HOLSET®
TURBOCHARGERS

Holset HE851

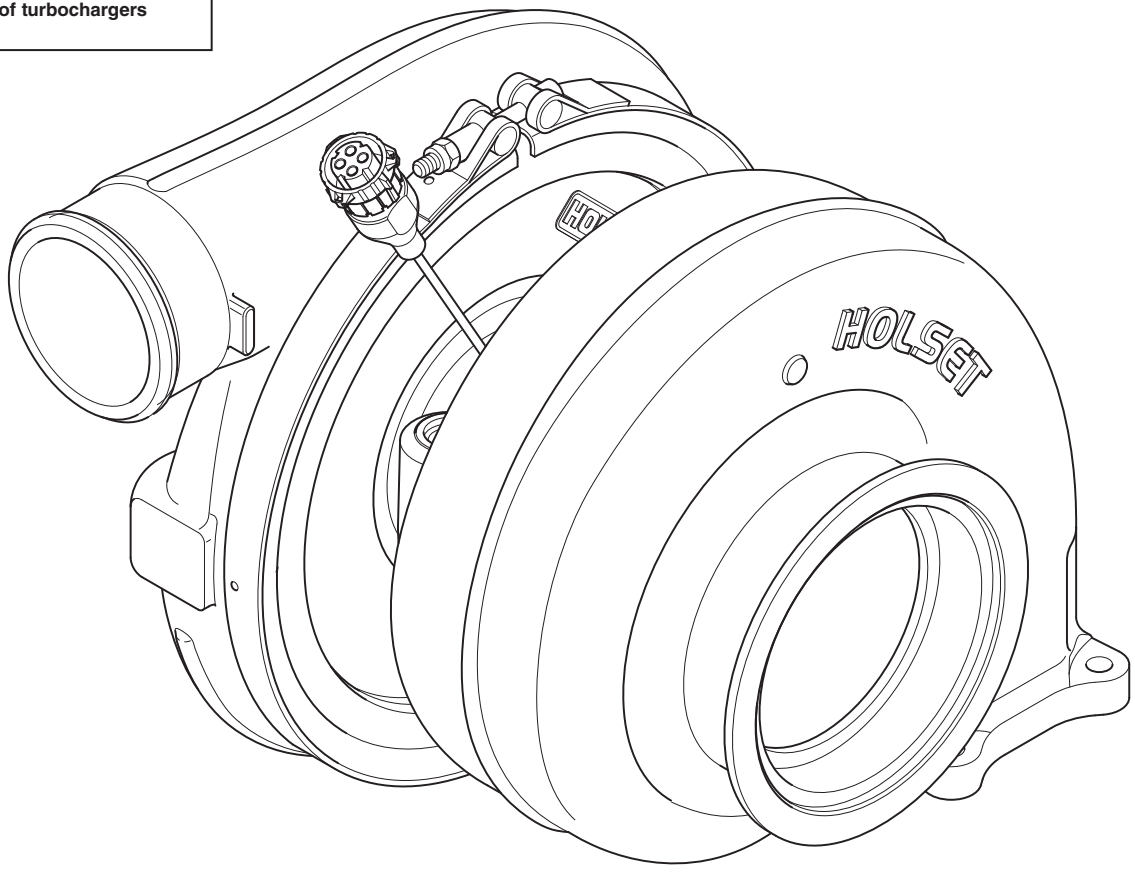
Service Repair Manual

⚠ 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



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.

Table of Contents

1: Introduction

2: Component Identification

3: Troubleshooting and Diagnosis

4: Component Testing and Replacement

6: Service Data Sheets

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 unfamilier with navigating in PDF documents are refered 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 unlikley event of a major turbocharger malfunction. (This section is not available for this product at date of issue).

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. 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.

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

Warning ⚠
Maintanence 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 designated turbochargers weigh up to 60 kg (132 lb) and turbine housing weight is greater than 20 kg (45 lb).

Caution △
This turbocharger 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. It is important not to overload the turbocharger by external attachments or forces.
3. The air filter must remove particles greater than 5 μm 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 tightened to the values specified by the Equipment and Engine manufacturers to withstand depressions up to 6.3 kPa (0.91 lbf/in^2)
4. Hose and clip connections of the intake manifold system must be tightened to the values specified by the Equipment and Engine manufacturers to withstand turbocharger pressure ratio.
5. Exhaust system connections must be tightened to the values specified by the Equipment and Engine manufacturers to be capable of operating at exhaust back pressures of up to 10 kPa (1.5 lbf/in^2). Subject to an extensive review by Holset and formal approval, this limit may be increased to 25 kPa (3.6 lbf/in^2) if a catalytic convertor is fitted. Exhaust brake applications are permitted to operate at a continuously rated pressure up to 450 kPa (65.3 lbf/in^2) Holset has experience of instantaneous pressures up to 700 kPa (101.5 lbf/in^2) but any application operating above 450 kPa (65.3 lbf/in^2) must be referred to Holset for approval.
6. Oil should be filtered to 10 μm with efficiency of 60% TWA (Time Weighted Average) /20 μm with efficiency of 85% TWA. Efficiency assessed using ISO Standard 4572/SAE J 1858. Always use filters recommended by the engine manufacturer.
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 where extended oil drain periods are used.
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.
12. Crankcase pressure should be limited to 0.8 kPa (0.12 lbf/in^2). Pressure above this level should be referred to Holset for further evaluation. Closed crankcase ventilation (CCV) systems are known to operate at elevated pressure and all applications must be referred to Holset for approval.
13. Oil pressure of 150 kPa (20 lbf/in^2) 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^2) although 600 kPa (88 lbf/in^2) is permitted during cold start up. Under idling conditions pressure should not fall below 70 kPa (10 lbf/in^2).
14. Recommended oil flows for the turbochargers are 3.5 litre/min at idleand 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^2=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**.

INSRPEKTION 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 DURCHFÜRHREN**.

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 estes manual para clarificar el proceso de las instrucciones. Cuado aparece uno de estos simbolos, su significado se espcifica 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** mec·nica o del tiempo.

LUBRIQUESE la pieza o el montaje.

Indica que se dar· una **LLAVE DE TUERCAS** o el **TAMA—O DE HERRAMIENTA**.

APRIETESE hasta un par torsor especifico.

Ceriórese de que est·n 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 apparait, 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 seue significados estão déscritos abaixo.

ATENÇÃO - Os procedimentos de Manutenção ou Serviços que não forem seguidos correctamente 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 passe de **DESMONTAGEM**.

Indica um passo de **MONTAGEM**.

Requer inspeção.

LIMPE a peça ou conjunto.

Requer Medição mecãnica 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 eixorotor estejam alinhadas.

Requer medição **ELÉTRICA**.

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

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

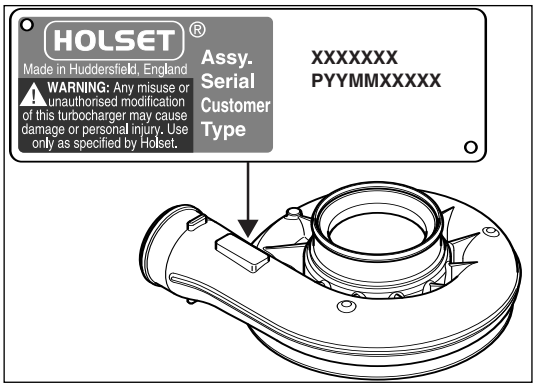
Indica que os componentes podem estar pesados.

