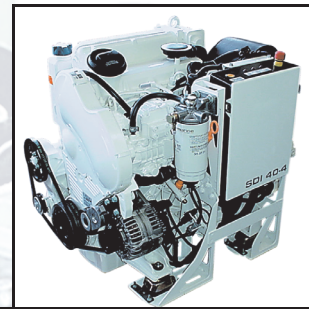




Design and Function

**Boat Engines from
Volkswagen Marine**



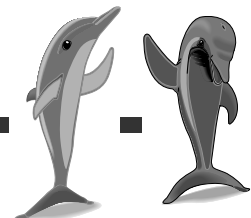
**SDI 40-4 with Saildrive
SDI 50-4 with Saildrive
SDI 60-4 with Saildrive**



**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!

NEW



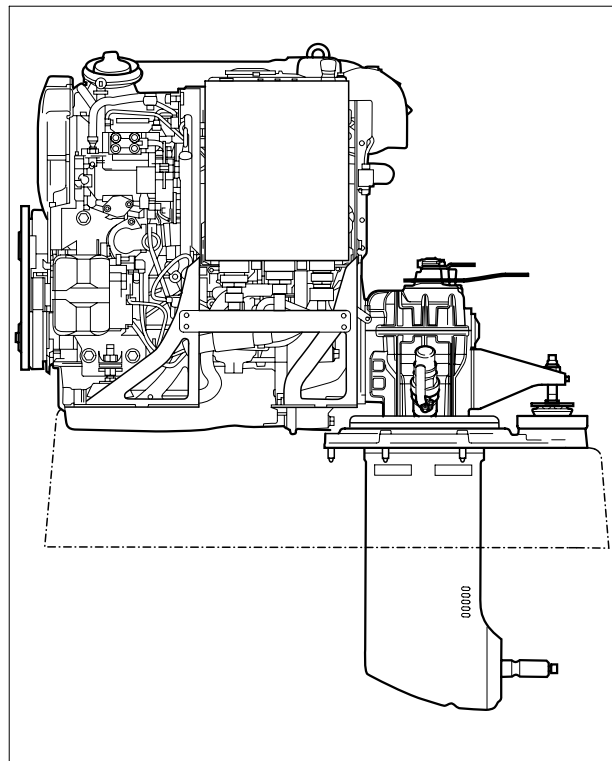
**Important
Note**

This installation description explains the procedure for the installation of all 4-cyl. SDI Volkswagen Marine Boat Engines with Saildrive.

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 should be procured exclusively from specialist dealers.

Correct professional installation of the engine and its attached parts is very important for ensuring that all components will operate together properly. This work must be carried out with extreme care.



Marine Boat Engine with Saildrive

EB4-0048

Contents

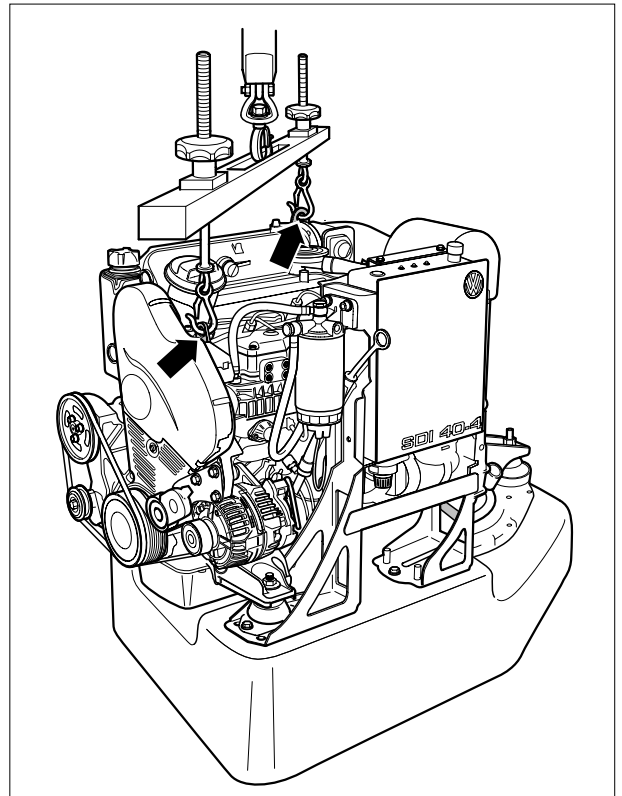
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Installation instructions

Engine installation and removal

- For the installation and removal of the Volkswagen Marine Boat Engine with a crane and lifting device, the lifting eyes provided at the engine must be used (see arrows in illustration).
- 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.
- For the engine removal, it is recommended to disconnect the underwater part from the Saildrive.
- Before installing the underwater part, engage the drive and turn the underwater part shaft. This facilitates the insertion of the shaft joint.
- The underwater part is then bolted to the Saildrive. The tightening torque of the bolts is specified in the Saildrive Information enclosed and must be observed.



EB4-0035

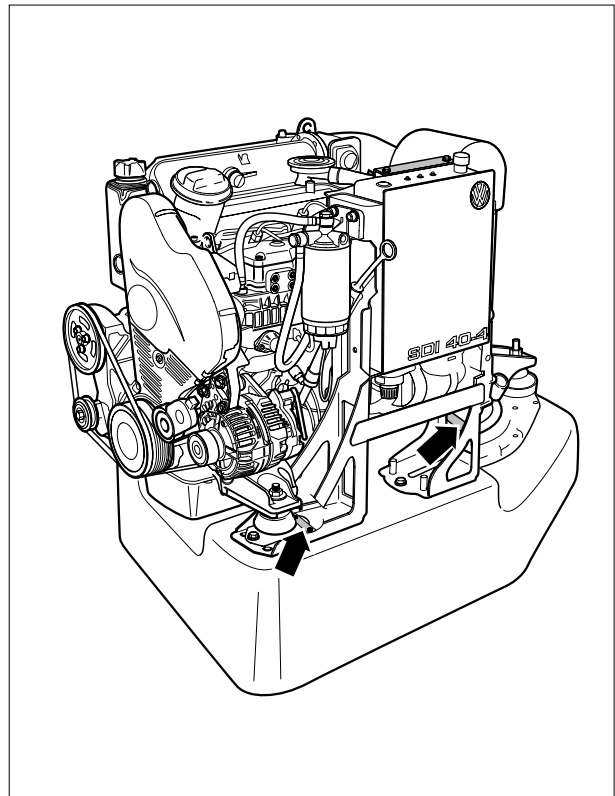
The qualified experts of the Volkswagen Marine Team are available to answer technical questions and provide technical information on all aspects of the Volkswagen Marine Boat Engine.

Transport protections at the engine

- Two transport protections (see arrows in illustration) are provided at the engine for installation and removal.
- Remove these protections after the engine has been adjusted in its final installation position in the boat.
- Then attach the engine mounts with the bolts supplied to the subframe. Observe tightening torque on page 9

Note

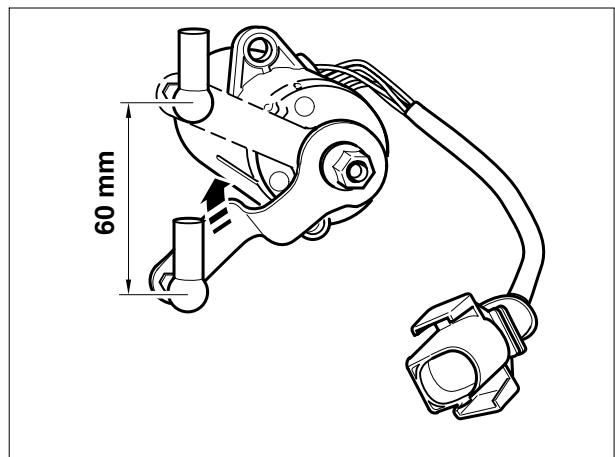
Store transport protections in a safe place for later use!



EB4-0036

Throttle cable adjustment at throttle-position sensor

- Adjust the throttle cable to a dimension of 60 mm between the idling position and the full-throttle position on the throttle-lever position sensor (see illustration).
- The precise adjustment of the throttle-lever position sensor is important for the achievement of the full engine power. The throttle lever must contact the lower edge of the bracket of the central electric unit.



EB4-0025

Installation instructions

Charging auxiliary batteries

- Battery isolation diodes may not be used.
- Battery cut-off relays must be used.
- Please contact your Volkswagen Marine dealership for further information.

Connection of hot-water boiler

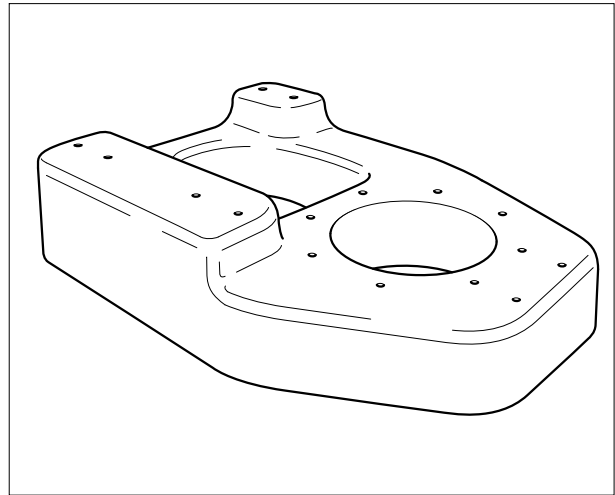
- If you wish to install a hot-water boiler, please contact your Volkswagen Marine dealership.

Operation of engine with Saildrive

- Please observe the instructions in your owner's manual!

Saildrive subframe

- The subframe must be adjusted to the boat's hull by careful trimming.
- The subframe must be adjusted in such a way that the Marine Engine with the Saildrive is mounted as low as possible in the hull.
- Subsequent lamination (inside and outside) creates a secure attachment of the subframe with the hull.
- The laminate layer (glass-fibre material) around the subframe must have a minimal thickness of 7 mm.



EB4-0056

Attachment of engine with Saildrive on the subframe

- The Saildrive is supplied with 16 collar bolts for the installation of the Marine engine.
- These collar bolts must be tightened to 20 Nm.

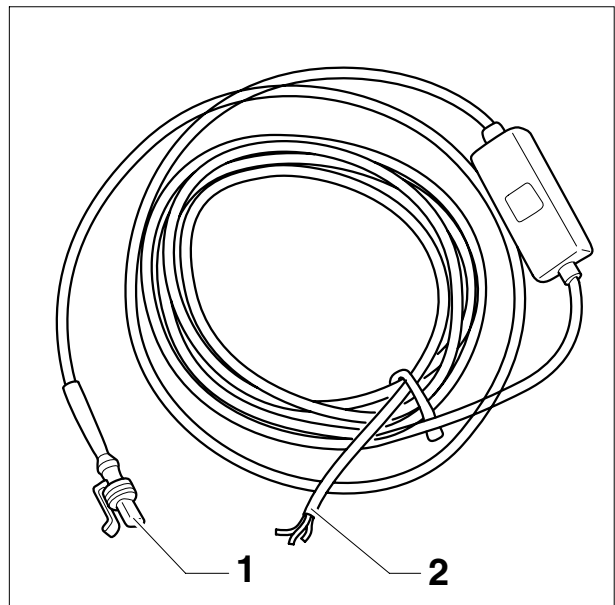
Connection of water sensor wiring

- The water sensor wiring included in the supply must be correctly routed and installed. Please perform the following steps:

Connect the the connector - 1 - to the water sensor connection at the Saildrive.

