



## Design and Operation

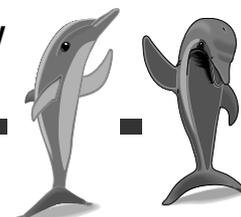
### Boat Engines from Volkswagen Marine



**TDI 100-5**  
**TDI 120-5**  
**TDI 150-5**     **SDI 55-5**  
**TDI 150-5D**   **SDI 75-5**

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**NEW**



**Important  
Note**

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**These installation instructions show the design and operation of new developments!  
The contents will not be updated.**

For current test, adjustment and repair instructions, please see the Service literature intended for this purpose.

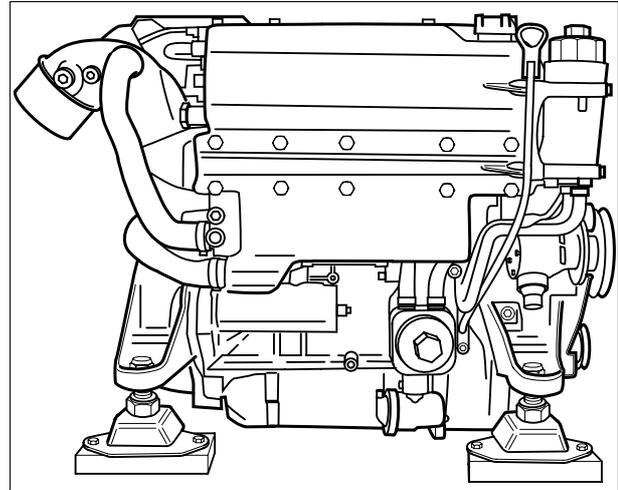
This installation description explains the procedure for the installation of all 5-cyl. Volkswagen Marine Boat Engines

## General Information

- The Volkswagen Marine Accessories Catalogue contains the extensive range of Volkswagen Marine accessories.
- Products that are not listed in these installation instructions or the Volkswagen Marine Accessories Catalogue, but are required, should be purchased exclusively from specialised dealers.

Correct professional installation of the engine and its attached parts is very important for ensuring that all the components will operate together properly.

This work must therefore be carried out with extreme care.



**Example: 5-Cyl. SDI 55-5**

EB5-0001

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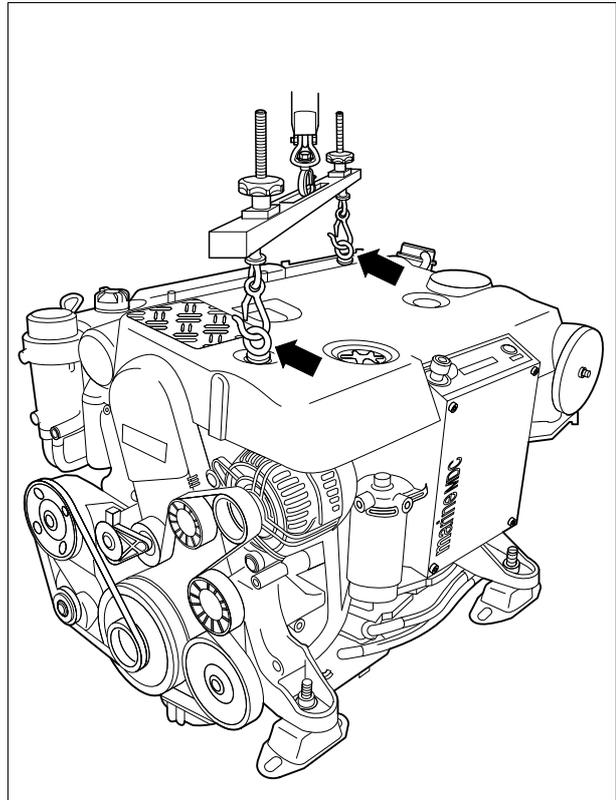
# Installation instructions

- In order to remove the Volkswagen Marine boat engine from the transport container, the transport eyes included in the tool set must be screwed into the threaded mounts provided (see arrows in the illustration). A motorised crane and the appropriate lifting gear should be used.
- The two hanging eyes provided on the engine (see illustration) must be used when installing and removing the Volkswagen Marine boat engine
- The installation location and space for the engine must be selected so that maintenance work on the engine can be carried out without problems.

Sufficient space must be created for installing and removing the engine.



The qualified experts on the Volkswagen Marine Team are available to answer special questions and provide technical information on all aspects of the installation of the Volkswagen Marine boat engine.



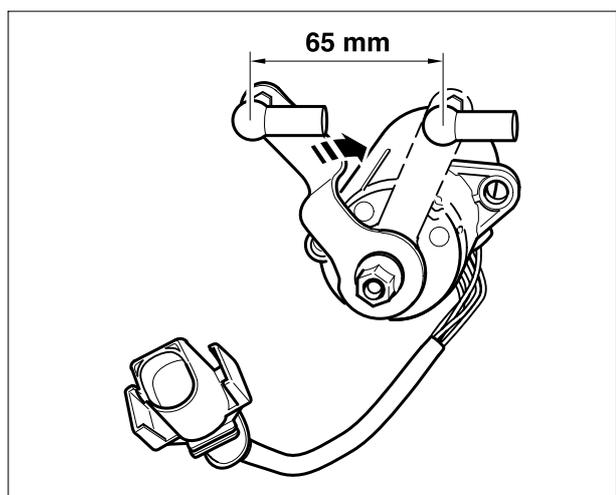
EB5-0096

## Adjusting throttle Bowden cable on throttle-lever position sender

Adjust the throttle Bowden cable so that a dimension of 65 mm results between the idling position and the full-throttle position (see illustration).

### Note

The sensor dimension must be complied with to achieve the full engine output.



EB5-0097

# Installation instructions

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## **Retrofitting reversing gear on the Volkswagen Marine boat engine**

- When retrofitting the reversing gear, you must observe various things and replace components. Please contact the Volkswagen Marine Team for this purpose.

## **Engine with reversing gear in operation**

- Observe the information on this topic in your operating instructions.

## **Propeller model**

- When selecting a propeller, ensure that the motor can achieve nominal speed in all operating modes.

## **Operation with battery cut-off diodes**

- Operation with battery cut-off diodes is not permissible.
- Exclusively use a battery split-charge relay for this purpose. In case of queries, please contact your nearest Volkswagen Marine dealer.

## **Individual instrumentation (optional)**

- If you require individual instrumentation, please contact your nearest Volkswagen Marine dealer.

## **Connecting a hot water boiler**

- If you require a hot water boiler, please contact your nearest Volkswagen Marine dealer.



If you do not observe the installation guidelines, you could damage your Volkswagen Marine boat engine.

# Exhaust System

## Introduction

Volkswagen Marine boat engines are operated with wet exhaust systems. The wet exhaust system has its name from the introduction of water.

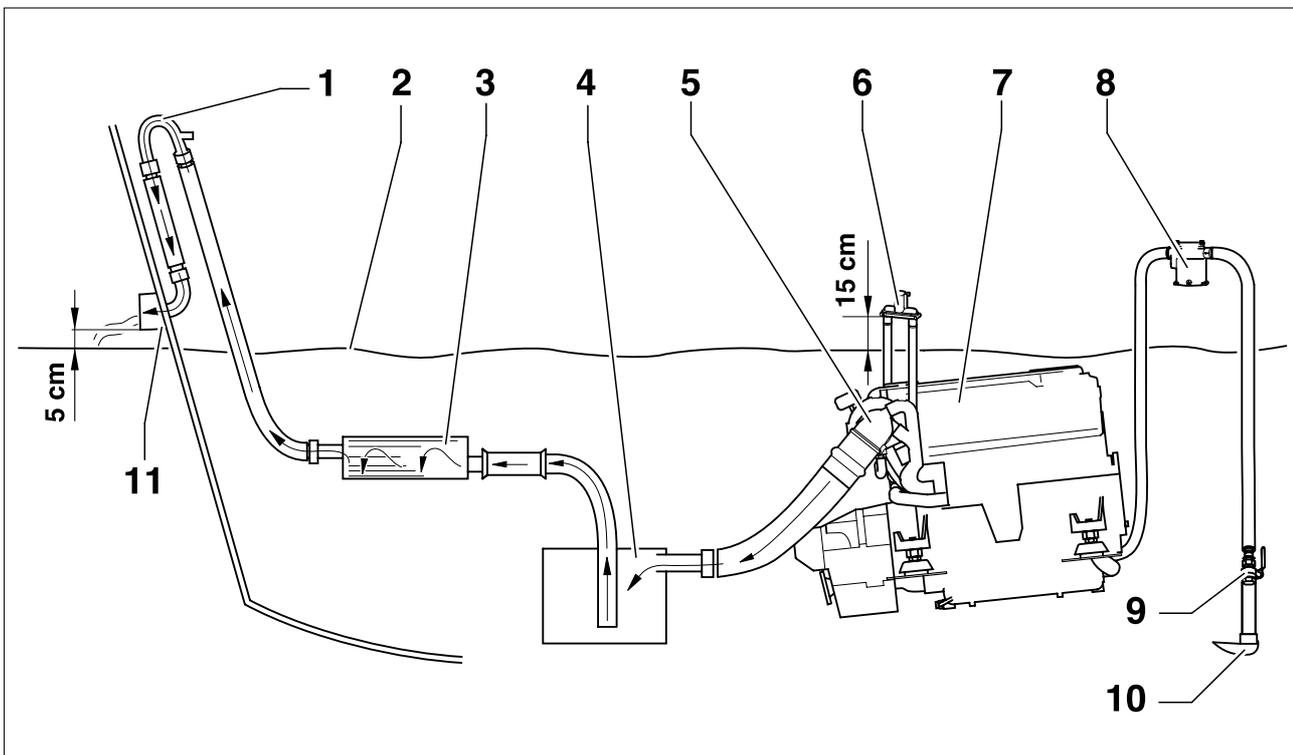
After the exhaust plenum chamber or turbocharger the flow of exhaust gas is deflected through the exhaust-pipe connection piece. In these exhaust-pipe connection pieces the raw water/seawater is injected into the exhaust gas of the engine.

