Voith Turbo

VOITH

Aftersales Service Manual Voith Retarder VR 115 E

153.00009710 I 2005-11

Table of Contents

1. About this Document

1.1 Purpose of this Document

This Aftersales Service Manual provides information and instructions on maintenance and repair of the Voith Retarder VR 115 E.

1.2 Target Groups

This Aftersales Service Manual is intended for service people for service and diagnoses only and may not be reproduced or given to third parties.

1.3 Other Applicable Documents

Documents	Information	Item number
Voith retarder oil change intervals/oil specification list	Oil change intervals and approved oil types	153.000831xx
Operating instructions for Voith Retarder VR 115 E	Information on the safe, professional and economical operation of the Voith Retarder VR 115 E	H67.2964xx
Cooling water quality list	Approved coolants	H67.2224xx
Operating instructions for retarder tester	Measured values for constant-air pressure and pump pressure	Included in scope of delivery of the retarder tester(153.001085xx)
Operating instructions for Diana-Lite test software	Information on the testing of: • Constant-Air Pressure Control Loop • pump pressure (p_{dyn})	Included in the scope of delivery of the Diana-Lite test software (153.000776xx)
Operating instructions for the WinDia diagnostic software	Instructions on PC diagnosis for the Digiprop and VERA^{TM} controllers	3623-020900
Gearbox-specific documents on the retarder	Information on safe, professional installation and removal of the retarder	On request

1.4 Symbols and Identifications

Structure of warnings

LEVEL OF DANGER

Type and source of danger!
Possible consequences if not observed.
⇨ Measures for the prevention of danger and its consequences.

Levels of danger

The warnings are categorized into four levels of danger:

CAUTION

Potentially hazardous situation which, if not avoided, may result in property damage.

⚠ CAUTION

Potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

⚠ WARNING

Potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ DANGER

Imminently hazardous situation which, if not avoided, will result in death or serious injury.

Notes

NOTE

Information on easier and safer work with the retarder.
⇨ Measures for easier and safer work with the retarder.

Distinctions

⇨ One-step action instruction.

1. First step of an action instruction. Other steps follow and are numbered in sequence.

1.5 Item Numbers

The item numbers used are usually found in the spare parts lists.

Exceptions:

- One- or two-digit item numbers
- Item numbers with a slash

1.6 Legal/Contact Information

For questions and work procedures not described in these documents, contact the respective organisation for your area.

Voith Turbo
Produktgruppe Retarder

Postfach 1555
74555 Crailsheim
Deutschland

Phone: 00 49 79 51 / 32-401, 32-422, 32-1860
Fax: 00 49 79 51 / 32-756
service-retarder@voith.com
www.voith.com

2. Basic Safety Information

2.1 Product Safety

The retarder is constructed according to state of the art technology and acknowledged safety regulations.

Nevertheless, hazardous situations and property damage may occur as a result of improper usage, maintenance and repair.

⇨ Observe safety and warning information.

2.2 Staff Qualification

⇨ Allow only qualified professionals to carry out repair and maintenance work.

2.3 Safety-Conscious Working

Voith does not assume any liability for personal injury and/or property damage caused by improper and unprofessional work.

⇨ Observe the following regulations:

- Accident-prevention regulations
- Other generally acknowledged safety regulations and occupational health
- Motor vehicle regulations
- Safety regulations for handling chemical substances such as oils and greases

2.4 Environmental Protection

⇨ Drained fuels and fluids, consumables and old parts must be disposed of properly.

2.5 Troubleshooting

Voith provides a warranty/goodwill service for defective parts only.

⇨ Do not replace parts on mere speculation.

2.6 Maintenance and Repair

Danger of burning and scalding via squirting oil!

The oil in the retarder may be hot.

⇨ Work carefully.

Danger of burning and scalding via hot coolant!

The coolant may be hot.

⇨ Work carefully.

Danger of burns via hot parts!

Parts of the retarder may be hot.

⇨ Work carefully.

⇨ Wear protective gloves or use cloths if necessary.

Damage to property via soiled parts!

Considerable damage or malfunctions may occur due to soiling.

⇨ Ensure cleanliness.

Damage to property via improper cleaning!

⇨ Do not aim the jet of a high-pressure cleaner (steam-jet device) at valves, pressure sensors or ventilators of the retarder.

2.7 Driving Mode

⇨ Ensure that the retarder is fully functional for all vehicle maneuvers, i.e.:

- Retarder properly filled with oil
- Retarder electronics connected and functional
- Pneumatic control connected and functional

Driving after repair/oil change

Oil ejection!

De-aeration not performed.

⇨ De-aerate retarder.

- Switch off retarder foot control if present and possible
- Move vehicle at 50 km/h
- Activate retarder at brake stage one five times for approx. 5 sec. each time

Towing

⇨ Tow vehicle with retarder max. 100 km at max. 40 km/h.

Parking

⇨ Do **not** use retarder as a parking brake, as it does not act as a brake when the vehicle is standing still.

Failure while driving

During failure of the retarder, or while temperature adaptation is active, only the service brake is functional.

⇨ Adjust the speed of the vehicle with the service brake.

⇨ Engage the lowest possible gear to achieve a high engine speed.

⇨ Continue driving in this way until the retarder is available at full capacity again.

2.8 Warranty

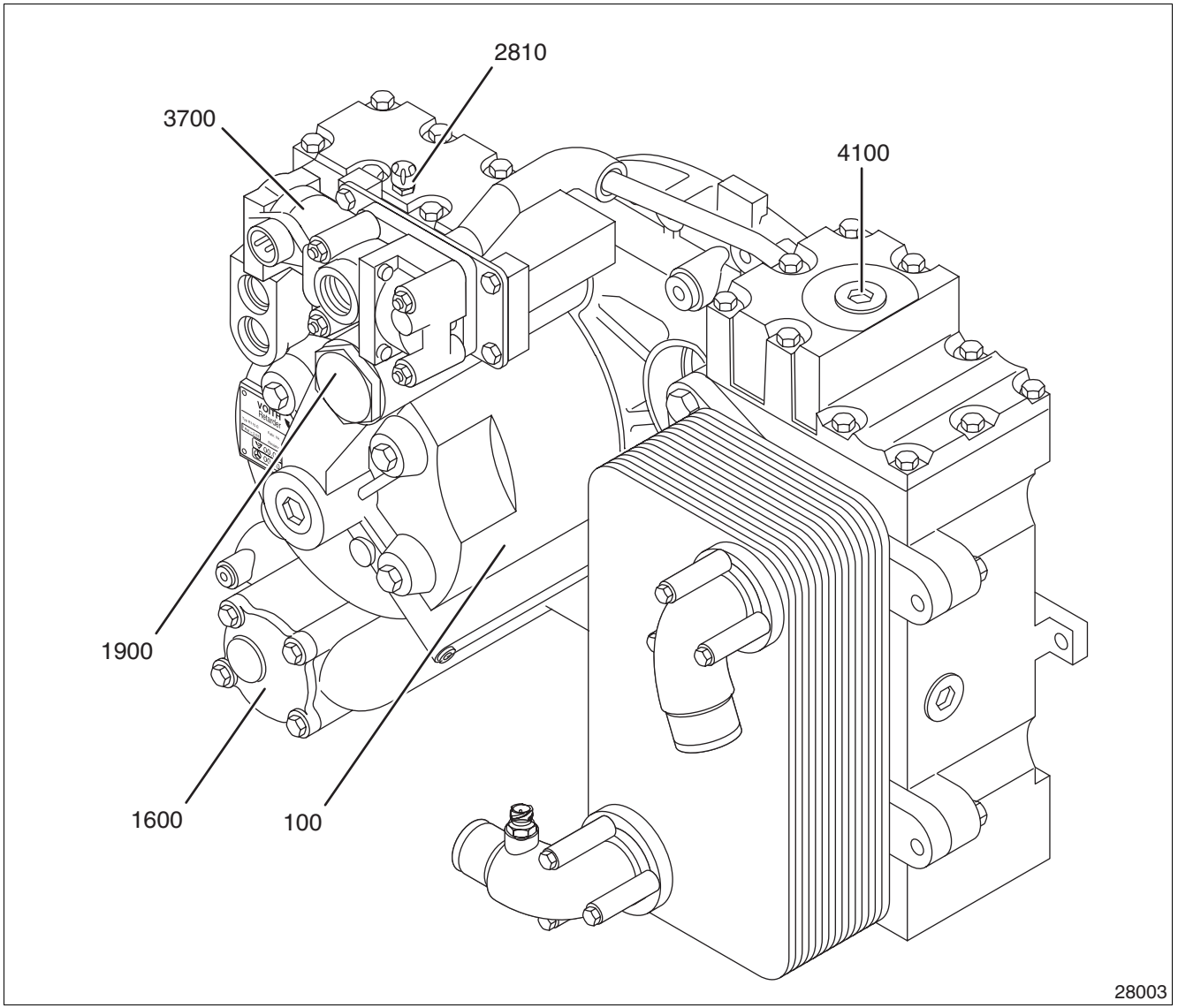
Voith accepts no liability for damage caused by changes to the retarder or the use of spare parts, accessories, attachments and special features not tested and approved by Voith.

⇨ Use only parts approved by Voith to ensure the safety of the vehicle.

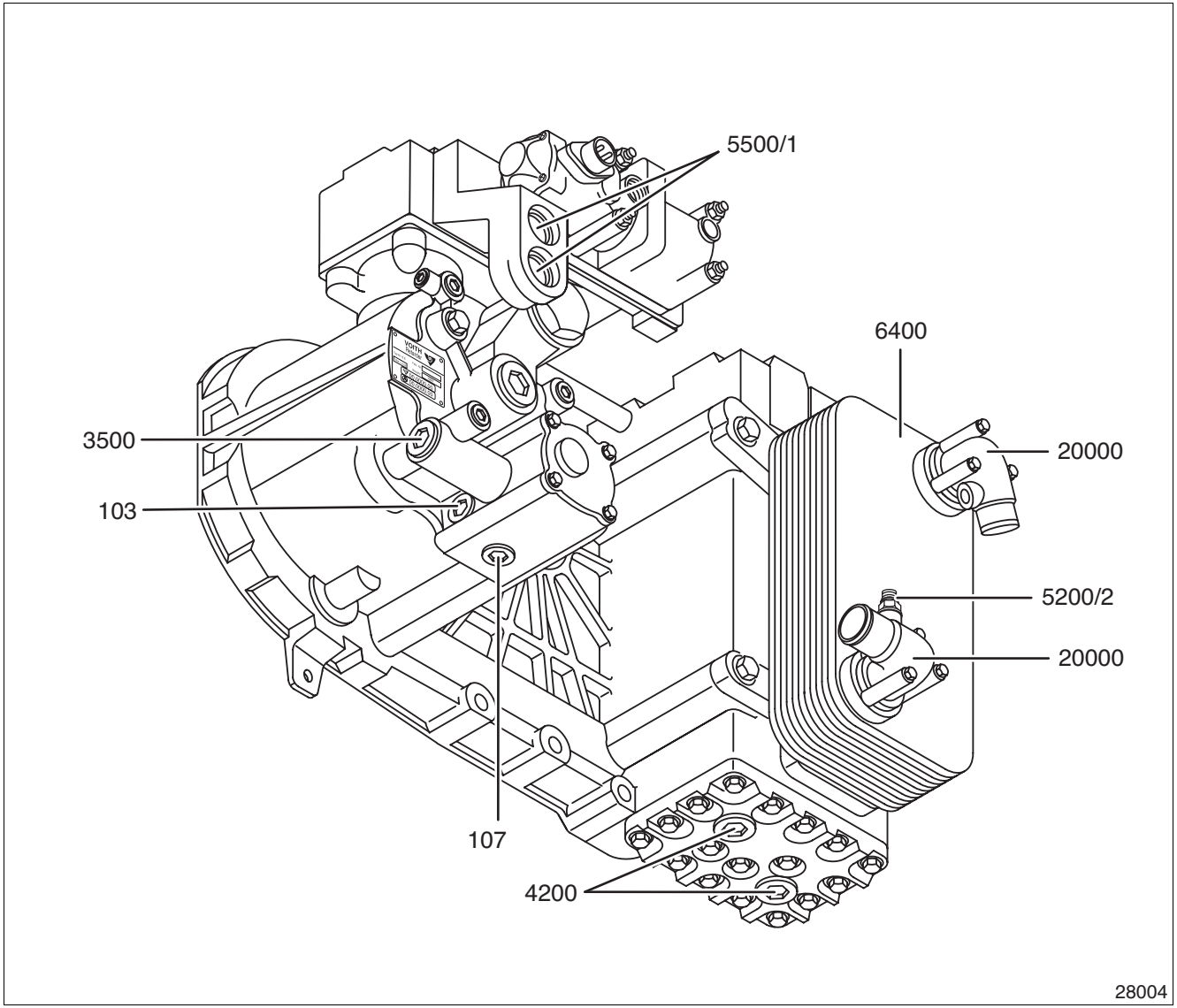
3. Design and Function

3.1 Overview of the Modules

Item No.	Designation
100	Retarder housing
1600	Valve cover (non-return valve outlet)
1900	Non-return valve inlet
2810	Vent and air filter
3700	Proportional valve
4100	Screw plug M30x1.5 (oil filler plug)



Item No.	Designation
103	Screw plug M12x1.5
107	Screw plug M24x1.5 (oil drain plug)
3500	Screw plug M30x1.5
4200	Screw plug M24x1.5 (oil drain plug)
5200/2	Coolant temperature sensor M14x1.5
5500/1	Ventilation
6400	Heat exchanger
20000	Water neck