Connect the wire ends -2- as described in the following and as shown in the wiring diagram (bottom) on page 10 dargestellt:

1. brown wire to terminal 30 (permanent supply)
2. blue wire to buzzer or indicator light
3. yellow/green wire to terminal 31 (ground)

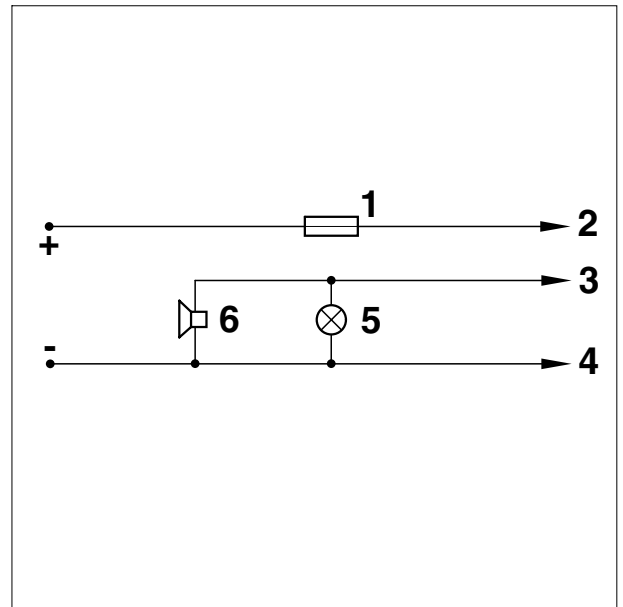


EB4-0052

Installation instructions

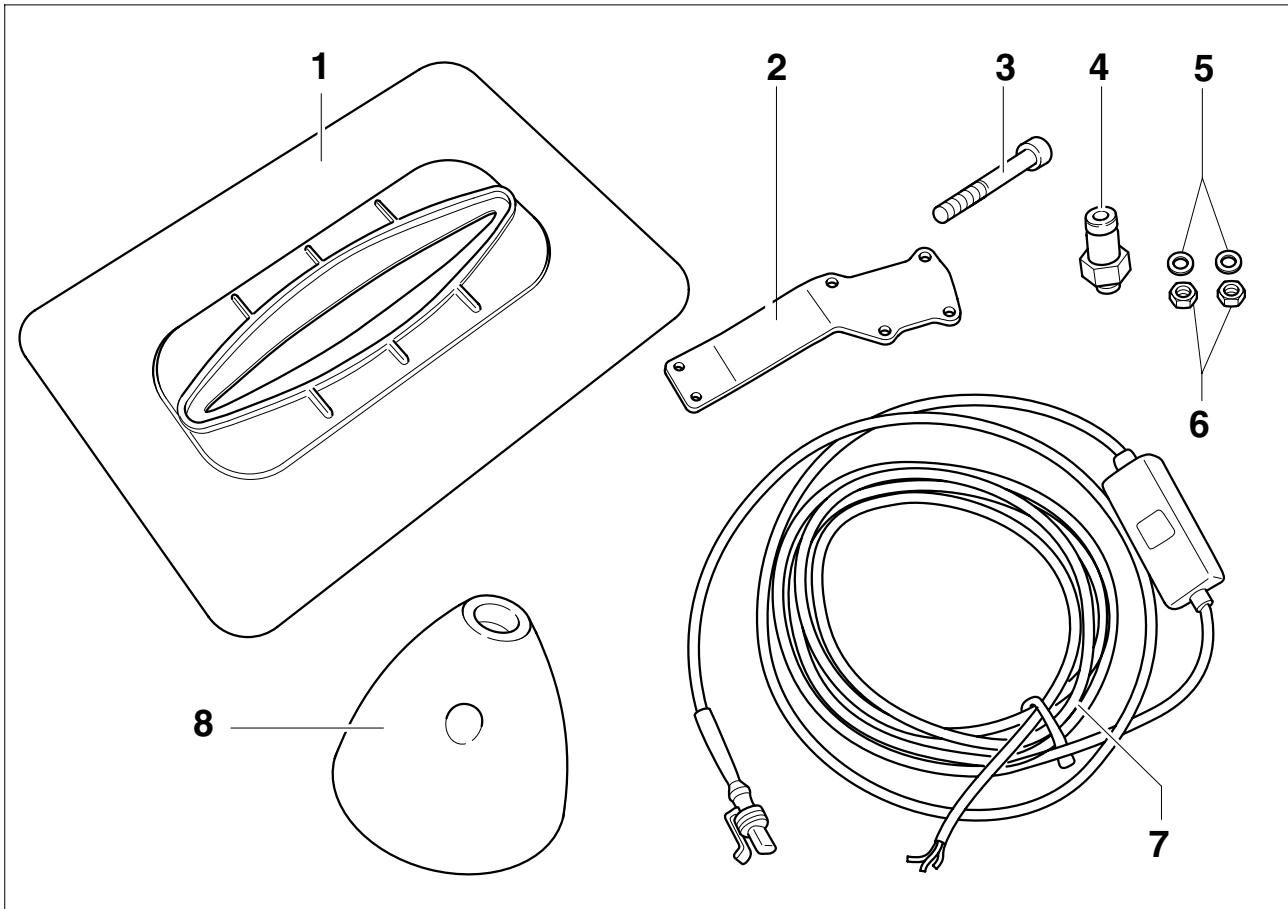
Wiring diagram for the water sensor wiring connection at the cockpit

1. Fuse (2 Ampere)
2. from terminal 30 (permanent supply) to the fuse at the brown wire of the water sensor wiring
3. from the buzzer and/or indicator light to the blue wire of the water sensor wiring
4. from terminal 31 (ground) to the yellow/green wire of the water sensor wiring
5. Indicator lamp
6. Buzzer



EB4-0053

Saildrive accessories



EB4-0051

Key

1. Rubber protection cover
2. Throttle cable bracket
3. Bolt (internal hexagonal)
4. Oil drain plug
5. Washer
6. Nut
7. Water sensor wiring, see "Wiring diagram for the water sensor wiring connection at the cockpit" on page 10
8. Propeller cone

Exhaust system

Introduction

SDI Volkswagen Marine Boat Engines use "wet" exhaust systems, which means that the exhaust system is cooled by sea water.

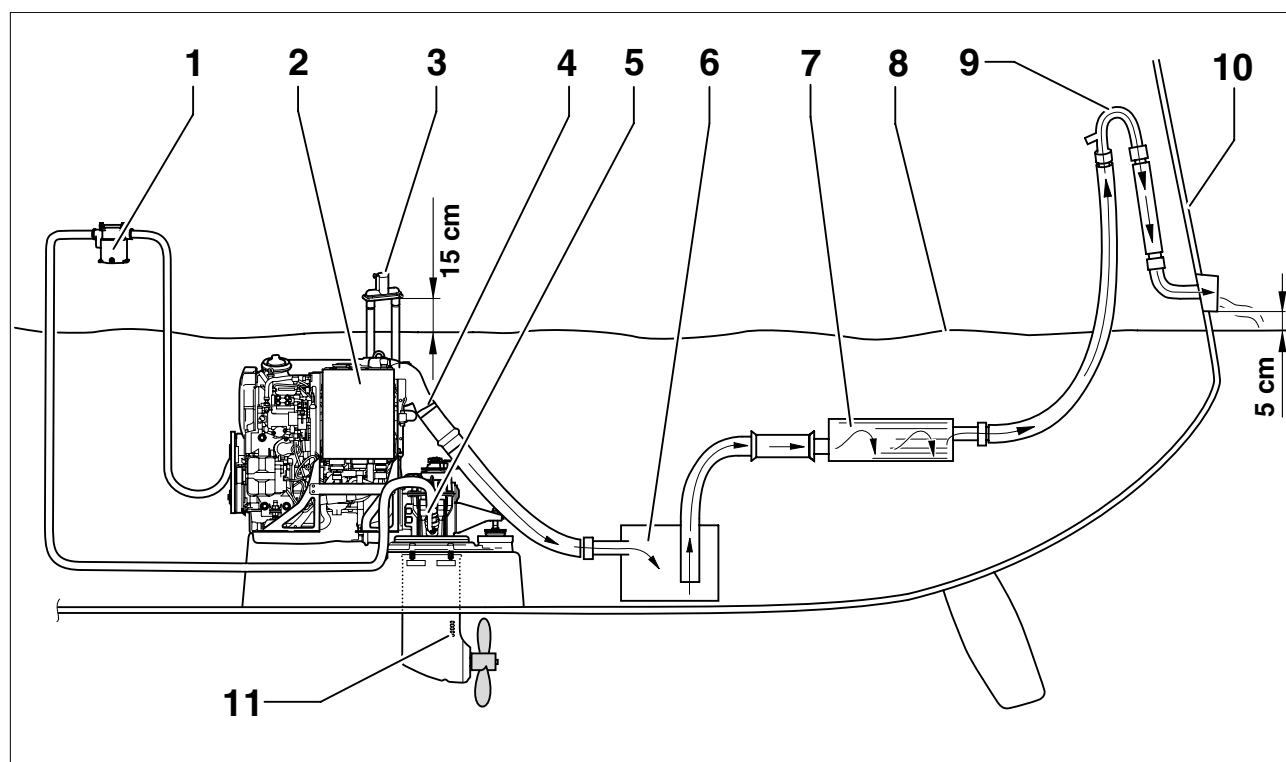
The sea water is introduced into the exhaust pipe (Pos. 4.) upstream of the exhaust plenum (Pos. 6.).

The sea water significantly reduces the exhaust gas temperature, hence rubber hoses and PVC parts can be used for the remaining length of the exhaust system. The hoses must have a temperature resistance of at least 200 °C.

Note

The exhaust plenum (Pos. 6.) must be large enough to hold all reflowing sea water when the engine is turned off.

Installation overview of an exhaust system of an SDI engine with Saildrive



EB4-0037

Key

- | | |
|--|--|
| 1. Seawater filter | 7. Muffler |
| 2. Engine | 8. Waterline |
| 3. Vent, see page 33
(at least 15 cm above waterline) | 9. Gooseneck
(Exhaust pipe lower edge at stern bushing to be
located at least 5 cm above water line) |
| 4. Exhaust pipe | 10. Stern bushing |
| 5. Sea water valve at Saildrive | 11. Sea water inlet at Saildrive |
| 6. Exhaust plenum | |

Notes

- The layout of exhaust system shall have as few bends as possible. The minimum line diameter of 60 mm must be observed. Hose connections must always be secured with heavy-duty hose clamps. Hose connections and rubber bushings must be temperature-resistant.
- When designing the exhaust system, the maximum backpressure must be considered and may not be exceeded.

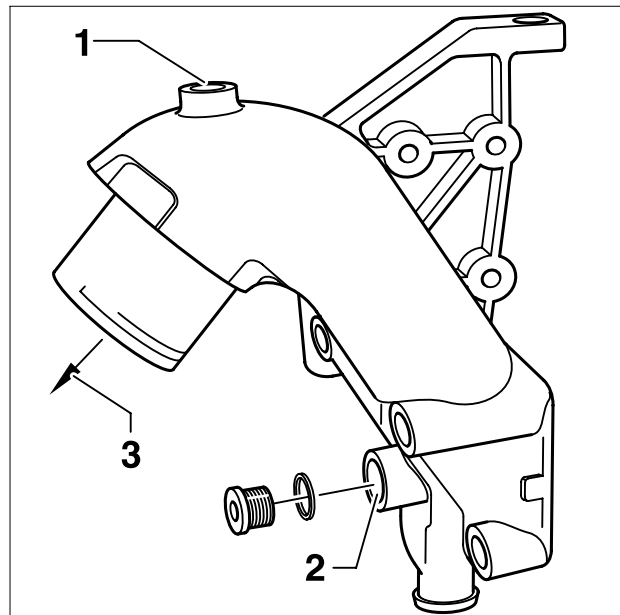
To following maximum backpressures at nominal power output may not be exceeded:

- SDI 40-4 with 29 kW= 75 mbar
- SDI 50-4 with 37 kW= 100 mbar
- SDI 60-4 with 44 kW= 150 mbar



These values must not be exceeded.

Exhaust pipe elbow of SDI engine



EB4-0002

Key

1. Plug for exhaust probe
2. Connection for sea-water temperature sensor (optional)
3. Exhaust outlet

Engine mounts

Engine-side unit mount installation

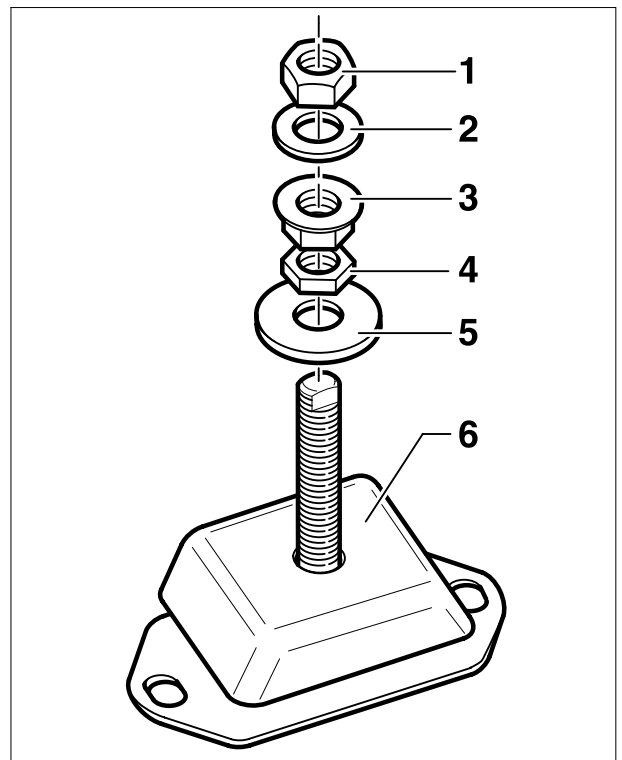
- The engine mounts must not be wound-up during installation, otherwise, severe vibrations or damage may occur.
- Use only genuine Volkswagen Marine engine mounts.
- The collar bolts supplied with subframe must be used to attach the engine mounts (see illustration on page 15).
- To provide adequate access to the oil dipstick, slide the electric box bracket as close to the engine as possible.