## Note

The water collector (item 4. in the illustration) should be of a size to hold all the seawater flowing back when the engine is not running.

The raw water/seawater mixes with the exhaust gases and greatly cools them down so that rubber connection hoses and PVC parts can be used for the remainder of the exhaust system that must have a temperature stability of at least 200 °C.

## Installation Overview for the Exhaust System: Example of a TDI engine with reversing gear



EB5-0084

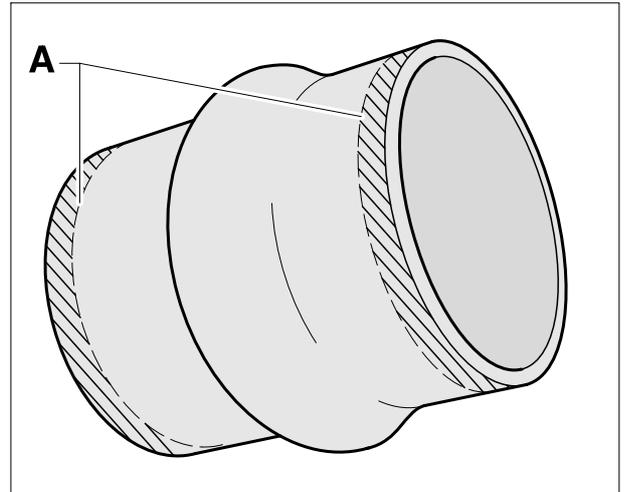
## Legend

- |   |  |
|---|--|
| 1. Goose neck (the lower edge of exhaust pipe with stern bushing must be at least 5 cm above the waterline) | 6. Ventilation unit (mount at least 15 cm above the waterline) |
| 2. Waterline  | 7. Engine  |
| 3. Silencer   | 8. Seawater filter   |
| 4. Water collector  | 9. Seawater valve  |
| 5. Exhaust pipe   | 10. Intake fitting   |
|   | 11. Stern bushing  |

# Exhaust System

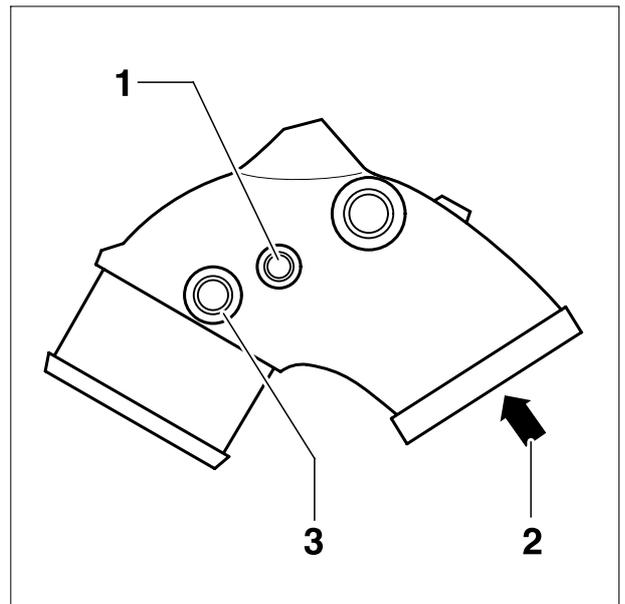
## Note

The entire exhaust system should be installed with as few pipe bends as possible.  
The line cross-section should not be less than 100 mm.  
The hoseconnections must always be secured with double hose clips.  
The hose connections and rubber muff couplings must be temperature-resistant.



EB5-0005

When designing the exhaust system ensure that it is not so long as to exceed the correct maximum value for the exhaust gas counter-pressure.



EB5-0086



**These values may not be exceeded.**

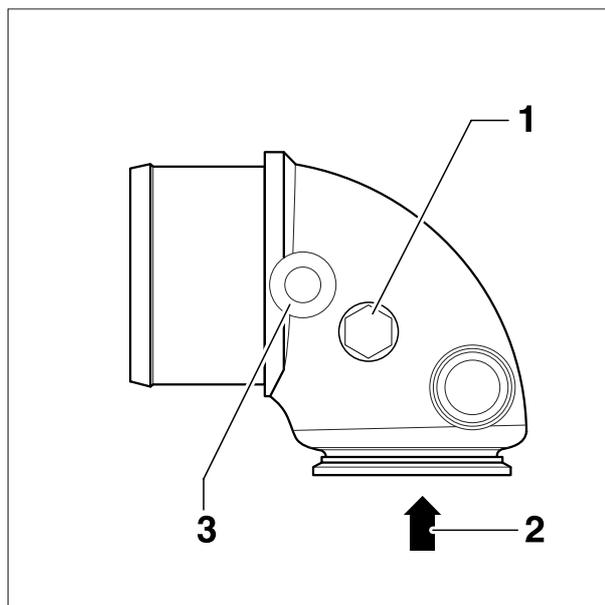
## Legend

1. Sealing plug for exhaust gas extraction
2. Exhaust gas inlet
3. Connection for raw-water temperature sensor (optional)

Measurement is conducted at the exhaust-gas connection piece.  
For this purpose you must unscrew the measuring screw (see illustration - item 1) on the exhaust gas connection piece and insert the exhaust gas extraction probe.

**Note**

In place of the sealing plug you can also install an exhaust-gas temperature sensor.



EB5-0087

**Legend**

- 1. Sealing plug for exhaust gas extraction
- 2. Exhaust gas inlet
- 3. Connection for raw-water temperature sensor (optional)

# Unit/engine mounting

## Notes on installation of unit mounting

- The unit mounting may not be twisted during installation. Otherwise heavy vibrations and damage can occur.
- Make sure that there is no twisting on the output train and the unit mountings after installing and aligning the engine.
- Use only the original Volkswagen Marine unit mountings.
- The mounting bolts for the unit mounting on the boat hull must be provided with washers (see illustration on page 11).

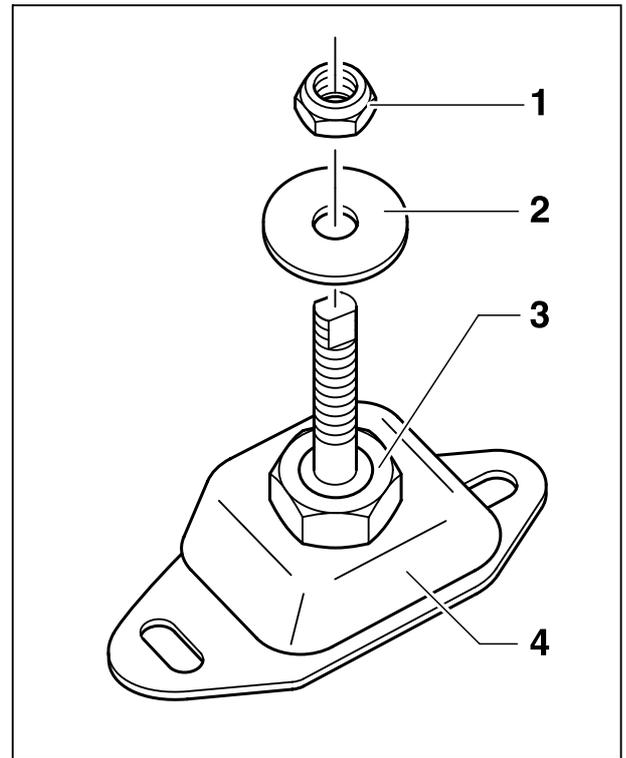
## Procedure

The unit mounting should be uniformly loaded at all mounting points after installing the engine.

Centre and tilt the engine to the corresponding height with the height adjustment (see item 3. in the illustration) on the unit mounting.

Centring in the centre of the height adjustment is ideal.

After aligning the engine, secure the screw fittings (see illustration item 1) on the unit mountings evenly and with a torque of **105 ± 5 Nm**.



EB5-0088

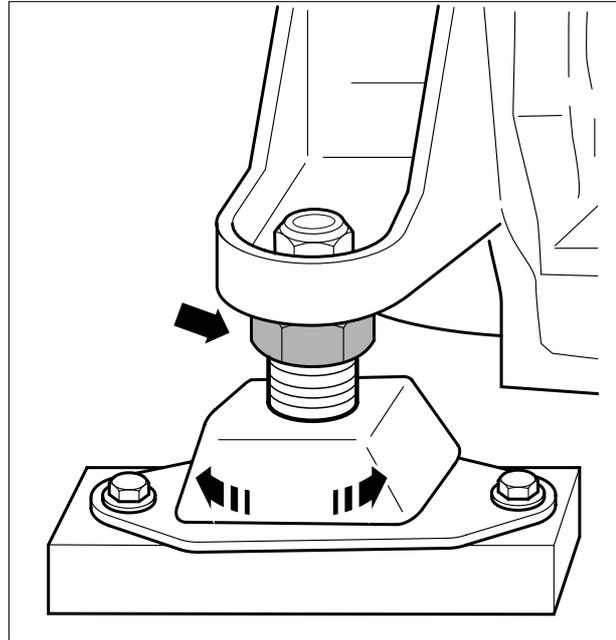
## Legend

1. Mounting nut: 105 ± 5 Nm
2. Washer
3. Height adjustment
4. Unit mounting with base plate



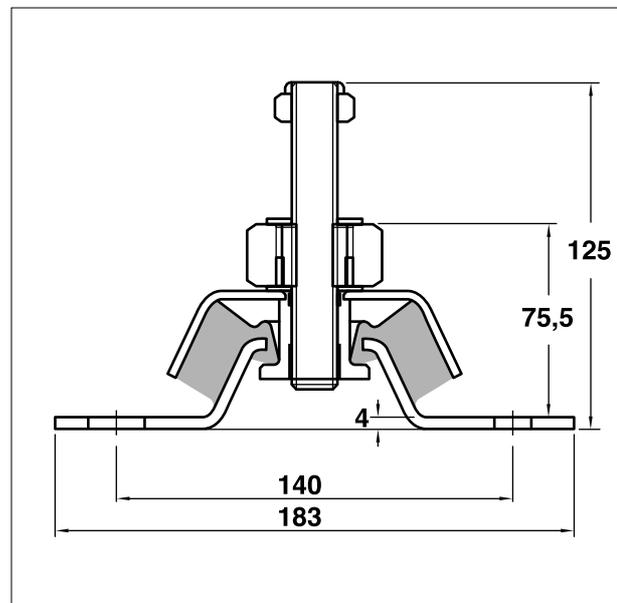
To prevent lateral turning (twisting) during tightening, you must brace the height adjustment -arrow- of the unit/engine mounting with a suitable tool (e.g. open end spanner).

