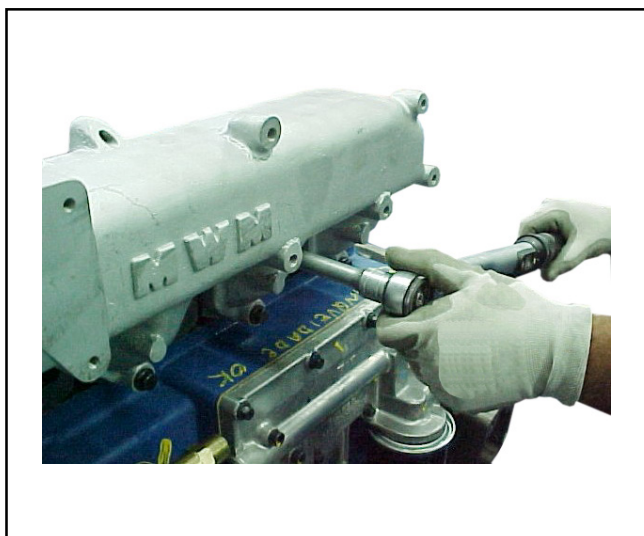


Intake, Exhaust and Turbocharger System

Disassembly Notes	15-2
Inspections	15-2
Intake Manifold and Elbow Tightening Torques Specification	15-3
Exhaust Manifold Tightening Torques Specification	15-4
Turbocharger Tightening Torques Specification	15-4
Assembly	15-5

Cautions

- ***Wait the engine to cool down to perform any service. Exhaust manifold and turbocharger reach very high temperatures and offer burns risk.***
- ***Never perform service on any component of the system while the engine is running.***
- ***Do not inspect the exhaust system with the engine in operation inside rooms without appropriate ventilation, because exhaust gases are extremely toxic.***

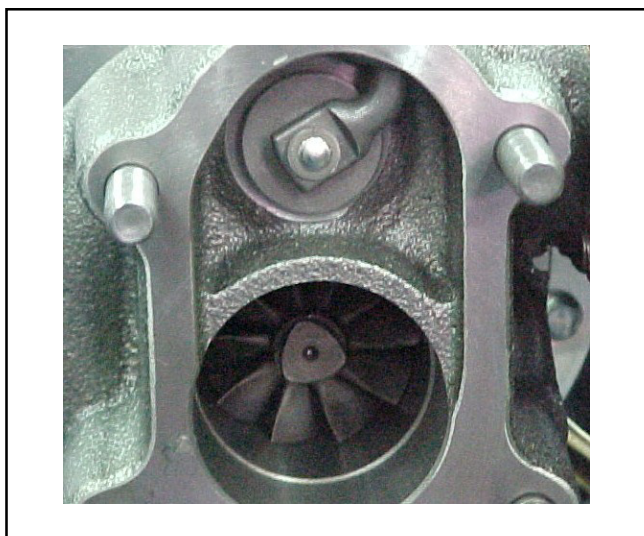


Disassembly Notes

4.12TCE and 6.12TCE Engines: During turbocharger disassembly, pay attention to do not loosen the waste-gate adjustment nut.

During the disassembly of the exhaust tripartite manifold, the crusts of coal must be removed from the rings and sealing seats between manifolds.

To loosen the manifolds bolts use the tool MWM nr. 9.612.0.690.002.4.