Procedure

With the engine installed, all engine mounts must be uniformly loaded.

Centre and tilt the engine to the desired height using the height adjustment of the mount (see illustration, pos. 3.). An optimal setting would be the centre position of the height adjuster.

After adjusting the height, tighten the mounting nut (see illustration, pos. 1.) with **65 Nm**. Secure the collar nut with a suitable spanner against rotation (see page 15).



EB4-0013

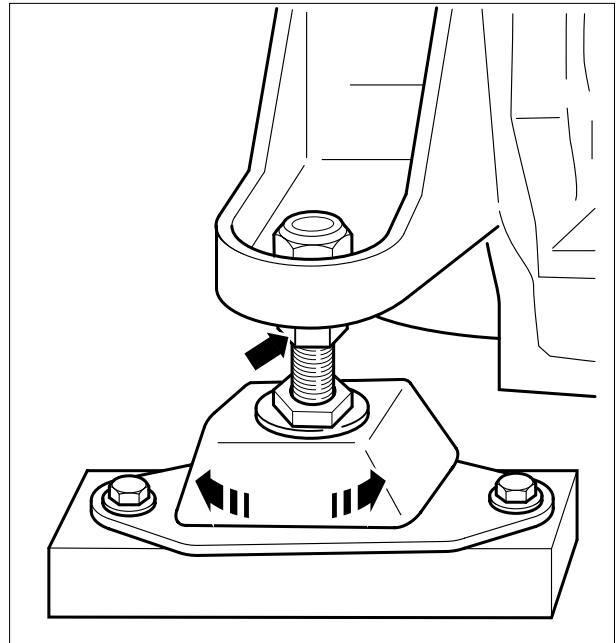
Key

1. Mounting nut (65 Nm)
2. Washer
3. Collar nut for height adjustment
4. Mounting nut (do not loosen)
5. Washer
6. Engine mount with base plate



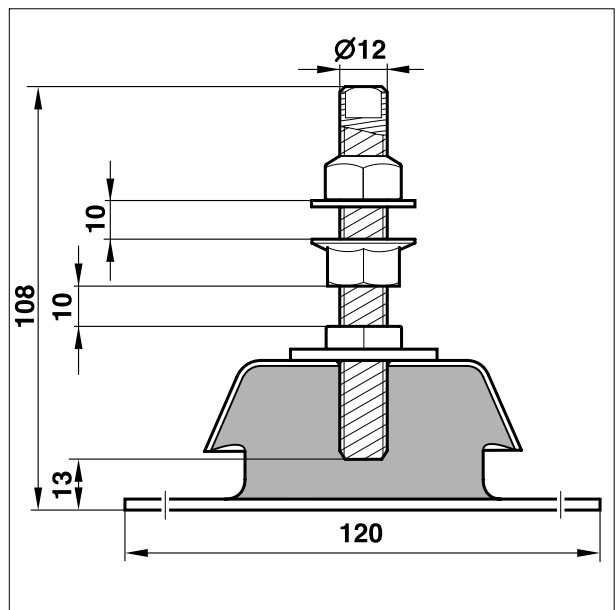
To prevent wind-up (twisting) of the Sairdrive's engine mount when tightening the upper nut, the collar nut arrow in illustration) must be secured against rotation with a suitable spanner. (e.g. open-jaw spanner) secured .

Use the collar bolts supplied to attach the base plate to the subframe.



EB4-0017

Engine mount dimensions



EB4-0014

Engine mount

Gearbox-side engine-mount installation

- The engine mounts must not be wound-up during installation, otherwise, severe vibrations or damage may occur.
- Ensure that the engine mounts and the Saildrive rubber seal are stress-free after the installation and alignment of the engine with the Saildrive.
- Use only genuine Volkswagen Marine engine mounts.

Procedure

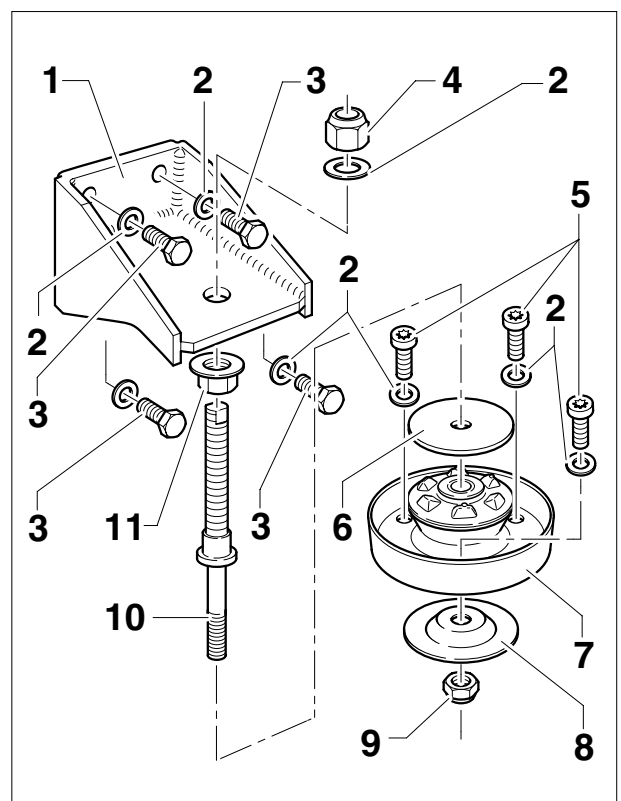
With the engine with Saildrive installed, all engine mounts must be uniformly loaded.

Centre and tilt the engine with Saildrive to the desired height using the height adjuster of the Saildrive mount (see illustration, pos. 11.).

After adjusting the height, tighten the nut (see illustration, pos. 4.) to **65 Nm**. Secure the collar nut with a suitable spanner against rotation.



Ensure that the Saildrive's rubber seal is installed stress-free at the subframe when aligning the Saildrive.



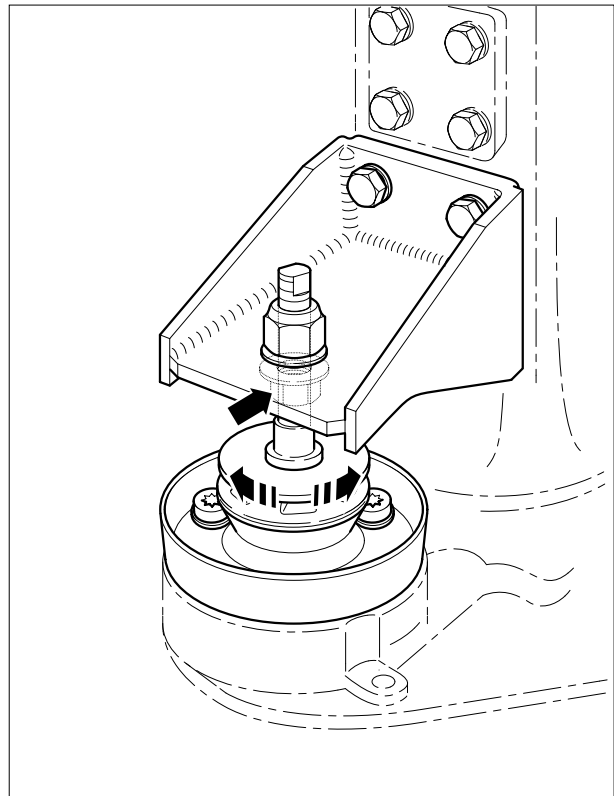
EB4-0049

Key

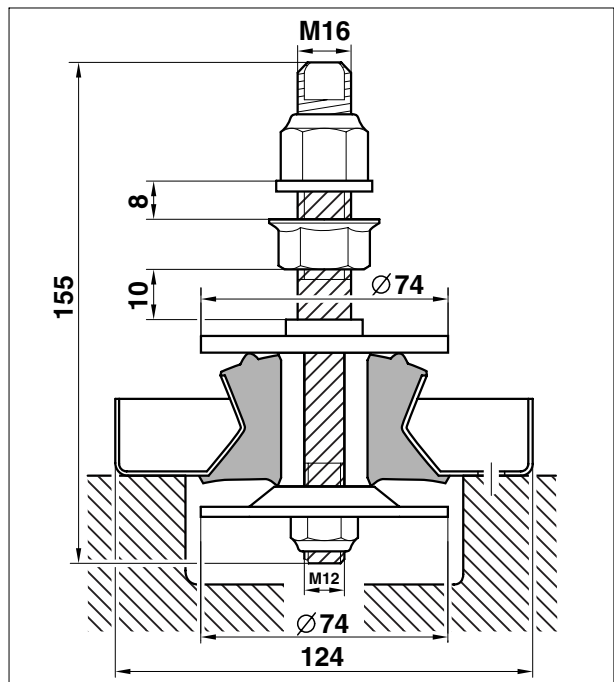
1. Bracket at Saildrive
2. Washer
3. Bolt (40 Nm)
4. Nut (65 Nm)
5. Bolt (20 Nm)
6. Top washer
7. Engine mount with base plate
8. Bottom washer
9. Nut (65 Nm)
10. Stud
11. Collar nut for height adjustment



To prevent wind-up (twisting) of the Sairdrive's engine mount when tightening the upper nut, the collar nut arrow in illustration) must be secured against rotation with a suitable spanner. (e.g. open-jaw spanner) secured .



EB4-0050



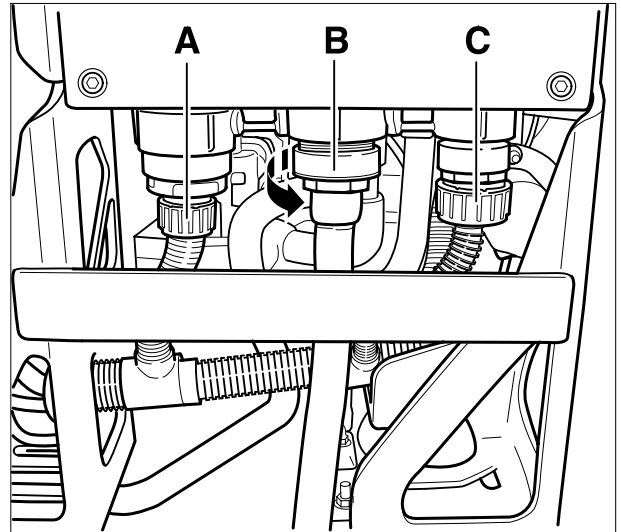
Engine mount dimensions

EB4-0040

Electrical system

Connections at engine

- The attachment of the electric connections with multi-pin plug connectors to the central engineelectric unit and of the main wiring harness with the high-capacity connector is simple and safe.
- Turn the caps of the multi-pin connectors **-A-**, **-B-** and **-C-** of the central engine electric unit in the direction indicated by the arrow until it can be felt that they lock and that the connector is secured.



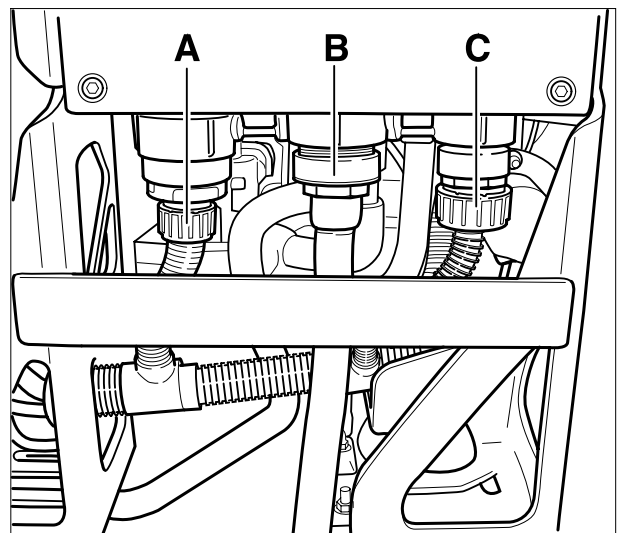
EB4-0023

Note

Use only the wiring harness tool T 01905 and T 01906 to remove and attach the multi-pin connectors.