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

Vá para Conteúdo

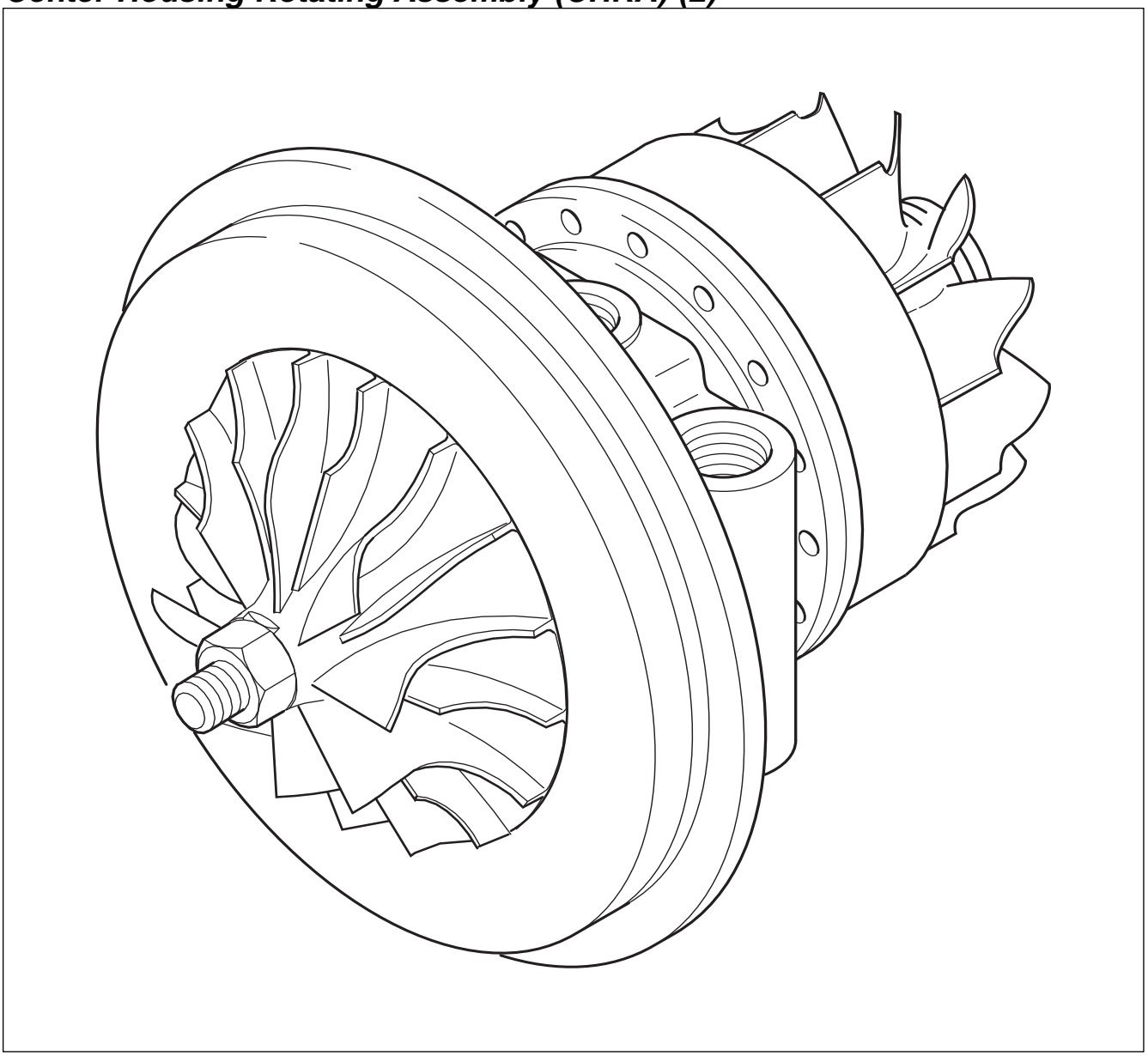
Turbocharger Identification

Dataplate



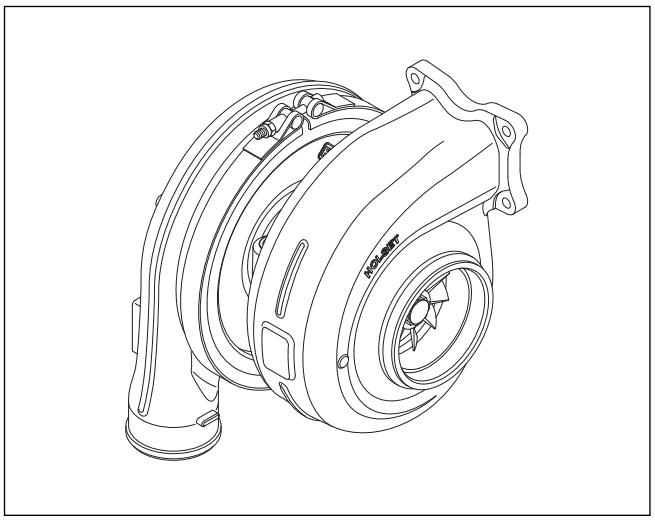
Note
Dataplates will be fitted to the compressor housing (8). The information from the dataplate must be quoted for service and parts support.

Center Housing Rotating Assembly (CHRA) (2)

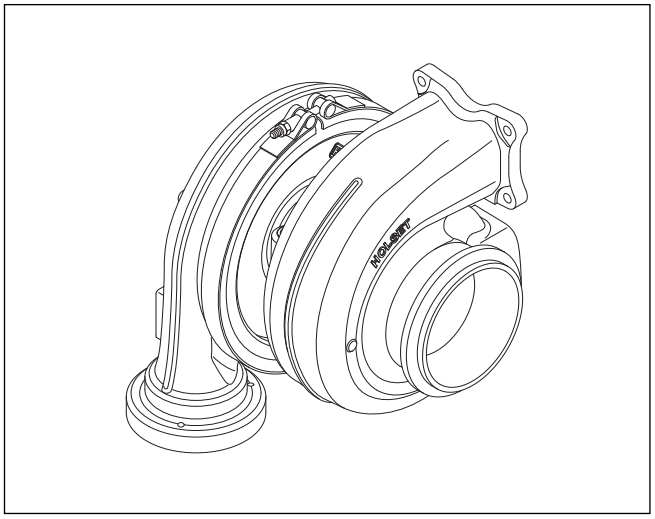


Installation Options

Type A



Type B



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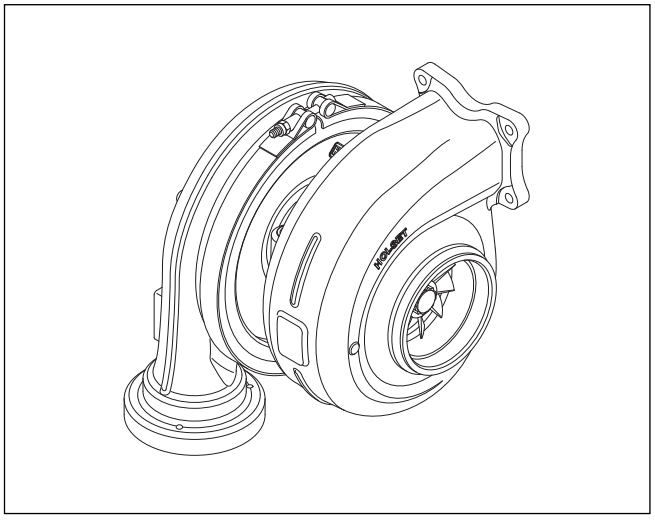
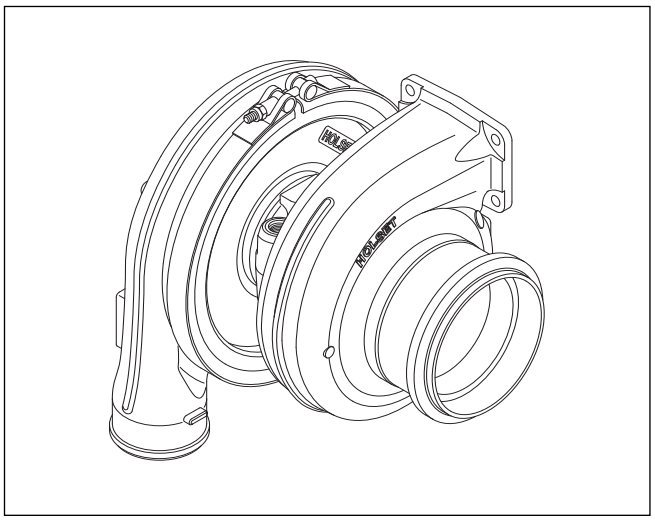
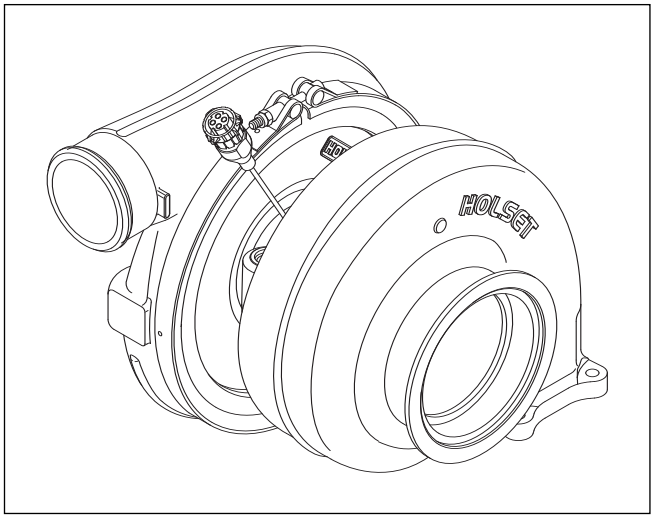