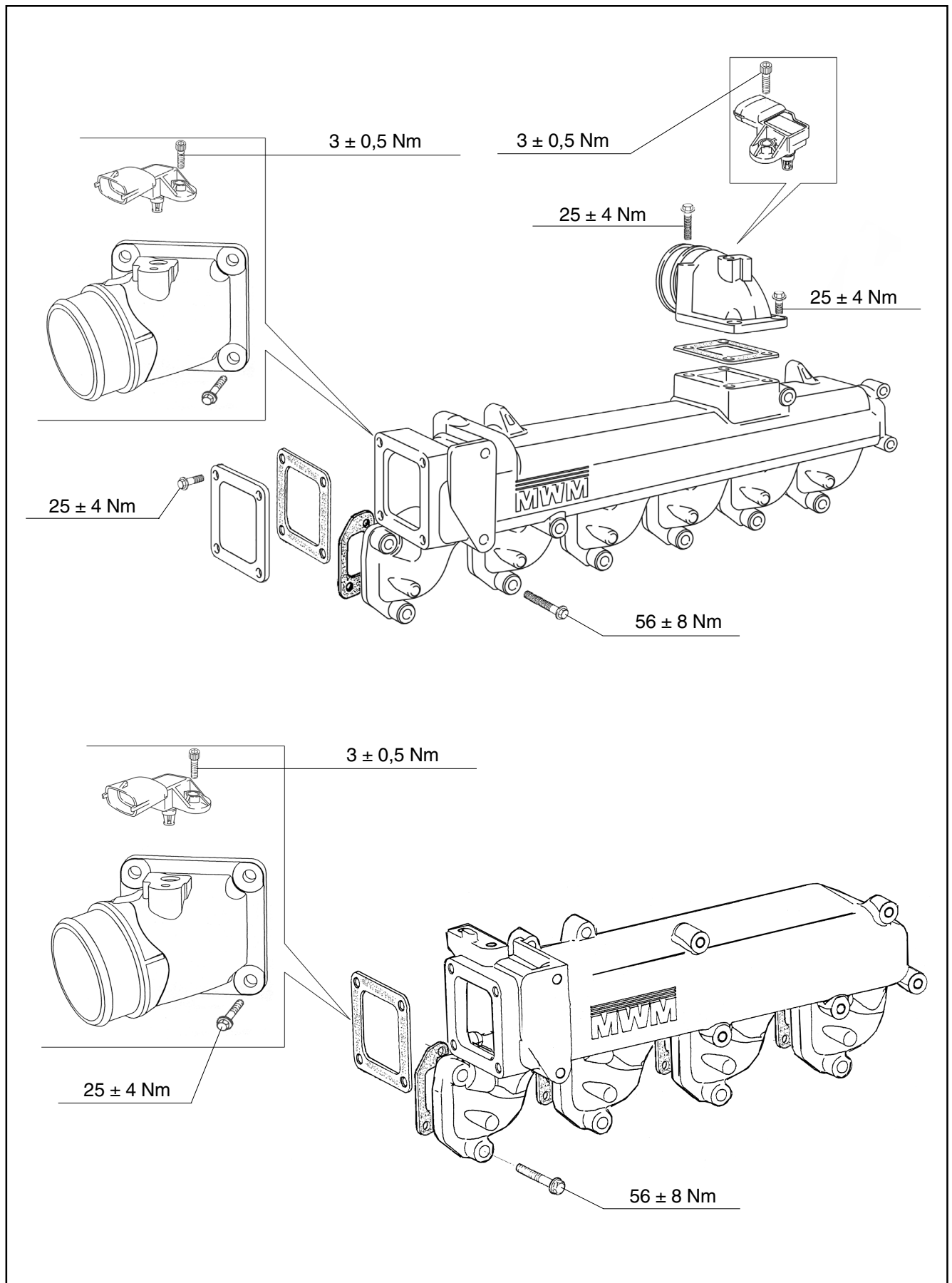
Inspections

Check the general condition of the turbo blades. The contamination of the intake air can cause premature waste of the rotor. Check if there are oil leakages through the sealing rings of the rotor shaft. To check for leakages, visually check the gases outlet in the turbine carcass and the air outlet in the compressor carcass.