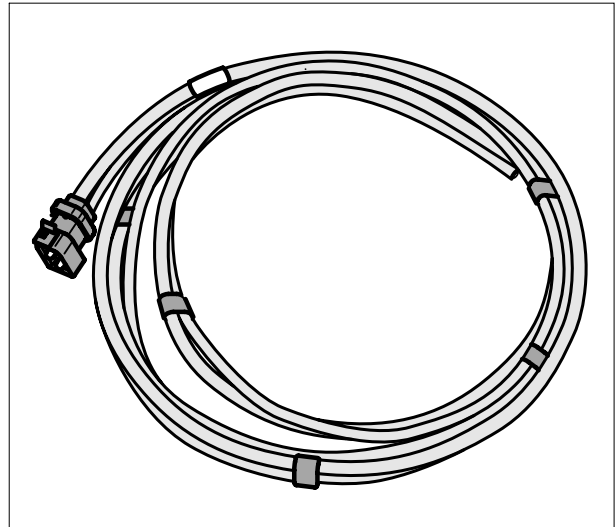
The multi-pin connectors **-A-** and **-B-** have been pre-mounted at the factory. Connector **-C-** must be fitted after installing the engine.



EB4-0024

Battery connection

The battery connection wiring supplied with the engine is equipped with a special high-capacity connector on the engine-side end. The other end of the wiring must be shortened to the appropriate length and must be equipped with suitable crimp connectors.

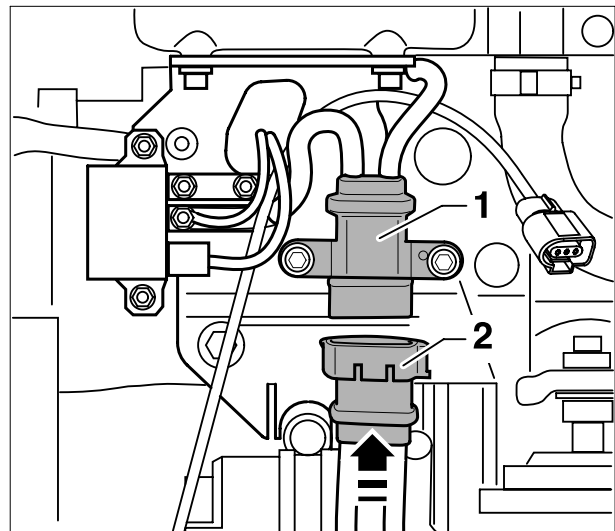


EB5-0041

Connect the high-capacity connector **-2-** of the battery cable to the connector on the engine **-1-** in the direction indicated by the arrow.

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

- Connect the black wire (ground) to the negative pole of the battery.
- Connect the red wire (+) to the positive pole of the battery.

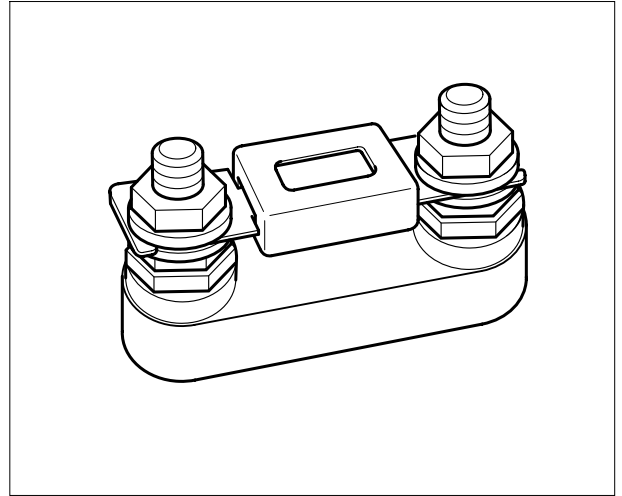


EB4-0016

Electrical system

Notes

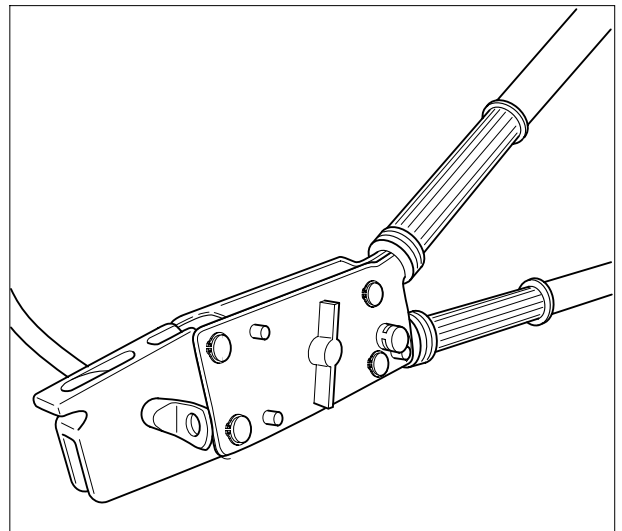
- The installation of a blade-type fuse with a capacity of 400 Ampere (see illustration) immediately behind the battery terminal is recommended.
- Also install a battery main switch in the supply line so that the main power circuit can be immediately interrupted in case of emergency or when performing work on the engine.



EB5-0012



Ensure that the crimp connection is made properly when attaching ring cable shoes to the ends of the battery connecting cables (35 mm²).

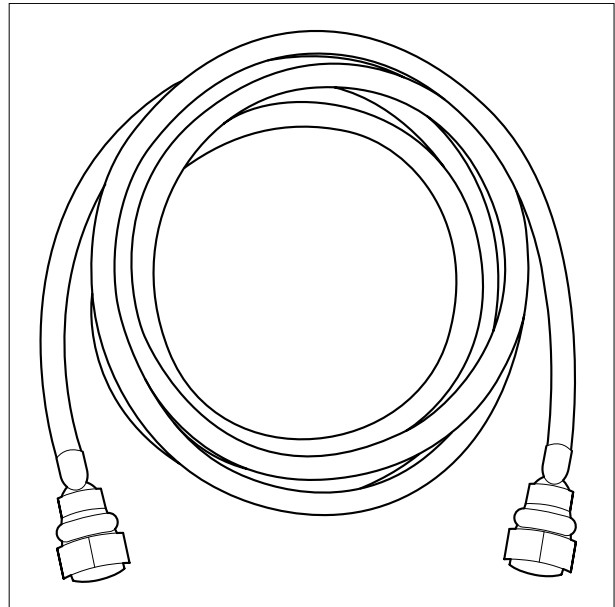


EB5-0013

Main wiring harness (instrumentation)

The wiring harness available from Volkswagen Marine in various lengths (see illustration) is attached to the centre connector at the central engine electric unit (see illustration in “Connections to engine” on page 23). The other end of the harness is connected to the instrument adapter harness and the ignition lock.

Harnesses are available in different lengths.



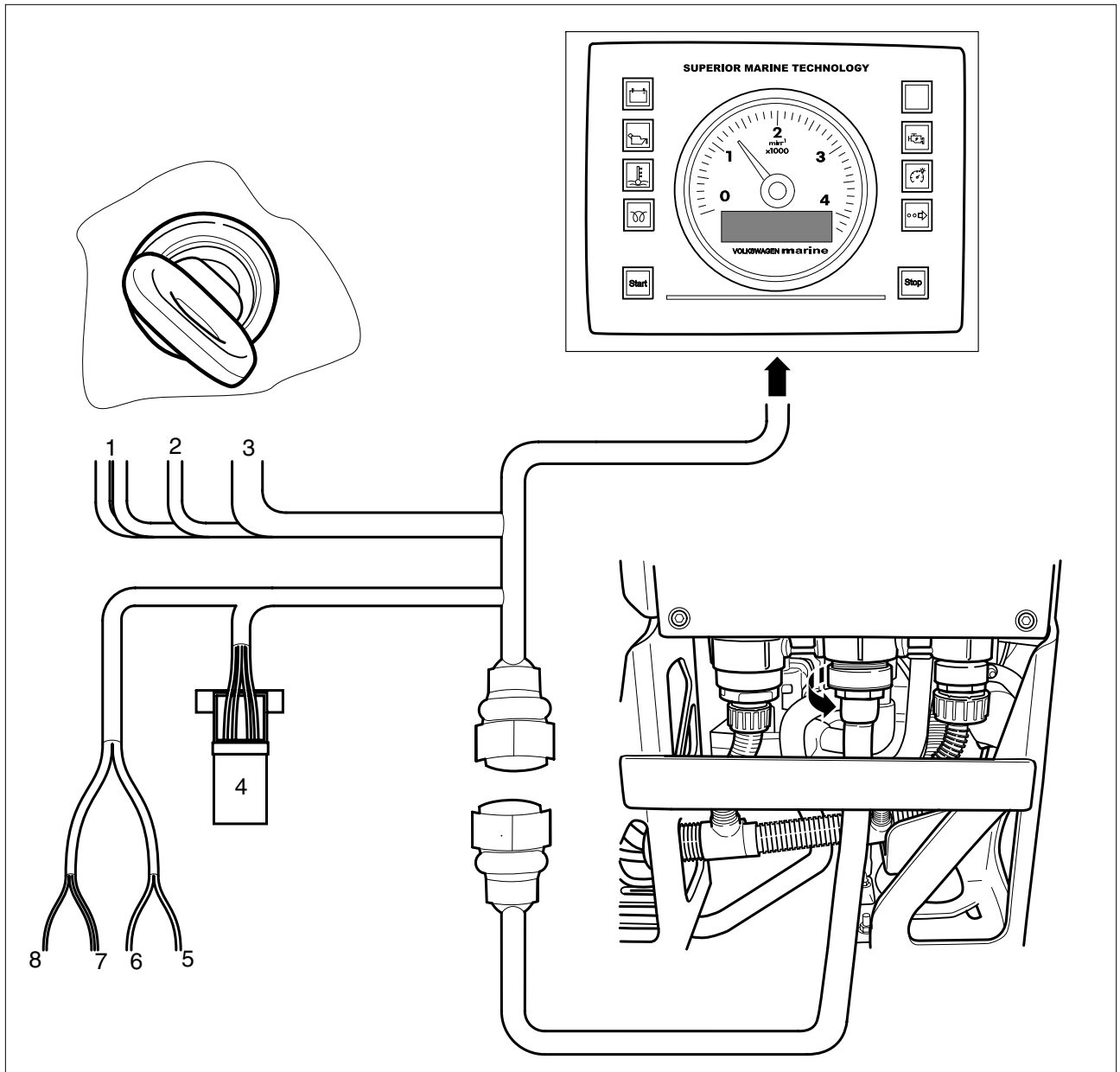
EB5-0014

Electrical system

Installation overview of standard instrumentation

The instrumentation comprises an instrument panel and an ignition lock.

A template for the cut-out for the instrument panel is provided on page 41.



EB4-0041

Key

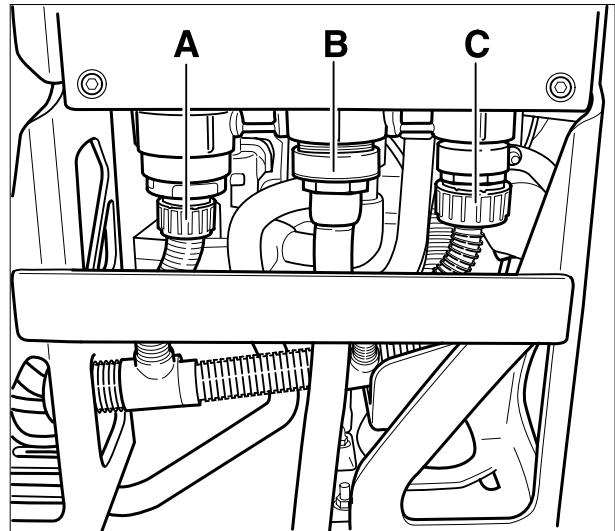
- | | |
|--|--|
| 1. to terminal 15 of the ignition switch | 5. to terminal of battery cut-out relays (if installed) |
| 2. to terminal 50 of the ignition switch
(2 wires) | 6. to terminal of battery cut-out relays (if installed) |
| 3. to terminal 30 of the ignition switch
(2.5 mm ²) | 7. to terminal of throttle-lever neutral position switch
(if installed) |
| 4. dimmer relay | 8. to terminal of throttle-lever neutral position switch
(if installed) |

Connections to engine

Connect the multi-pin connector of the main harness to the central electric unit (see illustration: connector **B**).

Note

Use only the wiringharness tool T 01905 and T 01906 to remove and attach the multi-pin connectors.



EB4-0024

Instrument panel installation

Connect the ignition lock and the instrument panel to the main harness, see "Installation overview of standard instrumentation" on page 22.

Note

A template for the cut-out for the instrument panel is provided on page 41.

