Workshop Manual
(Group 21)

TAD1240GE, TAD1241GE/VE
TAD1242GE/VE, TWD1240VE

Workshop Manual

Industrial Engines

TAD1240GE, TAD1241GE/VE, TAD1242GE/VE, TWD1240VE

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Introduction

This Service Manual contains descriptions and repair instructions for the Volvo Penta products or product versions listed in the table of contents. This manual should be used together with the Service Manual ***Technical data*** for the relevant engine. Be sure to use the correct service literature.

Carefully read the safety information and ***General information*** and ***Repair instructions*** in the Service Manual before starting service work.

Important

This following special warning symbols are found in the Service Manual and on the product.

WARNING! Warns for the risk of injury, damage to the product or property or that serious malfunctions could arise if the instructions are not followed.

IMPORTANT! Used to draw attention to anything that could cause injury or the malfunction of a product or property.

NOTE: Used to draw attention to important information to facilitate work operations or handling.

To provide an overview of the dangers of which you should always be aware and the precautionary measures that should always be taken, we have listed them here.

Make it impossible for the engine to start. Turn off the current by means of the main switch (or switches) and lock it (them) in the off position before starting service work. Affix a warning sign in the driver's area.

As a rule, all service work should be performed when the engine is switched off. However, some work, such as certain adjustments, requires the engine to be running. Approaching a running engine could be dangerous. Bear in mind that loose-fitting clothes or long hair could get caught in rotating parts and cause serious injury.

If work is performed near a running engine, an incautious movement or dropped tool could in the worst case lead to bodily harm. Be mindful of hot surfaces (exhaust pipes, the turbocharger, charge air pipes, starter elements, etc.) and hot liquids in lines and hoses on an engine that is running or has just been stopped. Before starting the engine, refit all guards and protective elements that were removed in the course of performing service work.

Make sure that the warning and/or information decals affixed to the product are always in plain sight. Replace any decals that have been damaged or painted over.

Never start the engine unless the air filter is fitted. The rotating impeller in the turbocharger could cause serious injuries. Foreign objects in the inlet line could also cause machinery damage.

Never use starter spray or the like to help start the engine. It could cause an explosion in the inlet manifold. Danger of injury.

Start the engine in well-ventilated areas only. If the engine is running in a confined space, exhaust gases and crankcase gases should be conducted away from the engine compartment or workshop area.

Avoid opening the coolant filler cap when the engine is still hot. Steam or hot coolant could squirt out while the built-up pressure is lost. If necessary, open the filler cap slowly and release pressure in the cooling system. Be extremely careful if a cock, plug or coolant line must be removed while the engine is still hot. Steam or hot coolant could squirt out in an unexpected direction.

Hot oil can cause burns. Avoid getting hot oil on your skin. Make sure that the lubricating system is depressurized before starting any work on it. Never start or run the engine with the oil filler cap removed as oil under pressure could then escape.

Stop the engine before doing any work on the cooling system.

If other equipment connected to the engine changes its center of gravity, special lifting devices may be needed to obtain the right balance and ensure safe handling.

Never perform any work on an engine that is suspended solely from a lifting device.

Never work alone when heavy components are to be removed, even if a safe lifting device such as a lockable block and tackle is used. Even if a lifting device is used, two people are generally required; one to handle the lifting device and the other to make sure that the components go clear and are not damaged when lifting.

Always ensure in advance that there is sufficient space for dismantling to be done without risk of injury or material damage.

WARNING! Electrical system and fuel system components of Volvo Penta products are designed and manufactured to minimize the risk of explosion and fire. The engine must not be run in environments in which they will be surrounded by explosive media.

Always use fuel recommended by Volvo Penta. See the Owner's Manual. Use of a lower grade fuel could damage the engine. On a diesel engine, a poor grade of fuel could lead to binding of the control rod and overrevving of the engine, causing risk of injury and damage. Poor fuel can also give rise to higher maintenance costs.

Bear in mind the following when cleaning with high-pressure equipment: never direct the jet of water on seals, rubber hoses, electrical components or the radiator. Never use the high-pressure function when cleaning the engine.