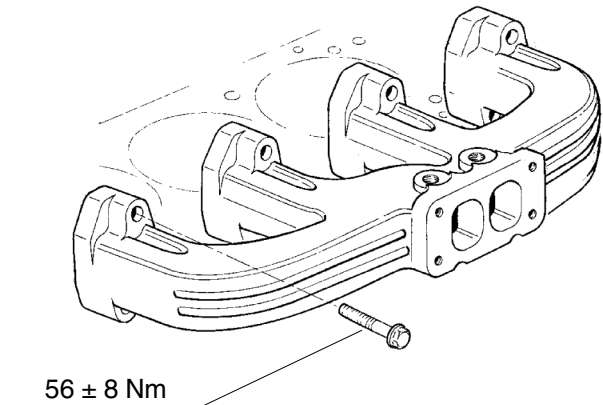
Check for contact marks between rotors and carcasses. If any irregularity is detected, take the turbocharger to an authorized service station of the turbo manufacturer. Any violation of this component causes the cancellation of the warranty.

Test the waste-gate system. Disconnect the waste-gate pipe and with compressed air apply 1 bar pressure to the waste-gate. The valve is correctly operating if it can be detected the movement of the stem.

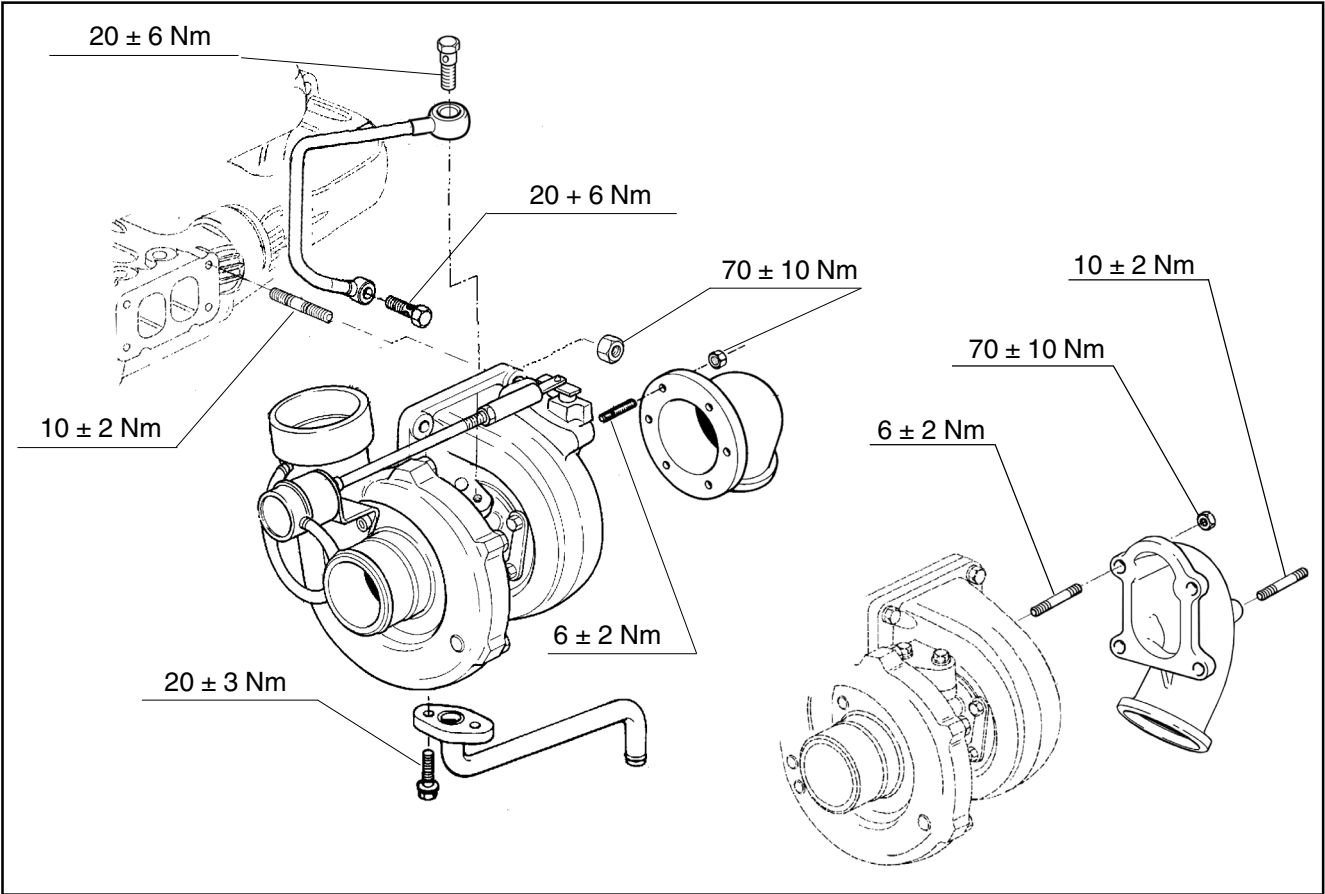
Intake Manifold and Elbow Tightening Torques Specification