Electrical system

Navigation instrument connection

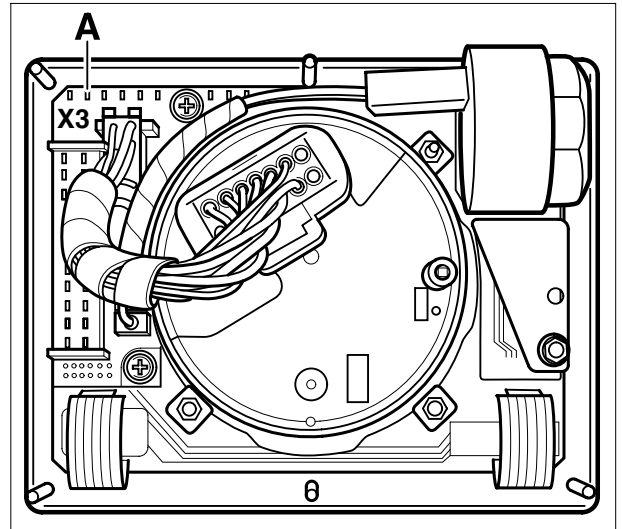
In order to fully utilize the extensive features of the multi-function display, the instrument panel can be connected to a navigation instrument with NMEA interface (e.g. GPS receiver, LOG or other).

For this purpose, connect the terminal „X3“ (see illustration, item **A**) to the NMEA interface of your navigation instrument:

- Terminal rail „3“ terminal „2“ for connection **NMEA-A**
- Terminal rail „X3“ terminal „1“ for connection **NMEA-B**

Note

To configure your multi-function display, please refer to the corresponding supplemental owner's manual of the multi-function display in your set of owner's manuals.



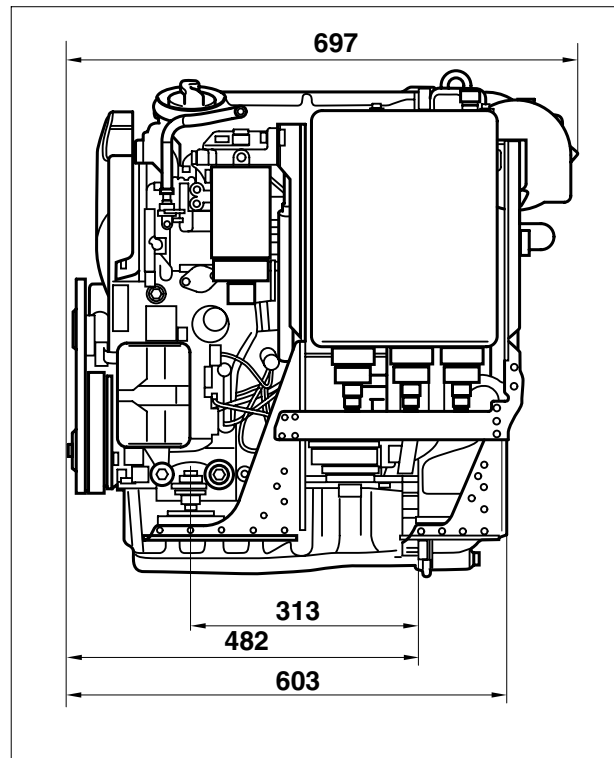
EB4-0004

Engine installation dimensions

Installation dimensions of SDI Volkswagen Marine Boat Engines (without Saildrive installed)

Installation height: see page 27.

Lateral view



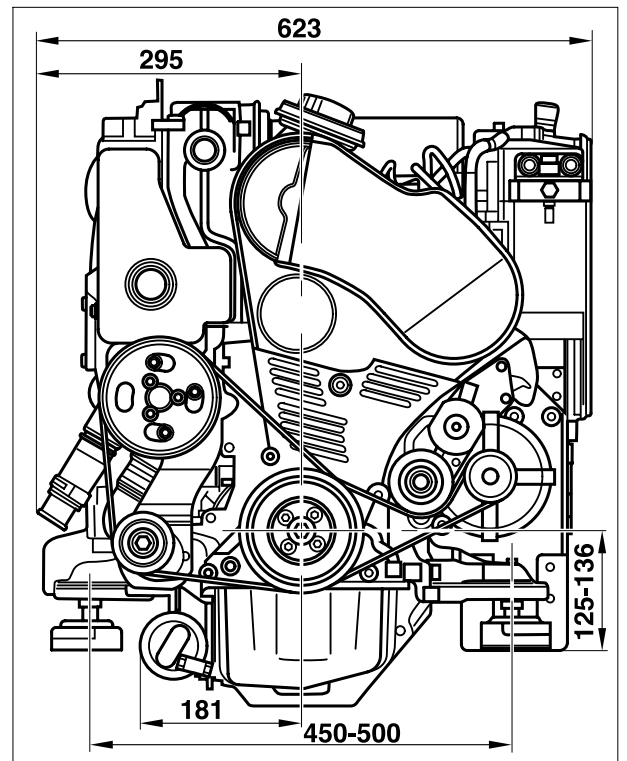
SDI engine

EB4-0043

Engine installation dimensions

Front view

Installation height: see page 27.



SDI engine

EB4-0005

Installation dimensions of all SDI Volkswagen Marine Boat Engines (with Saildrive installed)

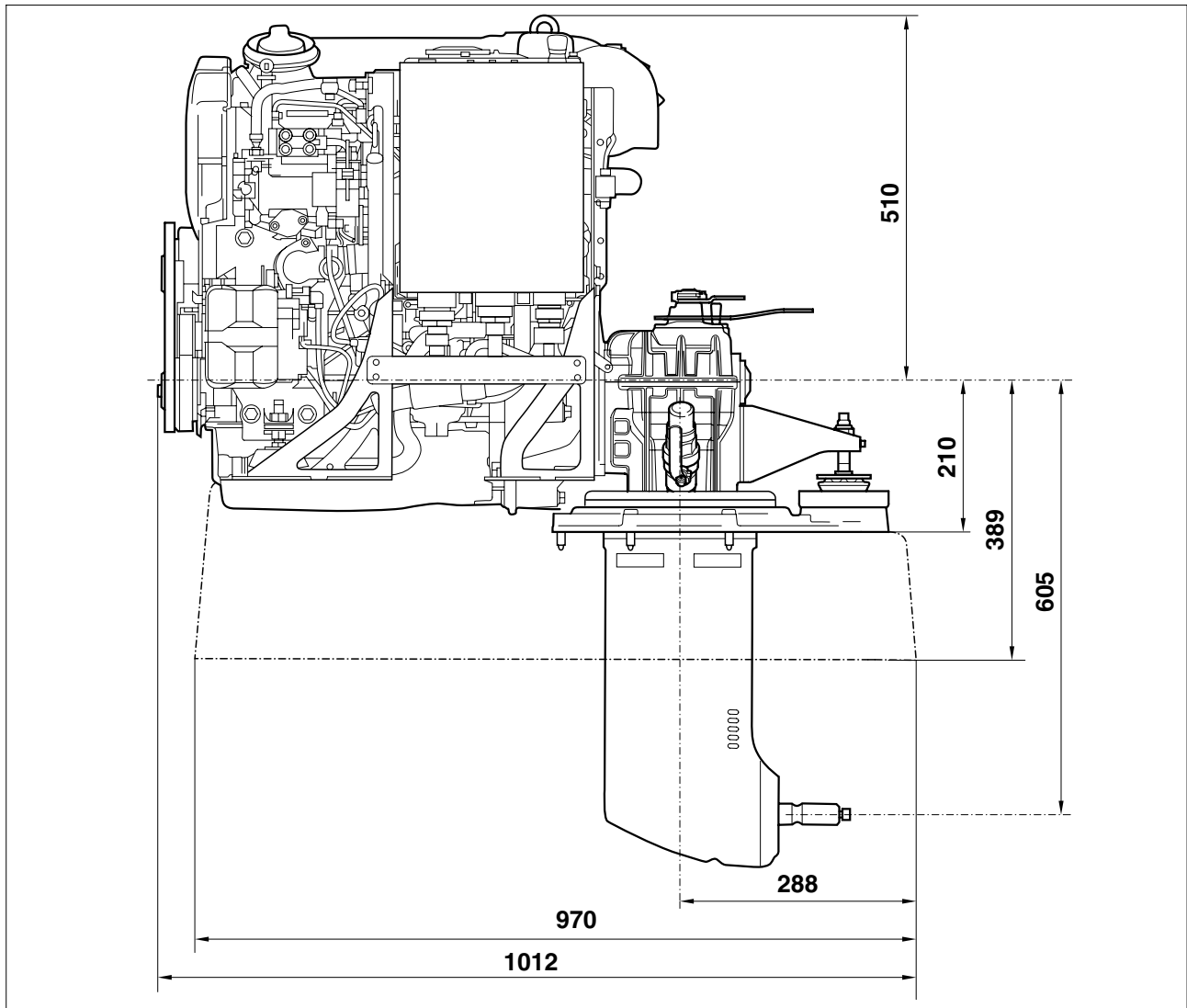
Marine Boat Engines are combined with the following Saildrive variants:

SDI 40-4 with ratio 2.16

SDI 50-4 with ratio 2.16/2.52

SDI 60-4 with ratio 2.52

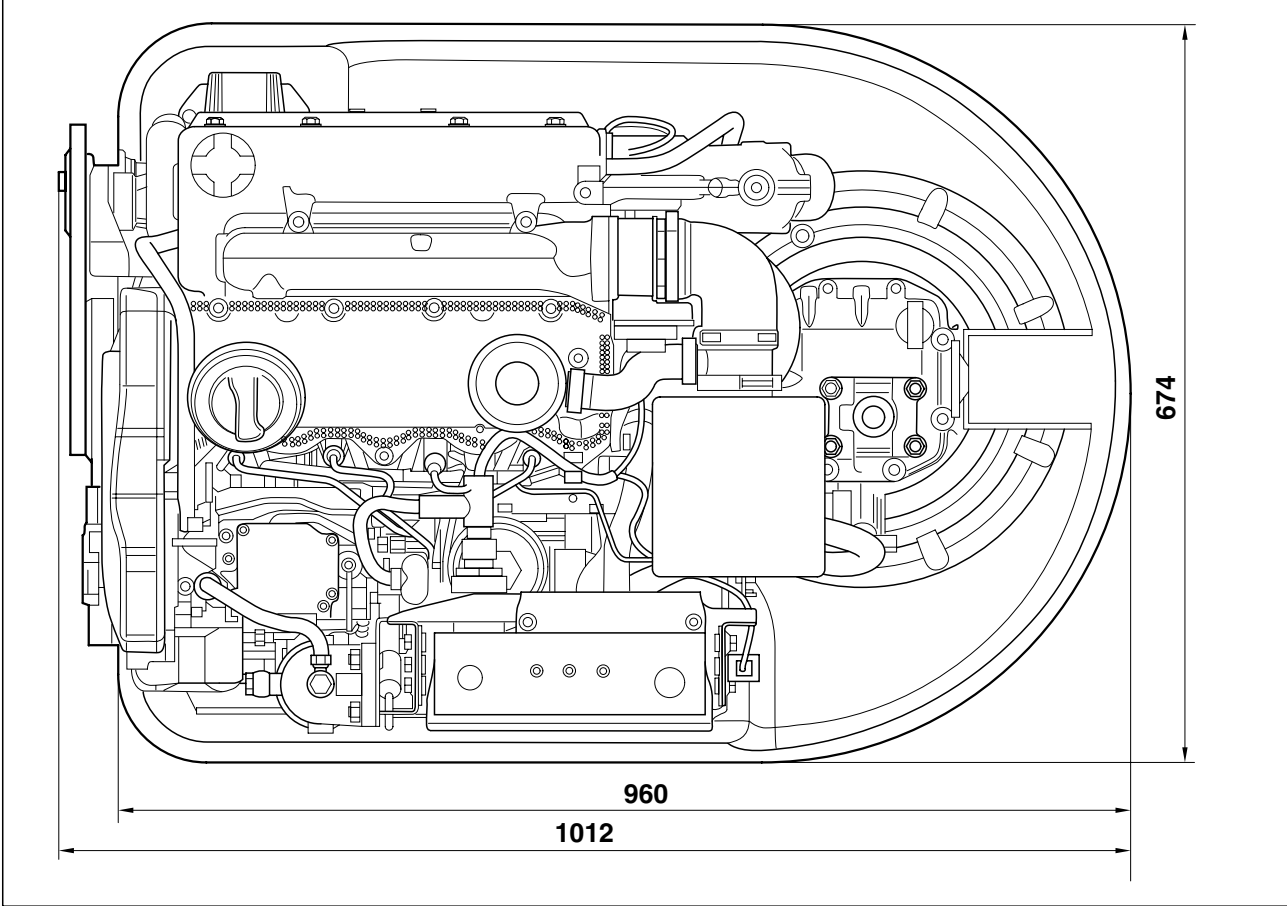
Lateral view



EB4-0031

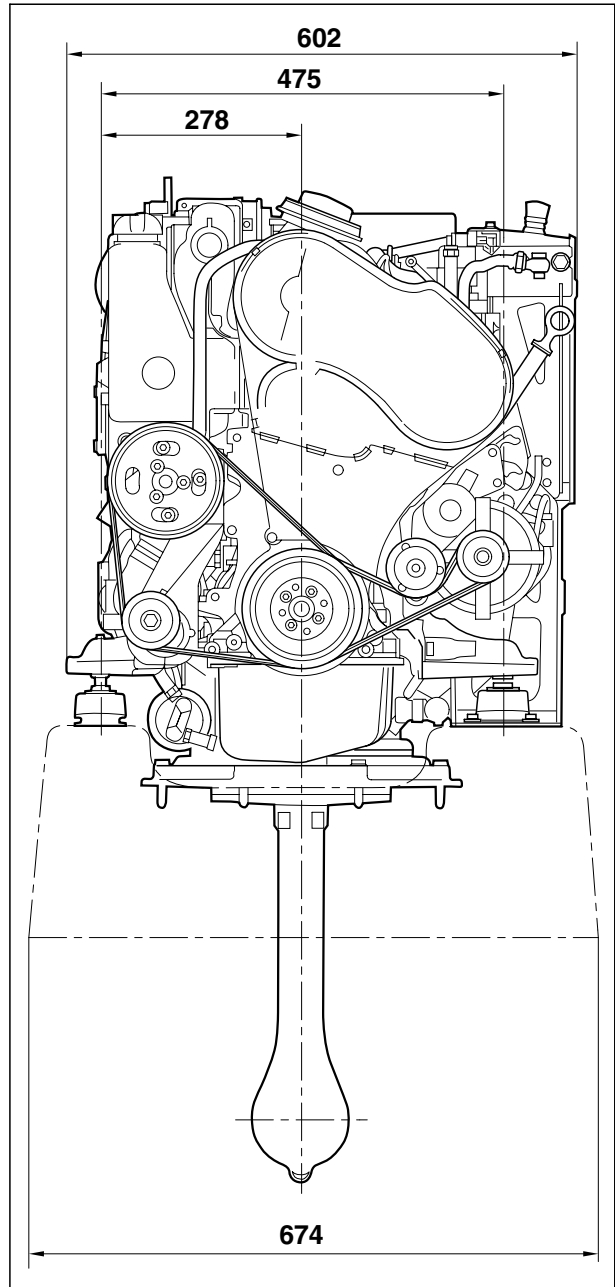
Engine installation dimensions

Top view



EB4-0032

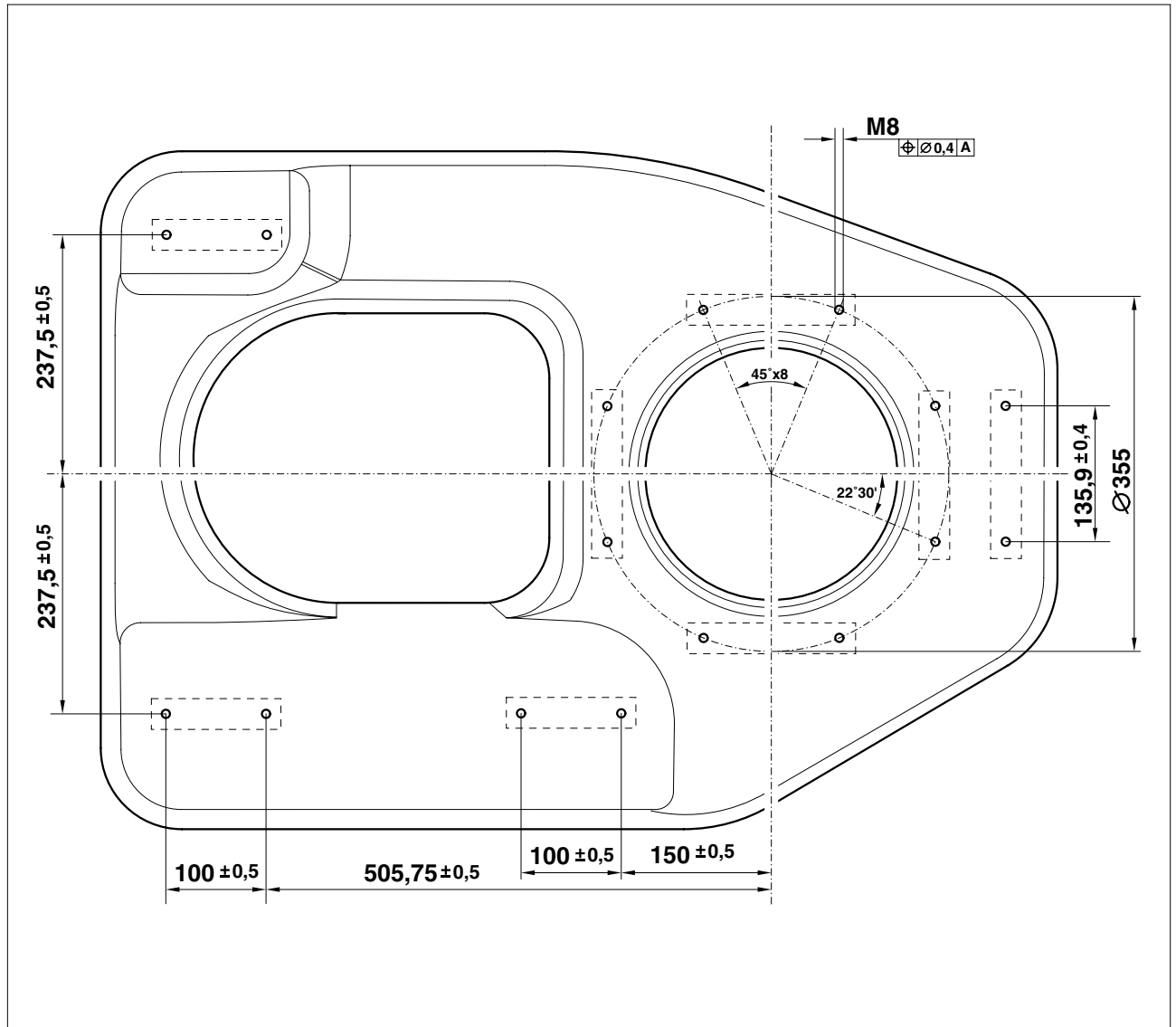
Front view



EB4-0033

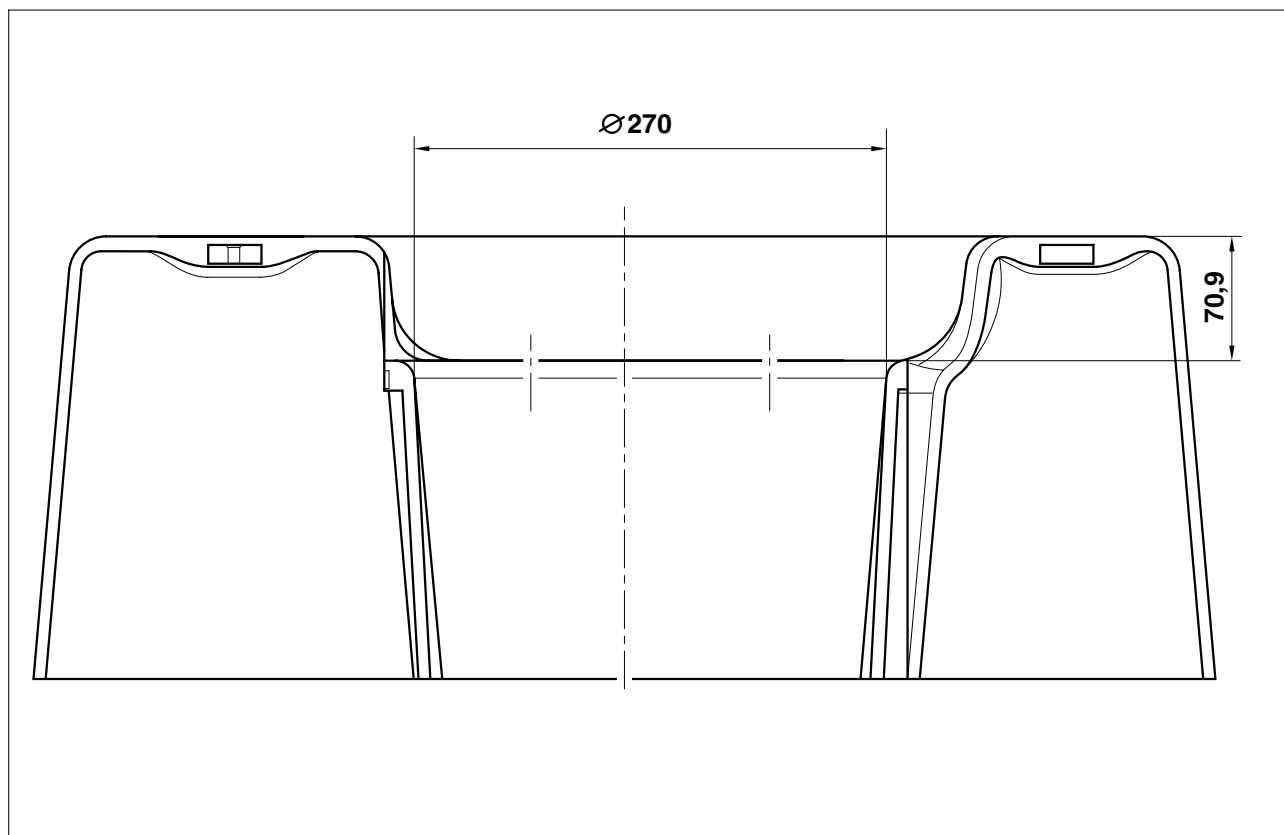
Subframe installation dimensions

Top view



EB4-0054

Front view



EB4-0055

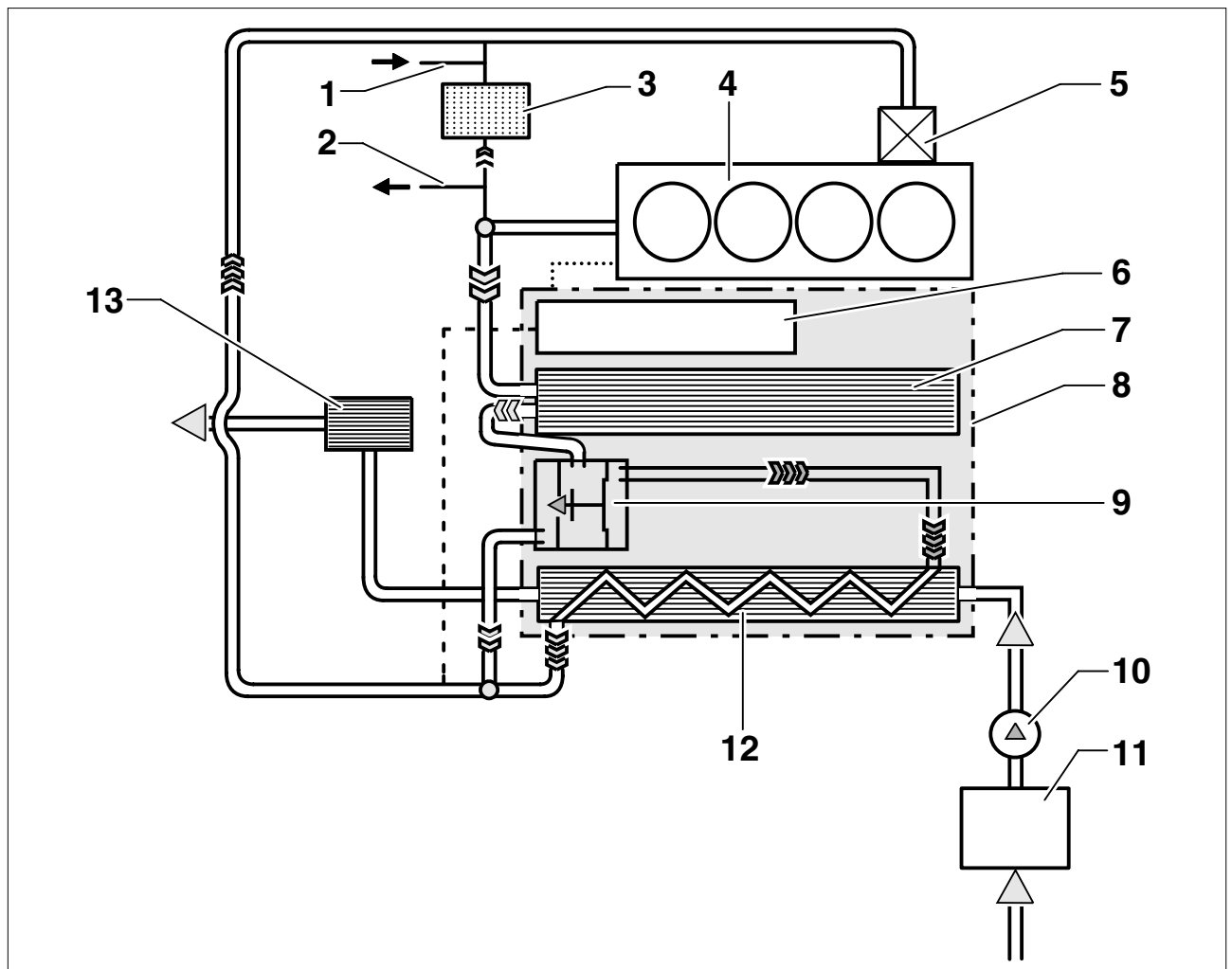
Cooling system

Introduction

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

The sea water circuit (secondary circuit) is an open circuit into which the sea water is induced, passed through a heat exchanger and is returned outboards via the exhaust system.