To mount the base plate on the boat hull, use mounting bolts with a suitable washer.



EB5-0077

### Dimensions of unit mounting

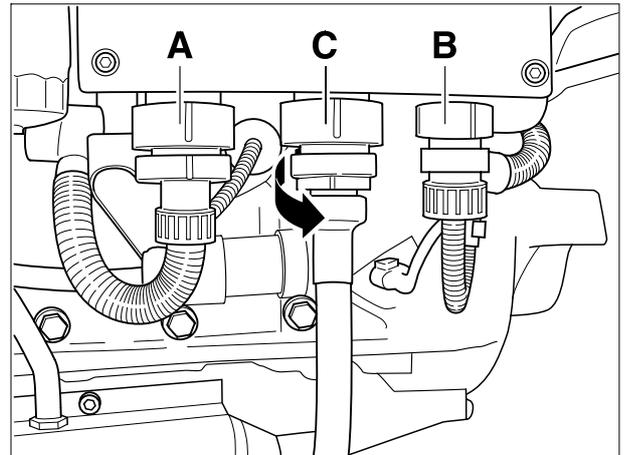


EB5-0008

# Electrical system

## Connections on engine

- The electrical wiring connections with multi-pin connectors to the engine fuse box/relay plate, and the main wiring loom with high-voltage connectors are easy and safe to install.
- The multi-pin connectors **-A-**, **-B-** and **-C-** of the engine fuse box/relay plate and the connection unit/relay box must be screwed in the direction indicated by the arrow until they can be felt to lock into place and the plug is securely connected.



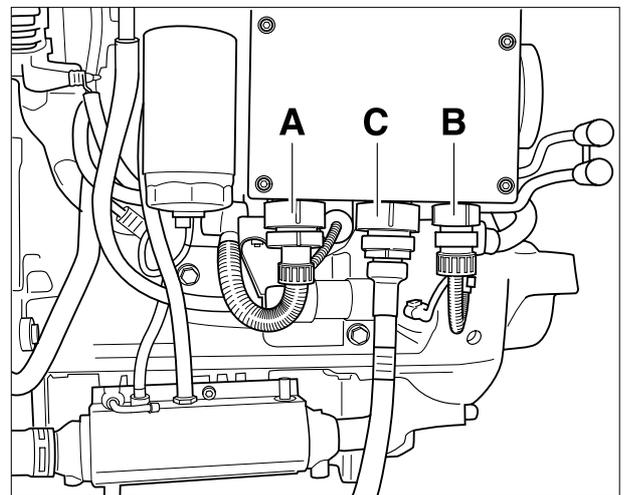
EB5-0010

## Note

The wiring loom spanners T 01905 and T 01906 must be used to remove and fit the multi-pin connectors.



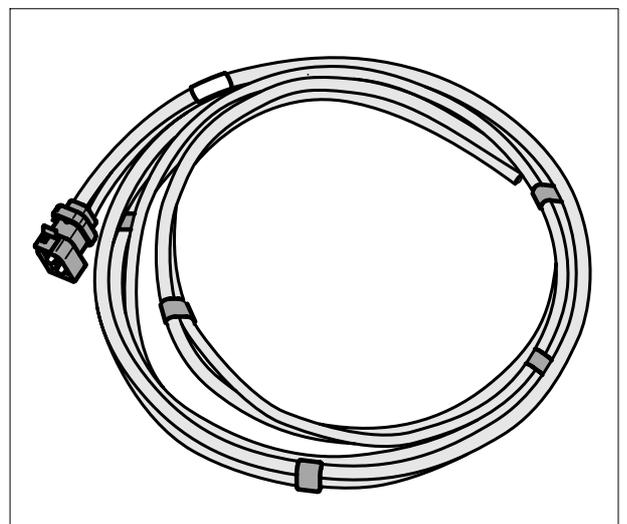
The multi-pin connectors **-A-** and **-B-** are already pre-mounted at the factory. The connector **-C-** must be fitted after installing the engine.



EB5-0009

## Battery connection

The battery connection cable included with the engine is equipped with a special high-voltage plug on the engine end. The other end of the cable must be shortened to the appropriate length and suitable crimp connectors mounted on it.

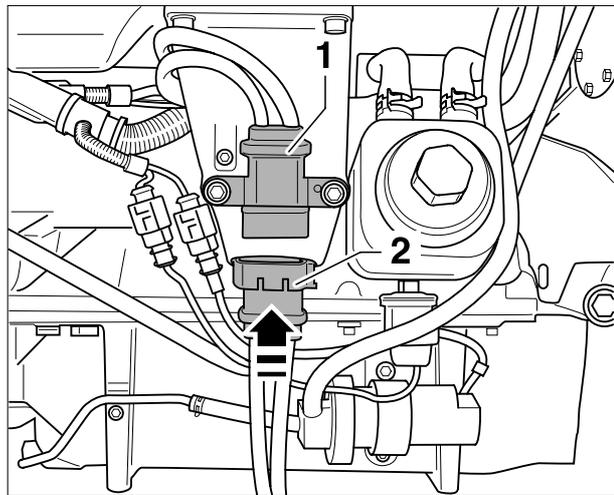


EB5-0041

Connect the high-voltage plug **-2-** on the battery connection cable in the direction indicated by the arrow to the engine connection plug **-1-** on the engine.

Use only high-quality battery terminals for the connections to the battery.

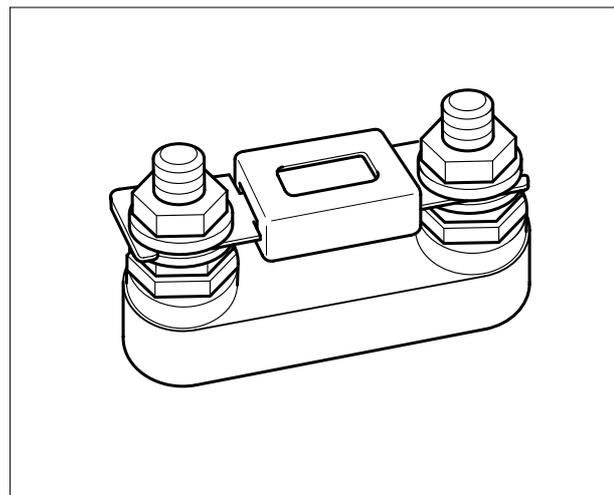
- The black cable (earth) must be connected to the negative terminal of the battery.
- The red cable (positive) must be connected to the positive terminal of the battery.



EB5-0089

### Note

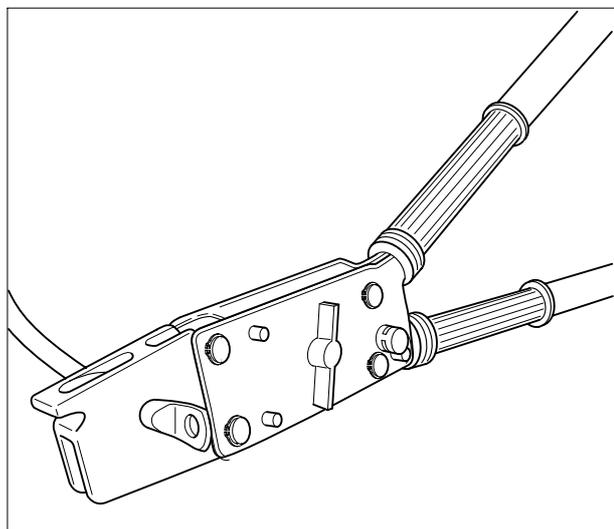
It is advisable to install a blade-type fuse with 400 A immediately in front of the battery connection. In addition, you should install a main battery switch in the supply line that immediately opens the main power circuit in case of danger and when working on the engine.



EB5-0012



**When mounting the ring cable lugs on the cable ends (35 mm<sup>2</sup>) of the battery connection cable, ensure that the crimp connection has been installed properly.**



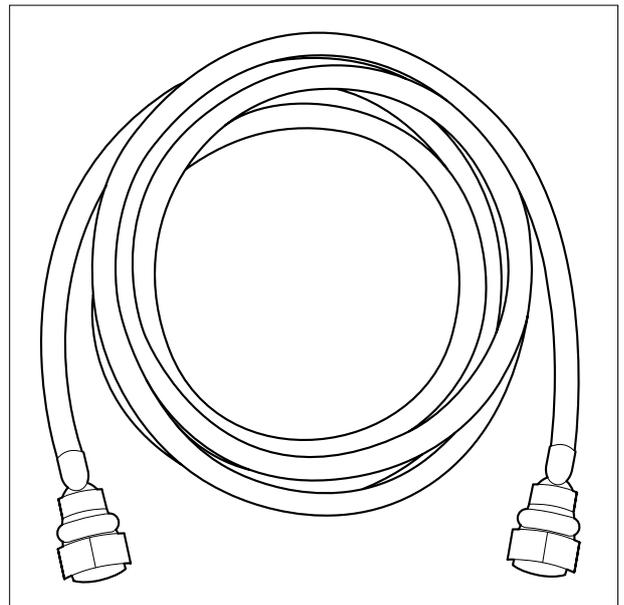
EB5-0013

# Electrical system

## Main wiring loom (instrumentation)

The connection cables available from Volkswagen Marine in various lengths (see illustration) must be connected with the central multi-pin connector of the engine fuse box/relay plate (see illustration on page 16 - Connection to engine). The other end of the connection cable is connected to the connection unit/relay box.