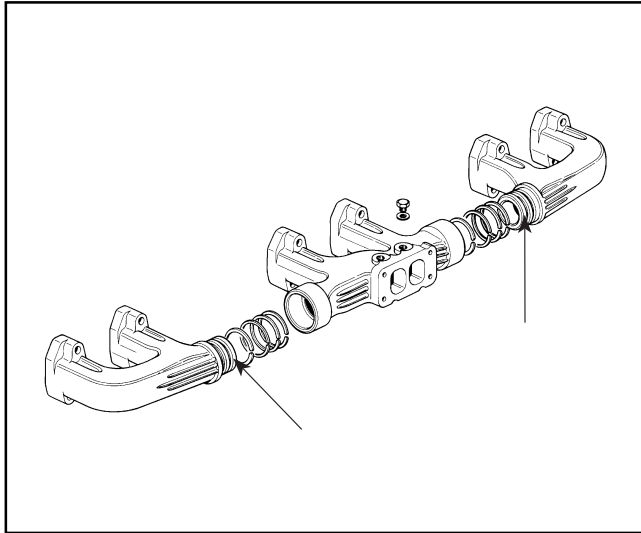


Exhaust Manifold Tightening Torques Specification



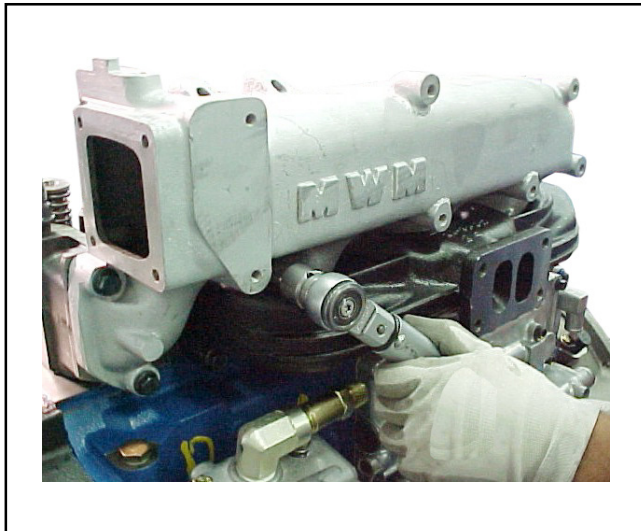
Turbocharger Tightening Torques Specification





Assembly

During the assembly of the exhaust tripartite manifold, use sealant on the sealing rings. Do not use an excessive amount in order to do not remain residues that could cause damages to the turbocharger. After applying the product, join the manifold parts and assembly on the cylinder heads, so that the drying occurs with the manifold already assembled.

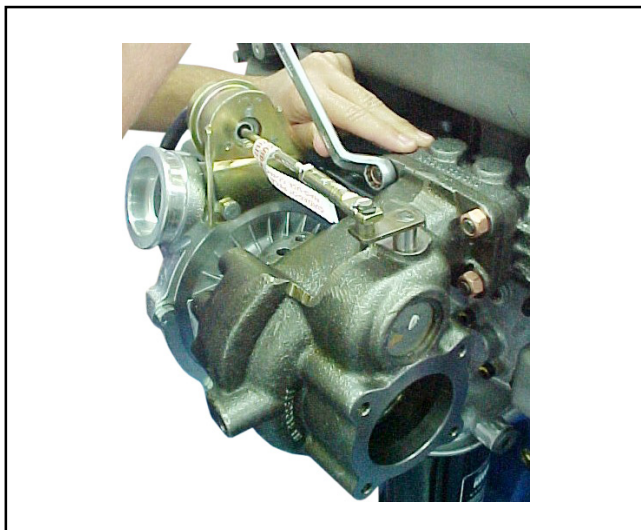


Assembly exhaust manifold with all new gaskets. Tighten the bolts according to the specification from the centre to the edges.