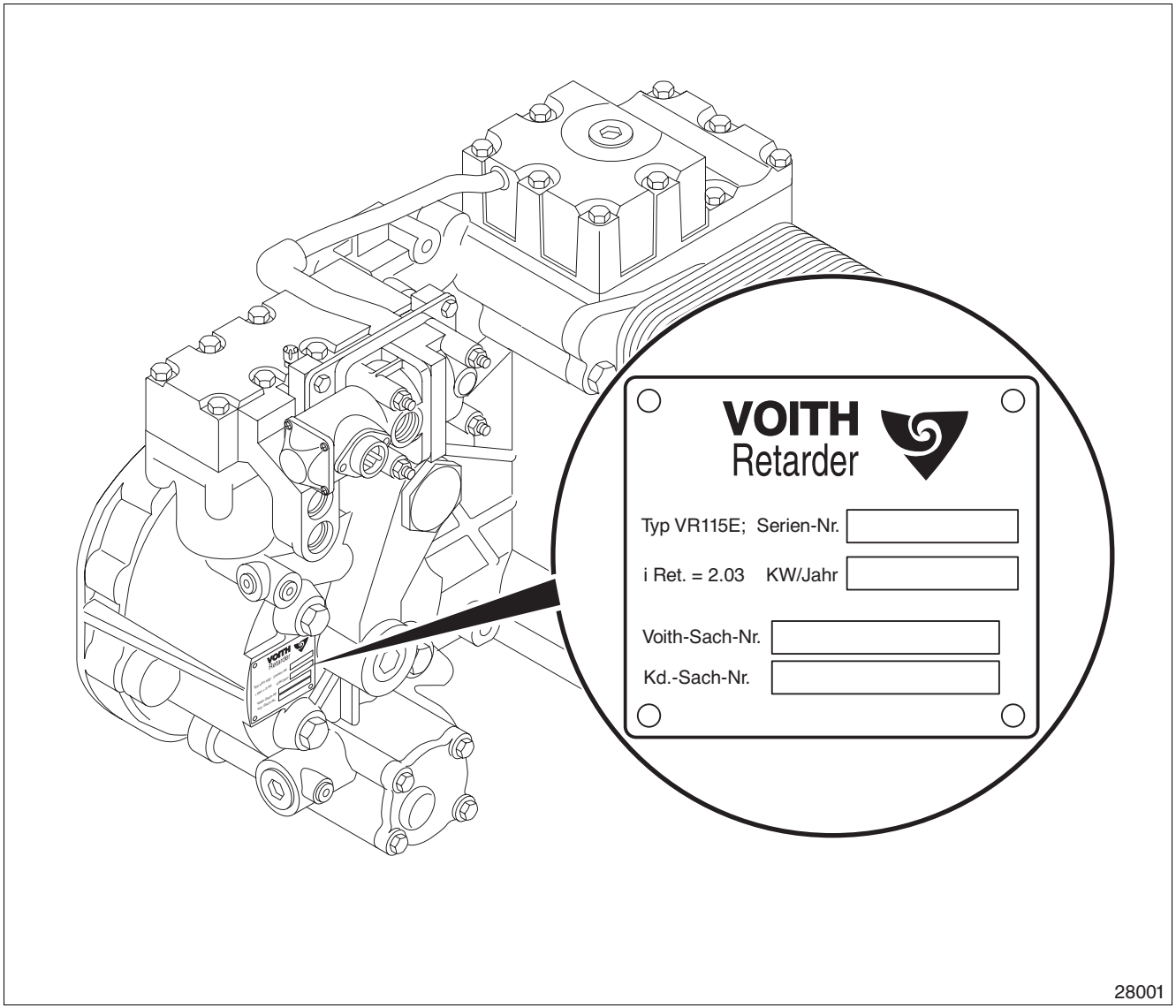


3.2 Retarder Identification

NOTE

⇨ Specify the following data in case you have questions or are ordering spare parts:

- Serial number (Serien-Nr.)
- Voith item number (Voith-Sach-Nr.)

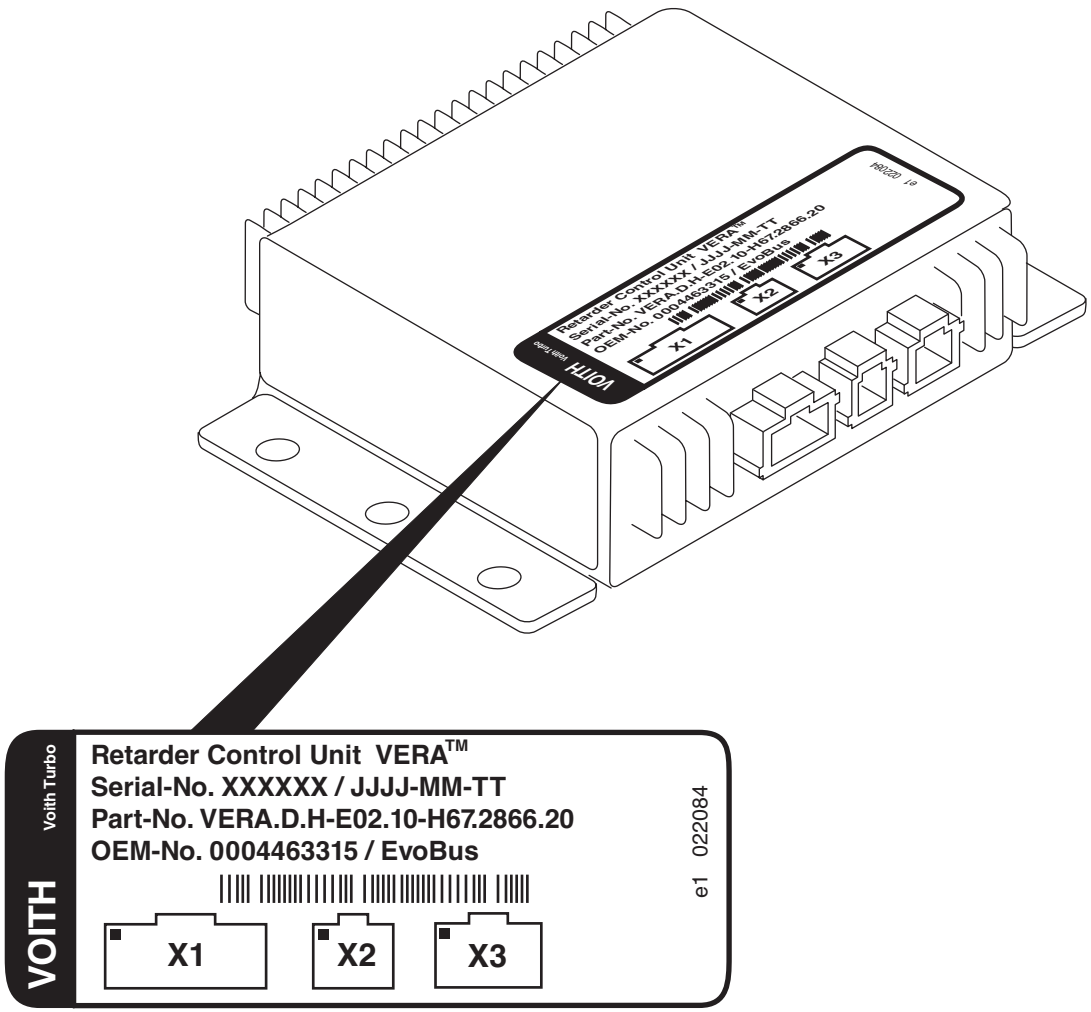


3.3 Controller Identification (VERA^{TM})

Example:

NOTE

- ⇨ Specify the following data in case you have questions or are ordering spare parts:
  - Serial number (Serial-No.)
  - Part number (Part No.)
- ⇨ Specify the following data of the retarder (see page 14):
  - Serial number (Serien-Nr.)
  - Voith item number (Voith-Sach-Nr.)

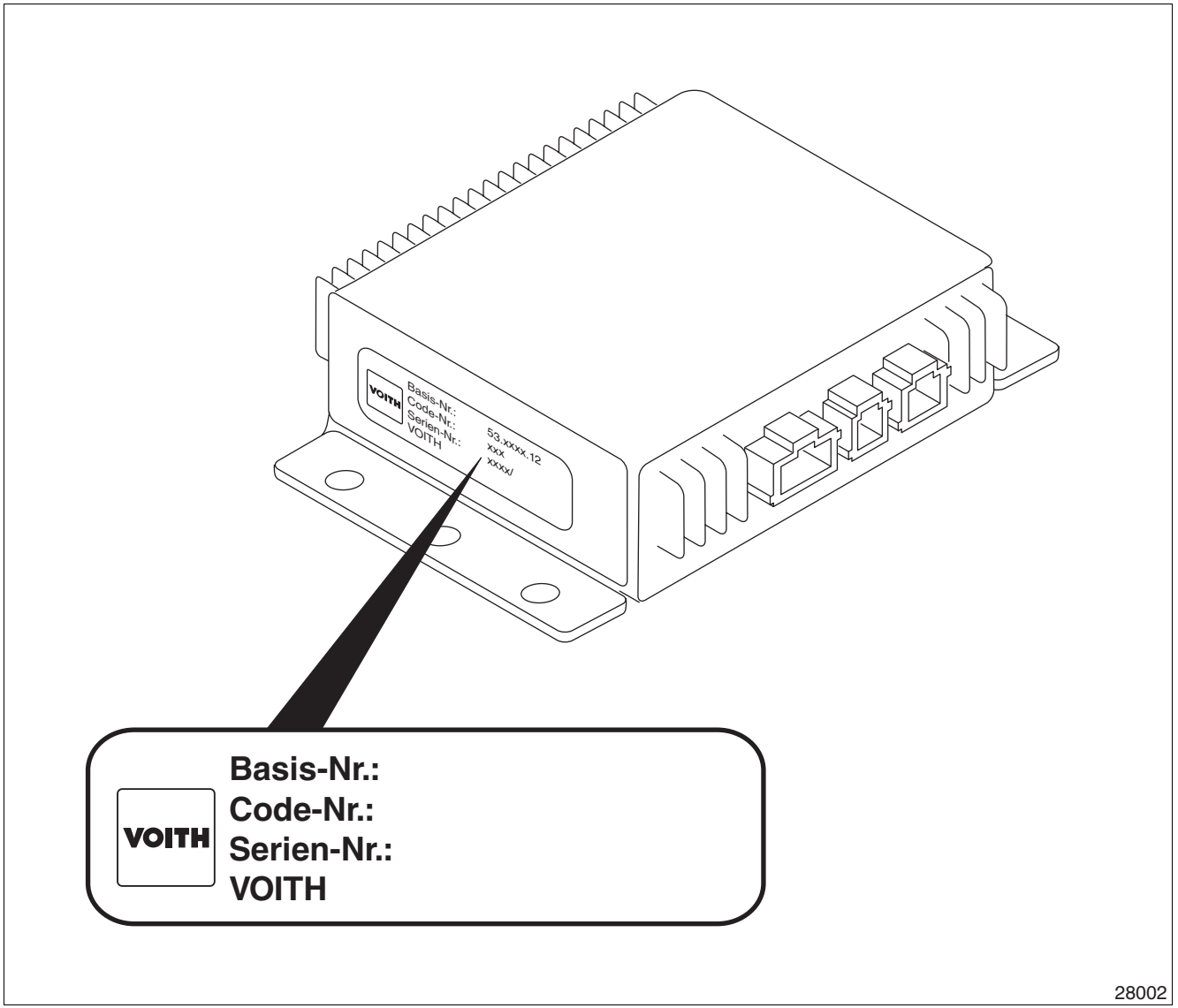


3.4 Controller Identification (Digiprop)

Example:

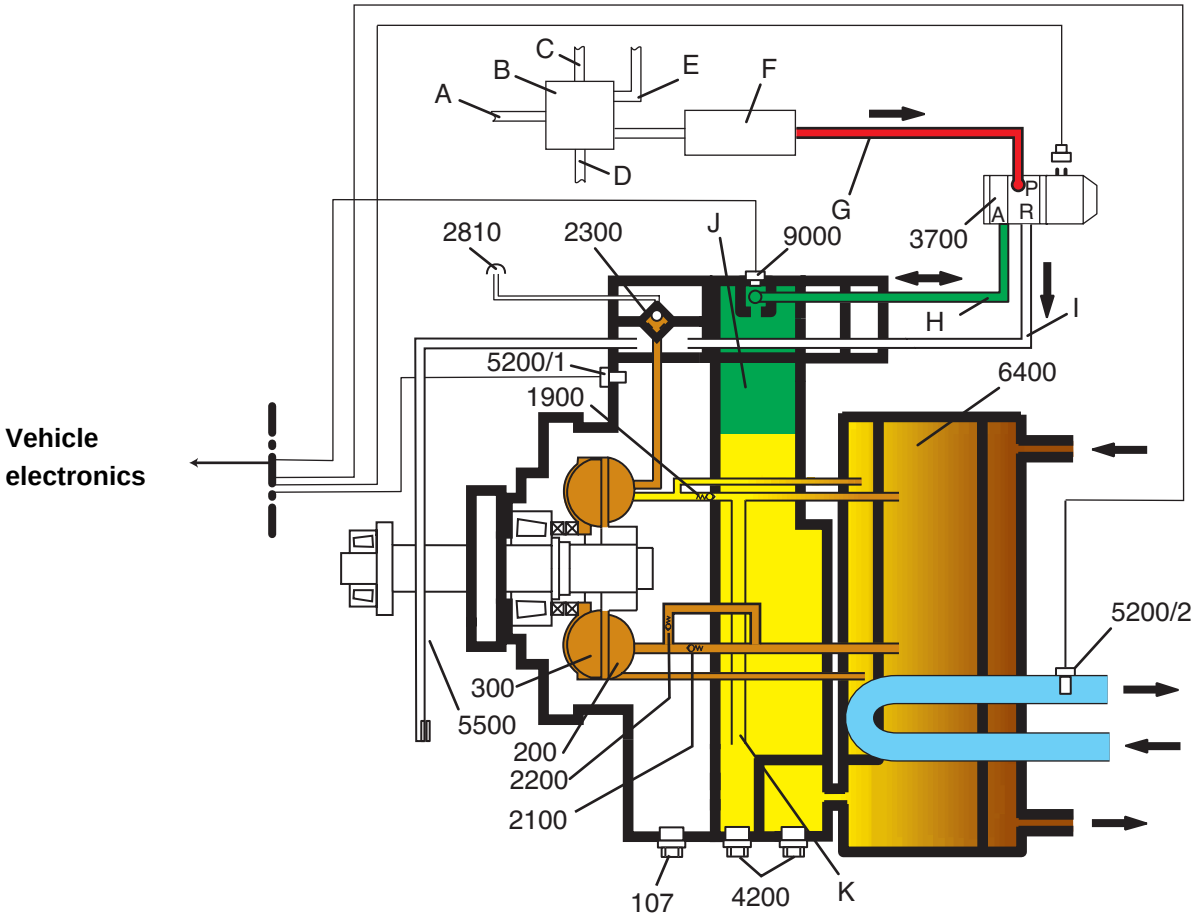
NOTE

- ⇨ Specify the following data in case you have questions or are ordering spare parts:
  - Basic number (Basis-Nr.:)
  - Serial number (Serien-Nr.:)
- ⇨ Specify the following data of the retarder (see page 14):
  - Serial number (Serien-Nr.)
  - Voith item number (Voith-Sach-Nr.)