Installation Options

Type D

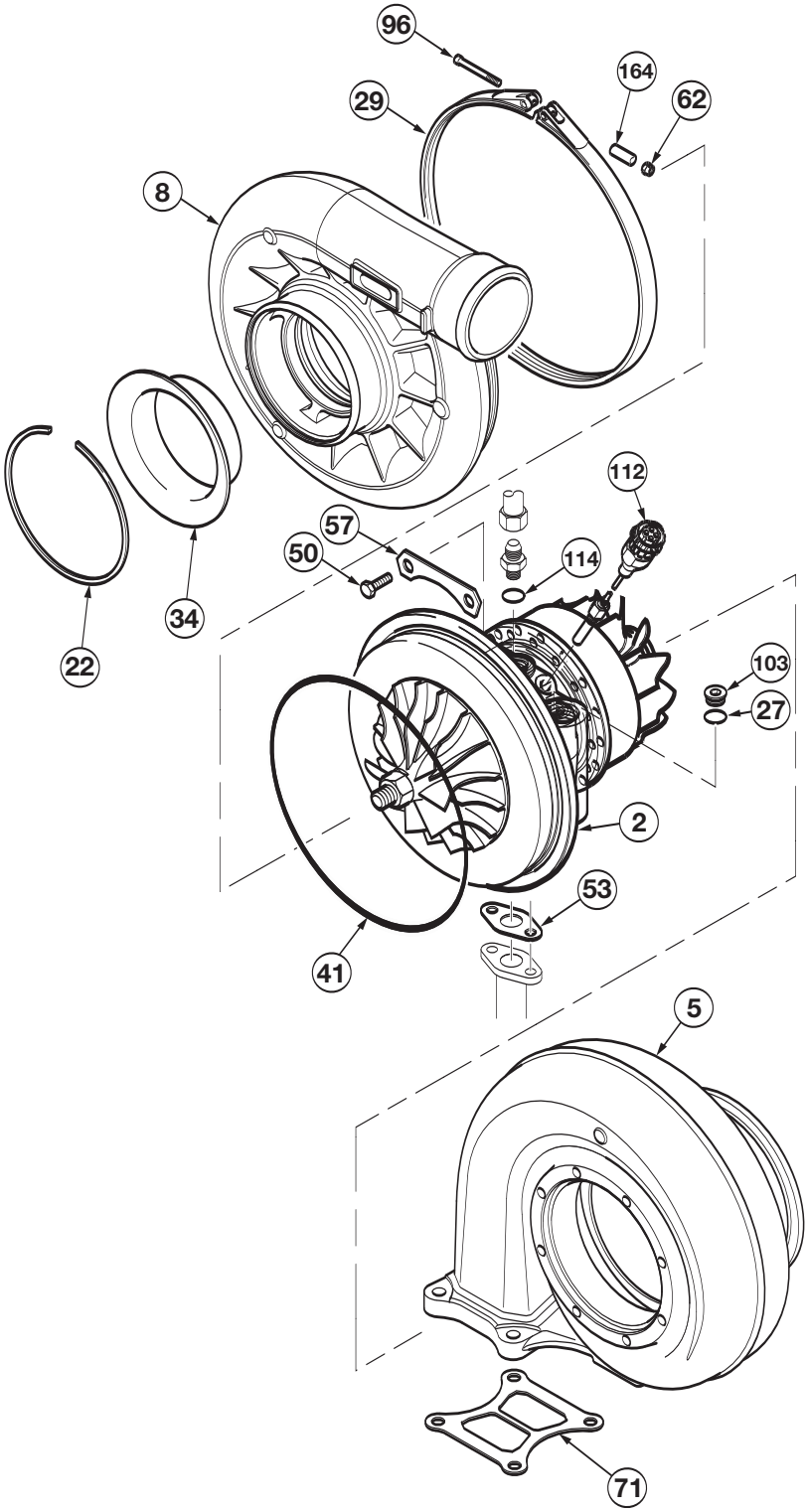


Type E



Exploded View - HE851

With speed sensor

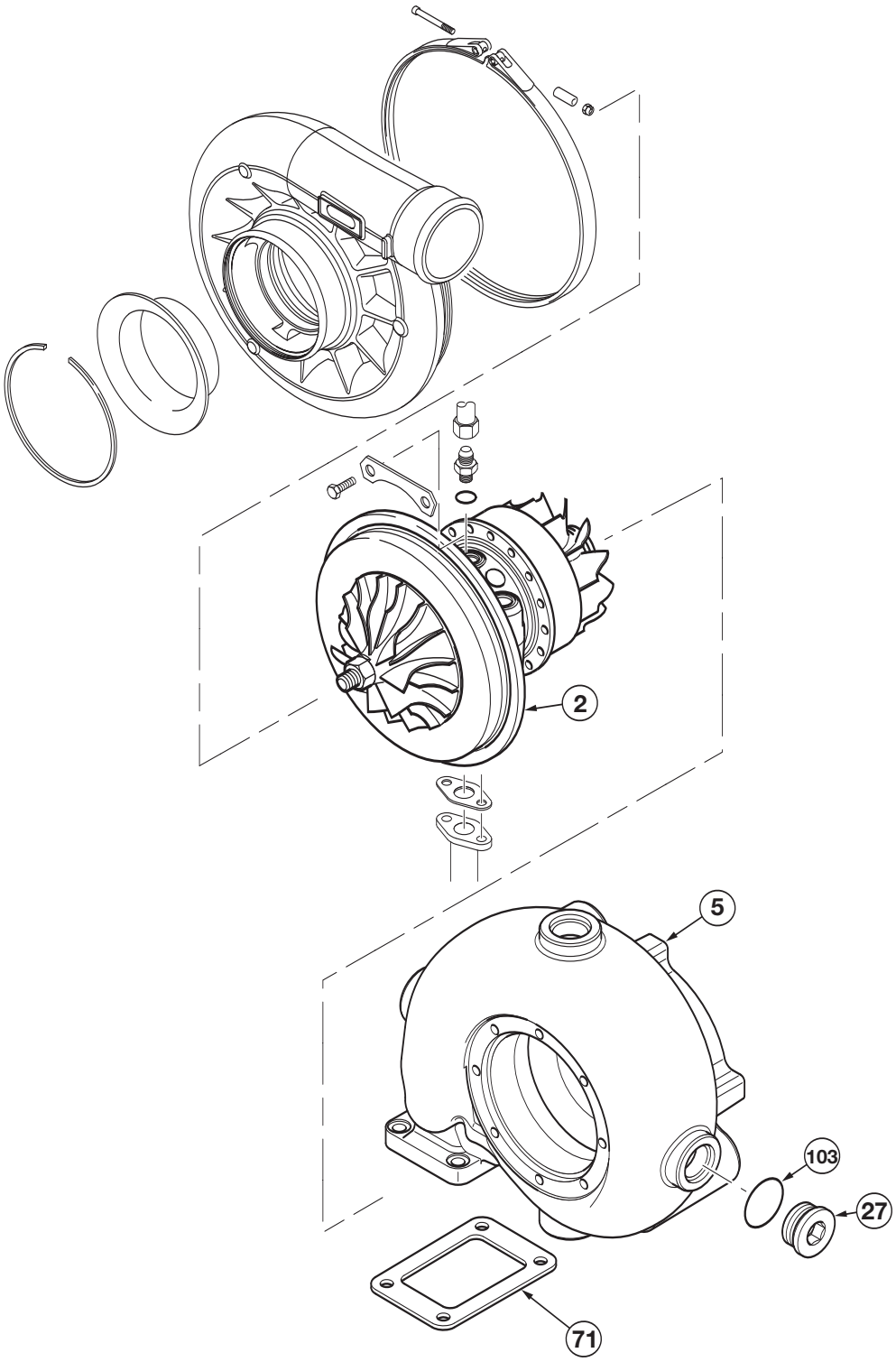


Note

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 - HE851

Housing options



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.

Component List - HE851

Item No.	Description	Quantity
2	CHRA (Core)	1
5	Turbine Housing	1
8	Compressor Housing	1
22	Retaining Ring, Inlet Baffle	0/1
29	V-band Clamp, Compressor	1
164	Spacer Sleeve, V-Band *	1
96	Screw, V-band *	1
62	Locknut, V-band*	1
34	Inlet Baffle	0/1
41	O-Ring Seal, Compressor Housing*	0/1
50	Lockplate, Turbine Housing*	4
53	Gasket, Oil Outlet*	1
57	Bolt, Turbine Housing*	8
71	Gasket, Turbine Housing	1
103	Blanking Plug	0/4
112	Speed Sensor*	0/1
114	O-Ring Seal, Oil Inlet	1
115	O-Ring Seal, Water	0/4

Note
Exploded views may not contain all listed components.

Fault Finding chart - All Applications

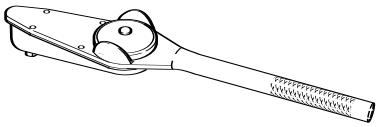
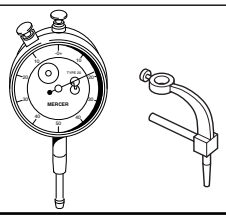
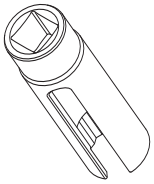
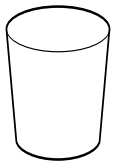
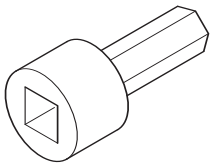
	Engine Running Hot	Poor Transient Response	Smoke	Engine Lacks Power	Black Exhaust Smoke	Blue Exhaust Smoke	High Oil Consumption	Turbocharger Noisy	Cyclic Sound from the Turbocharger	Oil Leak from Compressor Seal	Oil Leak from Turbine Seal
Dirty air cleaner Clean or replace element according to manufacturer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

Fault Finding chart - Speed 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 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.			●	●	●					●	

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	
	6 mm Allen Key 5/8 in Allen Key	

Caution ⚠

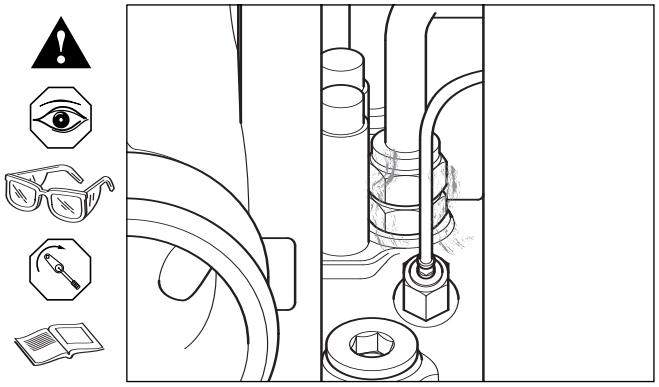
All Service and Maintenance settings are shown in Holset's Service Data Sheet. It is essential that these settings are used. Common tools found in mechanic's tool box not included.