Various cable lengths are available.



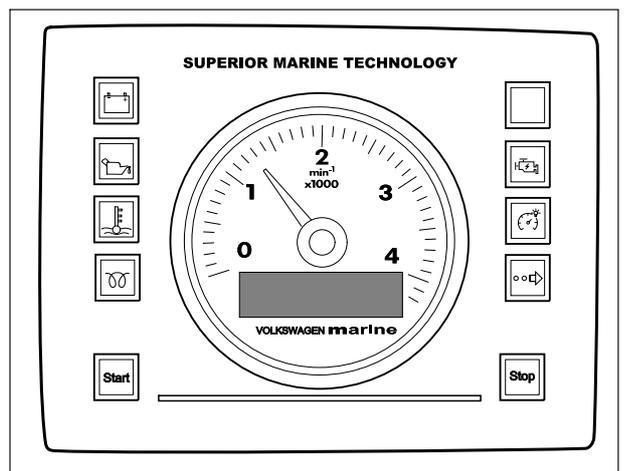
EB5-0014

## Main instrumentation

Volkswagen Marine offers you two instrumentation options for your boat. You can either use the full set of modern instrumentation from Volkswagen Marine or you can put together a customised set of your own design.

Volkswagen Marine boat engines are designed for use with instruments of the VDO "Ocean Line"™ White.

The extensive functions of the multi-function display are only available when the Volkswagen Marine rev. counter is used. This rev. counter is included in both the flybridge instrumentation from Volkswagen Marine.



EB5-0037

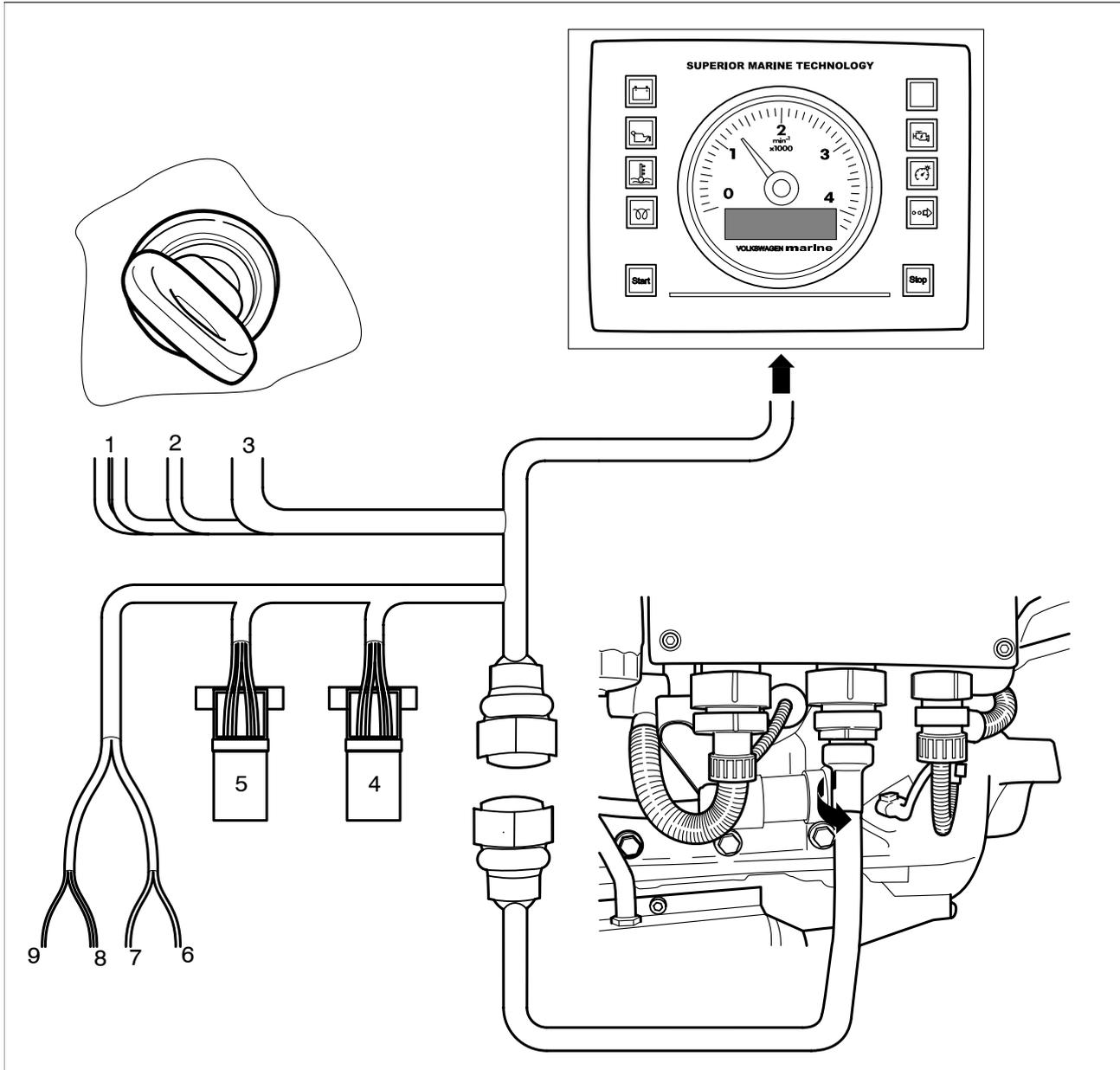
## Note

If you require individual instrumentation, please contact your nearest Volkswagen Marine dealer.

## Installation overview of standard main instrumentation

The instrumentation consists of two components, i.e. the instrument panel and the ignition switch.

The installation template for cutting out the instrument panels is provided from page 29.



EB5-0106

### Legend

- |   |  |
|---|--|
| 1. on ignitionswitch connection terminal 15                           | 5. dimmer relay  |
| 2. on ignitionswitch connection terminal 50<br>(2 cables)             | 6. to battery cut out relay connection terminal                    |
| 3. on ignitionswitch connection terminal 30<br>(2,5 mm <sup>2</sup> ) | 7. to battery cut out relay connection terminal                    |
| 4. alarm relay  | 8. to throttle-lever neutral position switch<br>connection contact |
|   | 9. to throttle-lever neutral position switch<br>connection contact |

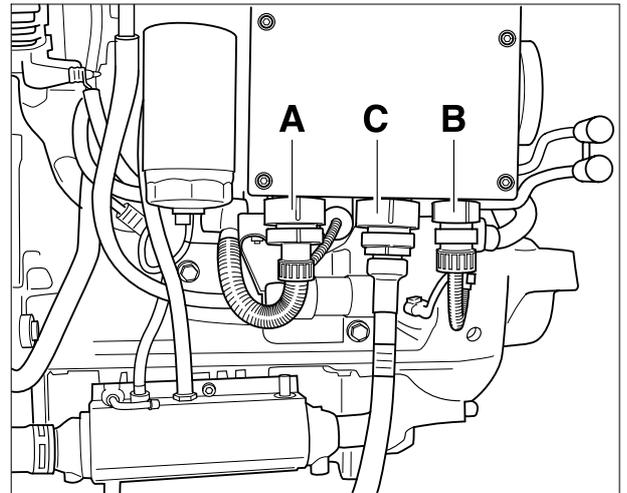
# Electrical system

## Connection to engine

Connect the multi-pin connections of the main wiring loom to the fuse box/relay plate (connection -C-).

### Note

The wiring loom spanners T 01905 and T 01906 must be used to remove and fit the multi-pin connectors.



EB5-0009

## Installing instrument panel

Connect the ignition switch and the instrumentation to the main wiring loom from the engine as described on page 15 (installation overview of standard instrumentation).

### Note

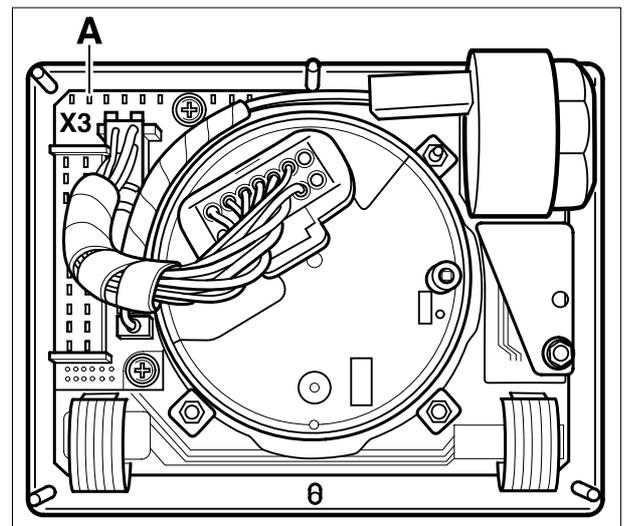
Installation templates for installing the instruments panels are provided from Page 29

## Connecting navigation instruments

In order to fully utilise the extensive functions of the multi-function display you must connect the main or flybridge instrument panel to a navigation instrument with an NMEA interface (e.g. GPS receiver, LOG etc.).