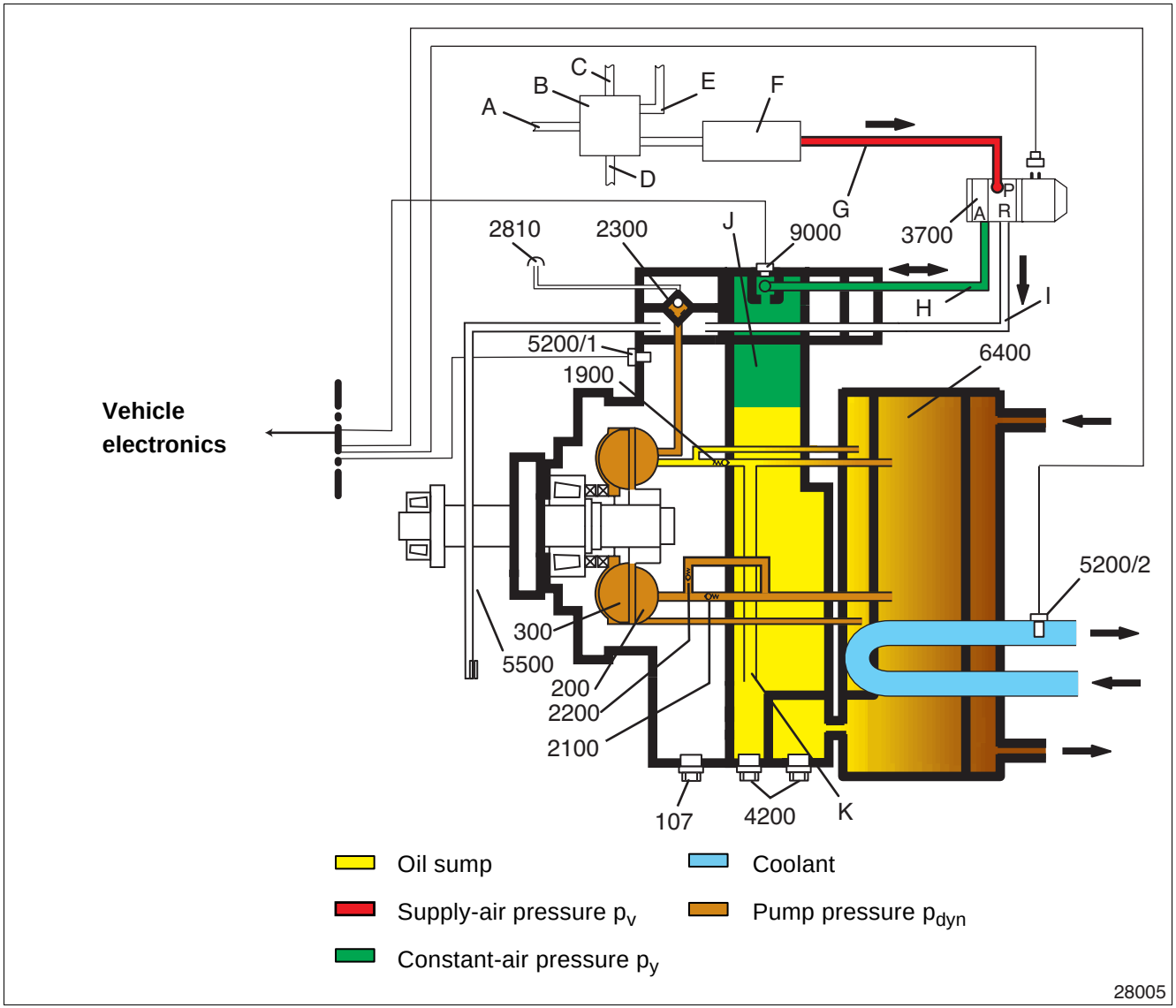


3.5 Function and Control Scheme

Item No.	Designation
A	Compressed-air line (pressure controller)
B	Four-circuit protection valve
C	Compressed-air line (brake circuit 2)
D	Compressed-air line (brake circuit 1)
E	Compressed-air line (parking brake)
F	Air tank for auxiliary equipment
G	Supply-air pressure (p_v) "P"
H	Constant-air pressure (p_y) "A"
I	Ventilation line "R"
J	Oil tank
K	Rising duct
107	Oil drain plug
200	Stator
300	Rotor
1900	Non-return valve (inlet)
2100	Non-return valve (outlet)
2200	Pressure control valve



Item No.	Designation
2300	Casing ventilation
2810	Ventilation filter
3700	Proportional valve
4200	Oil drain plug
5200/1	Oil temperature sensor
5200/2	Coolant temperature sensor
5500	Ventilation
6400	Heat exchanger
9000	Pressure sensor



3.6 Function Description

Non-return valve (inlet) (1900)

When the retarder is switched on, the oil sump is pressurized. This opens the non-return valve (inlet) (1900) and allows oil into the working space.

Non-return valve (outlet) (2100)

In braking mode, the oil reaches the heat exchanger from the working space via the non-return valve (outlet) (2100), is cooled down and is fed back into the system circuit.

Pressure control valve (2200)

In no-load operation of the retarder, the pressure control valve (2200) regulates the lubrication.

Casing ventilation (2300)

At the beginning of the braking process, the oil expels the air located in the system circuit from the retarder via the casing ventilation (2300) and a de-aeration filter (2810).
Once the system circuit is free of air, a float will rise and seal the casing ventilation.

Proportional valve (3700)

Depending on the intensity of the electric input signal, the proportional valve (3700) issues a pneumatic constant-air pressure which acts on the oil tank of the retarder.

Oil temperature sensor (5200/1) and coolant (5200/2)

The temperature sensors are screwed into the cooling system of the vehicle (return pipe from retarder to heat exchanger) and in the oil duct of the retarder. The temperature sensors pass on information on the temperature of the coolant and oil to the controller.

Maximum values for the temperature of coolant and oil are set in the controller for protection of the cooling system and the retarder. To prevent the values being exceeded, the controller adapts the braking torque of the retarder accordingly via the constant-air pressure p_y.

The braking torque and the heat produced regulate themselves until an equilibrium has been reached between the braking force and the heat dissipated via the vehicle cooling system.

If the temperature limit is exceeded during braking, the braking torque is adapted to protect the cooling system and retarder.

If the critical temperature threshold has been exceeded, the braking torque is no longer active.

The controller also adjusts the braking torque if the temperature of the oil increases rapidly, regardless of the actual temperature of the oil.

During temperature adaptation or failure of the retarder, you must use the service brake to slow down the vehicle.

Pressure sensor (9000)

The pressure sensor (9000) measures the pneumatic constant-air pressure. A deviation from the allowed pressure tolerance is recognized as a fault and displayed by the controller.

4. Maintenance and Service

4.1 Maintenance Intervals

The maintenance intervals depend on the stress put on the retarder.

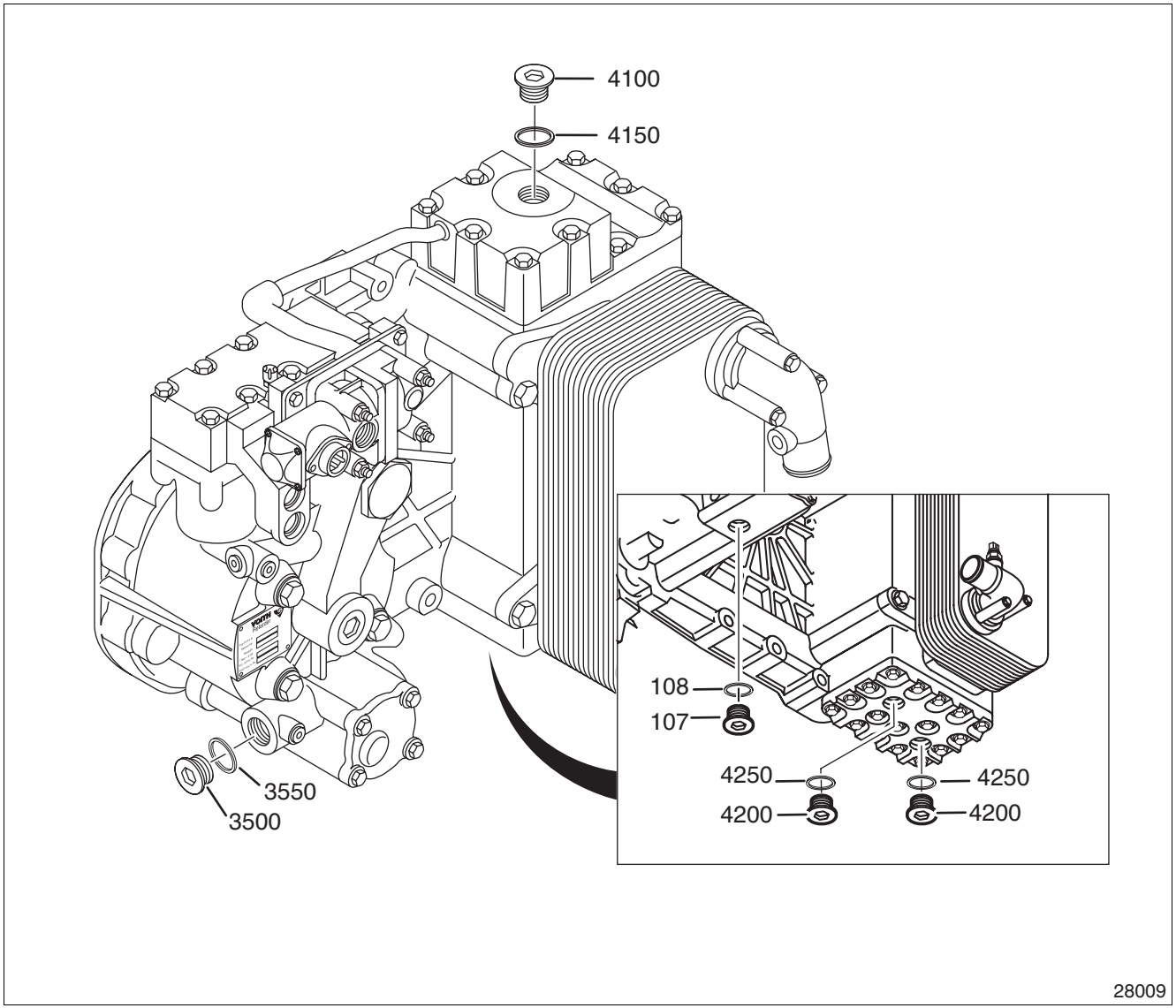
Activity	Interval	See
Change oil	⇨See document: Oil change intervals/ oil specification list 153.000831xx	Page 22
Check oil level	–	Page 25
Drain coolant	⇨Observe specifications of vehicle manufacturer	Page 28

4.2 Oil Change

Item No.	Designation
107	Screw plug M24x1.5, hexagon socket head, w.a.f. 12, with copper sealing ring: 80 Nm with integrated sealing ring: 47 Nm
108	Sealing ring A24x29, replace
3500	Screw plug M30x1.5, hexagon socket head, w.a.f. 17, with copper sealing ring: 130 Nm with integrated sealing ring: 100 Nm
3550	Sealing ring A30x36, replace
4100	Screw plug M30x1.5, hexagon socket head, w.a.f. 17, with copper sealing ring: 130 Nm with integrated sealing ring: 100 Nm
4150	Sealing ring A30x36, replace
4200	Screw plug M24x1,5, hexagon socket head, w.a.f. 12, with copper sealing ring: 80 Nm with integrated sealing ring: 47 Nm
4250	Sealing ring A24x29, replace

NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.



NOTE

⇨ Observe the reduced tightening torque with the integrated sealing ring.

The copper sealing ring variant is described in the instructions.

CAUTION

Incorrect tightening torque!

Leaky retarder.

⇨ Observe the proper tightening torque.

Oil quantity

Service filling (oil check, oil change)	7.0 l
After replacement of the heat exchanger	7.5 l
Refilling after complete disassembly, cleaning and emptied heat exchanger	7.8 l

Maintenance work during each oil change

- Visual inspection of retarder for leaks before and after the oil change.
- Check prop shaft screws for proper seating and tighten if necessary (See specifications of vehicle manufacturer).
- Tighten screw plugs of retarder basic module to the specified tightening torque (see page 91).
- Tighten fastening screws at retarder heat exchanger with the specified tightening torque (see page 91).

Requirements

- Vehicle is horizontal
- Oil is at operating temperature (> 60 °C)
- Retarder switched off
- Ignition switched off

Draining the oil

1. Place oil collecting pan below the retarder.

WARNING

Hot exiting oil!

Face and hands could be burned.

⇨ Ensure that the retarder and ignition are switched off.

CAUTION

Hot screw plugs!

Hands could be burned.

⇨ Work carefully.

⇨ Wear protective gloves or use cloths if necessary.

2. Unscrew the screw plug (4100).
3. Unscrew the screw plugs (107 and 4200).
4. Drain oil into an oil collecting pan.
5. Lubricate the new sealing rings (108 and 4250) with silicone-free, non-corrosive grease.
6. Screw in the screw plugs (107) with sealing rings (108) and tighten to 80 Nm.
7. Screw in the screw plug (4200) with sealing ring (4250) and tighten to 80 Nm.

Pressure control valve

NOTE

There are two variants of the pressure control valve.

- Pressure control valve variant 1 without sieve. Sieve is at the screw plug (3500)
- Variant 2; sieve is located directly in the pressure control valve

1. Unscrew the screw plug (3500).
2. Drain any oil that has accumulated in the oil collecting pan.
3. Lubricate the new sealing ring (3550) with silicone-free, non-corrosive grease.
4. Screw in the screw plug (3500) with sealing ring (3550) and tighten to 130 Nm.

Filling in the oil

CAUTION

Wrong oil type!

Damage to/failure of the retarder.

⇨ Use only approved oil (see oil specification list).

1. Fill in oil via the hole of the screw plug (4100).
2. Lubricate the new sealing ring (4150) with silicone-free, non-corrosive grease.
3. Screw in the screw plug (4100) with sealing ring (4150) and tighten to 130 Nm.

De-aerating the retarder

CAUTION

Oil ejection!

De-aeration not performed.

⇨ De-aerate retarder.