Always use protective goggles when performing work in which splinters, grinding sparks and splashes of acid or other chemicals could occur. The eyes are especially sensitive and an injury could result in loss of sight.

Avoid getting oil on your skin. Prolonged or recurring contact with oil can remove the skin's natural moisture, resulting in irritation, dehydration, eczema and other skin disorders. From a hygienic point of view, used oil is more harmful than fresh oil. Wear protective gloves and avoid clothes and rags ingrained with oil. Wash regularly, particularly before mealtimes. Use skin lotion intended for this purpose to avoid dehydration and facilitate cleansing of the skin.

Most chemicals intended for the product (such as engine and transmission oils, glycol, gasoline and diesel oil) or chemicals for workshop use (such as degreasers, paints and solvents) are injurious to health. Read the instructions on the package carefully. Always follow prescribed safety rules (such as the use of respirators, protective goggles, gloves, etc.). Make sure that other personnel are not unknowingly exposed to substances that are injurious to health such as through the air they breathe. Make provision for good ventilation. Deal with used and surplus chemicals in the prescribed manner.

Exercise great care when detecting leaks in the fuel system and testing fuel nozzles. Wear protective goggles. The jets from a fuel nozzle are under very high pressure and have great penetrative power; the fuel can penetrate deep into body tissues and cause serious injury. Risk of blood poisoning.

WARNING! The engine's pressure pipes should not be bent or reshaped under any circumstances. Damaged pipes must be replaced.

All fuels and many chemicals are flammable. Make sure that they cannot be ignited by an open flame or spark. Gasoline, certain dilutants and hydrogen from batteries, when mixed with air in the right proportions, are highly flammable and explosive. No smoking! Provide for adequate ventilation and take the necessary safety measures prior to the start of welding or grinding work in the vicinity. Always keep a fire extinguisher easily accessible at the workplace.

Ensure that rags saturated with oil and fuel, used fuel and oil filters are kept in a safe place prior to their disposal. Under certain conditions, spontaneous combustion can occur in oil-ingrained rags. Used fuel and oil filters are environmentally hazardous waste and, together with used lubricating oil, contaminated fuel, residual paint, solvents, degreasers and residual detergents, should be taken to a suitable plant for destruction.

Batteries should never be exposed to open flames or electric sparks. Never smoke near the batteries. When the batteries are being charged, they give off hydrogen which, when mixed with air, forms oxyhydrogen gas. This gas is highly flammable and very explosive. A spark, which can occur if the batteries are connected incorrectly, could cause a battery to explode, resulting in injury and damage. Do not disturb the connections when attempting to start (risk of sparks) and do not lean over any of the batteries.

⚠ Never mistake the positive and negative terminals for each other when installing the batteries. This could cause serious damage to the electrical equipment. Compare with the wiring diagram.

⚠ Always wear protective goggles when charging and handling batteries. The battery electrolyte contains highly corrosive sulfuric acid. If it gets on your skin, wash the area with soap and plenty of water. If the electrolyte gets in your eyes, rinse them at once with plenty of water and seek medical attention immediately.

⚠ Stop the engine and cut off the current with the main switch (or switches) before starting work on the electrical system.

⚠ The clutch should be adjusted with the engine switched off.

⚠ Use the lifting eyes mounted on the engine when lifting it. Always check that all lifting equipment is in good condition and that it has the right capacity for the job (engine weight plus transmission and extra equipment, if any).

⚠ To ensure safe handling and avoid damaging components mounted on the top of the engine, it should be lifted using an adjustable lifting beam or one adapted to the engine. All chains or cables should run parallel to each other and as perpendicular as possible to the top of the engine.

General information

About the Service Manual

This Service Manual contains descriptions and repair instructions for the standard versions of the TAD1240GE, TAD1241GE/VE, TAD1242GE/VE and TWD1240VE engines.

The Service Manual may show work operations performed on any of the engines listed above. Consequently, the illustrations and photographs showing certain details may not be completely accurate in a number of cases. The repair methods, however, are in all essentials the same. The engine designation and number are given on the type plate (see “Technical data TAD1240GE, TAD1241GE/VE, TAD1242GE/VE and TWD1240VE”).
The engine designation and number should always be quoted in all correspondence concerning any of the engines.