For this purpose, connect the connection terminal -A- marked with "X3" to the NMEA interface of your navigation instrument:

- Plug connector "X3" Terminal "2" for connection **NMEA-A**
- Plug connector "X3" Terminal "1" for connection **NMEA-B**



EB4-0004

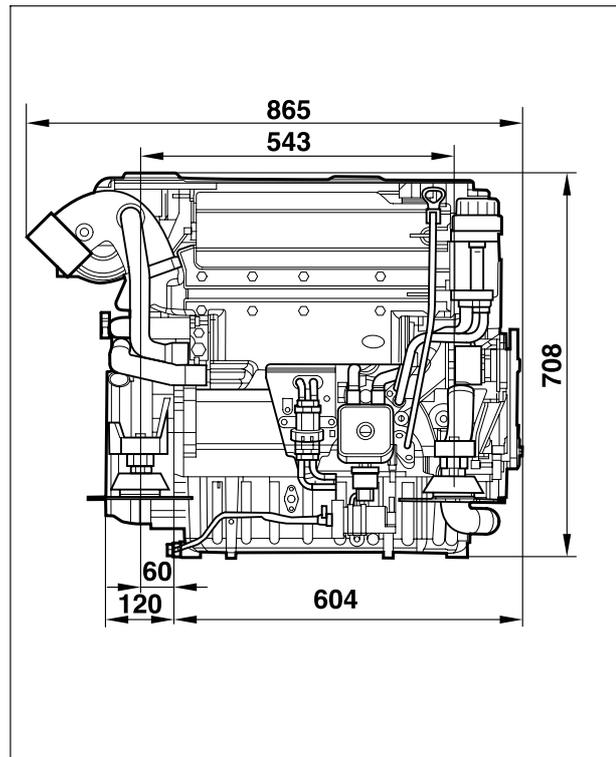
### Note

To configure your multi-function display, please read the additional operating instructions for the multi-function display in your operating instructions.

# Engine installation dimensions

## Installation dimensions for SDI Volkswagen Marine boat engine

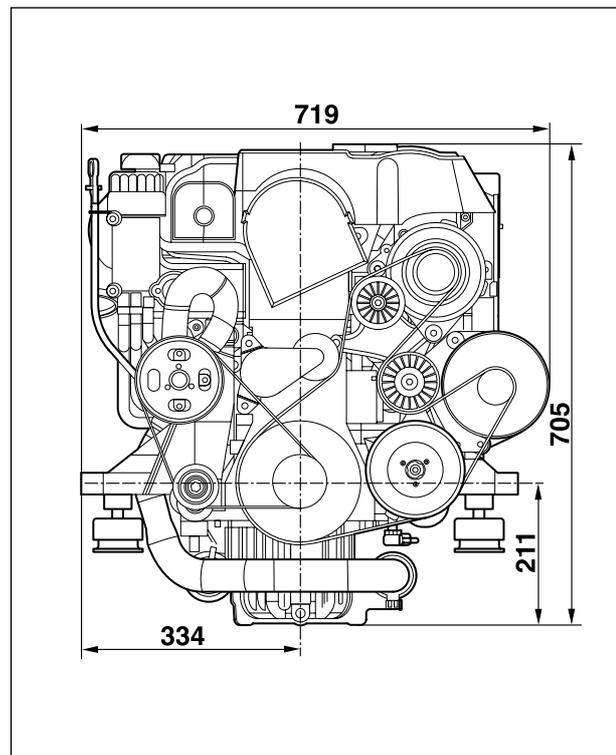
### Side view



SDI engine

EB5-0028

### Front view



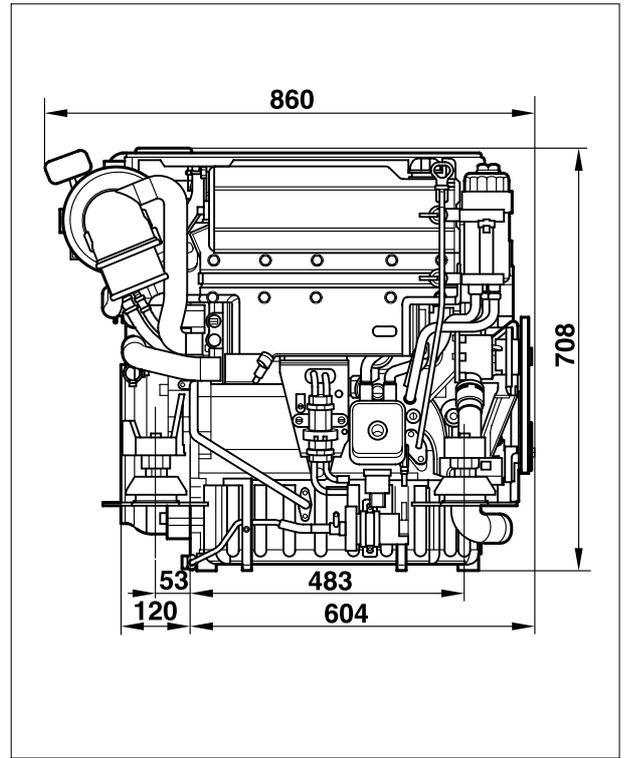
SDI engine with additional alternator

EB5-0029

# Engine installation dimensions

## Installation dimensions for TDI Volkswagen Marine boat engine

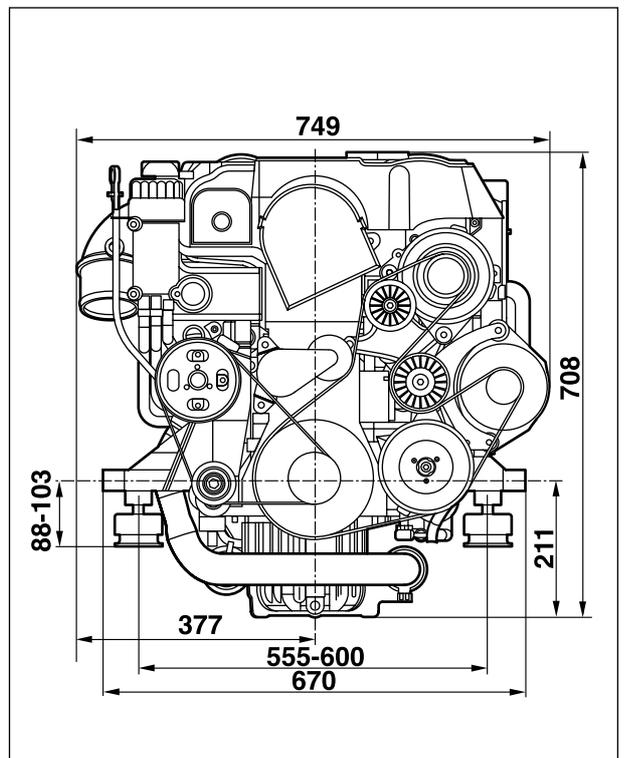
### Side view



TDI engine

EB5-0030

### Front view



TDI engine with additional alternator

EB5-0031

# Cooling system

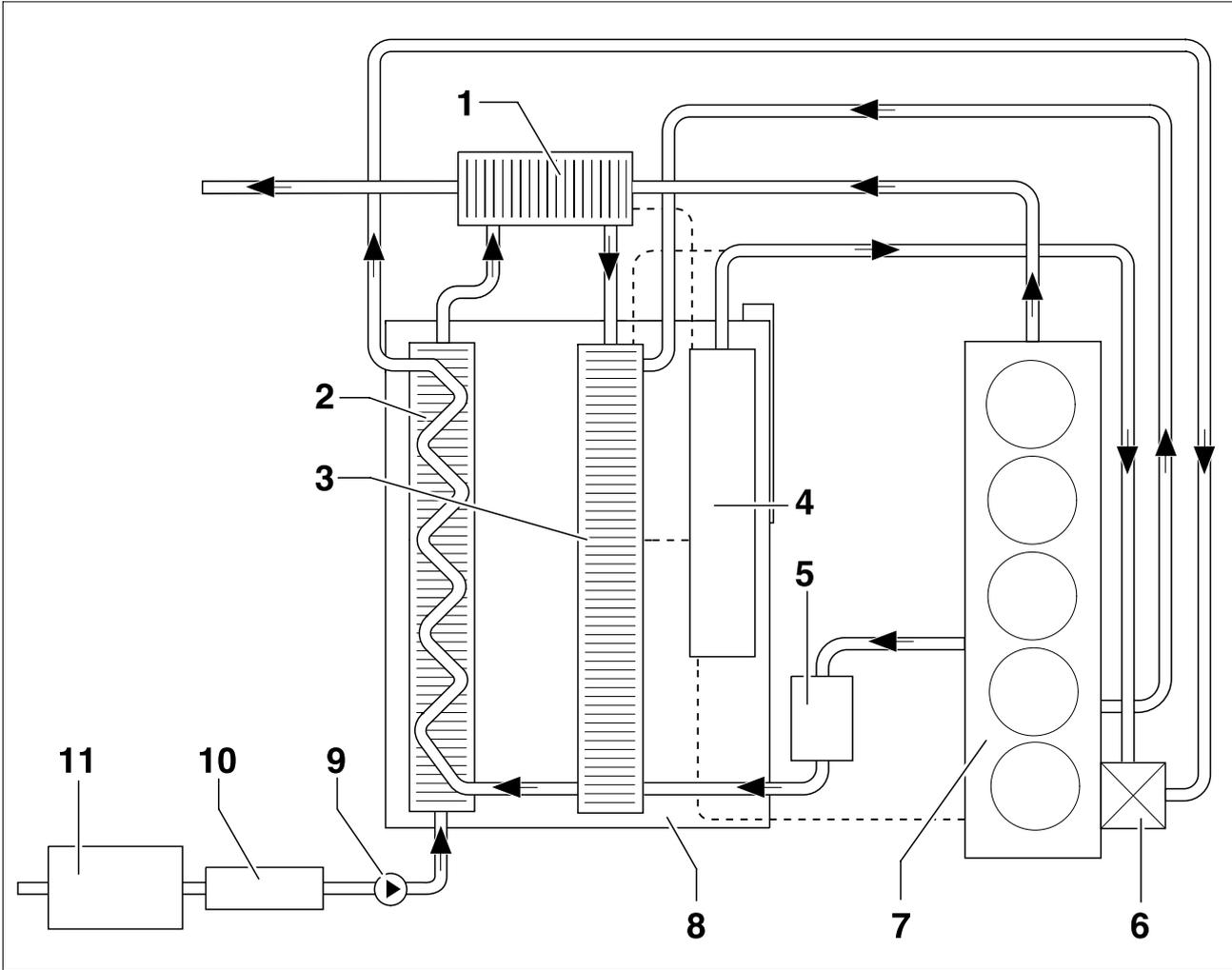
## Introduction

To keep the engine free of aggressive media, such as salt water, the Volkswagen marine engines are equipped with a dual-circuit cooling system.

