

# **Workshop Manual**

## **(Group 22-26)**

**TAD1240GE, TAD1241GE/VE**  
**TAD1242GE/VE, TWD1240VE**



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# Industrial Engines

## TAD1240GE, TAD1241GE/VE TAD1242GE/VE, TWD1240VE

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# Safety Information


## Introduction


The Service Manual contains descriptions and service instructions for the Volvo Penta products and versions of products listed in the list of contents. This manual should be used in conjunction with the Service Manual **Technical Data** for the engine in question. Make sure that the right service literature is used.

Read the available safety information and the **General information** and **Repair instructions** sections in the Service Manual carefully before starting service work.

## Important


The following special warning symbols occur in the Service Manual and on the products.


 **WARNING!** Warns of the danger of injury, extensive damage to the product or to property, or that serious functional failure could happen if the instructions are not followed.


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


**NOTE:** Used to draw attention to important information that will facilitate repairs or other operations.


To provide an overview of the dangers you should always be aware of 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 power at the main switch (or switches) and lock it (them) in the OFF position before starting service work. Place a warning sign in the operator's area.


 As a rule, all service work should be carried out when the engine is not running. However, some tasks, such as certain adjustments, need the engine to be running. Approaching a running engine can be dangerous. Keep in mind that loose-fitting clothes or long hair may get caught in rotating parts and cause severe injury.


 When working near a running engine, remember that a careless movement or a dropped tool could, in the worst case, lead to bodily harm. Be careful of hot surfaces (exhaust pipes, the turbocharger, turbocharger air ducts, starter etc.) and hot liquids in lines and hoses on a running engine or one that has just been stopped. Before starting the engine, replace all guards and protections that were removed during service work.


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


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













 Never use a starter spray or the like to help start the engine. It could cause an explosion in the intake manifold with the danger of injury.







 Start the engine in well-ventilated spaces only. If the engine is run in a confined space, exhaust gases and crankcase gases should be vented away from the engine room or shop area.

 Avoid opening the coolant filler cap while the engine is still hot. Steam or hot coolant could boil out when the cooling system's pressure is lost. If necessary open the filler cap slowly and release the pressure in the cooling system. Be extremely careful if a valve, plug or coolant line has to 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 pressure in the lubricating system is released before starting any work on it. Never start or run the engine with the oil filler cap removed because oil under pressure could then escape.

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

-  If other equipment attached to the engine changes its center of gravity, special lifting devices may be needed to obtain the right balance and ensure safe handling.
- Never work on an engine that is only suspended from a lifting device.
-  Never work alone when heavy components are to be removed, not even when a safe lifting device like a lockable block and tackle is used. Two people will generally be required, one to handle the lifting device and the other to make sure that the components are clear and are not damaged during the lift.
- Always make sure in advance that there is enough room to work in with no danger of causing injury or material damage.
-  **WARNING!** The electrical system and fuel system on Volvo Penta products are designed and manufactured to minimize the risk of explosion and fire. The engine must not be run in an environment where it will be exposed to explosive liquids or vapors.
-  Always use the fuel recommended by Volvo Penta. See the Owner's Manual. The use of a poorer grade of 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 with a consequent risk of injury and damage. Poor fuel can also cause higher maintenance costs.
-  When cleaning with high-pressure equipment, remember: 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 working where splinters, grinder sparks or splashes of acid or other chemicals could occur. 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 with irritation, dehydration, eczema and other skin disorders as a result. Used oil is more harmful than fresh oil. Wear protective gloves and avoid clothes and rags contaminated with oil. Wash regularly, particularly before meals. Use skin lotion intended for this purpose to avoid dehydration and to help cleanse the skin.
-  Most chemicals intended for the products (such as engine and transmission oils, glycol, gasoline and diesel fuel) or chemicals for shop use (such as degreasers, paints and solvents) are dangerous to your health. Carefully read the instructions on the container. Always follow the prescribed safety rules (for the use of respirators, protective goggles, gloves, etc.). Make sure that other personnel are not accidentally exposed to substances that are dangerous to health—by breathing vapors, for example. Make provision for good ventilation. Dispose of used and surplus chemicals in the prescribed way.
-  Take great care when looking for leaks in the fuel system or testing fuel nozzles. Wear protective goggles. The jets from a fuel nozzle are under very high pressure and have great penetrating power; the fuel can penetrate deep into body tissues and cause serious injury, including the risk of blood poisoning.
-  **WARNING!** Under no circumstances should the engine's high-pressure tubing be bent or reshaped. Damaged tubing 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 solvents and hydrogen from batteries, when mixed with air in the right proportions, are highly flammable and explosive. No smoking! Arrange for adequate ventilation and take the necessary safety precautions before starting welding or grinding in the vicinity. Always keep a fire extinguisher easily accessible at the workplace.
-  Make sure that rags contaminated with oil or fuel, as well as used fuel or oil filters, are kept in a safe place prior to their disposal. Under certain conditions, spontaneous combustion can occur in oily rags. Used fuel and oil filters, along with used lubricating oil, contaminated fuel, left-over paint, solvents, degreasers and detergents are all environmentally hazardous waste and should be taken to a recycling facility for proper treatment.