On Engine Checks

Oil Leakage

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

Warning
Always wear safety glasses.

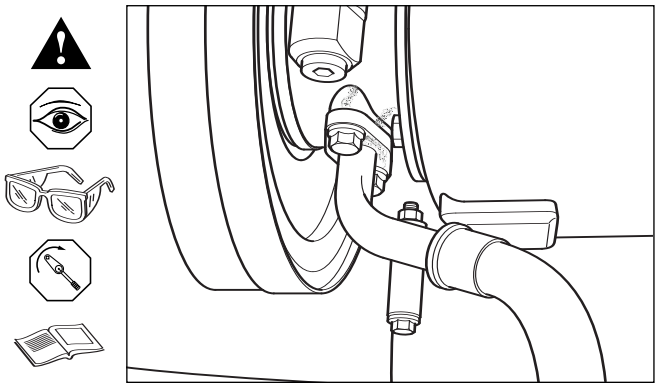


Replacement gaskets, seals and adapters should be fitted without sealant as this can contaminate the oil. Torque tighten adapter to value shown in ***Service Data Sheet***.

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

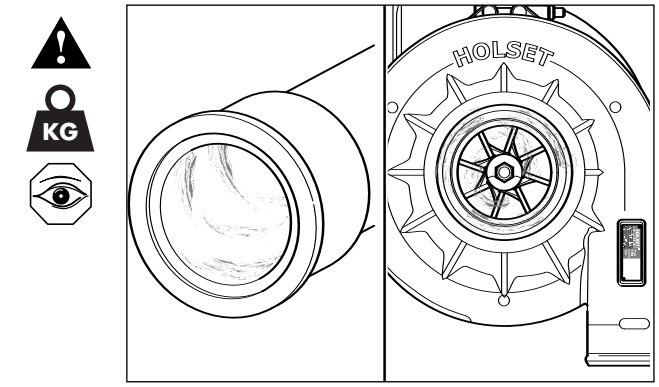
Warning
Inlet oil is pressurized and outlet oil is hot. Never take service action with engine running. Protect face and hands from hot fluid leakage.



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 overall angle not less than 30° below the horizontal.

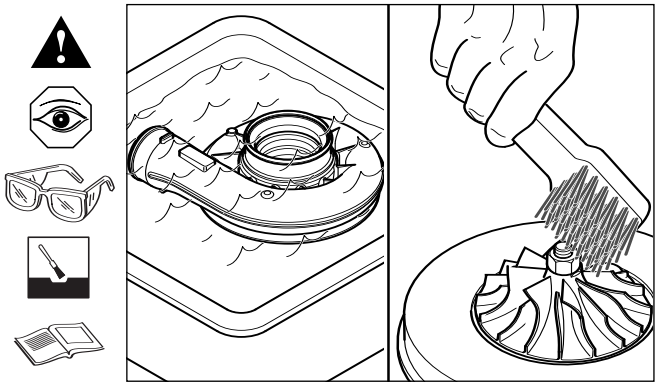
Warning
Turbochargers and installation parts are heavy. Always use safe lifting methods.



Closed crankcase ventilation systems tend 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***. Rotor components can be cleaned using a non metallic bristle brush. to clean housing. Rotor components can be cleaned using a non metallic bristle brush.

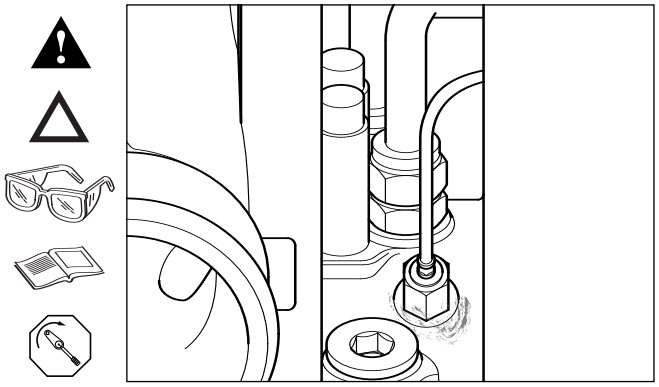
Warning
Titanium compressor wheel edges are sharp. Handle with care.



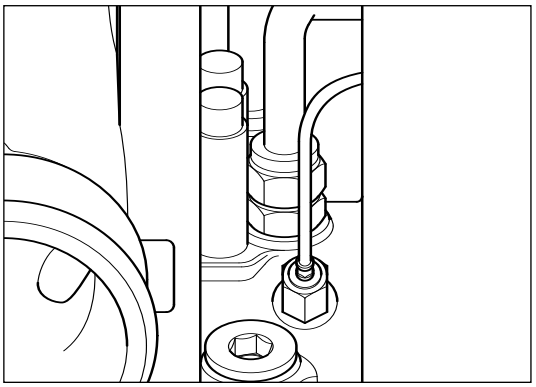
Warning
Always wear safety glasses.

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

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



Caution
Where fitted, ensure speed sensor and cable are not damaged when correcting coolant or oil inlet leak. Always use engine manufacturer's cable route and clips.



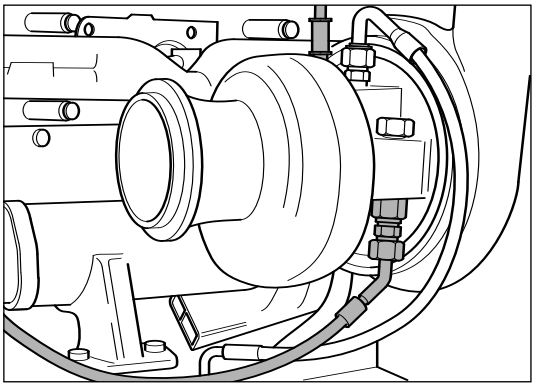
Coolant Leakage

Coolant Plug 1 1/16 UN-2A (5/8 in Allen Key)

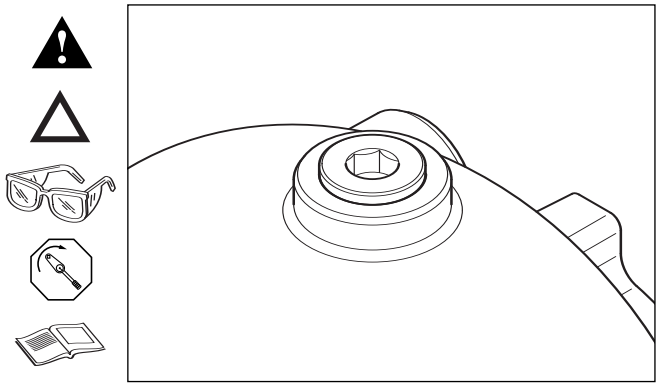
Repair by replacement of coolant inlet and outlet fittings. Where housing threads are damaged replace turbocharger. Torque tighten adapters to value specified by engine manufacturerer.

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

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



1 5/16 UN-2A (5/8 in)



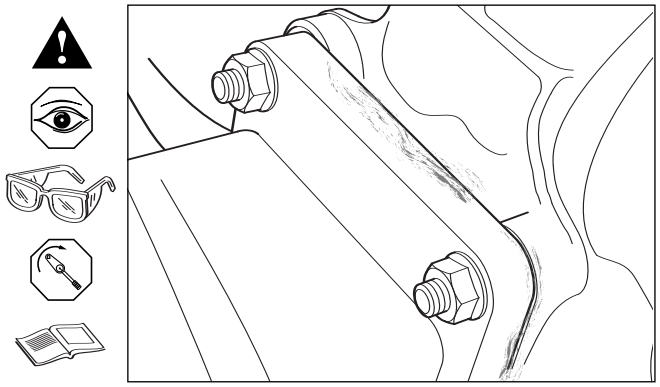
Warning
Always wear safety glasses.

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

Caution
Turbine housing plugs are fitted with an o ring seal. Always always use parts recommended by engine manufacturer or Holset.

In event of coolant leakage from plug or adapter, re-tighten 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.

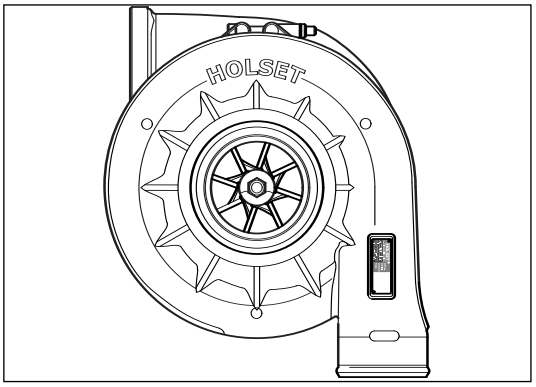
Check flange for cracks.