The seawater circuit (secondary circuit) is an open circuit in which the seawater is sucked in and is routed to the outside again via the exhaust system after it has flowed through the heat exchanger.

## Cooling circuit

### Example: SDI engine



EB5-0093

## Legend

- |                           |                                |
|---------------------------|--------------------------------|
| 1. Exhaust manifold       | 7. Engine                      |
| 2. Main heat exchanger    | 8. Housing of radiator package |
| 3. Exhaust plenum chamber | 9. Seawater pump               |
| 4. Coolant expansion tank | 10. Combination radiator       |
| 5. Oil cooler             | 11. Seawater filter            |
| 6. Coolant pump relay     |                                |

# Cooling system

## Seawater circuit

The seawater enters, sucked in by an intake fitting in the boat hull, with a seawater valve located downstream.

The seawater filter filters the impurities out of the entering seawater.

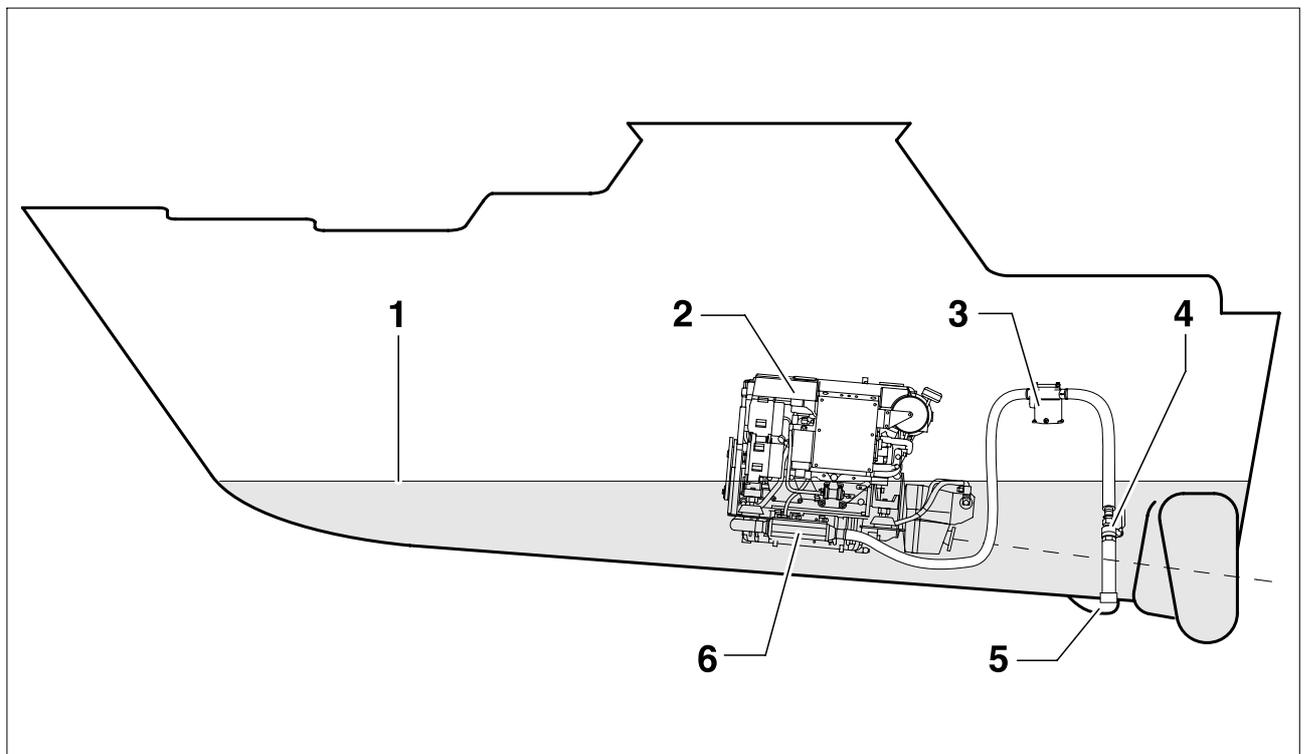
## Bleeding seawater circuit using ventilation unit

A ventilation unit must be used to prevent seawater from entering the exhaust system via the intake side of the seawater circuit (see illustration on page 7, illustration item 6.; Installation overview of exhaust system).

## Note

If the cooling system is below the waterline, it can happen that the exhaust system fills with water when the boat has been standing still for some time. This is because the sea water pump is not 100% water tight and a lifting effect in the coolant circuit results in suction. In this case, close the seawater valve.

## Installation overview of seawater cooling



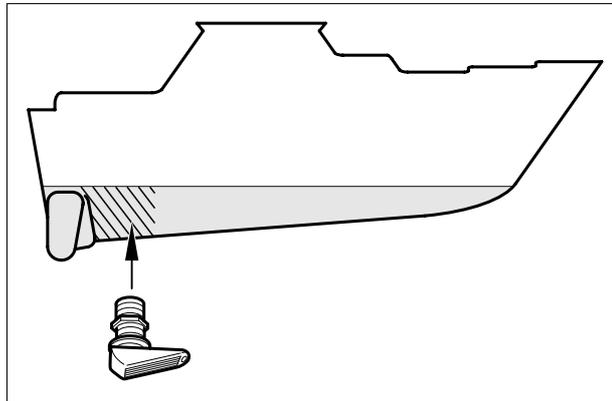
EB5-0094

## Legend

- |                    |                         |
|--------------------|-------------------------|
| 1. Waterline       | 4. Seawater valve       |
| 2. Engine          | 5. Intake fitting       |
| 3. Seawater filter | 6. Combination radiator |

### Notes on intake fitting

- The intake fitting is equipped with an intake screen so that coarse dirt cannot be sucked in and the intake line is not clogged.
- On motorboats the angled side of the intake screen must face the front. The intake fitting should be installed in the shaded area (see illustration) of the boat if possible. The speed backs up the water toward the inside in this case.



EB5-0017

### General information

- The seawater flows through the combination radiator after the seawater filter. This combination radiator (for fuel and hydraulic oil) is divided into two sections. The first half is used to cool the gear oil (reversing gear) or the hydraulic oil of the power steering with the Z-drive. The second half cools the fuel flowing back to the fuel tank.
- The suction hose from the seawater filter to the combination radiator must have a diameter of at least 38 mm. The hose should be as short as possible. The use of two hose clips per connection is recommended.
- In the main heat exchanger the seawater absorbs the heat of the coolant circuit, cooling the engine. On the TDI 150-5 seawater also flows through the intercooler and must be drained accordingly when storing for the winter.



The measures required for storing the Volkswagen Marine boat engine for the winter are described in the operating instructions of the Volkswagen Marine boat engine.

