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Cylinder head/gasket, replacing

[999 5454](#)
[951 2666](#)
[999 5670](#)
[999 5451](#)
[951 2050](#)
[951 2767](#)
[999 5452](#)
[999 5718](#)
[999 5719](#)
[999 5450](#)

Note!

As the illustrations in this service information are used for different model years and / or models, some variation may occur. However, the essential information in the illustrations is always correct.

Preparation

Remove the cable from the battery negative terminal. First read [Note when disconnecting and connecting the battery lead](#).

Coolant, draining

- Remove the front air baffle.
 - Open the engine nipple.
 - Drain the coolant into a container.
 - Close the nipple.
 - Remove the screw that holds the inlet pipe for the coolant pump to the cylinder block.
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Exhaust manifold, removing

Turbo US

Remove the exhaust manifold acc. to [Exhaust manifold, replacing](#).



Starter motor, removing

Remove:

- lower hose to the charge-air cooler.
 - inlet pipe's support console.
 - connector for oil pressure switch.
 - plastic charge-air pipe from the turbo.
 - starter motor's screws.
 - unhook the starter motor and let hang.
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Fuel line, draining

Drain the fuel line. See [Draining the fuel injection system](#).

Fuel line, removing

Loosen the fuel line at the quick-coupling on the fuel rail.

Installing the cylinder head

Note!

For tightening torques not in the text, see [Tightening torques for 4-cylinder gasoline engines](#).

Note!

To ensure that there is no exhaust leakage, see: [Flanged joint assembling](#).



Components, removing

Remove:

- the cover over the injectors
- the cover over the throttle housing.
- the upper timing cover
- the cover over the ignition coils.
- the front timing cover.
- the throttle cable from the throttle housing's console.

Remove:

- the brake servo's vacuum hose. Pull on the hose while pressing down the plastic ring.
 - the turbo control valve from the air filter housing.
 - the mass air flow sensor's connector.
 - EVAP-valve's connection to mass air flow sensor's hose.
 - air filter housing's top part complete with hose.
 - the pipe screw for the water-heated crankcase ventilation.
 - the auxiliaries belt
-



Cable harness, exposing

Remove:

- the screw from the ignition coils' ground.
- the camshaft position sensor.

Remove:

- the ignition coils' connectors.

Place the cable harness to the side.

Screw loose the cable channel from the cylinder head's trailing edge and the throttle housing's console. Disconnect cables and hoses from the cylinder head's trailing edge.

Remove:

- water temperature sensor's connector.
- injectors' connectors.

Lay the cable channel and cable harness to the side.

Mark up and remove ignition coils and ignition cables.

Remove:

- camshaft's rear cover.
 - the camshaft position (CMP) sensor housing
 - the trigger wheel.
-



Inlet pipe, removing

Remove:

- upper radiator hose with thermostat housing's cover.
 - the screw holding the dip stick pipe to the intake manifold
 - connectors from air assistance valve and throttle position sensor.
 - crankcase ventilation's hose from camshaft cover.
 - vacuum hoses from inlet pipe, mark up location.
 - console between servo pump/inlet pipe.
 - screws that hold inlet pipe to the cylinder head.
 - the intake manifold
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Timing belt pulley, removing

Remove the timing belt pulley acc. to [Cylinder head/gasket, replacing:Camshaft seals, replacing.](#)

Remove the engine mount front for cylinder head.

Coolant pump's inlet pipe, disconnecting

Remove the two screws at the coolant pipe connection to the bypass channel.
Carefully turn the pipe to remove it from the cylinder block.



Camshaft cover and cylinder head, removing

Remove:

- VVT-valve.
- spark plugs from cylinder 1 and 4.

Install tool Special Tool: [999 5454](#) (2 pcs.) with 2-3 mm clearance to camshaft cover. Make sure that the screws in the spark plug thread is tightened all the way in.

Remove all the screws securing the camshaft cover to the cylinder head.