After assembly the manifold, assembly turbocharger fixation studs.

Apply the specified torque.

Retighten the bolts after the 1st operation of the engine.



Assembly the turbocharger. Apply the specified torque.

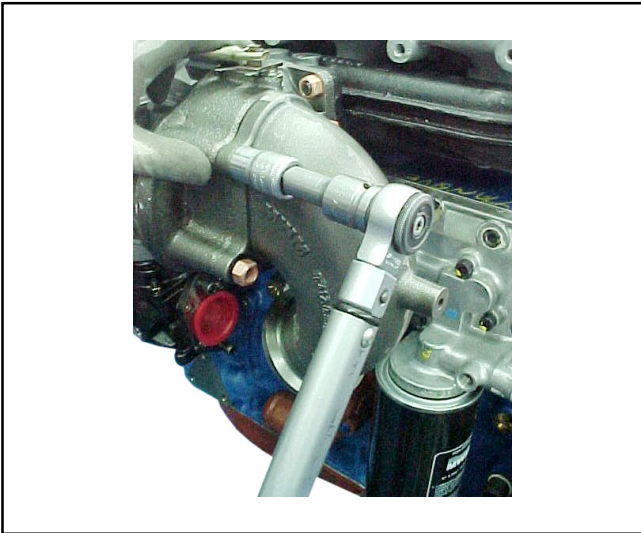
Retighten the bolts after the 1st operation of the engine.

After assembly the turbocharger, assembly the fixation studs of the exhaust elbow.

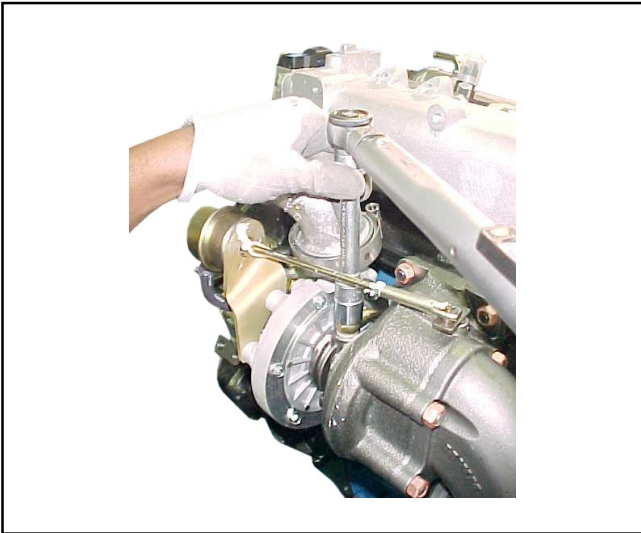
Apply the specified torque.



Assembly exhaust elbow.



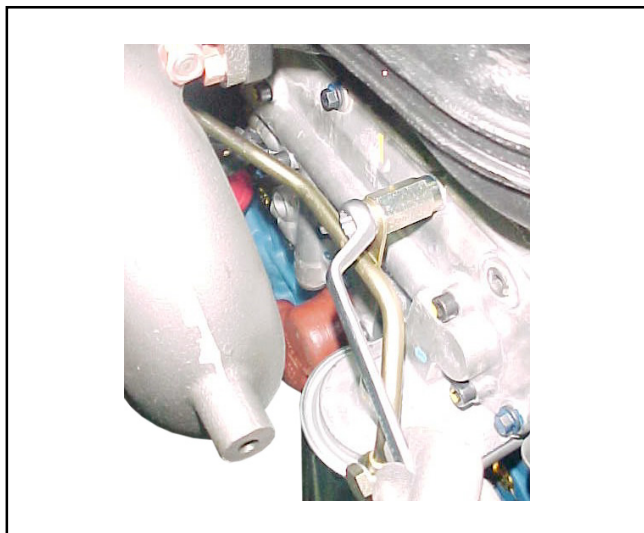
Tighten nuts according to the specification.
Retighten the nuts after the 1st operation of the engine.