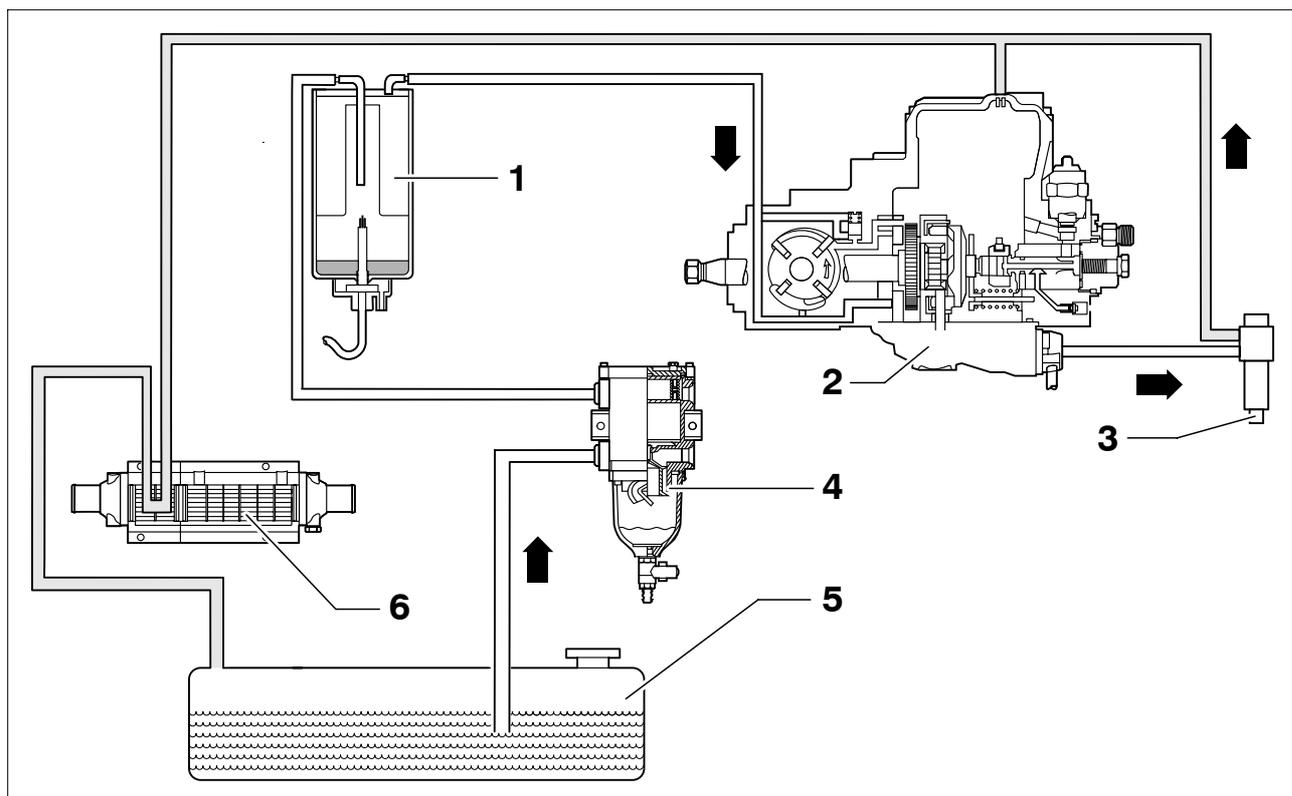
# fuel system

## Introduction

The fuel system consists of several components. These components (fuel tank, circulation pre-filter with water separator etc.) must be very clean and installed extremely carefully.

Impurities can cause engine malfunctions. The fuel system must be checked for leaks following installation to achieve the greatest possible protection against fire.

## Operating description of fuel system



EB5-0105

## Legend

- |   |  |
|---|--|
| 1. Fine fuel filter with water warning device | 4. Circulation pre-filter with water separator |
| 2. Injection pump                             | 5. Fuel tank                                   |
| 3. Injector                                   | 6. Combination radiator                        |



Please refer to the additional information on the following page!



- The space for the fuel system must be sufficiently ventilated. The fuel tanks and the filler necks must be provided with an earth connection to the battery (on steel boats to the boat hull).
- When arranging the components, ensure sufficient space for any maintenance or repair work required.
- The fuel supply line must be routed from the fuel tank via the circulation pre-filter and water separator. The line cross-section must be at least 8 mm.
- A fuel return line must be routed from the combination radiator to the fuel tank. The line cross-section must be at least 8 mm.
- The return line from the injection pump to the combination radiator is already mounted at the factory.
- Fuel lines, seals and their connections must be suitable for RME fuel (rape-oil fatty acid methyl ester/bio diesel) (see Technical data on page 27).

# Engine compartment ventilation

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## Introduction

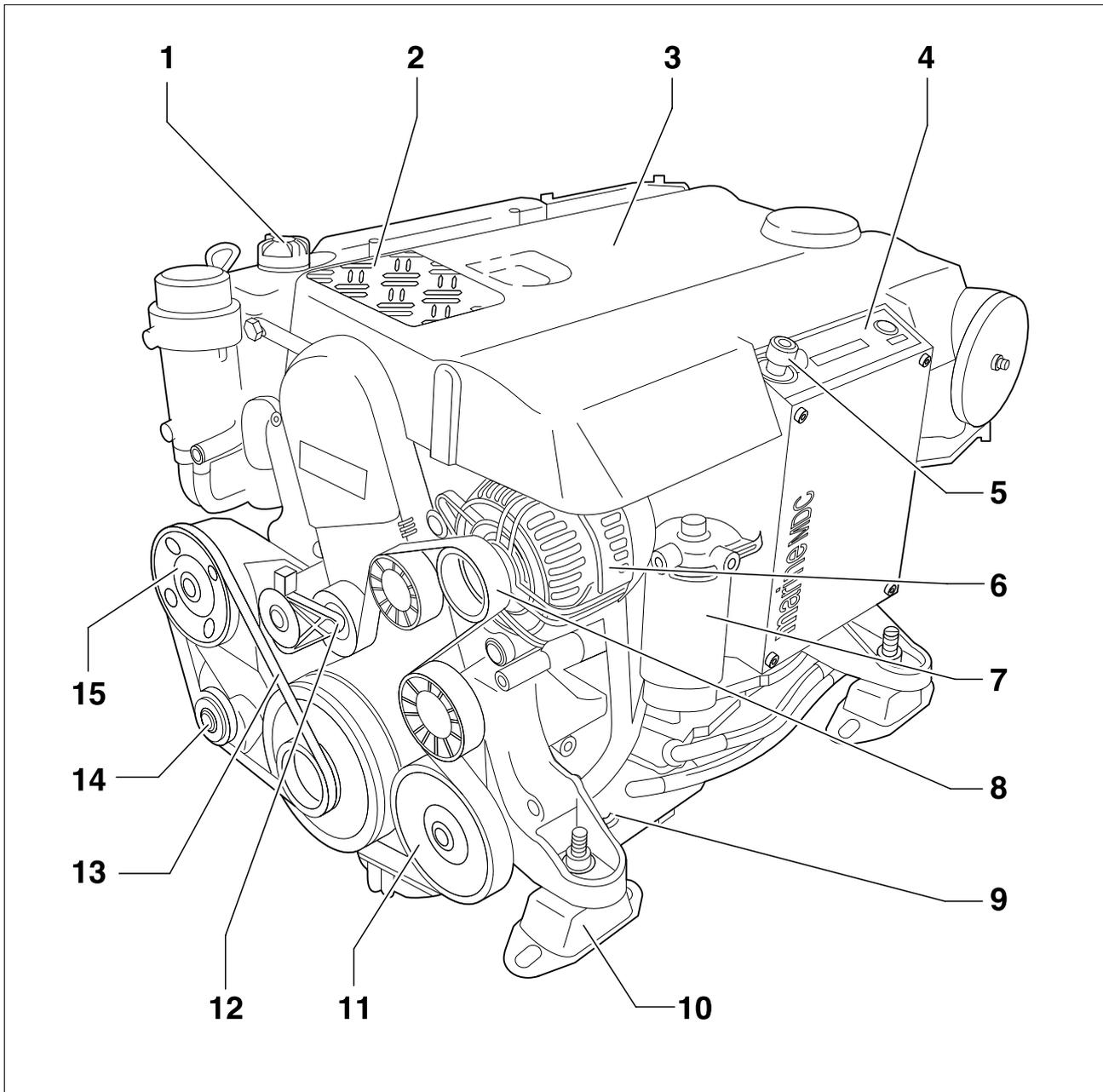


- The engine must be supplied with air (oxygen) to ensure optimum fuel combustion.
- The engine compartment must be ventilated sufficiently so that the temperature can be kept as low as possible at an optimum level.  
( $\Delta T_{\text{max}}$  over ambient temperature: 10 °C to 5 °C).



- The air inlet must be mounted where the air sucked in is as pure as possible and the engines own exhaust gases cannot be sucked in to produce optimum engine compartment ventilation.
- Water may not flow into the air inlet and outlet.
- The hydraulic cross-section of the air inlet is to be 80 cm<sup>2</sup>.
- If other devices (e.g. an auxiliary heater) are located in the engine compartment which require oxygen for their operation, this must be taken into account during your planning of the air inlet.