Use pliers Special Tool: [999 5670](#) to lift the cover from the cylinder head. Use the pliers at the pry lugs. Begin at cylinder and move alternately backwards.

Loosen the wing nuts a few turns and repeat the procedure.

Carefully press out the front and rear camshaft seals.

Caution!

Be very careful so that the sealing faces on the camshafts are not damaged.

Remove:

- tools Special Tool: [999 5454](#) .
- the camshaft cover
- the camshafts

Lift out the depressors. Use suction cup. **Not** magnet!

Caution!

Mark up and position the lifters so that their original positions can be established.

Remove the screws holding the cylinder head on the cylinder block. Start at the sides and work alternately towards the center. Get help to lift off the cylinder head.

Caution!

Do not damage the mating surfaces.



When replacing or working on the cylinder head

Remove:

- the thermostat housing
- all parts that shall be transferred to the new cylinder head.
- gaskets.

Caution!

Do not damage the mating surfaces.

Gasket face, cleaning

Clean the gasket faces for:

- the coolant bypass channel
- the intake manifold
- the cylinder block
- camshaft cover.

When replacing/reworking of the cylinder head, clean the gasket faces for:

- the manifold. Check that the studs are tightened
- the thermostat housing

Blow the oil ducts clean.

Caution!

Do not use a metal scraper. Use a soft putty scraper or gasket dissolver 1161440-1. The surfaces must be completely clean to seal tightly.

Warning!

Use a fume hood or extractor when using gasket solvent!



Aligning the crankshaft

Remove the blind cover plug.

Turn the crankshaft clockwise slightly to avoid the adjustment tool being in the wrong position.

Install gauge Special Tool: [999 5451](#) . Make sure that the gauge bottoms against the engine block.

Turn the crankshaft back counter-clockwise until it stops against the drift.

Check that the marking on the crankshaft timing belt pulley matches with the marking on the oil pump.

When replacing or working on the cylinder head

Install:

- thermostat housing. Use a new gasket.
- the manifold. Use new gaskets. Lubricate the studs using paste 116 1408

Caution!

Do not damage the mating surfaces.



Installing the cylinder head

Install a new cylinder head gasket.
Install the cylinder head.

Ensure that no wiring or hoses are trapped between the cylinder head and cylinder block.

Use new screws. Lubricate and install all the screws.
Tighten the screws as illustrated.

Tighten the screws in the following order:

1. Tightening torque **20 Nm** .
 2. Tightening torque **60 Nm** .
 3. Angle tighten **130°** . Use protractor Special Tool: [951 2050](#) .
-



Valve depressors and camshafts, installing

Note!

When installing a new cylinder head, the valve clearance must be set. See [Valve clearance setting / adjusting](#) .

Lubricate the valve guide wells.
Install all the tappets.

Note!

Make sure that the depressors end up in the same place as before. If needed, replace valve depressors to achieve correct valve clearance.

Lubricate the camshaft bearing seats.

Install the intake camshaft. Make sure that the groove at the back of the camshaft is **above** an imaginary center line.

Install the exhaust camshaft. Make sure that the groove at the back of the camshaft is **below** an imaginary center line.

Applying liquid gasket.

Wipe the oil film off the mating surfaces on the camshaft cover and cylinder head.

Install new O-rings around the spark plug wells on the cylinder head.

Apply liquid gasket 116 1059 on the camshaft cover.

Use roller Special Tool: [951 2767](#) .

The surface must be completely covered without any excess.

Caution!

Make sure that liquid gasket does not end up in coolant or oil channels.

Only a thin layer of liquid gasket is needed.



Camshaft cover, installing

Lubricate the camshaft lobes, the camshaft bearing surfaces and the top of the valve lifters.

Install the camshaft cover.

Install press tool Special Tool: [999 5454](#) (2x).

Tighten the camshaft cover screws alternately, keeping it parallel to the cylinder head using the press tools.

Install all screws and tighten from the middle and out towards the edges. Tighten with **17 Nm** .

Remove the press tools.

