

Workshop Manual

Group 30

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**TAD650VE, TAD660VE,
TAD734GE, TAD750VE, TAD760VE**

Group 30 Electrical system

Industrial Engines

TAD734GE, TAD650VE, TAD660VE, TAD750VE, TAD760VE

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Safety rules


Introduction


This workshop manual contains technical data, descriptions and repair instructions for the Volvo Penta products or product versions noted in the table of contents. Check that you have the correct Workshop Manual for your engine.

Read the available safety information, "General information" and "Repair instructions" in this workshop manual before you start to do any service work.

Important!


The following special warning symbols occur in this book and on the engine.


 **WARNING!** Warns for the risk of personal injury, property damage or that a mechanical fault can occur if the instructions are not followed.


 **IMPORTANT!** Is used to call attention to things which could cause damage or malfunctions to product or property.


NOTE! Is used to call attention to important information, to facilitate work processes or operation.


Below is a summary of the risks involved and safety precautions you should always observe or carry out when performing work on the EMS 2 system.


 Before electric welding is done, the connector on the EMS system must be disconnected. Disconnect the engine from system voltage by turning off the main switch. Disconnect the cable connectors from the control unit. Reconnect the EMS 2 control module terminal when the electric welding is finished and the electric welding equipment has been disconnected.


 Be careful, watch out for the moving components of the engine during function testing and in operation. Approaching the engine during operation entails a risk of personal injury. Remember that loose clothes or long hair can catch on rotating components and cause severe injury.


 Never do any work on an engine which just hangs from a lifting device (crane etc.).

 The engine must not be run in areas where explosive material or any gases are stored.

 Only start the engine in a well-ventilated area. If the engine is run in a confined space, make sure that the crankcase ventilation and exhaust gases can be led away from the workplace.

 The battery lockers must never be exposed to open flames or sparks. Never smoke close to the batteries. The batteries generate hydrogen gas when charged, which can form an explosive gas when mixed with air. This gas mixture is very flammable and highly explosive. A spark, which can be caused by incorrect battery connection, can cause a single spark which is sufficient to cause an explosion with resulting damage. Do not shift the connections when attempting to start the engine (spark risk) and do not lean over any of the batteries. Please refer to the advice in the instruction book.

 Always ensure that the + (positive pole) and – (negative pole) are securely connected to their appropriate terminals on the battery. If the batteries are wrongly connected, this can cause severe damage to the electrical equipment. Please refer to the wiring diagram.

 Always use goggles when charging and handling batteries. Battery electrolyte contains sulfuric acid, which is highly corrosive. If battery acid comes into contact with your skin, wash it off at once with a lot of soap and water, and then get medical help. If battery acid comes into contact with your eyes, flush your eyes at once (preferably with an eye shower) with a lot of clean water, and then get medical help at once.

General information

About this Workshop Manual

This workshop manual contains descriptions and repair instructions for the standard versions of the TAD734GE, TAD650VE, TAD660VE, TAD750 and TAD760VE engines.

The workshop manual can illustrate tasks done on any of the engines noted above. This means that the illustrations and photographs which clarify certain details might not correspond with other engines in some cases. Repair methods are similar in all important respects, however. If this is not the case, this is noted. Important differences are noted separately.

The engine designation and number are noted on the number plate and engine decal. The engine designation and number must always be given in all correspondence about any product.

The workshop manual is produced primarily for the use of Volvo Penta workshops and service technicians. For this reason the manual presupposes a certain basic knowledge and that the user can carry out the mechanical/electrical work described to a general standard of engineering competence.

Volvo Penta constantly improves its products, so we reserve the right to make modifications without prior notification. All information in this manual is based on product data which was available up to the date on which the manual was printed. Any material changes introduced into the product or service methods after this date are notified by means of Service Bulletins.

Spare parts

Spare parts for electrical and fuel systems are subject to various national safety requirements. Volvo Penta Original Spare Parts meet these specifications. Any kind of damage whatsoever, occasioned by use of non-original Volvo Penta spares for the product in question, will not be compensated by the warranty offered by Volvo Penta.

Certified engines

When doing service and repair on emission certified engines, it is important to be aware of the following:

Certification means that an engine type has been checked and approved by the relevant authority. The engine manufacturer guarantees that all engines made of the same type are equivalent to the certified engine.

This makes special demands on service and repair work, as follows:

- Maintenance and service intervals recommended by Volvo Penta must be complied with.
- Only Volvo Penta original spares may be used.
- Service to injection pumps, pump settings and injectors must always be done by an authorized Volvo Penta workshop.
- The engine must not be converted or modified, except for the accessories and service kits which Volvo Penta has approved for the engine.
- No installation changes to the exhaust pipe and engine air inlet ducts may be done.
- No seals may be broken by unauthorized personnel.