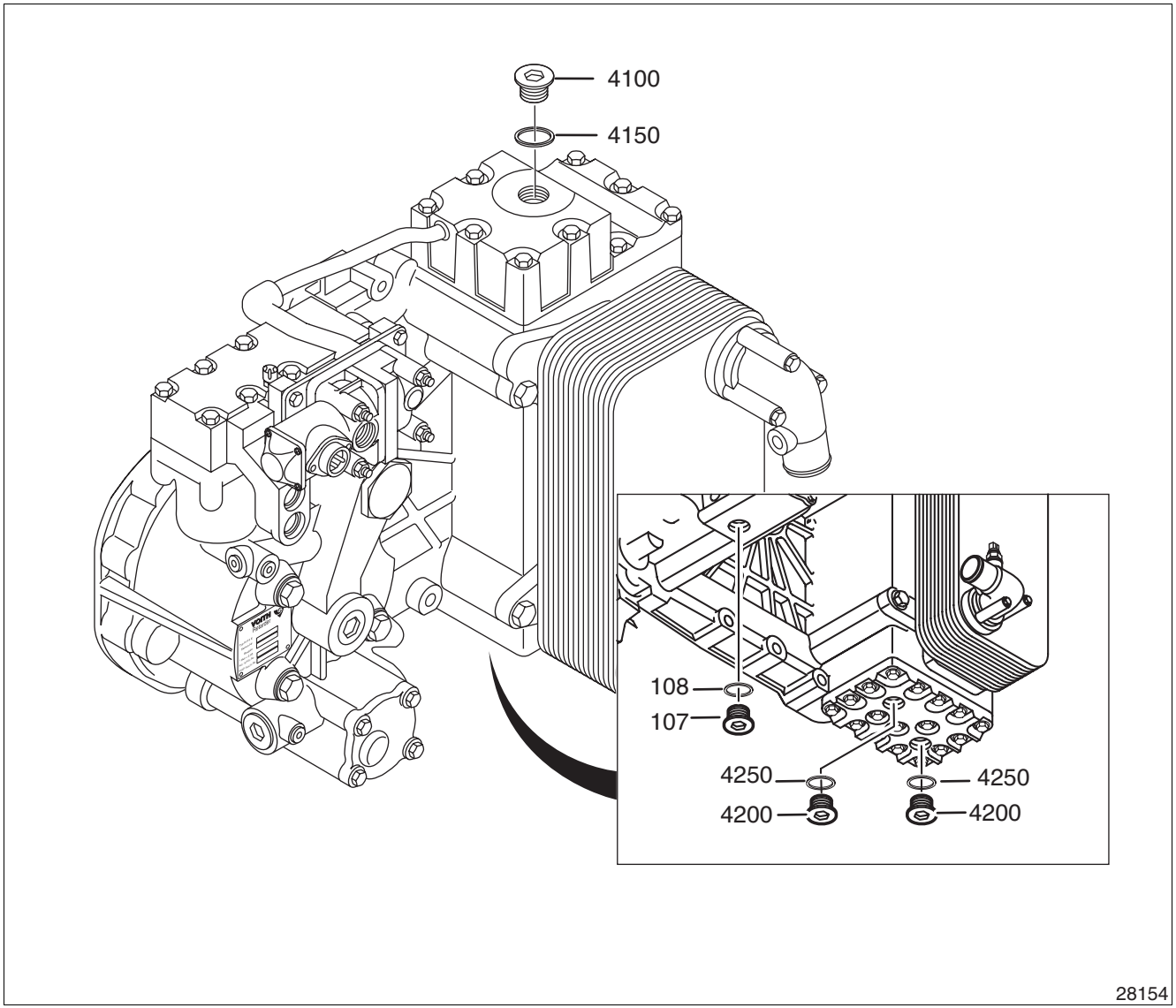
1. Switch off the retarder foot control if present and possible.
2. Move vehicle at 50 km/h.
3. Activate retarder at brake stage one five times for approx. 5 sec. each time.

4.3 Checking the Oil Level

Item No.	Designation
107	Screw plug M24x1.5, hexagon socket head, w.a.f. 12, with copper sealing ring: 80 Nm with integrated sealing ring: 47 Nm
108	Sealing ring A24x29, replace
4100	Screw plug M30x1.5, hexagon socket head, w.a.f. 17, with copper sealing ring: 130 Nm with integrated sealing ring: 100 Nm
4150	Sealing ring A30x36, replace
4200	Screw plug M24x1.5, hexagon socket head, w.a.f. 12, with copper sealing ring: 80 Nm with integrated sealing ring: 47 Nm
4250	Sealing ring A24x29, replace

NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.



NOTE

⇨ Observe the reduced tightening torque with the integrated sealing ring.

The copper sealing ring variant is described in the instructions.

Oil quantity	
Service filling (oil check, oil change)	7.0 l

Requirements

- Vehicle is horizontal
- Oil is at operating temperature (> 60 °C)
- Retarder switched off
- Ignition switched off

Draining the oil

1. Place oil collecting pan below the retarder.

⚠ WARNING

Hot exiting oil!

Face and hands could be burned.

⇨ Ensure that the retarder and ignition are switched off.

⚠ CAUTION

Hot screw plugs!

Hands could be burned.

⇨ Work carefully.

⇨ Wear protective gloves or use cloths if necessary.

2. Unscrew the screw plug (4100).
3. Unscrew the screw plugs (107 and 4200).
4. Drain oil into an oil collecting pan.
5. Lubricate the new sealing rings (108 and 4250) with silicone-free, non-corrosive grease.
6. Screw in the screw plugs (107) with sealing rings (108) and tighten to 80 Nm.
7. Screw in the screw plugs (4200) with sealing ring (4250) and tighten to 80 Nm.

Measuring the volume

1. Measure the volume of the drained oil.

NOTE

⇨ If oil is missing, check the retarder for leaks.

CAUTION

Wrong oil type!

Damage to/failure of the retarder.

⇨ Use only approved oil (see oil specification list).

2. If oil is missing, top up oil.

Filling in the oil

1. Fill in oil via the hole of the screw plug (4100).
2. Lubricate the new sealing ring (4150) with silicone-free, non-corrosive grease.
3. Screw in the oil filler plug (4100) with sealing ring (4150) and tighten to 130 Nm.

De-aerating the retarder

CAUTION

Oil ejection!
De-aeration not performed.
⇨ De-aerate retarder.

1. Switch off the retarder foot control if present and possible.
2. Move vehicle at 50 km/h.
3. Activate retarder at brake stage one five times for approx. 5 sec. each time.

4.4 Draining the Coolant

Item No.	Designation
20000	Water neck
20300	Screw plug M14x1.5, hexagon insert bit, w.a.f. 13, 32 Nm
20400	Sealing ring A14x20, replace

NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.

Requirements

- Retarder switched off
- Ignition switched off

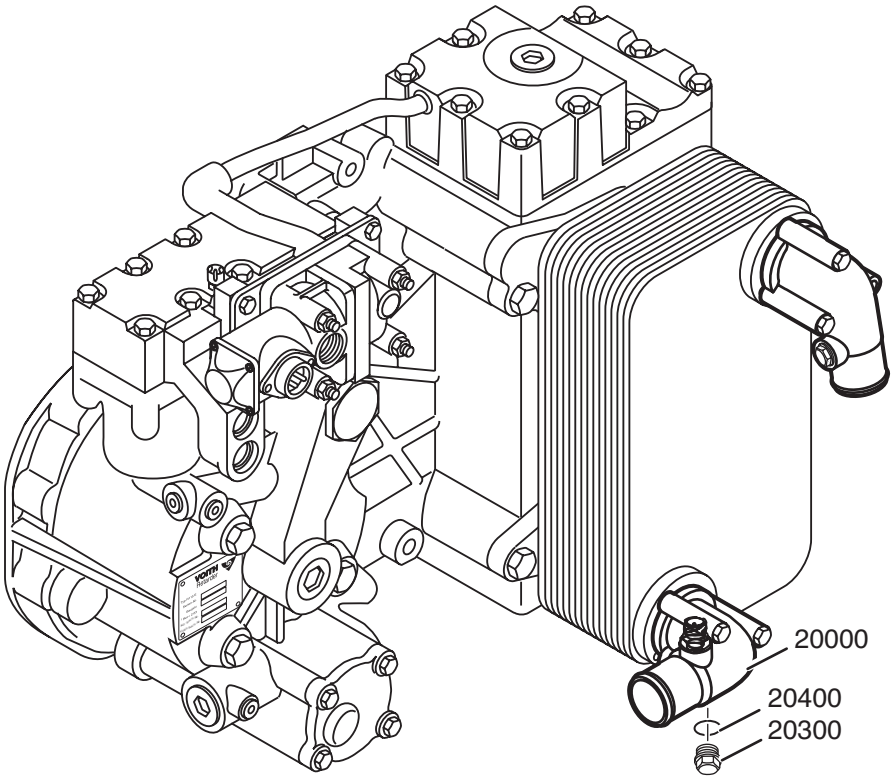
⚠ CAUTION

Hot parts and coolant!

Burns and scalding could occur.

⇨ Work carefully.

⇨ Wear protective gloves or use cloths if necessary.



28155

CAUTION

Incorrect coolant!

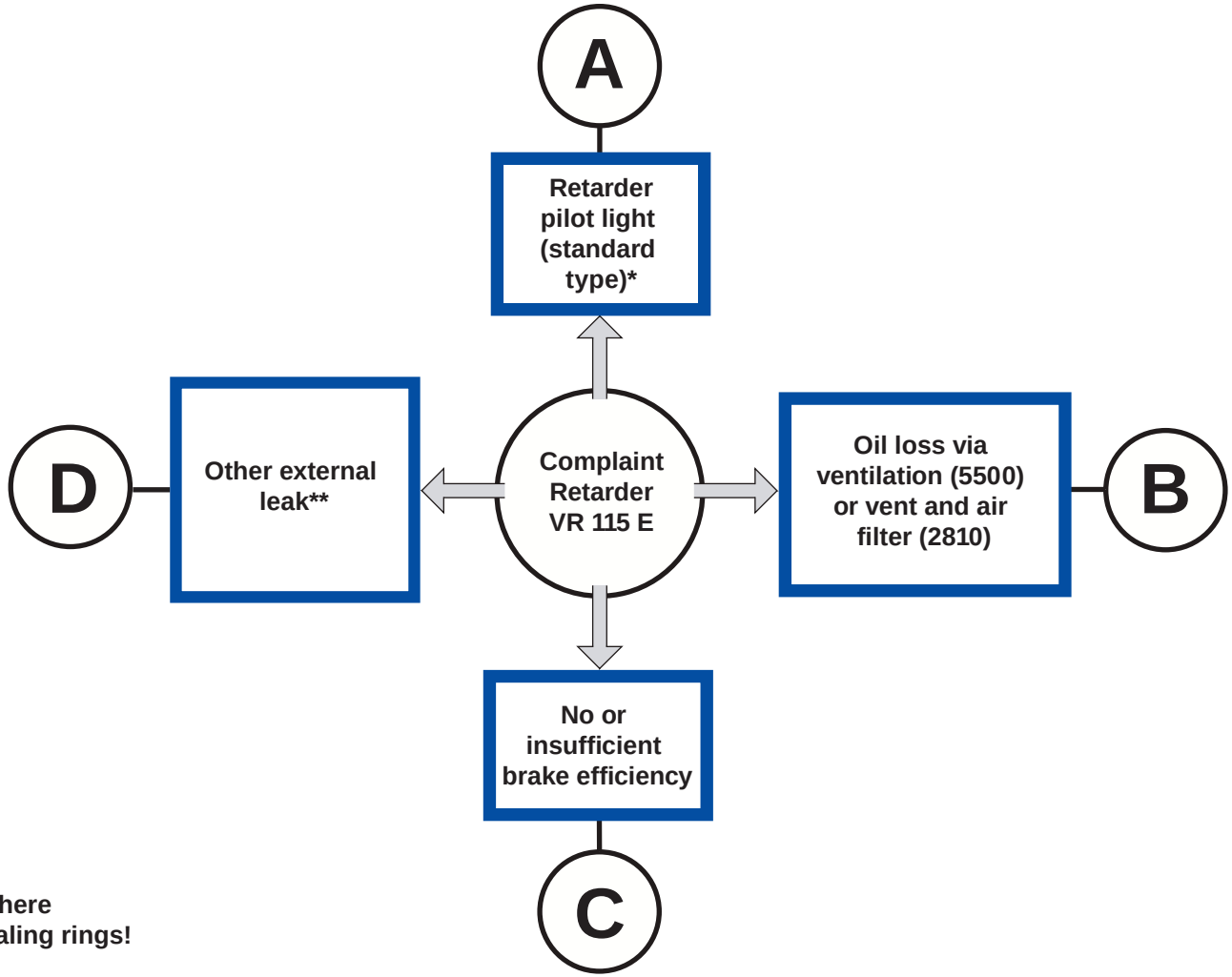
Damage to vehicle and retarder cooling circuits.

⇨ Observe the specifications of the vehicle manufacturer or those of Voith Turbo cooling water quality list.

1. Unscrew the screw plug (20300) and drain the coolant into a clean collecting vessel.
2. Replace the sealing ring (20400) and lubricate it with silicone-free, non-corrosive grease.

5. Diagnosis and Troubleshooting

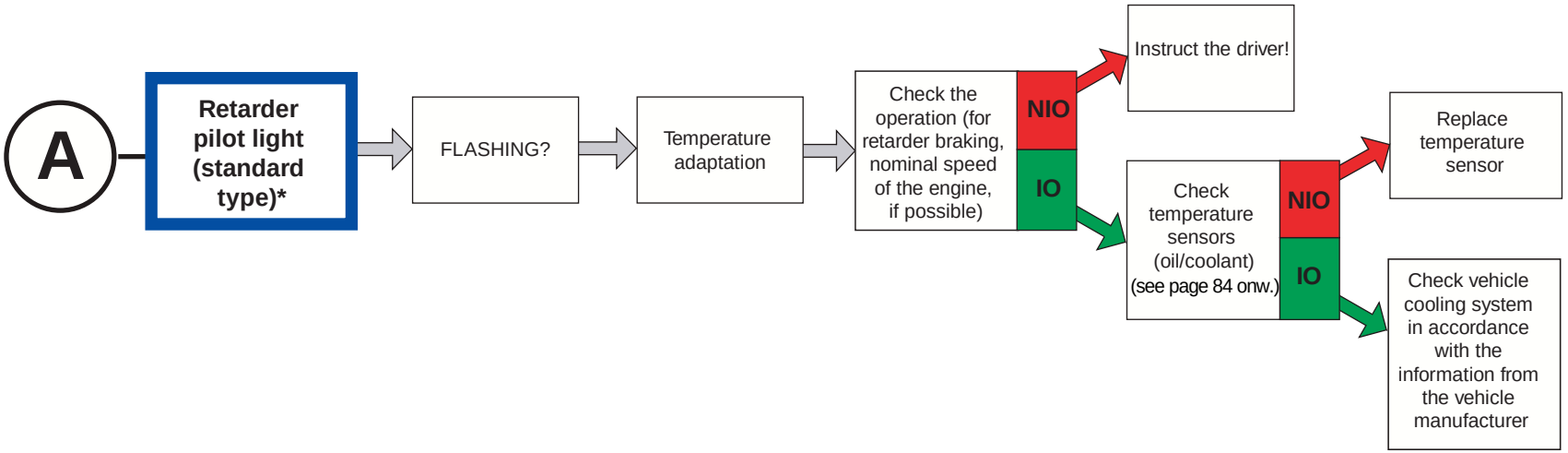
5.1 Troubleshooting Chart



*On-board diagnosis is possible if the OEM equipment allows it (display). Observe the specifications of the vehicle manufacturer.