Cooling circuit



EB4-0044

Key

- | | |
|-----------------------------------|-------------------------|
| 1. Boiler kit connection (return) | 8. Radiator package |
| 2. Boiler kit connection (supply) | 9. Thermostat |
| 3. Oil cooler | 10. Seawater pump |
| 4. Engine | 11. Seawater filter |
| 5. Coolant pump | 12. Main heat exchanger |
| 6. Coolant expansion tank | 13. Exhaust header |
| 7. Exhaust plenum | |

Seawater circuit

The seawater enters the cooling system via the Saildrive and a subsequent seawater valve. A seawater filter holds back impurities.

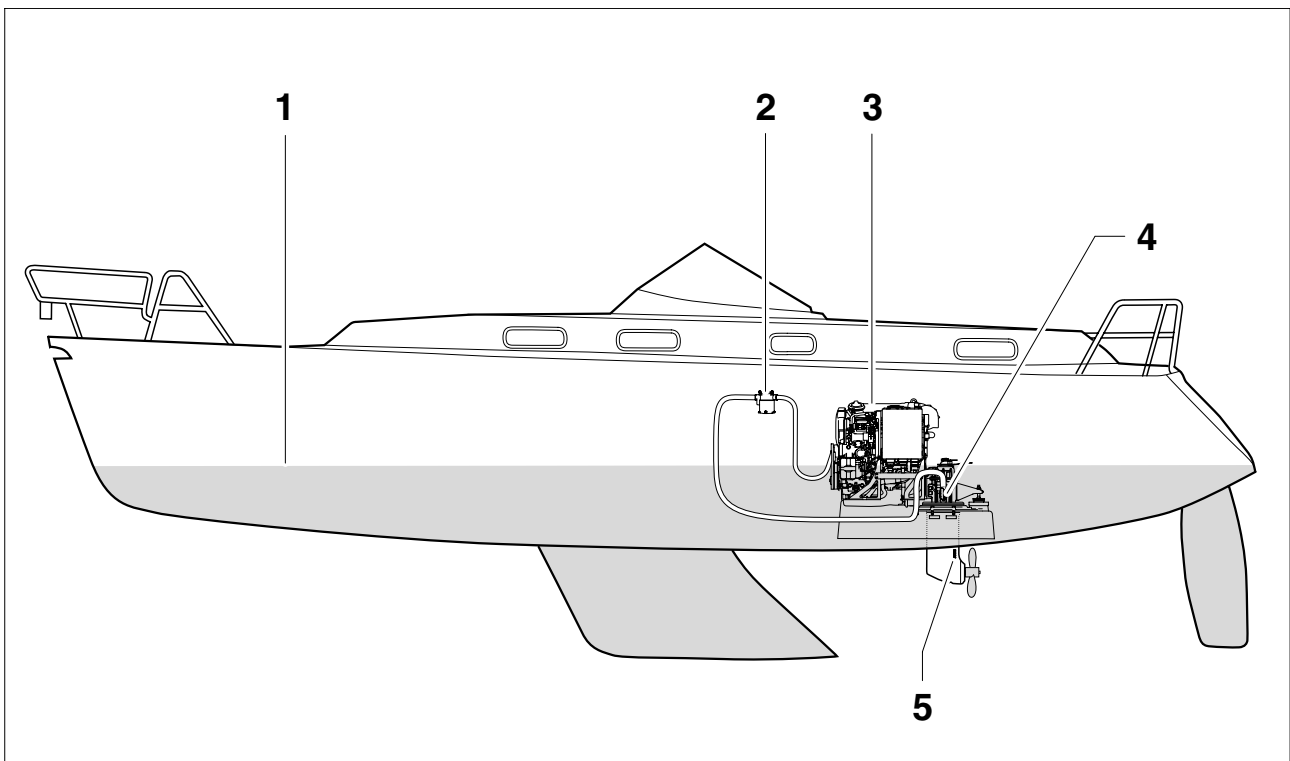
Bleeding of seawater circuit with a bleeding unit

To prevent ingress of seawater into the exhaust system via the supply side of the seawater circuit, a bleeding unit must be used (see illustration on page 12, item 6; Installation overview of an exhaust system of an SDI engine with Saildrive).

Note

If the cooling system is below the waterline, the exhaust system may fill with water when the boat has not been in use for some time. This is caused by a not 100 % tight seawater pump and a lifting effect in the cooling circuit. In this case, the seawater valve must be closed.

Installation overview of seawater cooling



EB4-0034

Key

1. Waterline
2. Seawater filter
3. Engine
4. Seawater valve
5. Intake

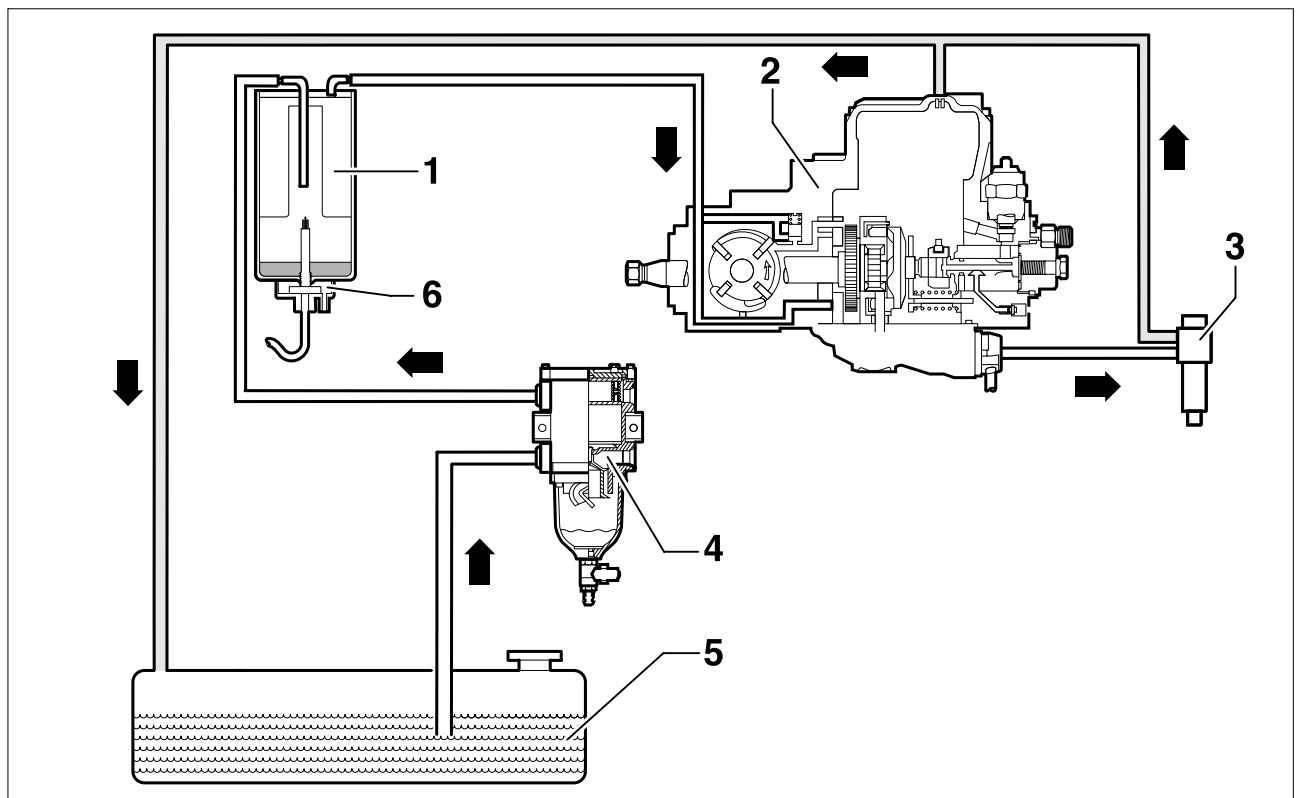
Fuel system

Introduction

The fuel system comprises several components. These components (fuel tank, circulation and fuel filter with water separator etc.) must be installed with great care and must be kept absolutely clean.

Any soiling may lead to engine malfunctions. To achieve the highest possible level of safety against fire, the fuel system must be checked for leaks after installation.

Operating description of fuel system



EB4-0015

Key

1. Prefilter
2. Injection pump
3. Injector
4. Circulation pre-filter with water separator
5. Fuel tank
6. Water sensor



Ensure that the instructions on the following page are observed!



- The installation space of the fuel system must be sufficiently ventilated. The fuel tanks and the filler neck must have an earthed connection to the battery (to the steel hull on steel boats).
- When arranging the components, ensure sufficient space for maintenance and repair work.
- The fuel supply line must be routed from the fuel tank to the circulation pre-filter with the water separator to the fuel main filter.
The line diameter must be at least 8 mm.
- A fuel return line must be routed to the fuel tank.
The line diameter must be at least 8 mm.
- Fuel lines, seals and fittings must be suitable for RME (Rape-Methyl-Ester, "Biodiesel"), see "Technical data" on page 39.

Engine compartment ventilation

Introduction

Diesel engines require a high amount of air. An insufficient air supply leads to increased black smoke and significantly reduced engine power.

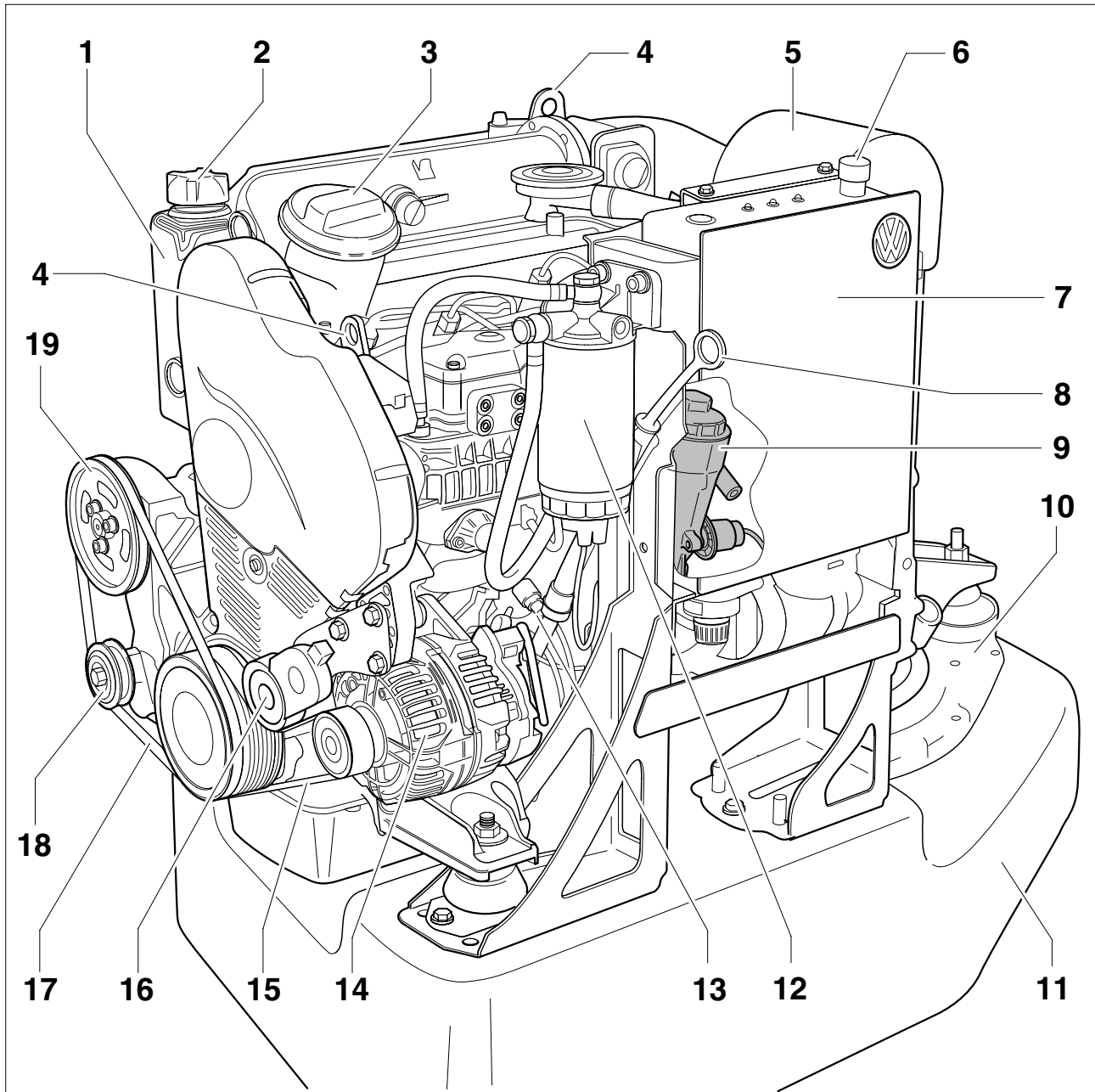


- To ensure an optimal fuel combustion, the engine must be supplied with sufficient air (oxygen).
- The engine bay must be sufficiently ventilated to keep the temperature at the lowest possible optimal level (ΔT_{\max} above ambient temperature: 10 °C to 5 °C).