The general advice in the instruction book about operation, care and maintenance applies.



IMPORTANT! Delayed or inferior care/maintenance, and the use of non-original spares parts means that Volvo Penta can no longer be responsible for guaranteeing that the engine complies with the certified version.

Damage and/or costs which arise from this will not be compensated by Volvo Penta.

Repair instructions

The working methods described in the workshop manual apply to work carried out in a workshop. For this reason, the engine is lifted out and mounted on an engine support. Unless otherwise stated reconditioning work which can be carried out with the engine in place follows the same working method.

The warning signs which occur in the workshop manual (please refer to "Safety information" for their meanings).

 **WARNING!**

 **IMPORTANT!**

NOTE!

are not comprehensive in any way, since we can not of course foresee everything, because service work is done in highly varying circumstances. For this reason, all we can do is to point out the risks which we believe could occur due to incorrect work in a well-equipped workshop, using work methods and tools tested by us.

All operations described in the Workshop Manual for which there are Volvo Penta Special Tools available assume that these tools are used when carrying out the repair. Volvo Penta Special Tools have been developed to ensure the most safe and rational working methods possible. It is therefore the responsibility of anyone using other tools or other working methods than we recommend to determine that there is no risk of personal injury or mechanical damage or malfunction as a result.

In some cases special safety precautions and user instructions may be required in order to use the tools and chemicals mentioned in the Workshop Manual. These rules must always be observed, so there are no special instructions about this in the workshop manual.

By following these basic recommendations and using common sense it is possible to avoid most of the risks involved in the work. A clean work place and a clean engine will eliminate many risks of personal injury and engine malfunction.

Above all, when work on fuel systems, lubrication systems, inlet systems, turbocharger, bearing caps and seals is done, it is extremely important that no dirt or other kinds of foreign particles are able to get in, since this would otherwise cause malfunctions or shortened repair life.

Our common responsibility

Each engine consists of a large number of collaborating systems and components. Any deviation of a component from its technical specification can dramatically increase the environmental impact of an otherwise good engine. For this reason, it is important that the specified wear tolerances are observed, that systems which are adjustable are correctly adjusted and that Volvo Penta Original Spares are used for the engine. The stated service intervals in the Maintenance Schedule (see the Owner’s Manual) must be observed.

Some systems, such as the components in the fuel system, require special expertise and special testing equipment for service and maintenance. For environmental reasons etc., some components are sealed at the factory. It is only permissible to work on sealed components if you are authorized to do such work.