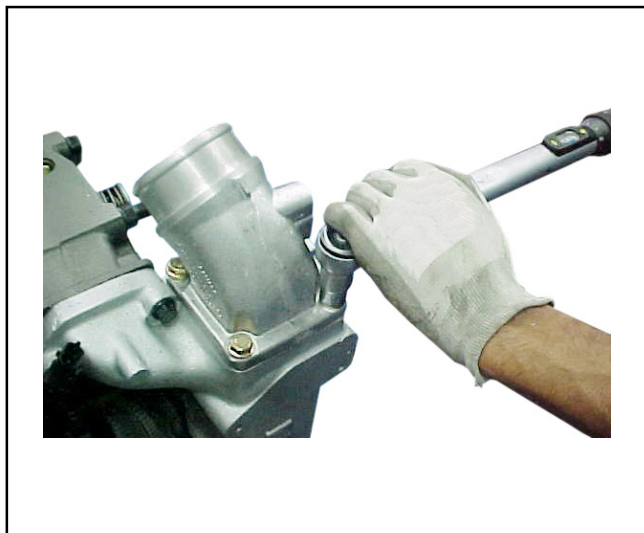
Assembly turbocharger lubrication piping.



Tighten the bolts according to the specification.



Assembly return pipe spacer.
Apply the specified torque.



Assembly intake elbow on intake manifold.
Apply the specified torque.



Assembly air temperature sensor.

Apply the specified torque.

Failures Diagnosis

Introduction	16-2
Symptom Table	16-3
Symptoms	16-3
Probable Causes Table	16-5
Probable Causes	16-5

Introduction

Next they are presented some typical problems which the engine may present, their probable causes and possible corrections for these problems.



Attention

- *Study in full detail the problem before trying any action.*
- *First check the simplest and obvious.*
- *Find the main cause and correct the problem.*

Symptoms Table

SYMPTOM	PROBABLE CAUSES
Low crank speed	01-02-03
Engine does not start	05-06-07-08-09-10-14-15-16-17-22-23-25-26-27-29-40-53
Difficult start (engine delays to start up)	01-02-03-05-07-08-09-10-14-15-16-17-18-22-25-26-27-29-40-53
Power lack / Performance	07-08-09-10-14-15-16-17-18-19-20-21-22-23-25-26-27-29-44-53-54-56-57
Engine misfiring	07-08-09-10-14-15-16-17-19-20-21-22-23-24-26-29-44-53
Excessive fuel consumption	09-14-15-17-18-21-22-23-25-26-27-29-57-60
Black smoke	09-14-15-17-18-21-22-23-25-26-27-29-53-54-57-60
White-bluish smoke	04-14-15-17-19-21-22-23-25-26-27-28-29-39-40-44
Low oil pressure	04-29-30-31-32-33-34-36-37-38-52
Engine inner beats	14-17-22-23-25-26-28-29-30-33-36-39-40-53
Excessive vibration	10-15-17-29-41-42-43-61-62
High oil pressure	04-32-35
Overheating	09-14-18-19-39-44-45-46-47-48-51-58-63-64-65
Excessive pressure in the crankcase with possible oil leakages	19-25-27-28-39-49-67
Low compression	09-14-19-22-23-25-26-27-28-40-53
Engine starts and stops	08-09-10-17-29

Symptoms Table (Continuation)

SYMPTOM	PROBABLE CAUSES
Engine and go off	29-49-55
High lubricant oil consumption	04-12-13-15-25-27-28-39-49-54-55-58-59-60-66
Water mixed to lubricating oil	10-19-50
Water mixed to lubricating oil	50
Irregular idle speed	07-08-09-10-16-17-29-59
Engine stops during vehicle stop	06-07-08-10-17-29
Engine misfiring	10-17-29