Check Marman and half Marman 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

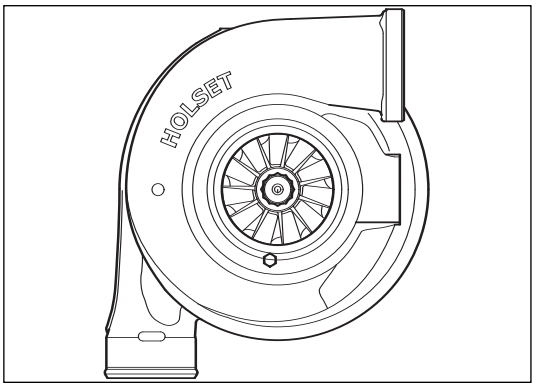
Check for cracked, bent or damaged compressor wheel blades.



Warning

Titanium compressor wheel edges are sharp. Handle with care.

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

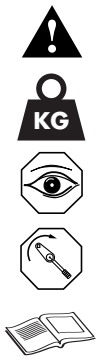


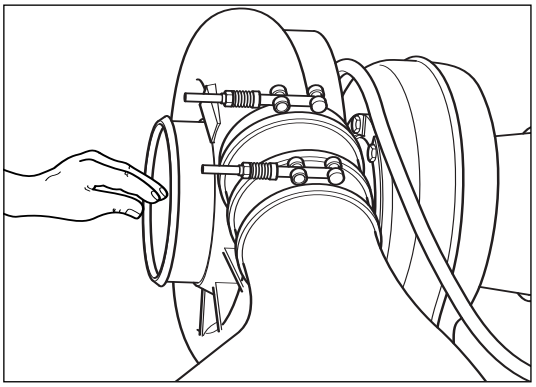
Caution

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, 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.

Caution

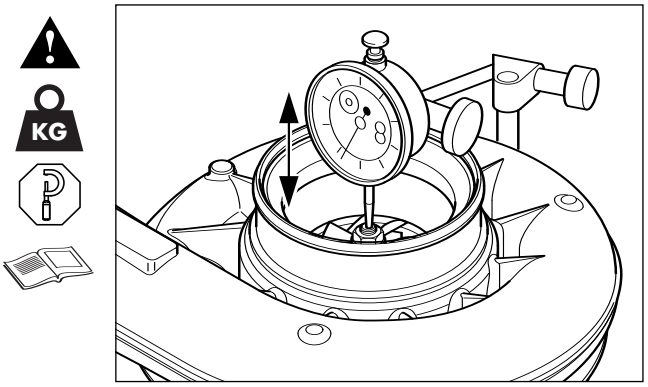
Air, oil and coolant hoses are specified by engine manufacturers to perform critical functions at pressure and temperature. To avoid leakage and potential turbocharger and engine failures, always use recommended components.

Bearing Clearance

Secure turbine housing and check 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 replace CHRA (core) (2).



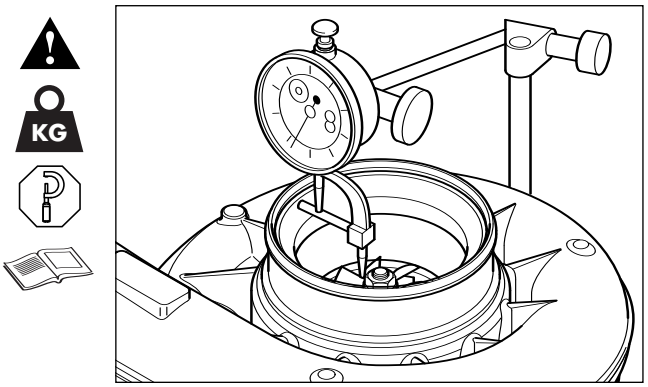
Warning
Turbochargers and installation parts are heavy. Always use safe lifting methods.

Warning
Titanium compressor wheel edges are sharp. Handle with care.

Check 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***.

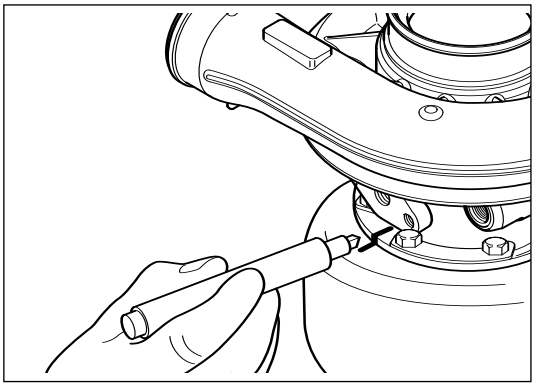
If axial clearance does not meet specification replace CHRA (core) (2).



Turbine and Compressor Housings

Turbine Housing

Place turbine outlet on a clean flat surface. Mark turbine housing andbearing housing. This action assists in re-assembly process defining correct component orientation.

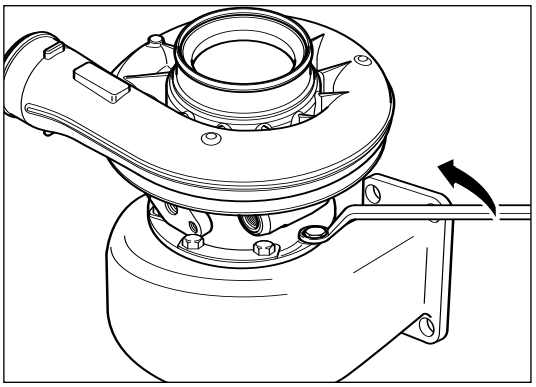


Warning
Always wear safety glasses.

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

M8 x 1.25 (13 mm A/F)

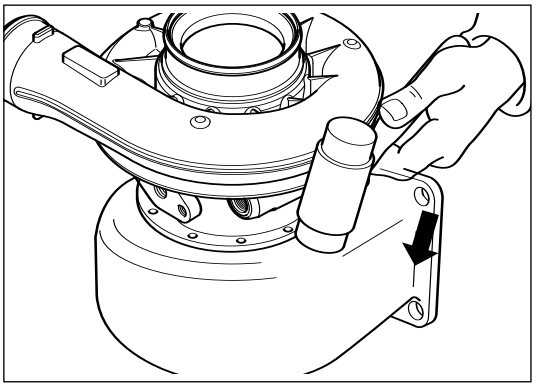
Secure turbine housing flange in vice. Use hammer and chisel to knock lockplate tabs away from turbine housing bolts. Loosen remove and discard 8 bolts (57) and 4 lockplates, (50).



Caution
Take care not to shear clamp plate bolts.

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

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

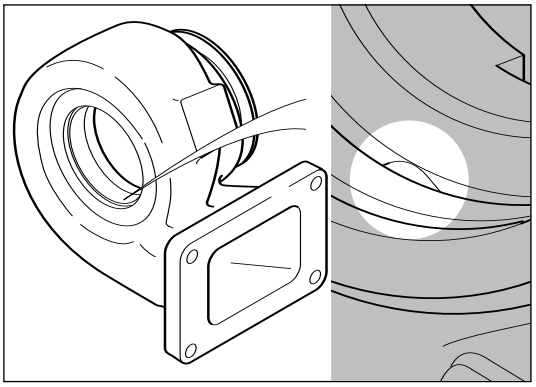


Caution
Never direct hammer blows on to turbine housing flange.

Caution
Turbine blades can be damaged when turbine housing is removed.

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

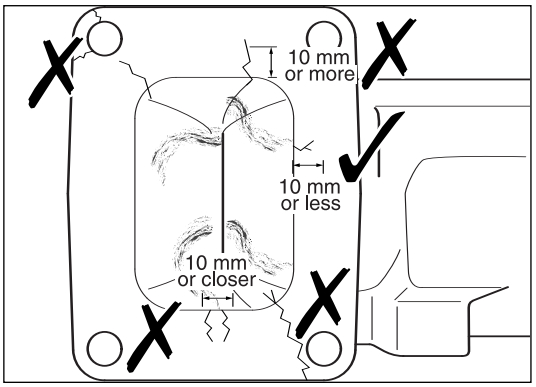
Caution
Where a crack will cause leakage to atmosphere turbine housing must be replaced.



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

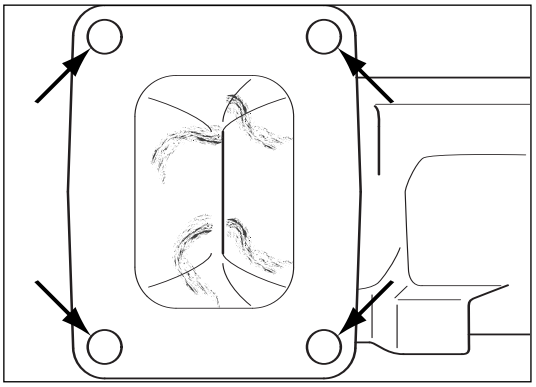
Always clean turbine housing before re-assembly paying particular attention to surfaces close to turbine wheel and bearing housing location. Refer to ***Cleaning of Housings*** for details.