**Before troubleshooting, ensure that there are no leaks at the screw plugs or sealing rings!

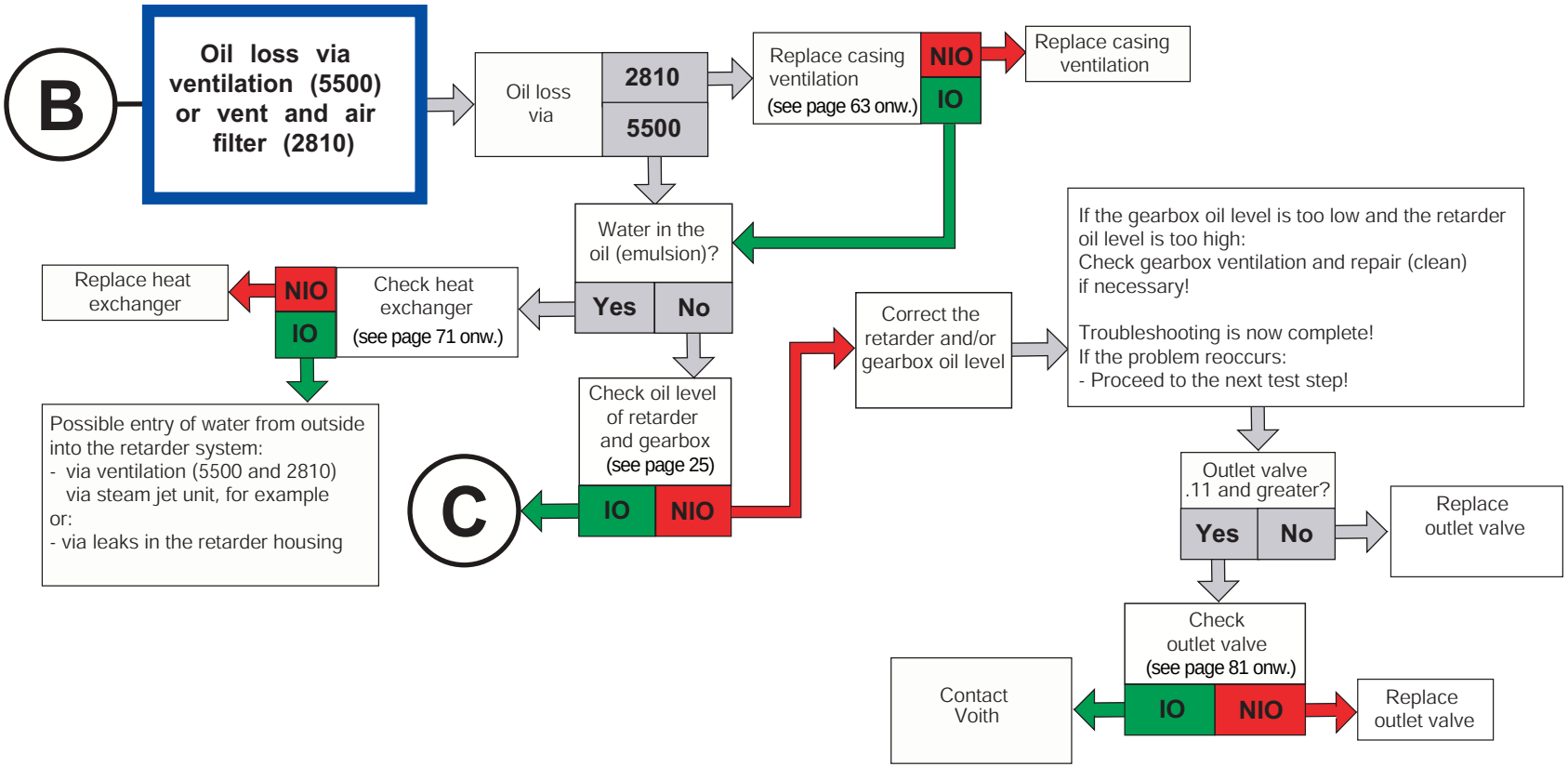
28013_en



*** On-board diagnosis is possible if the OEM equipment allows it (display). Observe the specifications of the vehicle manufacturer.**

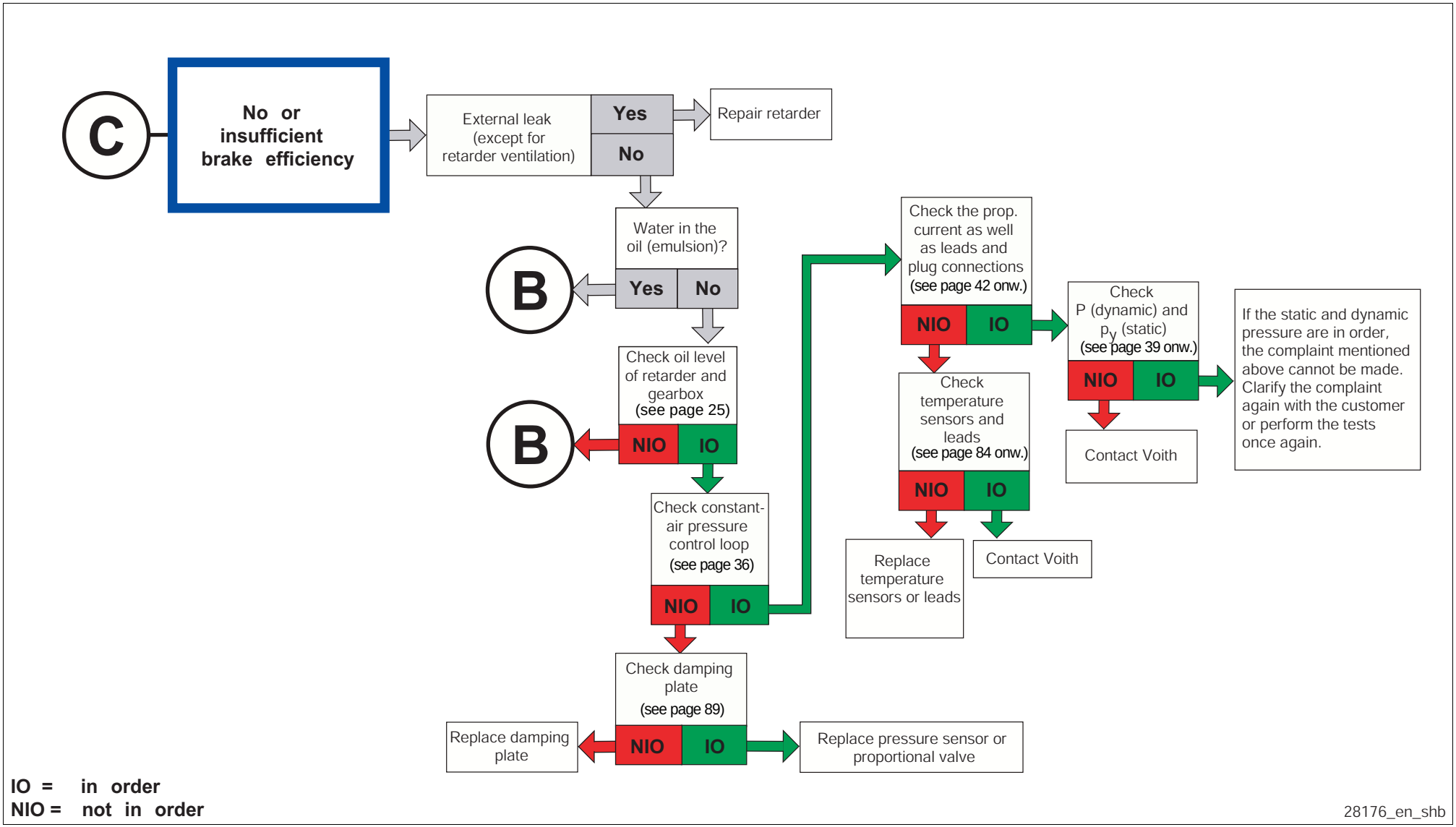
IO = in order
NIO = not in order

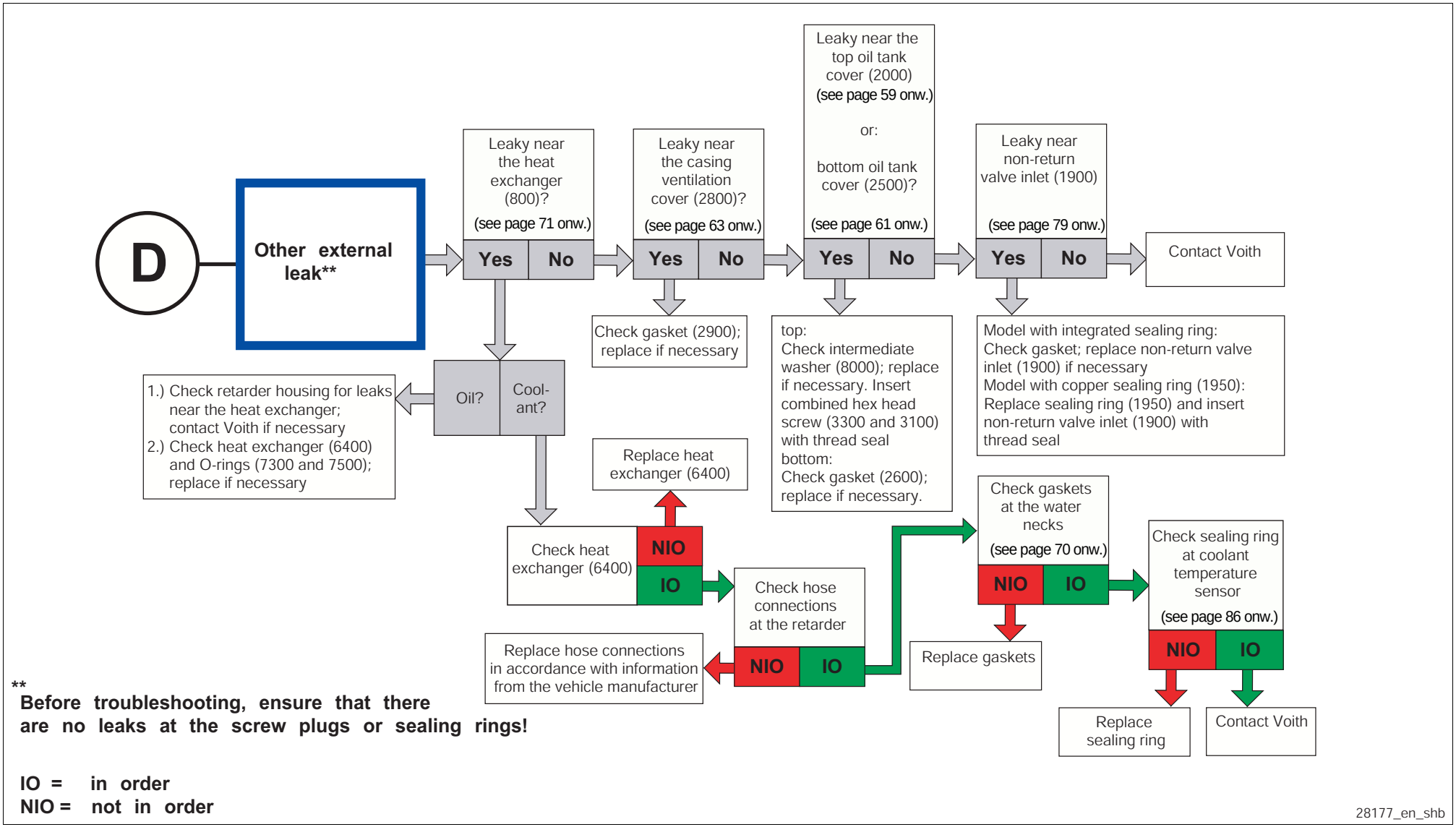
28014_en



IO = in order
NIO = not in order

28015_en_shb





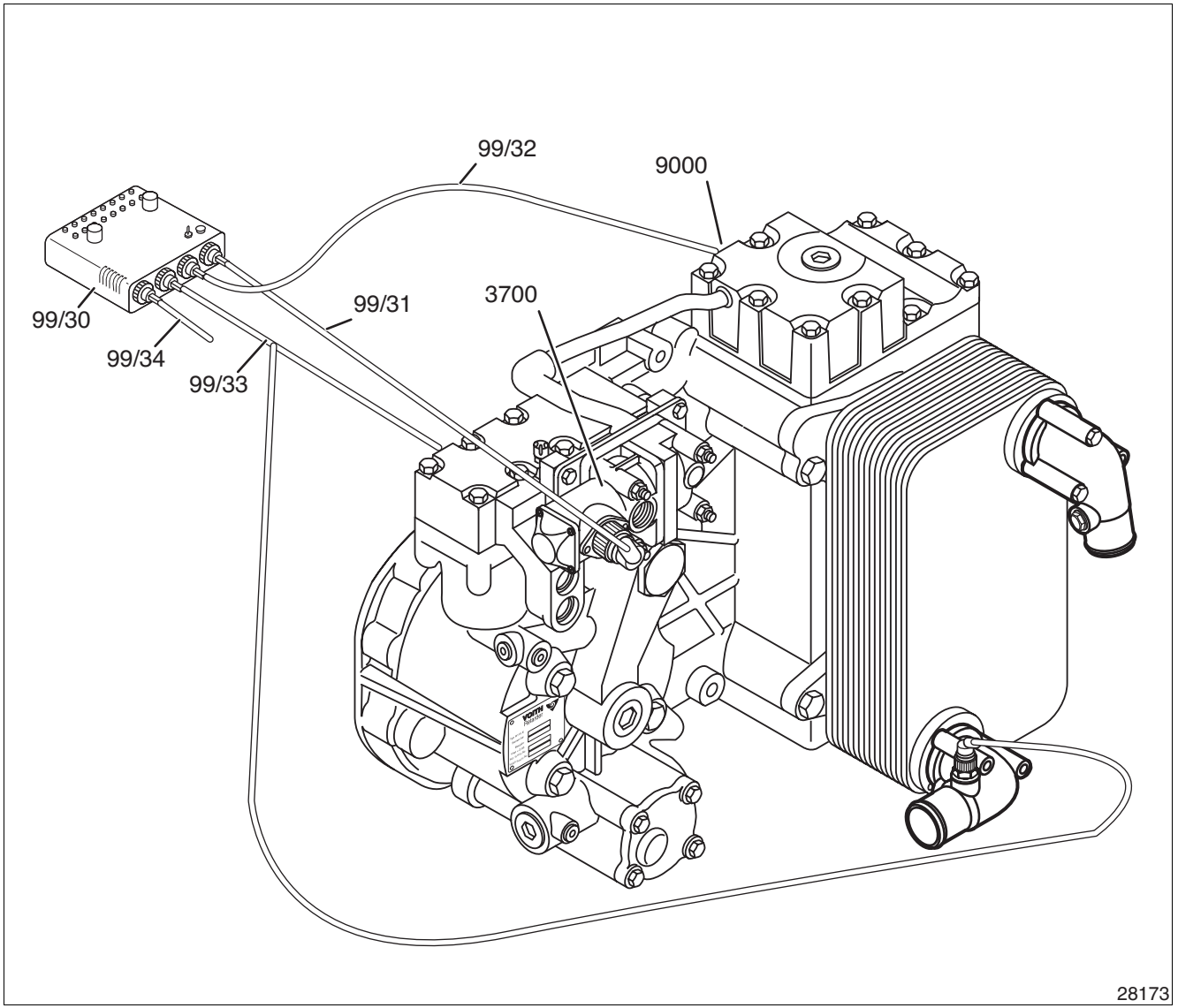
5.2 Constant-Air Pressure Control Loop

Item No.	Designation
3700	Proportional valve
9000	Pressure sensor
99/30	Retarder tester
99/31	Cable 1 (to the proportional valve)
99/32	Cable 2 (to the pressure sensor)
99/33	Cable 3 (to temperature sensors)
99/34	Cable 4 (to the vehicle voltage supply/ PC interface)

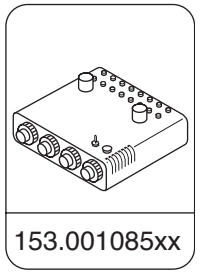
NOTE

The measurement of the constant-air pressure control loop provides information on

- internal and external leaks
- proper functioning
- proper control of the retarder



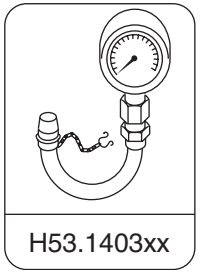
Special tools



Retarder tester in a case compl.