The Service Manual is primarily produced for Volvo Penta’s service workshops and their qualified personnel. It is therefore assumed that persons using the manual have the necessary basic knowledge and can perform work of a mechanical/electrical nature that occurs in their profession.

Volvo Penta is continuously developing its products and we therefore reserve the right to introduce changes and modifications. All the information in this manual is based on product data available up to the time of printing. Any vitally important changes to the product or service methods that are introduced after that date are announced in the form of Service Bulletins.

Spare parts

Spare parts for the electrical and fuel systems are subject to different national safety requirements. Volvo Penta Original Spare Parts meet these requirements. All types of damage occurring as a result of using non-original Volvo Penta spare parts for the product in question will not be covered under the terms of the warranty as undertaken by Volvo Penta.

Certified engines

For engines certified for nation and regional environmental legislation, the manufacturer undertakes to ensure that the environmental requirements are fulfilled both in new engines and those already in use. The product must correspond to the specimen product that was approved for certification. For Volvo Penta as the manufacturer to be answerable for ensuring that engines in use meet the stipulated environmental requirements, the following requirements as regards service and spare parts must be fulfilled:

The service intervals and maintenance measures recommended by Volvo Penta must be followed.

Only Volvo Penta Original Spare Parts intended for the certified engine version may be used.

Service involving injection pumps, pump settings or unit injectors must always be performed by an authorized Volvo Penta workshop.

The engine must not be rebuilt or modified in any way, except for the accessories and service kits that Volvo Penta has developed for the engine in question.

Installation changes to exhaust pipes and supply air ducts for the engine compartment (ventilation ducts) must not be made indiscriminately as this could affect exhaust emissions. Any security seals must not be broken by non-authorized personnel.

⚠ **IMPORTANT!** When spare parts are required, use only Volvo Penta Original Spare Parts.

If non-original spare parts are used, AB Volvo Penta will no longer be responsible for ensuring that the engine corresponds to the certified version.

All types of injury, damage or costs arising due to the use of non-original Volvo Penta spare parts for the product in question will not be covered under the terms of warranty as undertaken by Volvo Penta.

Repair instructions

The work methods described in the Service Manual apply to a workshop environment. The engine is therefore lifted out of place and mounted on an engine stand. Unless otherwise stated, reconditioning work that does not require the engine to be removed can be performed in situ using the same work methods.

The warning symbols found in this Service Manual (see ***Safety information*** for their meaning)

WARNING!

IMPORTANT!

Note:

are by no means all embracing as we cannot of course foresee everything that could happen as service work is performed under the most widely varying conditions. So we can only point out the risks we feel could arise as a result of incorrect handling when working in a well-equipped workshop using methods and tools that have been tested by us.

All work operations for which there are Volvo Penta special tools are described in the Service Manual using these tools. Special tools have been developed to ensure as safe and efficient methods of working as possible. It is therefore the obligation of anyone using tools or work methods other than those recommended by us to ensure that there is no risk of injury or material damage and that such use does not result in malfunction.

In a number of cases, there may be special safety rules and user instructions for the tools and chemicals mentioned in the Service Manual. Such rules and instructions must always be followed and there are no special instructions for them in the Service Manual.

The majority of risks can be avoided by taking certain elementary precautions and using common sense. A clean workplace and a clean engine eliminate many risks of injury and faulty operation.

It is extremely important, especially in connection with work on fuel systems, lubrication systems, inlet systems, turbochargers, bearings and seals, to keep out dirt and foreign particles of other kinds. If this is not done, malfunction or a shorter repair life could be the result.

Our common responsibility

Every engine consists of numerous interacting systems and components. The deviation of a component from its technical specification could dramatically increase the environmental impact of an otherwise good engine. It is therefore extremely important for specified wear tolerances to be maintained, for systems with facilities for adjustment to be correctly set and for Volvo Penta Original engine spare parts to be used. The intervals in the engine maintenance schedule must be followed.

Certain systems, such as fuel system components, may require special competence and special testing equipment. For environmental and other reasons, certain components are sealed at the factory. Work on these components must not be performed by persons not authorized for such work.