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



Cracking of turbine housing inlet flange and inlet duct generally requires turbine housing (5) replacement. Acceptance and rejection guidelines are shown in these illustrations. If 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

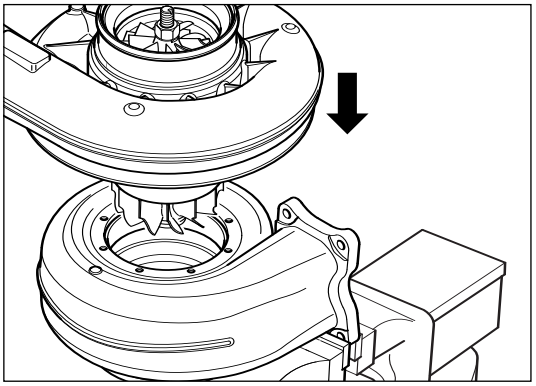
Check fastener hole diameter is not more than 1.5 mm larger than max. thread diameter of the fastener.

Warning
Always wear safety glasses.

To replace turbine housing secure housing in a vice. Apply anti seize compound to bearing housing bore location of turbine housing.

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

Caution
Turbine blades can be easily damaged when installing in turbine housing.

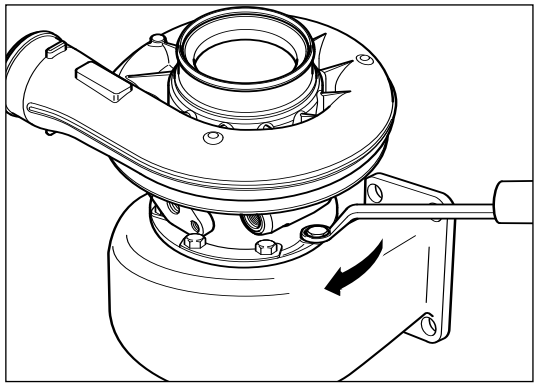


M8 x 1.25 (13 mm A/F)

Warning
Always wear safety glasses.

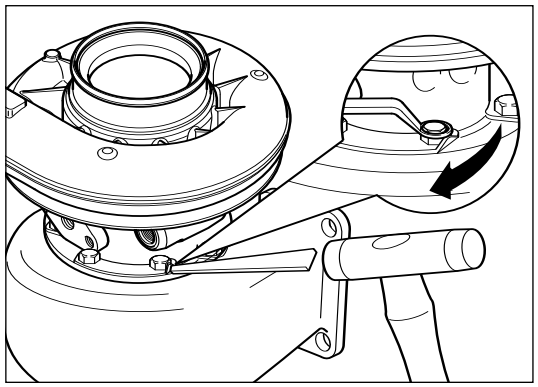
Install the four new lockplates (50)* and torque tighten eight new bolts, turbine housing (57)* to value specified in ***Service Data Sheet***.

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



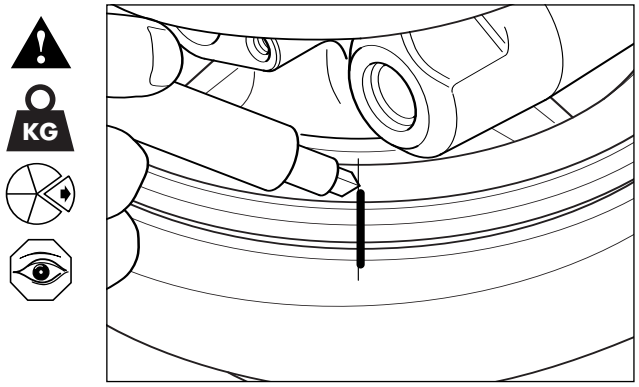
Following torque tightening it may be necessary to turn lockplate bolts in tightening direction until flat aligns with lock tab. Use hammer and drift to knock lockplate tabs into position against turbine housing bolts.

Warning
Titanium compressor wheel edges are sharp. Handle with care.



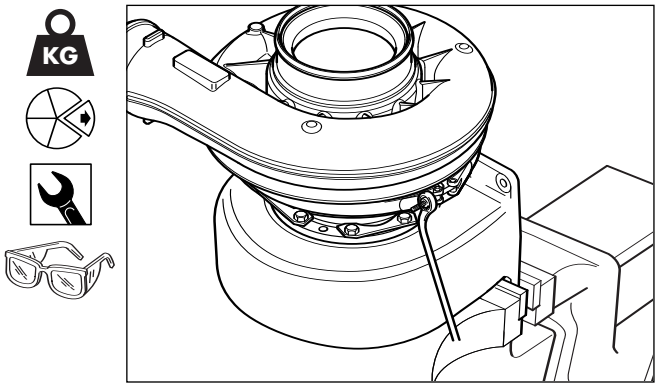
Compressor Housing

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.

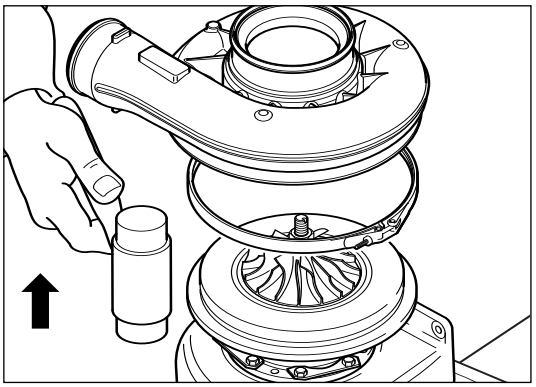
M8 (6 mm A/F Allen key)



Warning
Always wear safety glasses.

Secure turbine housing in vice.

Loosen and remove compressor housing V-band locknut (62) spacer (164), and screw (96).



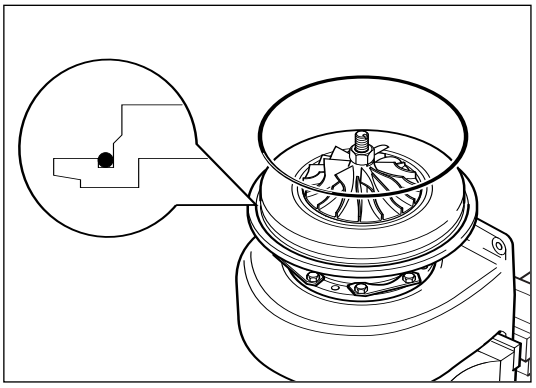
Warning
Titanium compressor wheel edges are sharp. Handle with care.

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

Remove V-band clamp and retain.

Caution
Compressor blades can be damaged when compressor housing is removed.

On some models, for example gas applications, removal of compressor housing will expose o-ring seal fitted into groove in diffuser flange.

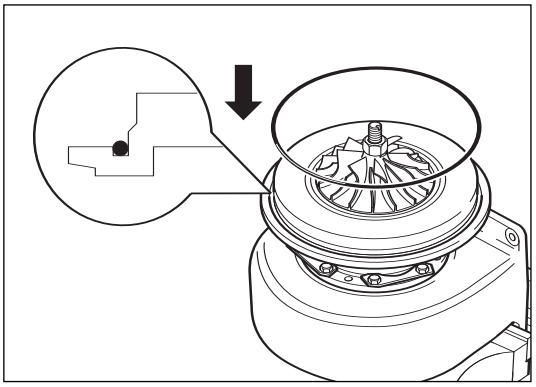


Warning
If there is any possibility that seal has been subject to fire, always wear neoprene gloves when handling.

Warning
Titanium compressor wheel edges are sharp. Handle with care.

Caution
Where a seal has been removed, always locate new o-ring seal into groove in diffuser flange at this stage.

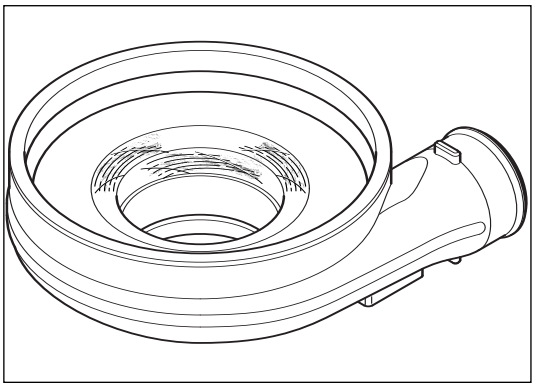
Insert new o-ring seal (41)*.



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.

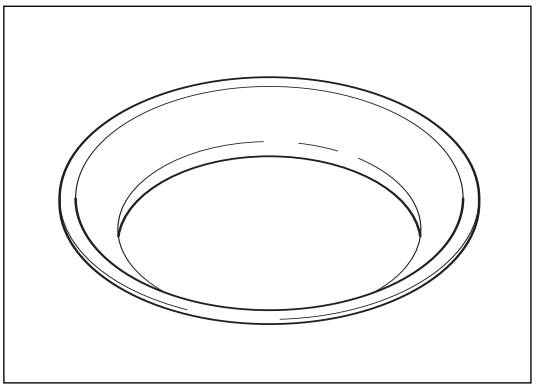
To clean compressor housings fitted with inlet baffle move to ***Inlet Baffle Option***.



Inlet Baffle Option

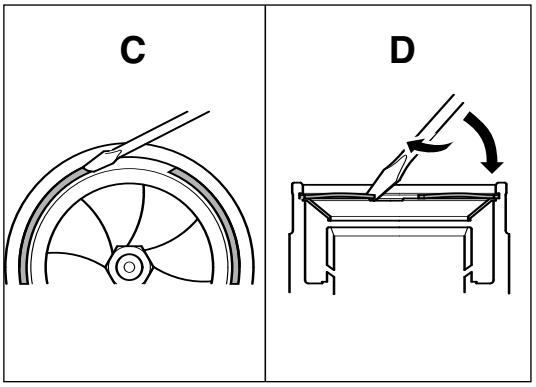
To clean compressor housings fitted with inlet baffle it is necessary to remove baffle.