- The air intake must be located in a position where only clean air is induced and the induction of the engine's exhaust gas is prevented.
- Water may not enter the air inlet and outlet.
- The cross-section of the air intake must be 80 cm².
- If other devices (e.g. an auxiliary heater) requiring air for combustion are installed in the engine bay, this must be considered in the layout of the air intake.

Component overview

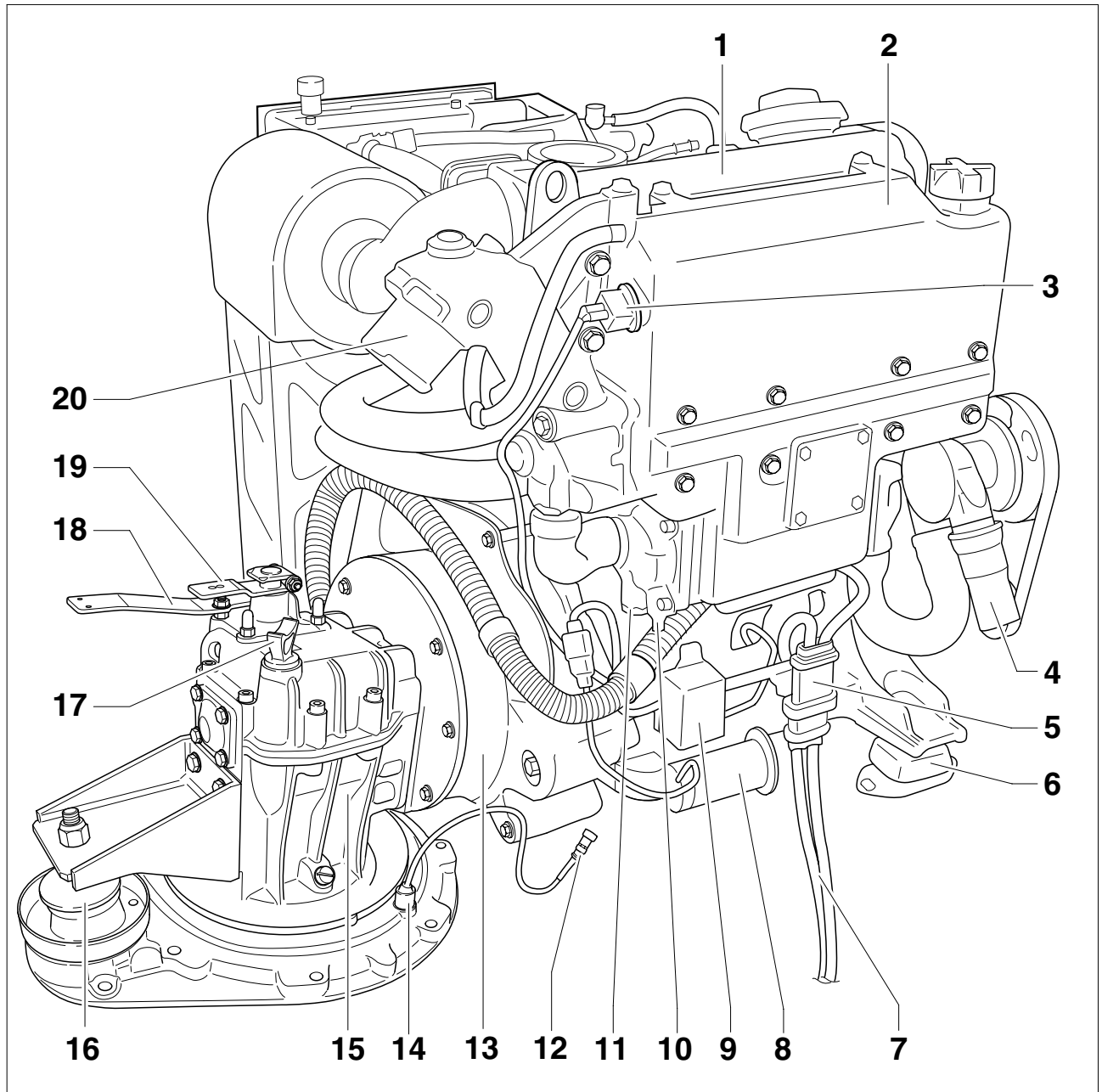


EB4-0046

Key

- | | |
|--|--|
| 1. Radiator package | 11. Subframe |
| 2. Coolant cap (use coolant G12, red colour) | 12. Fuel pre-filter (see maintenance instructions for service intervals) |
| 3. Oil filler neck | 13. Coolant drain plug |
| 4. Lifting eye | 14. Alternator |
| 5. Air filter | 15. Alternator drive belt |
| 6. Stop button | 16. Tensioner |
| 7. Central electric unit | 17. Seawater pump drive belt |
| 8. Oil dip stick | 18. Tensioner |
| 9. Oil filter | 19. Seawater pump |
| 10. Saildrive | |

Component overview



Key

- | | |
|---|--|
| 1. Intake manifold | 11. Reactive anode |
| 2. Radiator package | 12. Water sensor cable with connector |
| 3. Coolant level sensor | 13. Gearbox bell-housing for Saildrive |
| 4. Connecting hose to seawater filter | 14. Water sensor in Saildrive |
| 5. Engine connector | 15. Saildrive |
| 6. Engine mount | 16. Saildrive engine mount |
| 7. Battery cable with high-capacity connector | 17. Oil dip stick/filler neck |
| 8. Oil extraction pump | 18. Throttle cable bracket |
| 9. Earth switch-off relay | 19. Saildrive shift lever |
| 10. Coolant drain plug | 20. Exhaust-pipe flange |

EB4-0047

Engine description

Displacement	cm ³	1896
Bore/stroke	mm	79.5/95.5
Compression ratio		19.5: 1
Firing order		1-3-4-2

Output (acc. to ISO 3046 with Marine control unit)

SDI 40-4	at 2600 1/min	kW	29
SDI 50-4	at 3000 1/min	kW	37
SDI 60-4	at 3600 1/min	kW	44

Weight

SDI 40-4	kg	approx. 198
SDI 50-4	kg	approx. 198
SDI 60-4	kg	approx. 198

Maximum operating inclination

↕	15°	in all directions
	30°	short-term

Permissible engine operating data

Engine oil temperature

max. permissible temp. °C (°F) 130 (266)
in oil pan

Permissible coolant temperature

max. permissible temp. °C (°F) 105 (221)
at engine outlet during continuous operation

Electrical engine equipment

Alternator

12 V A 90

Starter 12 V kW 1.8

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

Pencil-type glow plugs V 12

Control unit

Type Bosch EDC 15 V +

Fault-code memory present:

Data retrieval with fault-code reader
V.A.G 1552/1551 or Diagnosis, Measuring and
Information System VAS 5052/5051.

Technical data

Cooling system

Dual-circuit cooling system comprising a gauge-pressure circuit with separate expansion tank and pressure-relief valve and a seawater circuit with an impeller pump.

Pressure-relief valve

Opening pressure (bar) 1.3 - 1.5

Thermostat

Beginn of opening °C (°F) 80 (189)

Coolant

Use a mixture of 60 % water and 40 % coolant additive G12 in accordance with TL VW 774D.

Fuel

Diesel as per DIN EN 590

minimum Cetan rating CZ > 49

Rape-Methyl-Ester ('Biodiesel')
as per DIN EN 51606

Lubrication system

Engine oil quality

Use only brand-name quality oils as specified in the Owner's Manual

Oil pressure

minimum pressure at 2000 1/min and 80 °C (176 °F)
engine oil temperature: 2.0 bar

Oil consumption

(max.) l/10 h 0.05 - 0.1

Capacities

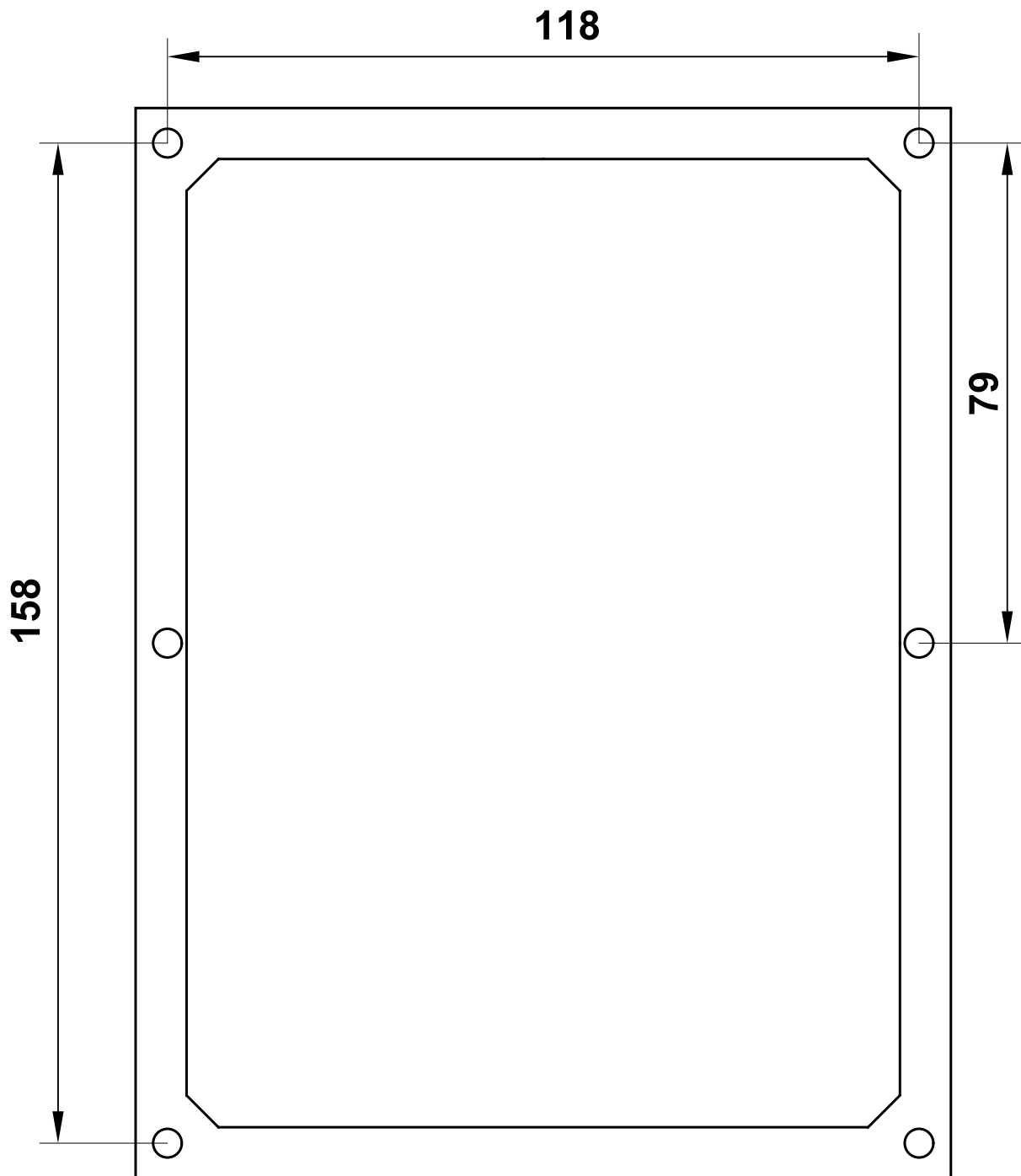
Cooling circuit ltr. approx. 8

Lubrication system

with filter ltr. 4.2 - 4.5

Difference between Min. and Max mark on oil dip stick ltr. approx. 1.0

Installation template for flybridge instrument panel



EB5-0076





Installation Instructions EB03

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