-  Batteries should never be exposed to open flames or electric sparks. Never smoke near batteries. When batteries are being charged they give off hydrogen gas, which combines with air to form a mixture that is highly flammable and extremely explosive. If batteries are connected incorrectly a spark can occur that could cause a battery to explode with injury and damage as a result. Do not disturb the connections when attempting to start an engine (risk of sparks) and do not lean over a battery.
  -  Never mix up the positive and negative terminals when installing batteries. A wrong connection could cause serious damage to the electrical equipment. Check against 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 see a doctor as soon as possible.
  -  Stop the engine and cut off the power at the main switch (or switches) before starting to 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 (weight of engine plus gearbox and extra equipment, if any).
- To ensure safe handling and to avoid damaging components mounted on the top of the engine, the engine should be lifted using a special-purpose fixture or an adjustable one set up for the engine. All chains or cables should run parallel to each other and be as perpendicular as possible to the top of the engine.

# General Information

## About the Service Manual

This Service Manual contains descriptions of and repair instructions for the standard versions of the TAD1240GE, TAD1241GE/VE, TA1242GE/VE and TWD1240VE model engines.

The Service Manual may show procedures performed on any of the engines listed above so the illustrations and photographs showing certain details may not be completely accurate in some cases. However, the repair methods are all essentially the same. The engine model and serial number are given on the data plate (see "Technical data TAD1240GE, TAD1241GE/VE, TAD1242GE/VE and TWD1240VE"). The engine model and serial number should always be given in all correspondence concerning any of the engines.

The Service Manual is primarily produced for Volvo Penta service facilities and their qualified personnel. It is therefore assumed that persons using the manual have the necessary basic knowledge and can carry out the mechanical and electrical tasks that occur 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 at press time. Any significant changes that have been introduced in the product or service methods after that date will be 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 warranty as provided by Volvo Penta.

## Certificated engines

For engines that are certificated for national and regional environmental legislation, the manufacturer undertakes to ensure that the environmental requirements are met both in new engines and in those already in use. The product must correspond to the sample product that was approved for certification. For Volvo Penta to be answerable as the manufacturer for ensuring that engines in use meet the stipulated environmental requirements, the following requirements regarding 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 certificated version of the engine may be used.

Service affecting injection pumps, pump settings or unit injectors must always be carried out by an authorized Volvo Penta facility.

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.

Modifications made to exhaust pipes and air intake ducts to install an engine in an engine room (ventilation ducts) must not be made indiscriminately as this could affect exhaust emissions. Security seals, if present, must not be broken by unauthorized 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 certificated version.

All types of injury, damages or costs arising from the use of non-original Volvo Penta spare parts for the product in question will not be covered by Volvo Penta.

# General repair instructions

The working methods described in the Service Manual apply to a shop environment where the engine is 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 carried out onsite using the same work methods.

The warning symbols that are used in the Service Manual (see **Safety information** for their meaning)



**WARNING!**



**IMPORTANT!**

## NOTE:

are by no means comprehensive because we naturally cannot foresee everything that could happen when service work is being carried out under the most widely varying conditions. So we can only point out the risks that we consider could arise as a result of incorrect handling when working in a well-equipped shop using methods and tools that have been tested by us.

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

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 no special instructions for this are given 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 malfunction.

It is extremely important, especially in working on fuel systems, lubrication systems, intake systems, turbos, bearings and seals, to keep out dirt and other kinds of foreign particles. If this is not done, malfunctions or a shortened repair life could 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 provisions for adjustment to be correctly set and for Volvo Penta Original Spare Parts to be used. The service 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 done by persons who are not authorized for such work. Keep in mind that most 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 properly destroyed and do not inadvertently end up in the environment.

## Tightening torques

Tightening torques for vital fasteners 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 clean threads, bolt heads and contact surfaces and lightly oiled or dry threads. If lubricants, thread locking compounds or sealants are required for certain fasteners, the type to be used is stated in the work description and in "Tightening torques." The torques in the table below are applicable to fasteners for which no special torque is specified. These torques are for guidance only and the fastener in this case need not be tightened with 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 fastener is tightened to a specified torque and then further tightened through a specified angle. Example: for 90° angle tightening the fastener is tightened an additional ¼ turn after the specified 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 used because the locking characteristics of the old nuts deteriorate if they are used again. For lock nuts with a plastic insert, Nylock®, for example, the tightening torques in the table should be reduced if the Nylock® nut has the same depth as a standard all-metal hex nut. Reduce the tightening torque by 25% for 8 mm or larger thread sizes. For deeper Nylock® nuts, where the all-metal thread is as deep 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 reassembling components it is therefore important to make sure that bolts are reinstalled in their original places. When installing new fasteners, check the spare parts catalog to make sure that the correct type is used.

## Sealants

Several different types of sealants and locking fluids are used on the engines. Their properties differ and they are intended for fasteners 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 therefore important that the right sealants and locking fluids are used on the fasteners where they are needed.

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

The same agents or agents with equivalent properties but from a different manufacturer should be used in service work.

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

Two different basic types of agent are used on the engines:

RTV agents (Room Temperature Vulcanizing). Used mostly as a sealant coating ("dope") on gaskets. RTV agents are easily visible when the gasket is removed and the old RTV agent must be cleaned off before the new gasket is installed.

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

Anaerobic agents These harden in the absence of air. They are used when two solid parts like castings are fitted together without a gasket. They are also commonly used to secure and seal plugs, the threads of studs, valves, oil pressure monitors etc.

Hardened anaerobic agents are glassy; they are usually colored to make them more visible. Hardened anaerobic agents are highly resistant to solvents and old agent cannot be removed. When reinstalling 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.

## Group 22 Lubricating System