Warning
Always wear safety glasses.



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

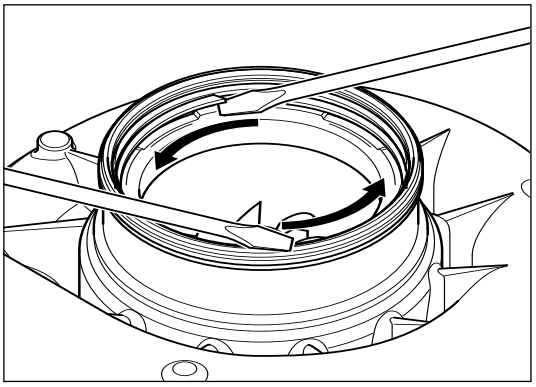
Caution
When removing inlet baffle retaining ring, be careful not to damage compressor wheel with screw driver. Use rag or rubber bung to protect wheel.



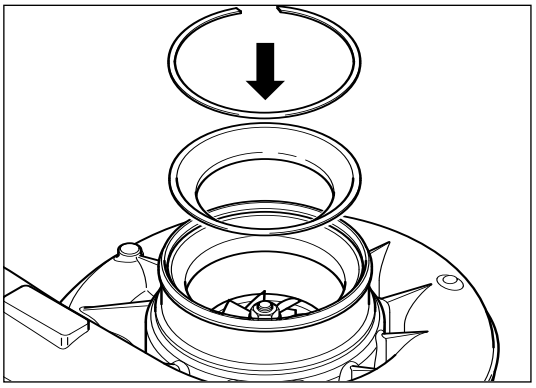
Push screwdriver in anti-clockwise (counter-clockwise) direction to force retaining ring out of groove. Remove retaining ring.

Remove inlet baffle.

Warning
Use free hand to contain disassembled ring within compressor inlet.



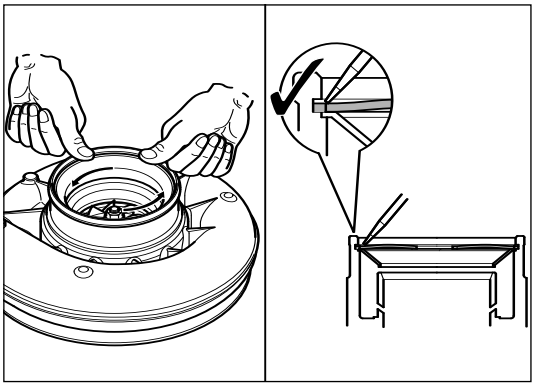
Following cleaning of compressor housing, locate inlet baffle (34) onto location edge of compressor housing inlet.



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

Hold one end of retaining ring (22) in position in its compressor cover groove. Press remainder of retaining ring into position using free hand.

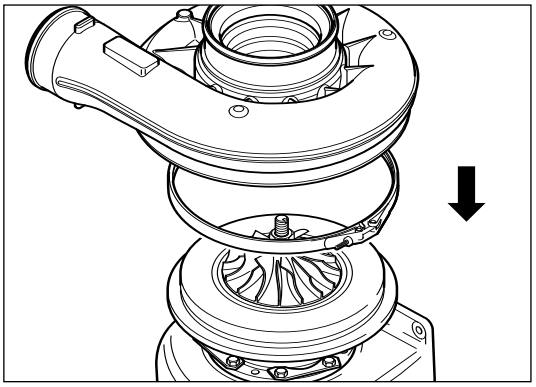
Use flat screw driver to make sure retaining ring is correctly seated in compressor cover groove.



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

Warning
Titanium compressor wheel edges are sharp. Handle with care.

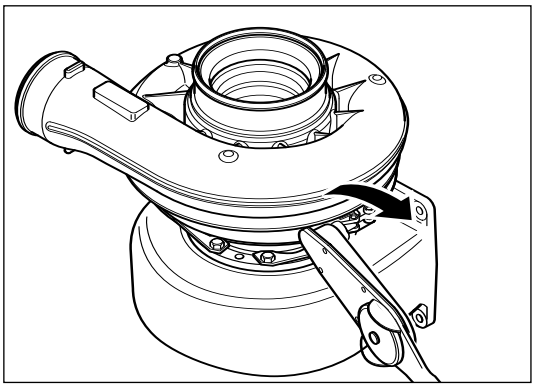
Ensure o ring seal is located in diffuser flange groove where o ring was removed on disassembly. Loosely fit V-band clamp (29)*. Carefully locate compressor housing over compressor wheel.



Caution
Do not damage compressor blades during installation.

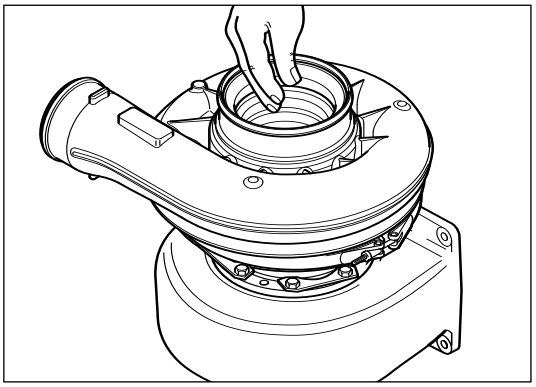
M8 (6 mm A/F Allen key)

Place V-band clamp in position. Insert cap head screw (96)* and spacer (164)*. Torque tighten new locknut (62)* to value specified in ***Service Data Sheet***.



Caution
All HE851 models use special V-band assembly. Always ensure that correct V-band assembly is used and torque tightened to value specified in ***Service Data Sheet***.

Ensure rotor assembly freely rotates.

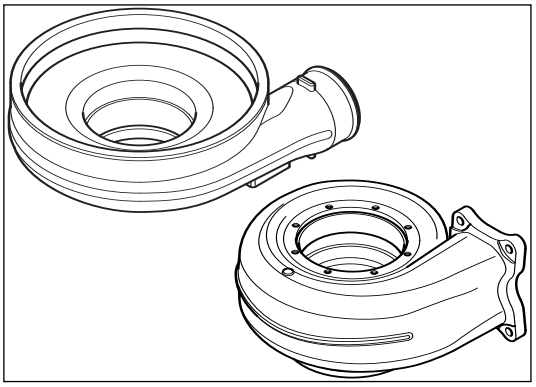


Warning
Turbochargers and installation parts are heavy. Always use safe lifting methods.

Cleaning of Housings

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

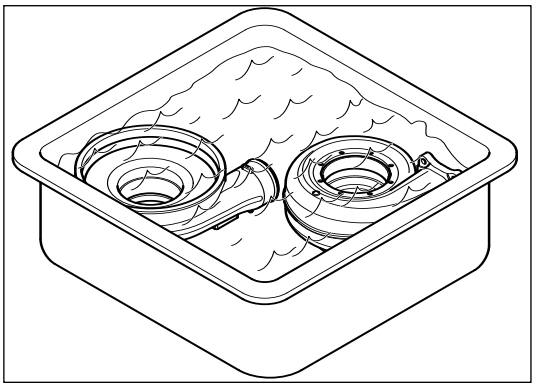
Visually inspect parts to detect signs of burning and other conditions in order to obtain as much information as possible before washing.



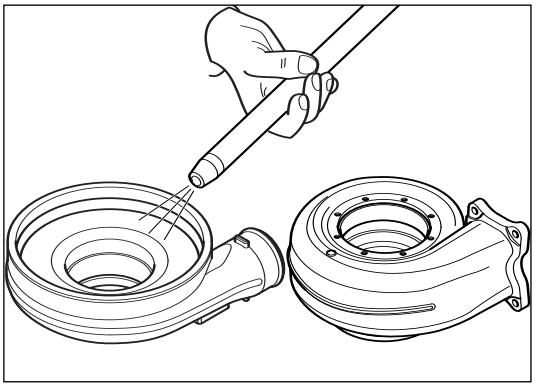
Caution
Housing surfaces adjacent to turbine and compressor wheels must be clean, smooth and free from deposits.

Warning
Always wear safety glasses.

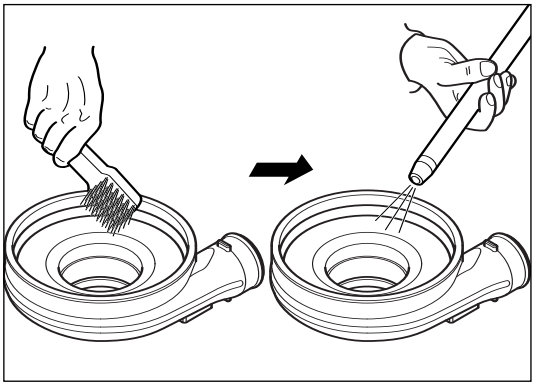
Soak housings in non-corrosive low flash point metal cleaner to loosen deposits.