# Component overview

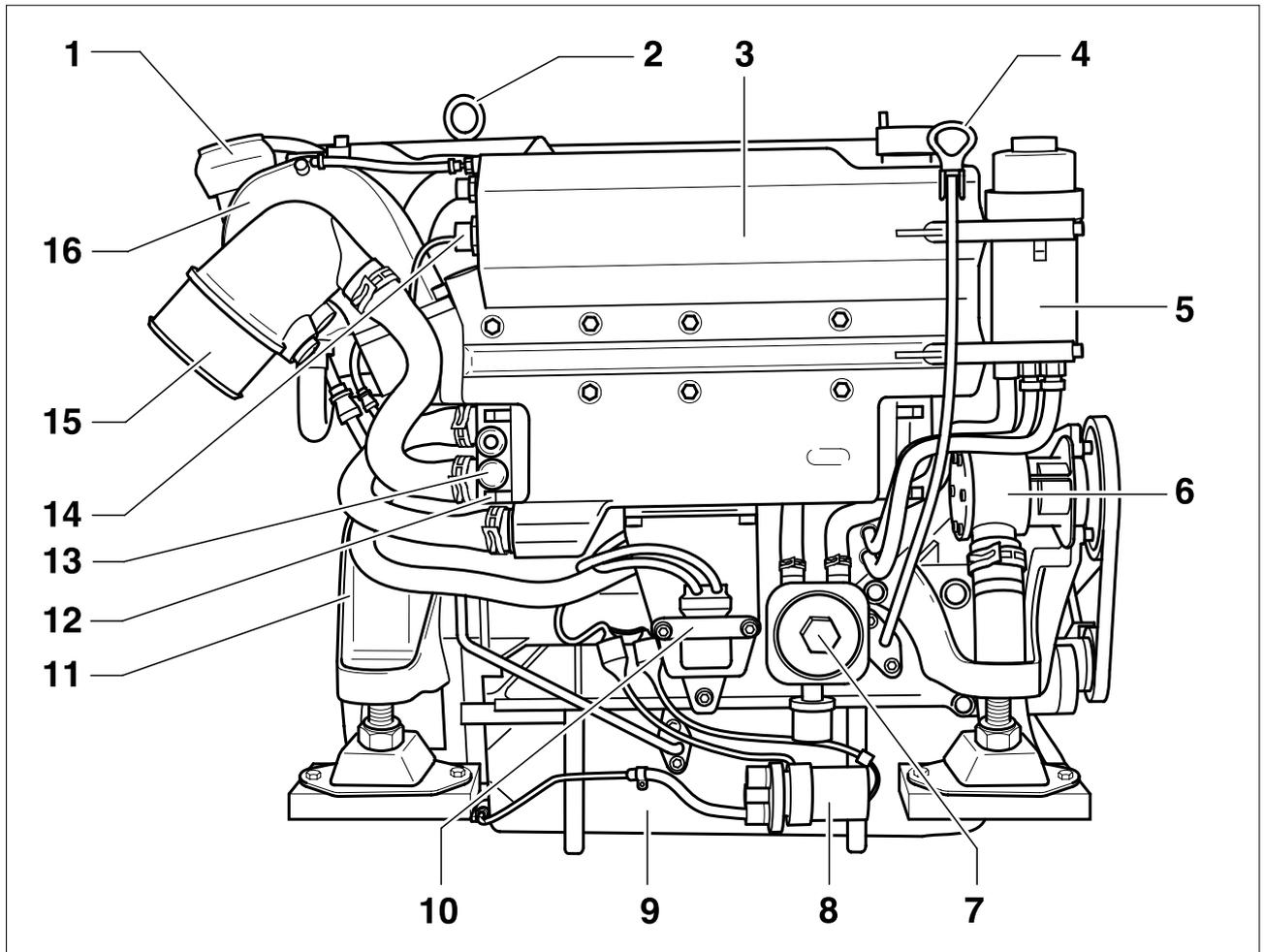


EB5-0082

## Legend

- |   |                                    |
|---|------------------------------------|
| 1. Coolant cap (use coolant G12, colour red)                          | 8. Ribbed V-belt                   |
| 2. Step plate   | 9. Combination radiator            |
| 3. Designer cover (tighten mounting screw to 4.5 Nm)                  | 10. Unit mounting                  |
| 4. Fuse box/relay plate   | 11. Power steering pump            |
| 5. Stop switch  | 12. Tensioner                      |
| 6. 3-phase AC alternator  | 13. Ribbed V-belt                  |
| 7. Fine fuel filter (see operating instructions for change intervals) | 14. Tensioner                      |
|   | 15. Belt pulley for sea water pump |

# Component overview



EB5-0085

## Legend

- |                                |                                   |
|--------------------------------|-----------------------------------|
| 1. Turbocharger pressure unit  | 10. Engine connection plug        |
| 2. Hanging eye                 | 11. Gearbox bell                  |
| 3. Housing of radiator package | 12. Coolant drain plug            |
| 4. Oil dip stick               | 13. Reactive anode                |
| 5. Oil filter                  | 14. Water level sender            |
| 6. Seawater pump               | 15. Exhaust-pipe connection piece |
| 7. Oil cooler                  | 16. Turbocharger                  |
| 8. Oil extraction pump         |                                   |
| 9. Oil sump                    |                                   |

## Engine description

<b>Displacement</b>	cm <sup>3</sup>	2461
<b>Stroke/bore</b>	mm	81/95.5
<b>Compression ratio</b>		19:1
<b>Firing order</b>		1-2-4-5-3

## Output (as per ISO 3046 with marine control unit)

SDI 55-5	at 2250 rpm	kW	40
SDI 75-5	at 3600 rpm	kW	55
TDI 100-5	at 2600 rpm	kW	74
TDI 120-5	at 3250 rpm	kW	88
TDI 150-5D	at 4000 rpm	kW	108
TDI 150-5	at 4000 rpm	kW	111

## Boost pressure (at nominal output and under standardised conditions)

TDI 100-5	at 2600 rpm	bar	1.15
TDI 120-5	at 3250 rpm	bar	1.15
TDI 150-5	at 4000 rpm	bar	1.15

## Weight

SDI 55-5	kg	approx. 260
SDI 75-5	kg	approx. 260
TDI 100-5	kg	approx. 275
TDI 120-5	kg	approx. 275
TDI 150-5	kg	approx. 280

## Maximum operating inclination

✂ 15° in all directions  
30° short-term

## Permissible engine operating data

### Perm. engine temperature

max. permissible temperature °C (°F) 130 (266)  
in oil sump

### Permissible coolant temperature

max. permissible temperature °C (°F) 105 (221)  
on engine outlet  
during continuous operation

## Electrical engine equipment

3-phase AC alternator 12 V A 120

**Starter 12 V** kW 2.0

**Battery 12 V** A (Ah) 380 (63)  
Minimum capacity

**Sheathed element glow plugs** V 12

## Control unit

Manufacturer Bosch EDC 15+

Fault memory present:

Checking with fault reader V.A.G 1552/1551 or the vehicle diagnosis, measuring and information system VAS 5052/5051.

# Technical data

## Cooling system

Dual-circuit cooling system (gauge pressure system with separate expansion tank and overpressure valve) and seawater circuit with impeller pump.

## Pressure relief valve

opens at                      bar (gauge pressure) 1.3 - 1.5

## Thermostat

Start of opening            °C (°F)    80 (189)

## Coolant

As antifreeze and anticorrosion, use 60% water and 40% G12 coolant additive in accordance with TLVW 774D.

## Fuel

**Fuel**                      **diesel**                      **as per DIN EN 590**

**Required minimum  
Cetane number**                      **CN > 49**

**Bio diesel**                      **as per EN 51 606**

## Oil supply

### Motor oil quality

Brand-name oils in accordance with oil specifications of operating instructions

### Oil pressure

at 2,000 rpm and 80 °C (176 °F) motor oil temperature bar (gauge pressure) at least 2.0

### Oil consumption

(max. permissible)    l/10 h    0.05-0.1

## Filling capacities

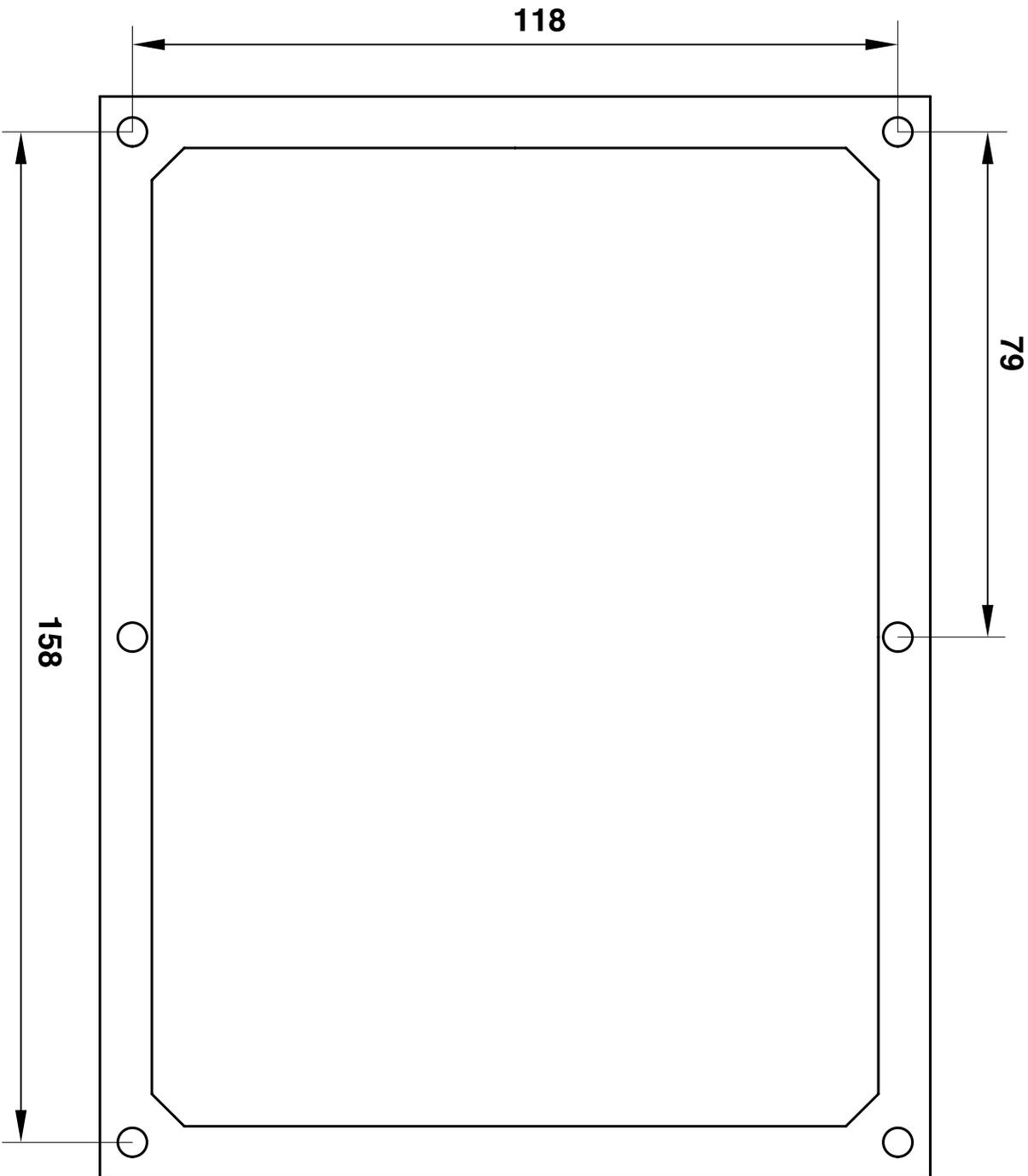
**Cooling circuit**                      ltr.                      approx. 12

### Oil circuit

with filter change                      ltr.                      6.0

Quantity difference between Min. and Max. marking on oil dip stick                      ltr.                      approx. 1.0

# Installation Template for Flybridge Instrument Panel



EB5-0076

# Installation Description EB04

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