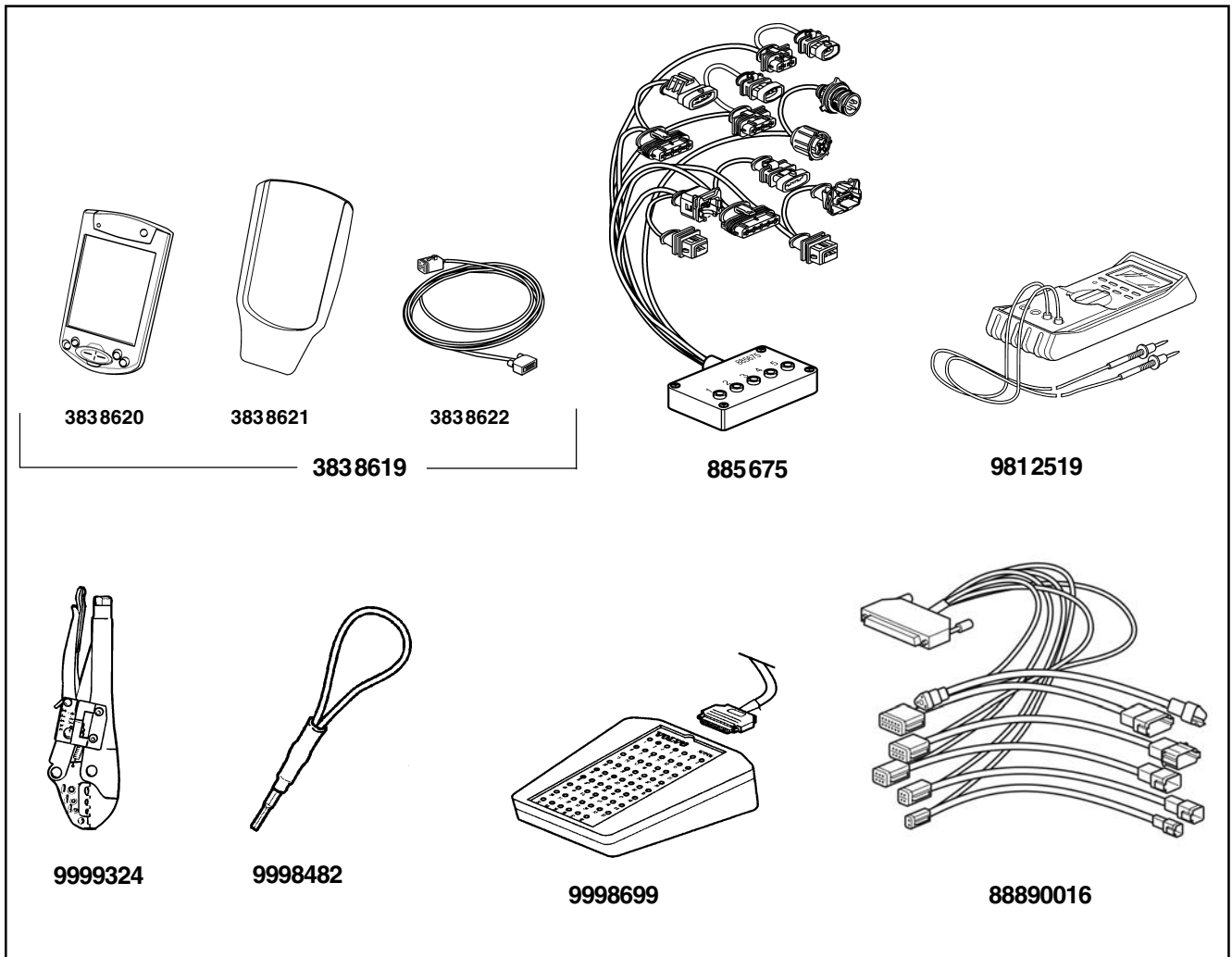
Remember that most chemical products, incorrectly used, damage the environment. Volvo Penta recommends the use of biodegradable degreasers whenever engine components are de-greased, unless otherwise specified in the workshop manual. When working aboard a boat, be careful to ensure that oils, wash residue etc. are processed for destruction, and are not inadvertently discharged with bilge water into the environment.

Tightening torques

The tightening torque for vital fasteners, which should be tightened with a torque wrench, are listed in “Technical Data: Special tightening torques” and noted in the job descriptions in the book. All torque specifications apply to clean screws, screw heads and mating faces. Torque data stated apply to lightly oiled or dry threads. If lubricants, locking fluids or sealants are needed on a fastener, the type of preparation to be used will be noted in the job description and in “Tightening Torques”. For fasteners where specific torque values are not given, please refer to “Technical data: General tightening torques”. General torque specifications are target values and the fastener does not need to be tightened with a torque wrench.

Dimension	Torque Nm
M5	6
M6	10
M8	25
M10	50
M12	80
M14	140
M16	220

Special tools



3838619 VODIA complete diagnostic tool.*
Components:

- 3838620 VODIA – palmtop computer (PDA) with SD card.
- 3838621 VODIA – docking station. Used with VODIA PDA (3838620).
- 3838622 VODIA – cable with connector. Used with docking station (3838621) on the engine's communication connector.

885675 Adapter cable for sensor test

9812519 Multimeter

9999324 Terminal crimping tool

9998482 Gauge for connector on control unit

9998699 Measurebox

88890016 Adapter cable

***Note.** More detailed information about using the VODIA tool can be found in the tool's instruction manual.

EMS 2 - "Engine Management System"

General information

EMS 2 is an electronic system with CAN communication (Controller Area Network) for diesel engine control. The system has been developed by Volvo and includes fuel control and diagnostic function.

The system consists of a control module, six injectors, a number of sensors that supply the control module with measurements, sockets for diagnosis and functional checks. The engine can be connected to a communications interface consisting of a CAN link and a serial link.

CAN - Controller Area Network

The J1939 CAN link is responsible after all communication between the engine control unit (EMS 2) and a communication interface (such as CIU/DCU), except for diagnostics. Diagnostics are managed by the so-called J1708/J1587 link. The CAN link is much faster than the J1708/J1587 link and has been designed to connect to other components that support the SAE J1939 protocol, such as instrument panels and transmissions.

If a fault develops on the CAN link, signals for the engine speed potentiometer, and the start and stop knobs are taken over by the J1708/J1587 link. However, instrument and indicator lamps are completely turned off.

If faults occur in both links, the engine starts to idle. The only way to shut off the engine in this case is to use the auxiliary stop (AUX-STOP).