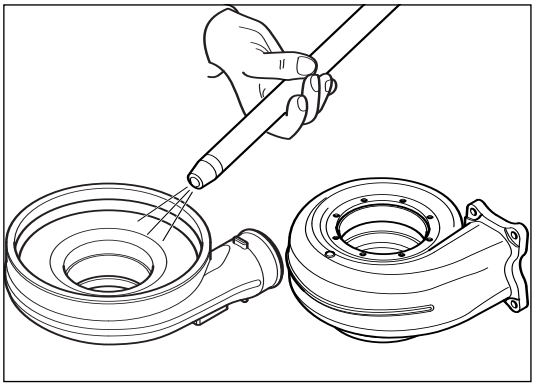
Dry components using compressed air.



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

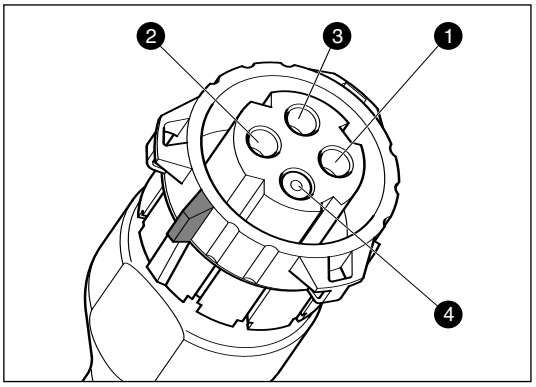
Warning
Do not bead blast Aluminium and Cast Iron components together.

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

After removing deposits, re-wash and dry components.

Speed Sensor

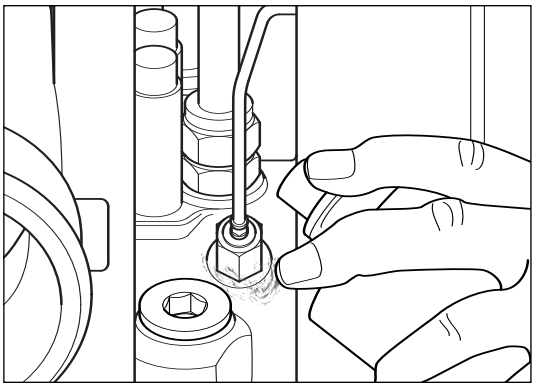
Sensor Check



Disconnect the sensor at its electrical connector. Using a multi-meter, check the resistance between pins 1 and 2 is in range 722 to 978 Ohm with the sensor at 20°C.

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

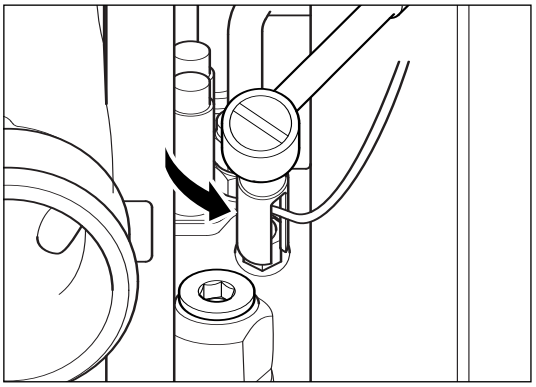
Sensor Removal



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.

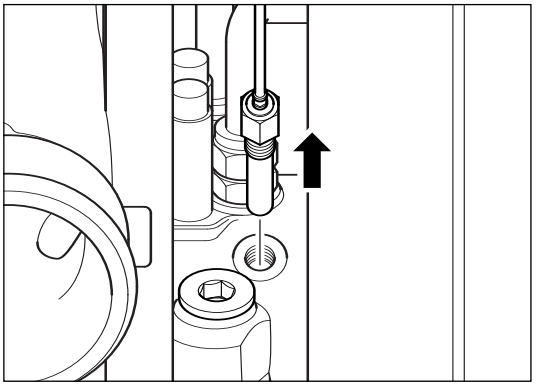
M10 x 1 (13 mm A/F)



Using Sensor Socket, loosen speed sensor.

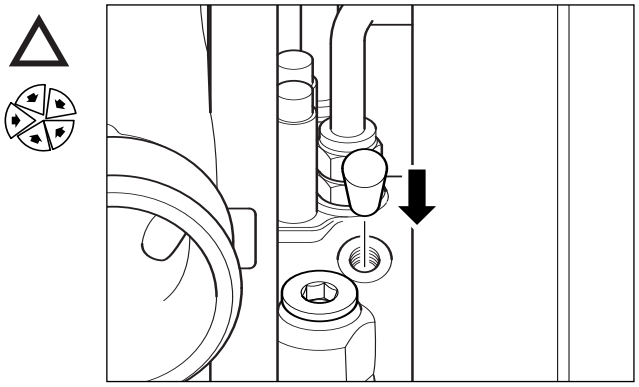
Caution
Breaking sealed joint may require significant torque. It is essential that sensor socket is properly engaged on sensor to avoid inadvertent damage to cable and connector.

Extract speed sensor and place on clean surface to avoid collection of metal particles.



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

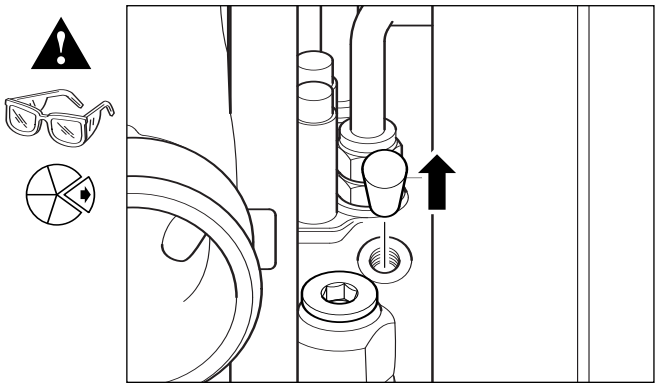
Insert clean rubber plug.



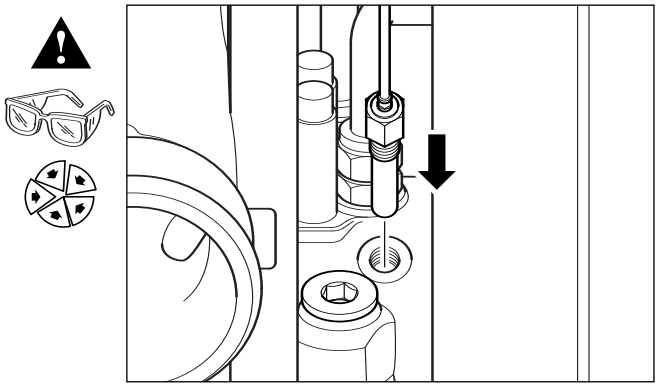
Sensor Replacement

Warning
Always wear safety glasses.

Remove clean rubber plug.



Prior to inserting speed sensor (112)* ensure it is clean and unable to collect metal particles as it is inserted. Sensor is designed to seal directly in bearing housing without any supplementary sealing. Do not fit an o ring or washer.

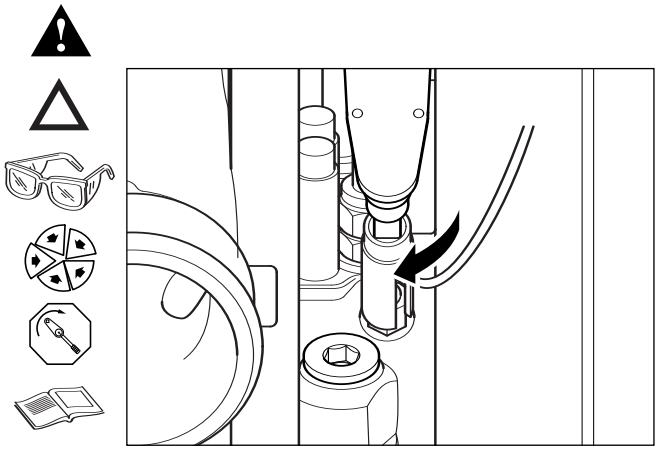


M10 x 1.0 (13 mm A/F)

Torque tighten sensor to 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 leak-proof compression joint between sensor and bearing housing.



Safe Lifting Methods

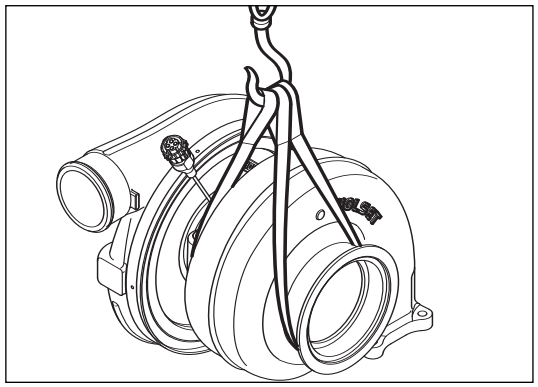
The designated turbochargers weigh up to 60 kg (132 lb) and include sensors, electrical wiring and connectors which are sensitive to handling.

Always use a mechanical lifting method and seek assistance.

Mechanical Handling

Warning
HE851 turbochargers are not fitted with lifting eye. Always seek assistance when lifting.

Always support the weight of turbocharger during removal and refitting using a sling and mechanical hoist system of correct load rating.



Warning
Never attempt to lift turbocharger manually.

HOLSET®
TURBOCHARGERS

Holset HE851
Service Repair Manual

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Part Number: 4029604 Rev.00 Ref. JV/KD Effect Date: 02:06

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