99/29

comprising:
99/30–99/35
99/40
50/35 & 50/36



Air pressure gauge 0–6 bar

99/7

NOTE

With the test software "Diana-Lite" (99/40), measured values can be read out and stored via the PC in addition to the tests with the retarder tester. The stored measured values can be transmitted to the Voith customer service for evaluation (see operating instructions on CD-ROM).

Requirements

- Ignition switched off
- Retarder switched off
- Battery voltage 18–32 V
- Supply-air pressure in auxiliary circuit 8–11 bar
- Oil level checked and in order
- Electrical system of vehicle checked and in order (see specifications of vehicle manufacturer)
- Electrical connections of the retarder are completely disconnected from the vehicle

Test scope

CAUTION

Hot parts!
Hands could be burned.
⇨ Work carefully.
⇨ Wear protective gloves or use cloths if necessary.

1. Connect the retarder tester (99/30) (see Test set-up diagram Page 36 and operating instructions of the retarder tester):
   - Connect cable 1 (99/31) to proportional valve (3700).
   - Connect cable 2 (99/32) to pressure sensor (9000).
   - Connect cable 3 (99/33) to oil temperature sensors (5200/1) and coolant (5200/2).
   - Connect cable 4 (99/34) to the vehicle voltage supply/PC interface.
2. Select the retarder type at the retarder tester (99/30).
3. Vehicle ignition: ON
4. Toggle switch at the retarder tester in position "EIN mit Regelkreis“.

5. With the multimeter (measuring type: volts), measure the voltage at the retarder tester socket "U_Versorgung".
The value must lie between **4.75 and 5.25 V**.

If this value is not reached: Replace proportional valve (3700).

6. With the multimeter (measuring type: volts), measure the voltage at the retarder tester socket "U_p_y IST".
The value must lie between **0.3 and 0.7 V**.

If this value is not reached: Replace proportional valve (3700).

7. Retarder tester switch "Stelldruck“ in position "100%".

NOTE

To assess the operation of the proportional valve (3700), the results of the following test are only valid during a testing period of 60 seconds maximum.

8. After approx. 20 seconds, the value "Act.setting pressure" displayed in Diana-Lite and the value displayed on the air pressure gauge (99/7) have to lie between **2.6 and 3.1 bar**.

If these values are not reached: Replace proportional valve (3700).

9. Retarder tester switch "Stelldruck“ in position "0%".

10. Toggle switch at the retarder tester in position "AUS".

11. Vehicle ignition: OFF

12. Detach the retarder tester (99/30) and pressure gauge (99/7), complete the retarder and vehicle.

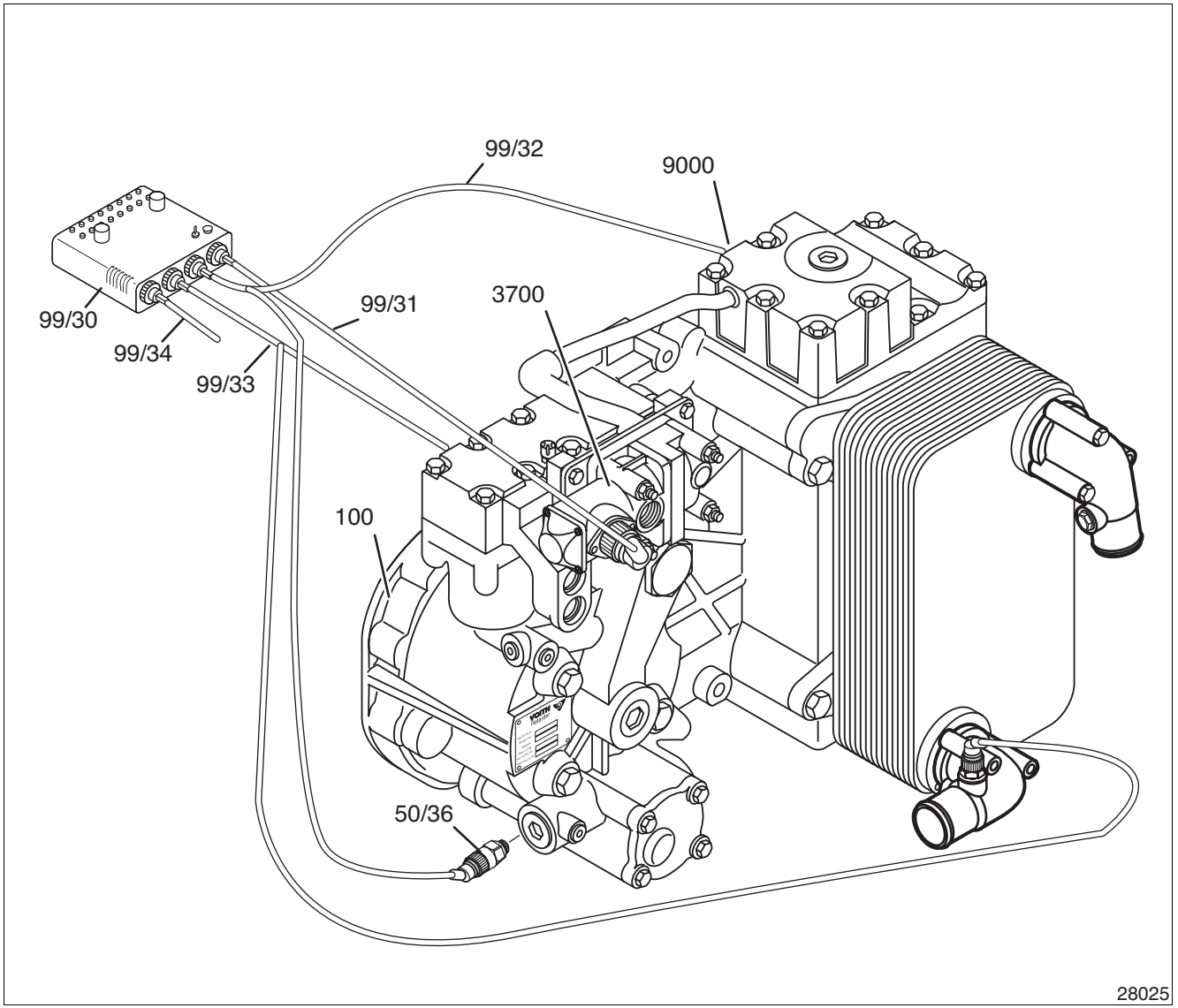
5.3 Pump Pressure (p_{dyn})

Item No.	Designation
100	Retarder housing
3700	Proportional valve
9000	Pressure sensor
50/36	Pressure sensor: 0–30 bar
99/30	Retarder tester
99/31	Cable 1 (to the proportional valve)
99/32	Cable 2 (to the pressure sensors)
99/33	Cable 3 (to temperature sensors)
99/34	Cable 4 (to the vehicle voltage supply/ PC interface)

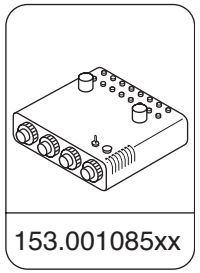
NOTE

Checking the pump pressure p_{dyn} provides information on

- the mechanical status of the rotor parts
- internal leaks
- proper functioning of the retarder



Special tools


153.001085xx

Retarder tester
in case compl.

99/29
comprising:
99/30–99/35
99/40
50/35 & 50/36

NOTE

With the test software "Diana-Lite" (99/40), measured values can be read out and stored via the PC in addition to the tests with the retarder tester. The stored measured values can be transmitted to the Voith customer service for evaluation (see operating instructions on CD-ROM).

Requirements

- Ignition switched off
- Retarder switched off
- Compressed-air pressure 6–11 bar
- Oil level checked and in order
- Electrical system of vehicle checked and in order (see specifications of vehicle manufacturer)
- Electrical connections of the retarder are completely disconnected from the vehicle
- No external leaks detected at retarder
- Vehicle secured
- Prop shaft at the retarder removed from the flanges (see specifications of vehicle manufacturer)

Test scope

CAUTION

Hot parts and oil!

Hands can be burned and scalded.

⇨ Work carefully.

⇨ Wear protective gloves or use cloths if necessary.

NOTE

Due to construction, a small amount of oil may leak out; this does, however, not affect retarder operation.

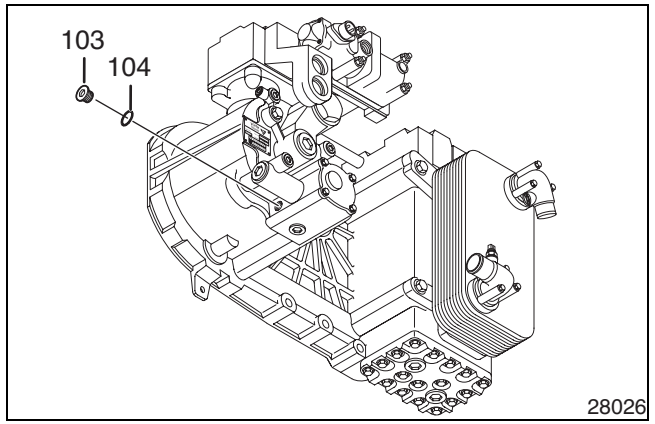
NOTE

⇨ Observe the reduced tightening torque with the integrated sealing ring.

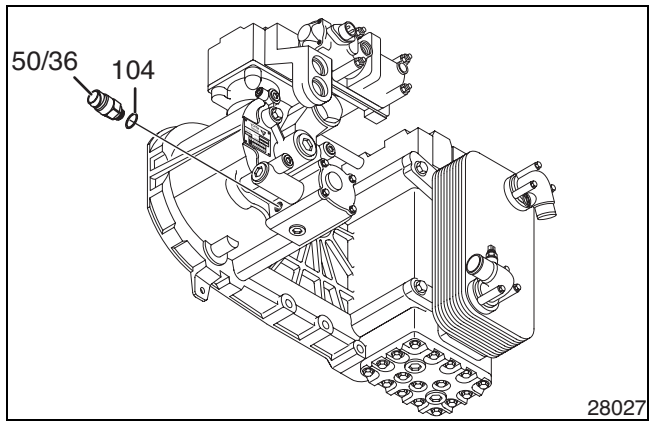
The copper sealing ring variant is described in the instructions.

NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.



1. Unscrew screw plug (103) and remove sealing ring (104).



2. Connect pressure sensor (50/36) to retarder housing (100) with sealing ring (104).

3. Connect the retarder tester (99/30) (see Test set-up diagram Page 39 and operating instructions of the retarder tester):

- Connect cable 1 (99/31) to proportional valve (3700).
- Connect cable 2 (99/32) to pressure sensor (50/36) and (9000).
- Connect cable 3 (99/33) to oil temperature sensors (5200/1) and coolant (5200/2).
- Connect cable 4 (99/34) to the vehicle voltage supply/PC interface.

4. Select the retarder type at the retarder tester.

5. Switch on the vehicle ignition and start the engine.

NOTE

⇨ Shift in direct gear (ratio 1:1). The engine speed 1,000 r.p.m. then corresponds to the prop shaft speed of 1,000 r.p.m..

6. Check pump pressure at engine speed 1000 min^{-1} (see operating instructions of the retarder tester).

7. Compare the measured pump pressure to the minimum dynamic pump pressure in accordance with the specifications of the retarder tester.

NOTE

If the setpoint of the constant-air pressure (p_y) is reached, but the pump pressure (p_{dyn}) is undershot, the retarder has an internal defect.

⇨ Contact Voith.

8. Disconnect the retarder tester (99/30) and all cables.

9. Disconnect the pressure sensor (50/36) and remove the sealing ring (104).

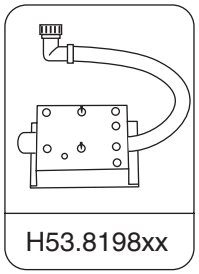
10. Lubricate the new sealing ring (104) with silicone-free, non-corrosive grease.

11. Screw in the screw plug (103) with sealing ring (104) and tighten to 20 Nm.

12. Remove prop shaft at the retarder from the flanges (see specifications of vehicle manufacturer).

5.4 Proportional Valve Current

Special tools



Measuring adapter

99/3

NOTE

When performing measurements using a commercially available multimeter (without real r.m.s. value measurement), exact readout of these measured values is not possible (display jumps).

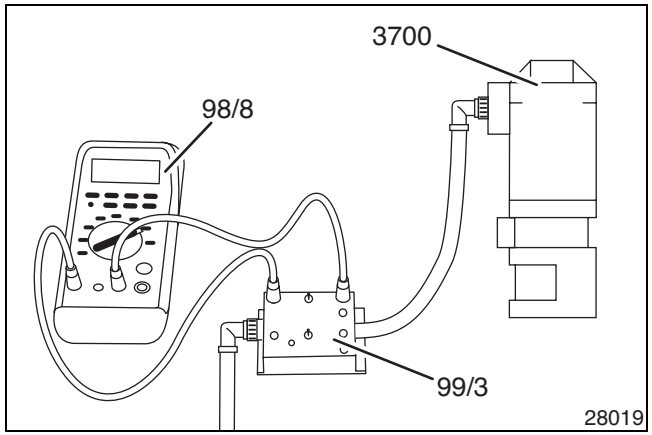
Commercially available tool

Multimeter (98/8)	with real r.m.s. value measurement, e.g. Fluke 179

Requirements

- Ignition switched off
- Retarder switched off
- Battery voltage 24–28 V
- Electrical system of vehicle checked and in order (see specifications of vehicle manufacturer)
- Fuse for retarder controller tested and in order
- Male and female plug connectors at proportional valve checked for damage or wear (notch scratches)
- Electrical lead and plug connections checked (visual inspection) and in order

Test scope



1. Disconnect the plug from the proportional valve (3700) and connect it to the measuring adapter (99/3).
2. Connect the plug of the measuring adapter to the proportional valve (3700).
3. Connect the multimeter (98/8).
   Measuring type: mA.
4. Turn the "Propventil" (prop valve) switch at the measuring adapter to position "I".
5. Switch on ignition.
6. Shift the retarder to the highest gear.

NOTE

Due to continuous readjustment in the control loop, the measured values may not be constant, but are within the specified range.

