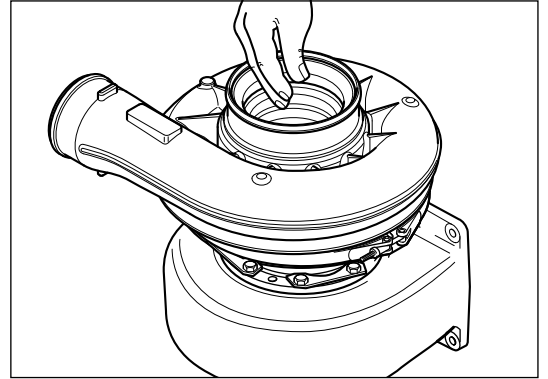




Ensure rotor assembly freely rotates.

**Warning** 

HX83 titanium compressor wheel edges are sharp.  
Handle with care.



# Holset HC5A/HX80/82/83/85 HT4B/4C/80 Service Repair Manual

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