Symptoms Table (Continuation)

Nr.	Probable Cause	What to do
01	Low battery charge	Charge or change battery
02	Bad contact on the electrical connections	Clean and retighten the connections
03	Defective starter motor	Correct the starter motor
04	Inadequate lubricant oil viscosity	Use oil of correct viscosity
05	Low start tension	Check connections, battery and starter motor
06	Fuel tank empty	Fill with fuel
07	Low pressure fuel pipe obstructed	Clean the system
08	Fuel filters obstructed	Clean fuel filters or change elements
09	Restriction in the air intake system	Free the intake system or clean air filter element (dry type)
10	Air in fuel system	Bleed the system
11	Leakages through sealing rings	Change cylinder liners sealing rings
12	Irregular rings seating	Change
13	High oil level in the carter	Correct level
14	Incorrect camshaft gear timing	Get the correct timing
15	Low compression	Measure compression and remove the failure
16	Fuel tank breathe obstructed	Free breathe
17	Inadequate fuel	Use recommended combustible
18	Obstructed exhaust	Free pipes, silencers, etc.
19	Leak through cylinder head gasket	Change gasket and check the causes of the leakage

Symptoms Table (Continuation)

Nr.	Probable Cause	What to do
20	Overheating	Check cooling system, and operation and installation conditions
21	Engine excessively cold	Check thermostat
22	Incorrect valves clearance	Adjust valves clearance
23	Griped valves	Correct the operation of the valves
24	Incorrect high pressure pipes	Change
25	Cylinders wear	Correct
26	Valves and seats burnt	Recondition or change
27	Broken, worn or griped rings	Change
28	Valves stems and guides worn	Change
29	Failure in electronic fuel injection system	Perform Diagnosis on the system according to the "Diagnosis Manual" of the engine
30	Damaged or worn bearings	Change
31	Low oil level in the carter	Complete level
32	Oil pressure indicator faulty	Change
33	Lubricant oil pump with inner wear	Change
34	Oil pump pressure relief valve locked open	Free and correct
35	Oil pump pressure relief valve locked closed	Free and correct
36	Pressure relief valve spring broken	Change
37	Defective oil pump suction pipe	Correct
38	Oil filter blocked	Change element
39	Piston griped	Repair cylinders

Symptoms Table (Continuation)

Nr.	Probable Cause	What to do
40	Incorrect piston height in relation to the engine block surface	Use correct pistons
41	Damaged fan	Change
42	Defective engine bracket cushions	Change / Correct assembly
43	Flywheel or flywheel housing misaligned	Align
44	Defective thermostat	Change
45	Water galleries restriction / liners with crusts	Clean the system
46	Fan belts loosen	Tension
47	Radiator blocked outside or inside	Clean
48	Defective water pump	Change
49	Carter breathe blocked	Clean
50	Oil cooler leakage	Correct
51	Lack of water in the cooling system	Complete level
52	Oil pump suction pipe sieve blocked	Clean
53	Valve spring broken	Change
54	Turbocharger damaged or needing cleanness	Repair or clean
55	Leakages through turbocharger oil seals	Change seals
56	Exhaust manifold linked to turbocharger	Change gaskets
57	Intake air low pressure	Check turbocharger. Correct leakages
58	Outer leakages (gaskets, seals, etc.)	Correct
59	Inadequate engine inclination angle	Correct

Symptoms Table (Continuation)

Nr.	Probable Cause	What to do
60	Engine operates overloaded	Operate the engine inside the load limit
61	Balancer unit out of position (4 cylinders engines)	Correct
62	Defective damper	Change
63	Liner protrusion below specification (leakage through liner collar)	Correct
64	Thermostat bad seating	Change
65	Lack or incorrect coolant proportion in the cooling system	Correct
66	Leakage through valve guide seals	Change
67	Defective PCV	Change