7. Read measured value and compare to the specified values:

Controller	Item number/ Code number	Measured value
Digiprop	138, 152, 155	396–596 mA
	150	365–565 mA
	151	379–579 mA
	153	423–623 mA
	157, 158	409–609 mA
	159	534–546 mA
	179, 180, 502, 504, 508, 512, 514	440–640 mA
	510	430–630 mA
VERA™	H67.2763.xx	440–640 mA
	H67.2866.xx	
	H67.3449.xx	
	H67.3457.xx	
	H67.3658.xx	
	153.000586.xx	

8. Disconnect multimeter.

9. Pull the plug from the measuring adapter (99/3) and connect it to the proportional valve (3700).

6. Removing and Installing the Retarder

DANGER

Retarder can fall!

Your body can be crushed severely.

⇨ Secure retarder against falling.

⇨ Use a suitabe device for hanging it up.

CAUTION

Improper removal/installation!

Damage to/failure of the retarder.

Warranty is voided.

⇨ Request and use gearbox-specific documents and special tools from VOITH.

CAUTION

Hot parts!

Hands could be burned.

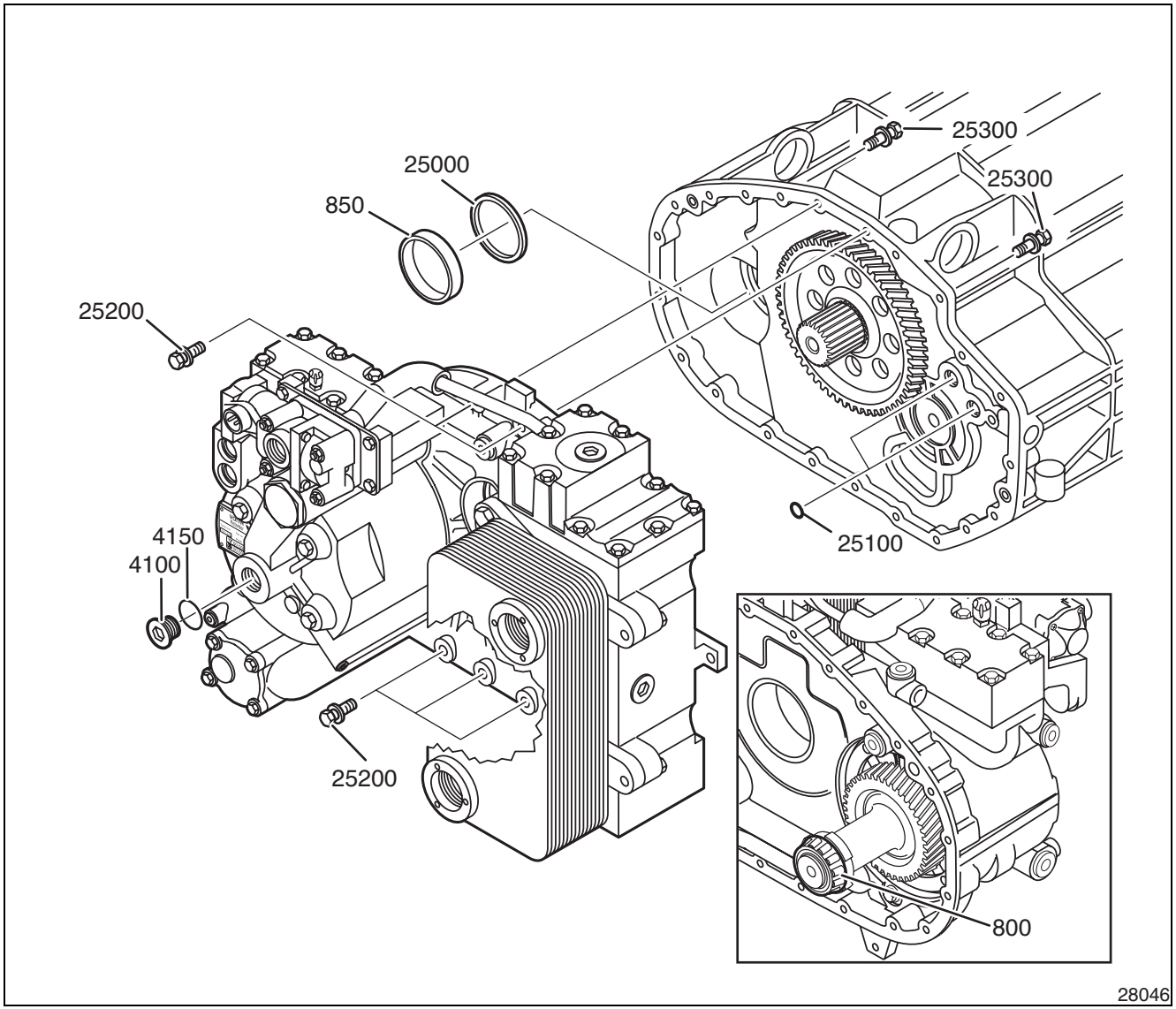
⇨ Work carefully.

⇨ Wear protective gloves or use cloths if necessary.

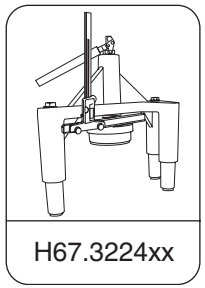
Item No.	Designation
800	Inside part
850	Outer ring Remove only if the taper roller bearing is replaced or a new shim is fitted
4100	Screw plug M30x1.5, hexagon socket head, w.a.f. 17, with copper sealing ring: 130 Nm with integrated sealing ring: 100 Nm
4150	Sealing ring A30x36, replace
25000	Shim
25100	O-ring 14x4, replace
25200	Hex head screw M10x70, hexagon insert bit, w.a.f. 16, 58 Nm
25300	Hex head screw M10x60, hexagon insert bit, w.a.f. 16, 58 Nm

NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.

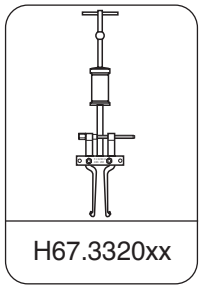


Special tools



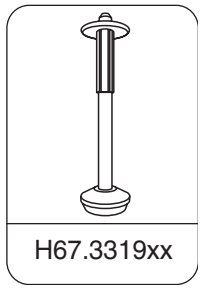
Measuring device

98/1



Puller for bearing outer ring

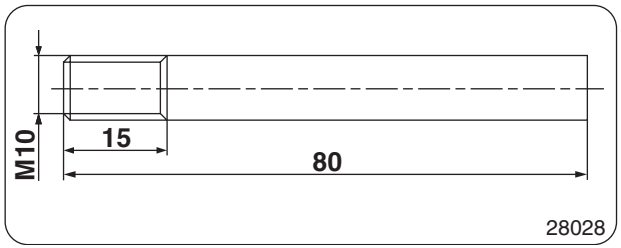
98/3



Drive-in tool

98/4

Tools for self-fabrication



Material: St37-2, DIN 17100 (1.80)

2 x Threaded bolt

NOTE

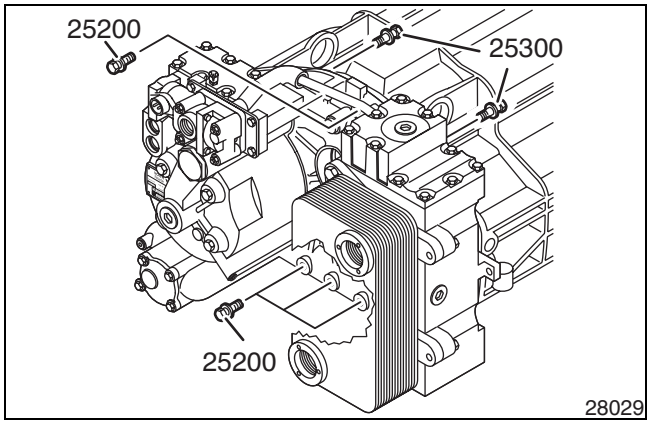
⇨ The shim must always be redetermined if

- the inside part (800) is replaced
- the retarder is attached to the gearbox
- the retarder has been repaired
- the gearbox has been repaired

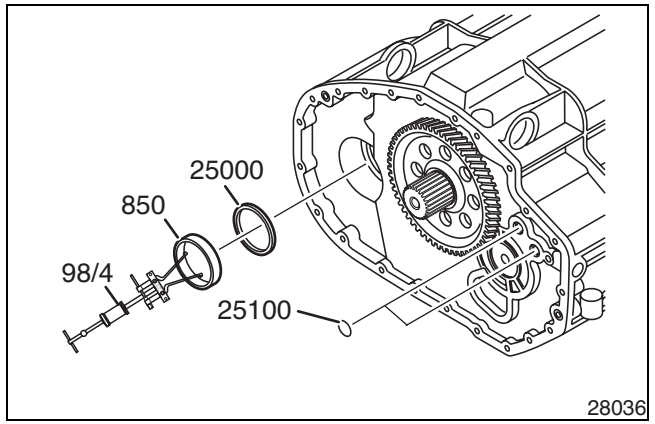
Requirements

- Retarder switched off
- Ignition switched off
- Supply-air pressure discharged
- Retarder oil discharged (see page 22)
- Coolant drained (see page 28)
- Gearbox oil discharged
- Propeller shaft at gearbox flange removed
- Output flange removed
- Speedometer sensor removed
- Retarder with gearbox removed from vehicle

Removal



1. Unscrew the hex head screws (25200) and (25300).
2. Remove retarder from the gearbox with a suitable lifting device.



3. Remove O-rings (25100) from the gearbox.

NOTE

⇨ For easier removal, heat the housing near the bearing outer ring to approx. 80 °C.

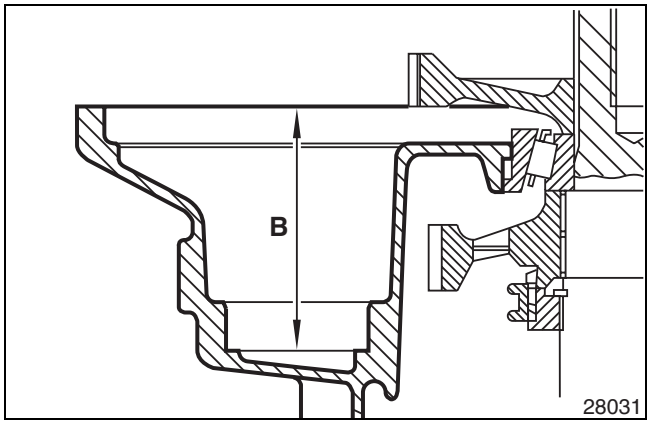
4. Remove outer ring (850) with the puller for the bearing outer ring (98/4) and remove the shim (25000).

Determining the shim

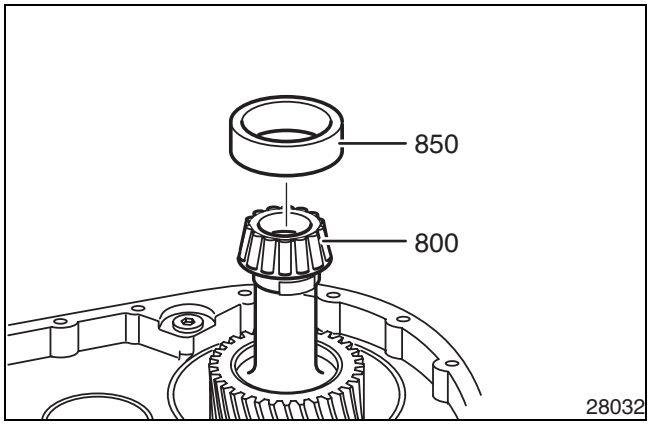
NOTE

⇨ Carry out measurements at the retarder and gearbox in the vertical position at room temperature.

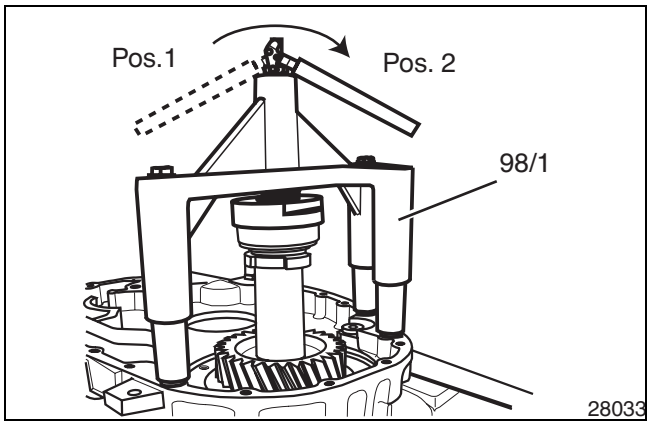
⇨ The retarder and gearbox must have cooled down.



1. Measure the distance "B" between the bearing surface on the retarder side of the gearbox housing and the bearing surface of the shim and write down the value.



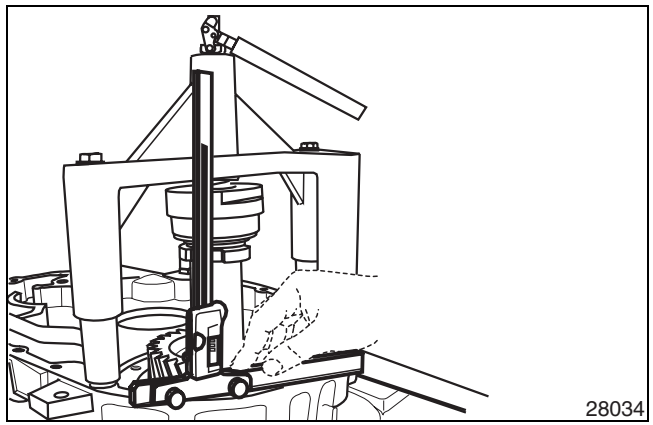
2. Place the bearing outer ring (850) onto the inside part (800).



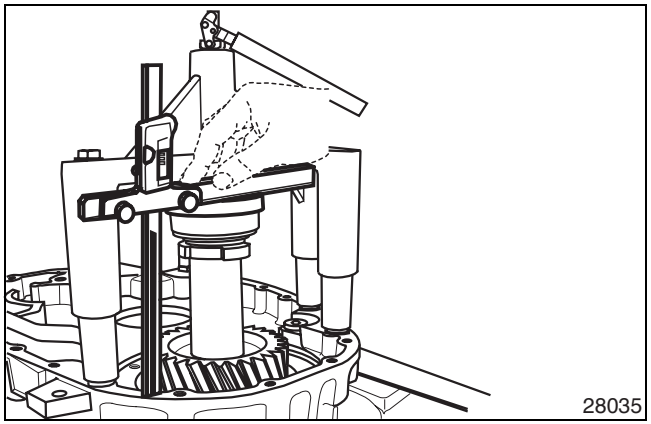
3. Place the measuring device (98/1) onto the retarder housing. Tighten the hex head screws to 10 Nm.