Bear in mind that the majority of chemical products, if incorrectly used, are hazardous to the environment. Volvo Penta recommends the use of biologically degradable degreasers for all cleaning of engine components unless otherwise expressly stated in the Service Manual. Take care to ensure that oils and residual detergent, etc. are dispatched for destruction and do not inadvertently end up in the environment.

Tightening torques

Tightening torques for vital bolted joints that should be tightened using a torque wrench are listed in ”Technical Data: Tightening torques” and are also given in the Service Manual’s work descriptions. All tightening torques refer to cleaned threads, bolt heads and contact surfaces as well as lightly oiled or dry threads. If lubricants, thread locking compounds or sealants are required for bolted joints, the type concerned is stated in the work description and in “Tightening torques”. The general tightening torques in the table below are applicable to bolted joints for which no special tightening torque is specified. The tightening torque is a guiding value and the joint need not in such case be tightened using a torque wrench.

Size	**Tightening torque**	
	Nm	**lbf.ft.**
M5	6	4.4
M6	10	7.4
M8	25	18.4
M10	50	36.9
M12	80	59.0
M14	140	103.3

Torque-angle tightening

In torque-angle tightening the bolted joint is tightened to a specified torque and then additionally tightened through a predetermined angle. Example: at 90° angle tightening the joint is tightened an additional 1/4 turn after the specified tightening torque has been reached, all in the same operation.

Lock nuts

Lock nuts that have been removed must not be reused. New ones must be fitted instead as the locking characteristics of the old nuts deteriorate or are lost if used several times. For lock nuts with a plastic insert, e.g. Nylock®, the tightening torques in the table should be reduced if the Nylock® nut has the same height or thickness as a standard all-metallic hex nut. Reduce the tightening torque by 25% for 8 mm or larger bolt sizes. For higher or thicker Nylock® nuts, where the all-metallic thread is as high as that of a standard hex nut, the tightening torques in the table are applicable.

Strength classes

Nuts and bolts are divided into different strength classes; the strength class is marked on the bolt head. A higher number indicates a stronger material. For example, a bolt marked 10-9 is stronger than one marked 8-8. When undoing bolted joints, it is therefore important to make sure that the bolts are refitted in their original places. When fitting new bolts, check the spare parts catalogue to ensure that the correct type is used.

Sealants

Several different types of sealants and locking fluids are used on the engine. Their properties differ and they are intended for joints of different strengths, temperature ranges, resistance to oil and other chemicals, and for the various materials and clearances in the engine.

For service work to be fully satisfactory it is important that the right types of sealants and locking fluids are used on the joints where such are required.

In the appropriate sections of the Service Manual, we have indicated the agents used in the production of our engines.

Similar agents or agents with corresponding properties but from a different manufacturer should be used in connection with service work.

When using sealing agents and locking fluids, it is important for the surfaces concerned to be free from oil, grease, paint and rust inhibitor. They must also be dry. Always follow the directions of the manufacturer regarding temperature, hardening time and other instructions relating to the product.

Two different basic types of agent are used on the engine. These are characterized by:

RTV agent (Room Temperature Vulcanizing). Used mostly on gaskets, e.g. sealing gasket joints or coated on gaskets. RTV agent is perfectly visible when the component has been dismantled and old RTV agent must be removed before the joint is sealed afresh.

The following agents are of RTV type: Loctite® 574, Volvo Penta 8408791, Permatex® No. 3, Volvo Penta 11610995, Permatex® No. 77. In all cases, old sealant can be removed with denatured alcohol.

Anaerobic agents. These harden in the absence of air. They are used when two solid parts like cast components are fitted together without a gasket. They are also commonly used to secure and seal plugs, the threads of studs, cocks, oil pressure monitors, etc. Hardened anaerobic agents are glass-like; they are therefore colored to make them more visible. Hardened anaerobic agents are highly resistant to solvents and old agent cannot be removed. When refitting a component, thorough degreasing is required followed by application of fresh sealant.

The following agents are anaerobic: Loctite® 572 (white), Loctite® 241 (blue).

Note Loctite® is a registered trademark of the Loctite Corporation; Permatex® is a registered trademark of the Permatex Corporation.

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