Install the spark plugs. Tighten to **30 Nm** .

Coolant pump's inlet pipe, installing

Install the inlet pipe for the coolant pump on the cylinder head. Use a new gasket.

Note!

Apply thread sealant, 116 1056 on the screws' threads.

Fit the camshaft gauge Special Tool: [999 5452](#) on the rear edge of the camshafts. Make sure the screws holding the gauge to the camshafts and the screw holding the gauges together as a unit are well tightened.

Front camshaft seal, installing

Lubricate the surfaces on the seal that the camshaft rotates against.

Install the new seal for the camshaft without VVT using drift Special Tool: [999 5719](#) .

Install the new seal for the camshaft with VVT using drift Special Tool: [999 5718](#) .

Install the screw holding the inner timing cover to the cylinder head.

Camshafts' timing belt pulley, installing

Install the camshafts' timing belt pulley acc. to [Cylinder head/gasket, replacing:Camshaft seals, replacing.](#)



Installing engine mounting

Place engine mount on cylinder head. Screw down the engine mount against the cylinder head. Tighten with **35 Nm** and then tighten through an angle of **75°**, one movement without interruption.

Right engine mount, installing

Install the lower timing cover.

Screw down the engine mount against the engine. Tightening torque **67 Nm**.

Install:

- screws on the body's console. M10 screw tighten with **50 Nm**
 - Install the upper timing cover.
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Finishing

Remove lifting beam and lifting hook.

Install:

- the servo reservoir.
 - servo hose's metal console on the auxiliary unit belt's rotation guard.
 - the auxiliaries belt
 - rear camshaft cover.
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Installing components

Install:

- blinder. Tightening torque **17 Nm** .
 - camshaft sensor housing. Tightening torque **5 Nm** .
 - cable channel.
-

Inlet pipe, installing

Install:

1. inlet pipe. Use new gasket. Tightening torque **17 Nm** .
 2. vacuum hoses from inlet pipe acc. to marking.
 3. crankcase ventilation's hose on camshaft cover.
 4. connectors from air assistance valve and throttle position sensor.
 5. oil dipstick tube.
 6. upper radiator hose with thermostat housing's cover.
-



Components, installing

Install:

- the ignition coils and ignition cables according to earlier markings.
- the ignition coils' ground cable.
- the camshaft position sensor.

Lay the cable channel and cable harness in place.

Install:

- the cable channel's screws on the cylinder head's trailing edge and the throttle housing's console.
- console between inlet pipe and servo pump.
- injectors' connectors.
- water temperature sensor's connector.
- air preheating hose between air filter and exhaust manifold's heat shield plate.
- the auxiliaries belt
- the pipe screw for the water-heated crankcase ventilation.
- air filter housing's top part complete with hose.
- EVAP-valve's connection to mass air flow sensor's hose.
- the mass air flow sensor's connector.
- the turbo control valve on the air filter housing.
- brake servo's vacuum hose.
- throttle cable.
- the inlet hose between mass air flow sensor and throttle housing.
- the front timing cover.
- the cover over the ignition coils.
- the upper timing cover
- the cover over the throttle housing.
- the cover over the injectors

Fuel line, installing

Press the fuel line into its quick-coupling on the fuel rail.

Exhaust manifold, installing

Turbo US

Install the exhaust manifold acc. to [Exhaust manifold, replacing.](#) .



Starter motor, installing

Install:

- the blind cover plug.
 - the starter motor
 - plastic charge-air pipe to the turbo.
 - inlet pipe's support console.
 - connector for oil pressure switch.
 - lower hose to the charge-air cooler.
 - front air baffle.
 - right front wheel acc. to [Installing wheels.](#) .
 - the negative battery cable. First read [Note when disconnecting and connecting the battery lead.](#) .
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Checking performed work

Change oil and oil filter, and fill coolant.

Check:

- the engine oil level
- the coolant level.

Warm up the engine until the thermostat opens.
Check the engine for leaks.
Top up the coolant if necessary.