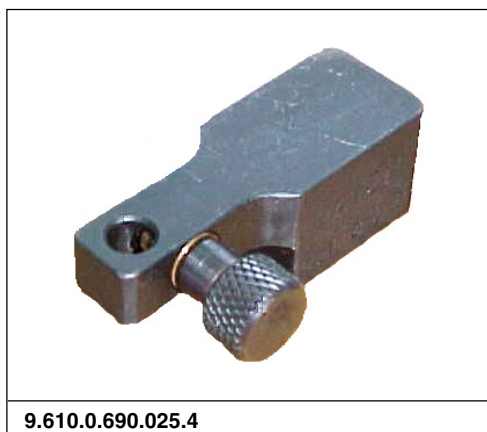
GUIDE-PIN FOR EXHAUST AND INTAKE MANIFOLD

9.407.0.690.027.4



GUIDE-PIN FOR CYLINDER HEAD AND BEARINGS

9.407.0.690.030.4



DEVICE TO MEASURE PISTON POSITION AND HEIGHT TO LINER

9.610.0.690.025.4



DEVICE TO REMOVE INJECTORS

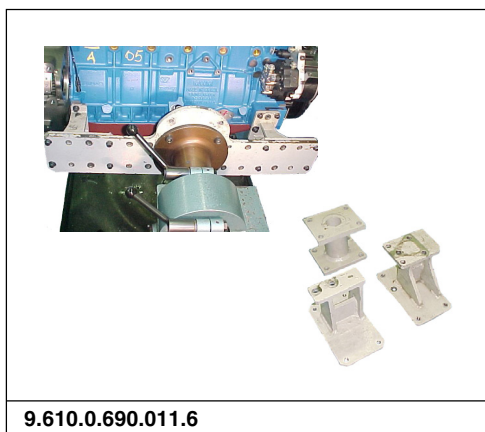
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DEVICE TO DISASSEMBLY AND ASSEMBLY VALVE SPRINGS



CONNECTOR FOR CYLINDER COMPRESSION TEST



ADAPTORS FOR ENGINE STAND



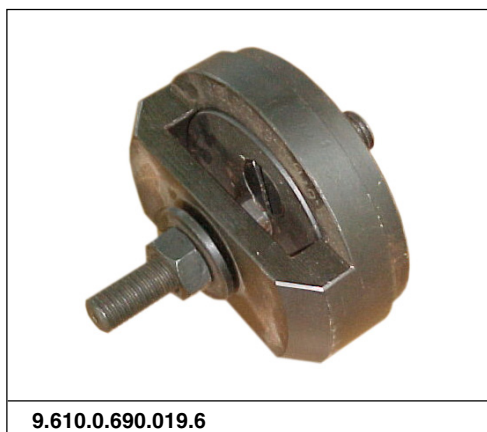
DEVICE TO ASSEMBLY VALVE GUIDES



DEVICE TO ASSEMBLY VALVE SEAL



DEVICE TO DISASSEMBLY CYLINDER LINER



DEVICE TO ASSEMBLY FRONT SEAL



DEVICE TO ASSEMBLY REAR SEAL



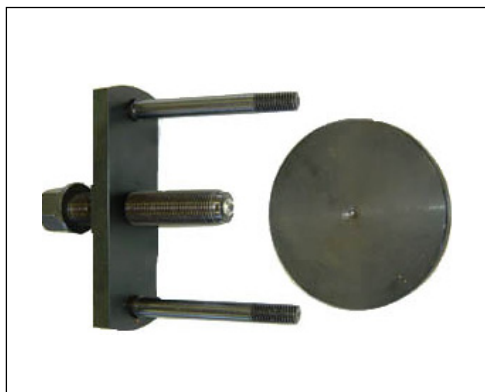
9.612.0.690.002.4

HEXAGONAL ARTICULATED DEVICE FOR EXHAUST MANIFOLD



9.610.0.690.026.4

DEVICE TO LOCK ENGINE FLYWHEEL



9.610.0.690.024.6

DEVICE TO ASSEMBLY CYLINDER LINERS



9.610.0.690.032.4

INSPECTION COVER TIGHTEN DEVICE