4. Move lever from position 1 to position 2. A defined pre-stress is applied to the drive shaft.

5. Turn the pinion clockwise 15 times by hand and anticlockwise 15 times.


28034

6. Place the depth caliper gauge on the retarder housing interface and zero it.


28035

7. Place the depth caliper gauge on the measuring surface of the measuring disk.

CAUTION

Dimension A outside tolerance range!
Damage to/failure of the retarder.
⇨ Contact Voith.

8. Measure dimension A from the measuring surface of the measuring disk to the interface of the retarder housing and write down the value. Tolerance of dimension A is 131.031–132.171 mm.

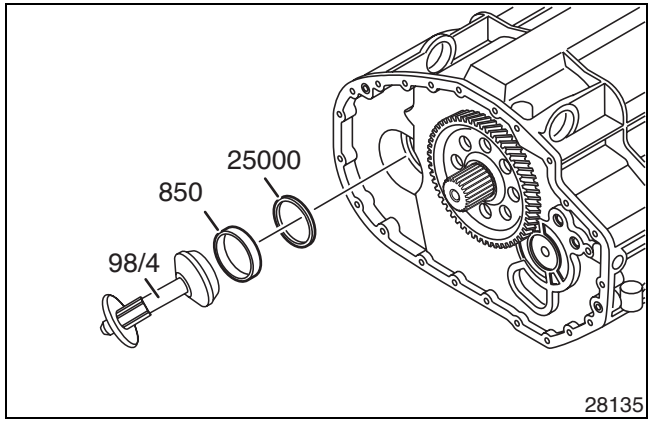
9. Determine the thickness of the shim.
Shim thickness = dimension B – dimension A – 0.02 mm.

Installation

NOTE

⇨ To reach the compensating dimension, several shims may be needed.

⇨ Always put the thicker shim first into the gearbox housing.



28135

1. Fit the shim (25000) into the gearbox housing.

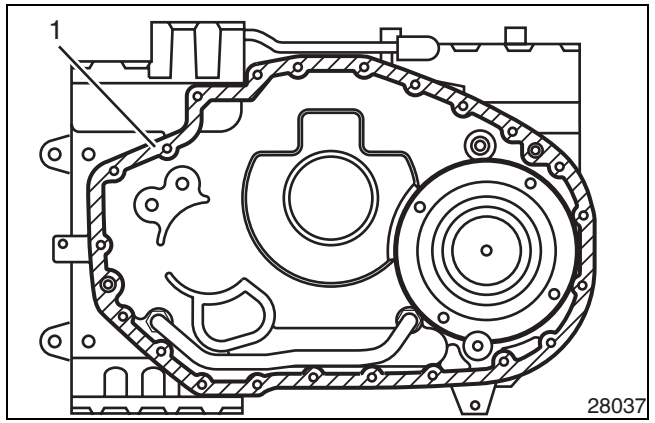
NOTE

⇨ Replace bearing outer ring (850) if taper roller bearing (800) is replaced.

NOTE

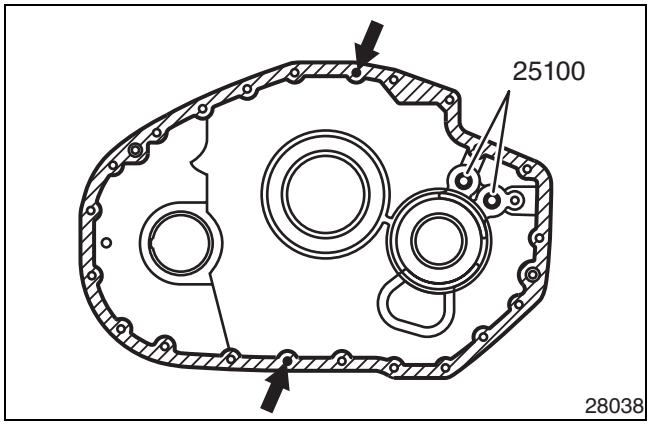
⇨ For easier mounting, heat the housing near the bearing outer ring to approx. 80 °C.

2. Fit bearing outer ring (850) into the gearbox housing and drive it in with the drive-in tool (98/3) until it stops.



3. Clean sealing surface of the retarder housing (1).

4. Position gearbox vertically with sealing surface upward.



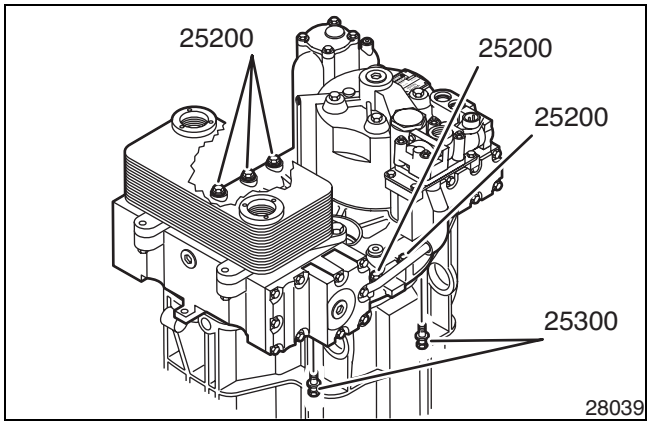
5. Clean sealing surface of the gearbox housing and apply surface seal A002989712010 (Voith item No. H53.3305xx).

6. Lubricate the new O-rings (25100) with silicone-free, non-corrosive grease and insert them into gearbox housing.

NOTE

The threaded bolts are necessary for mounting the sealing surface of the gearbox/retarder congruently.

7. Screw two threaded bolts M10x80 (see arrows) into the gearbox housing.



8. Place retarder on the gearbox housing.

9. Screw in hex head screws (25200).

10. Screw out threaded bolts M10x80.

11. Tighten hex head screws (25200) to 58 Nm.

12. Screw in hex head screws (25300) and tighten to 58 Nm.

7. Repair

7.1 Components Overview

Item No.	Designation
100	Retarder housing
107	Screw plug M24x1.5, hexagon socket head, w.a.f. 12, with copper sealing ring: 80 Nm with integrated sealing ring: 47 Nm
108	Sealing ring A24x29, replace
1600	Valve cover
1700	O-ring 60x3, replace
1900	Non-return valve "inlet" M48x1.5, hexagon insert bit, w.a.f. 55, with copper sealing ring: 280 Nm with integrated sealing ring: 280 Nm

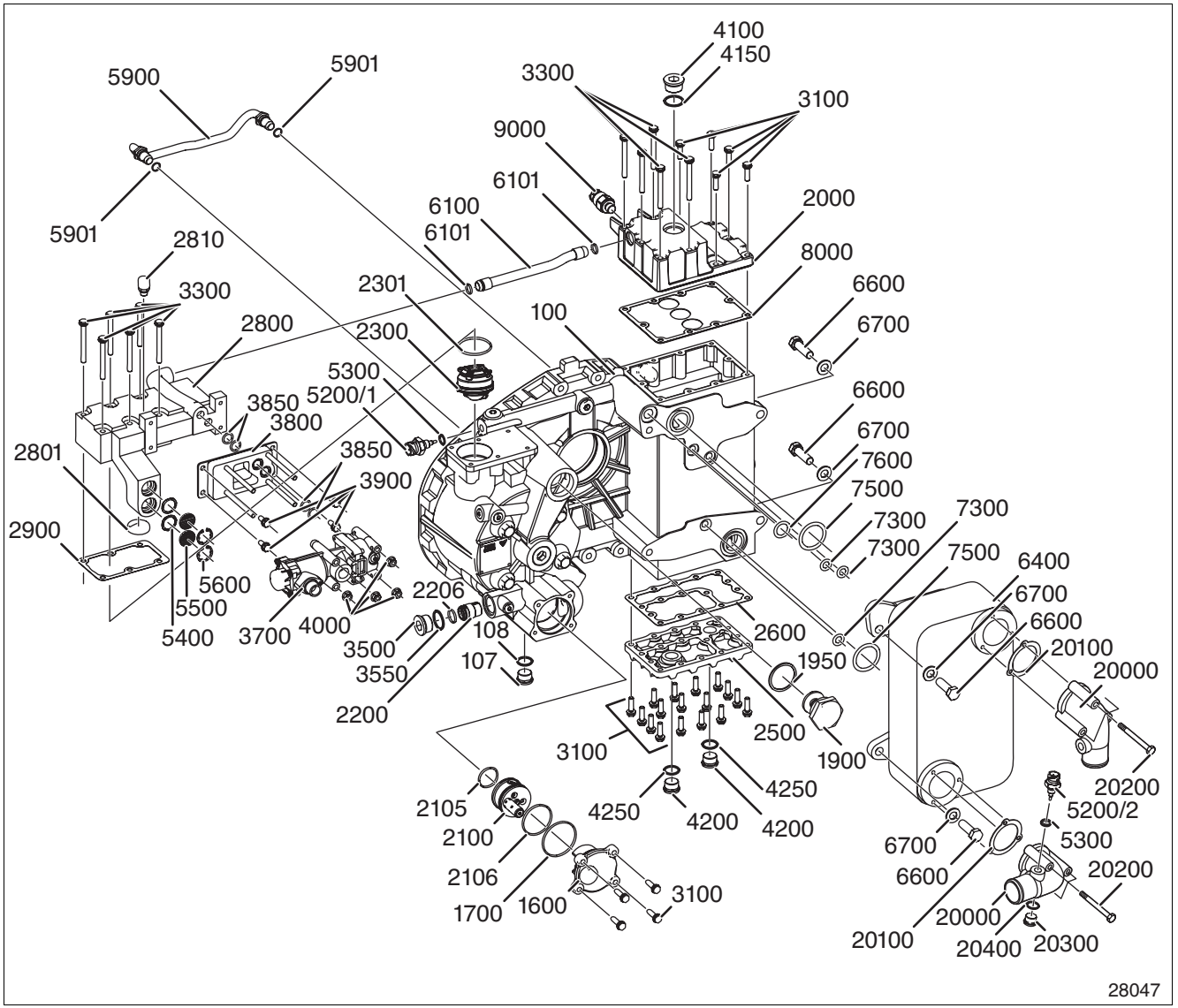
NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.

NOTE

⇨ Observe the reduced tightening torque with the integrated sealing ring.

The copper sealing ring variant is described in the instructions.



Item No.	Designation
1950	Sealing ring A48x55, replace
2000	Top oil tank cover
2100	Non-return valve "outlet"
2105	O-ring 34x3, replace
2106	O-ring 54x3, replace
2200	Pressure control valve
2206	O-ring 21.5x2.5, replace
2300	Casing ventilation
2301	O-ring 55x3, replace
2500	Bottom oil tank cover
2600	Cover gasket bottom, replace

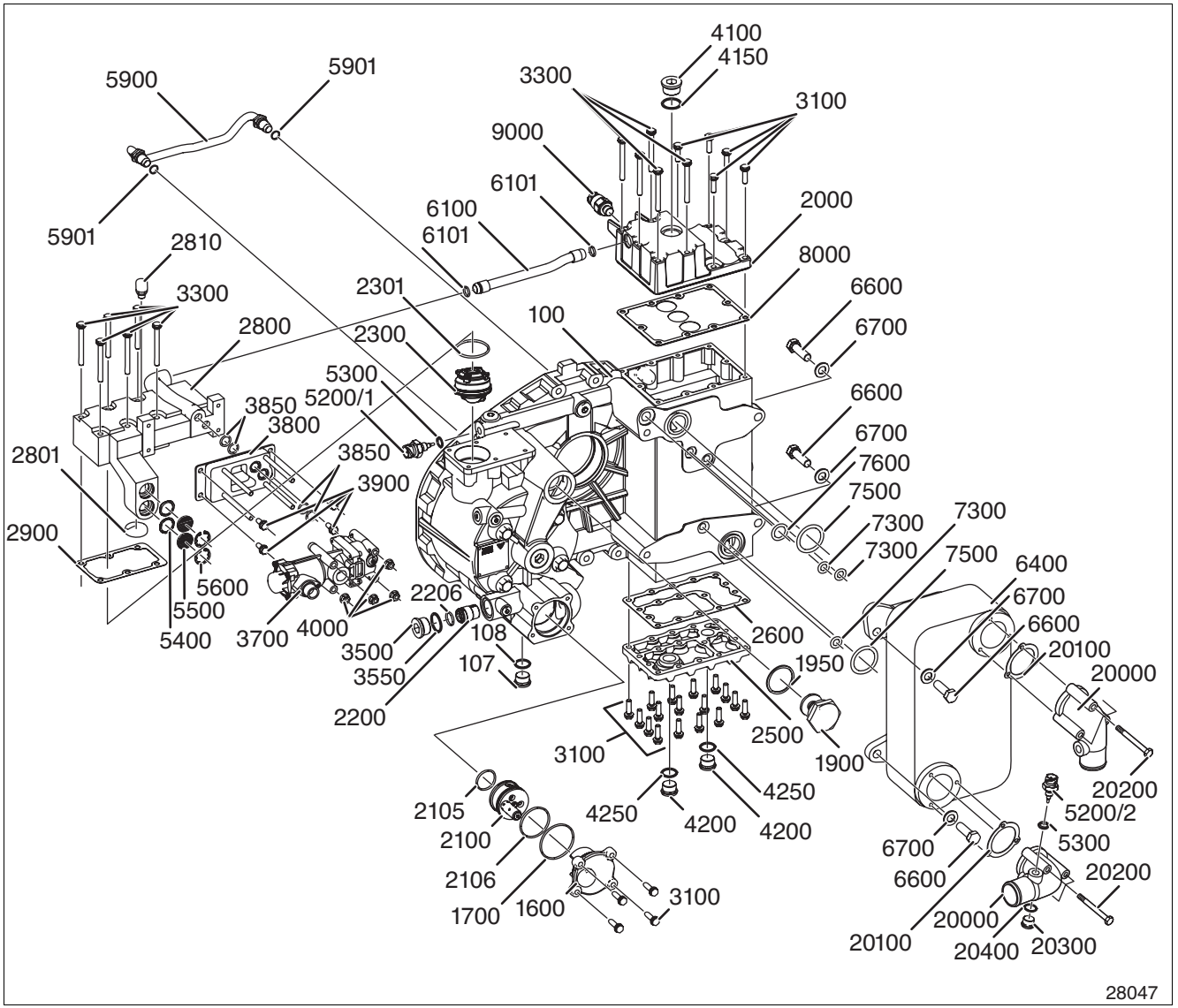
NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.

NOTE

⇨ Observe the reduced tightening torque with the integrated sealing ring.

The copper sealing ring variant is described in the instructions.



Item No.	Designation
2800	Cover of casing ventilation
2801	Cover
2810	Vent and air filter M12x1.5, hexagon insert bit, w.a.f. 17, 10 Nm
2900	Gasket, replace
3100	Combined hex head screw M8x30. hexagon insert bit, w.a.f. 13, 30 Nm
3300	Combined hex head screw M8x80, hexagon insert bit, w.a.f. 13, 30 Nm
3500	Screw plug M30x1.5, hexagon socket head, w.a.f. 17, with copper sealing ring: 130 Nm with integrated sealing ring: 100 Nm

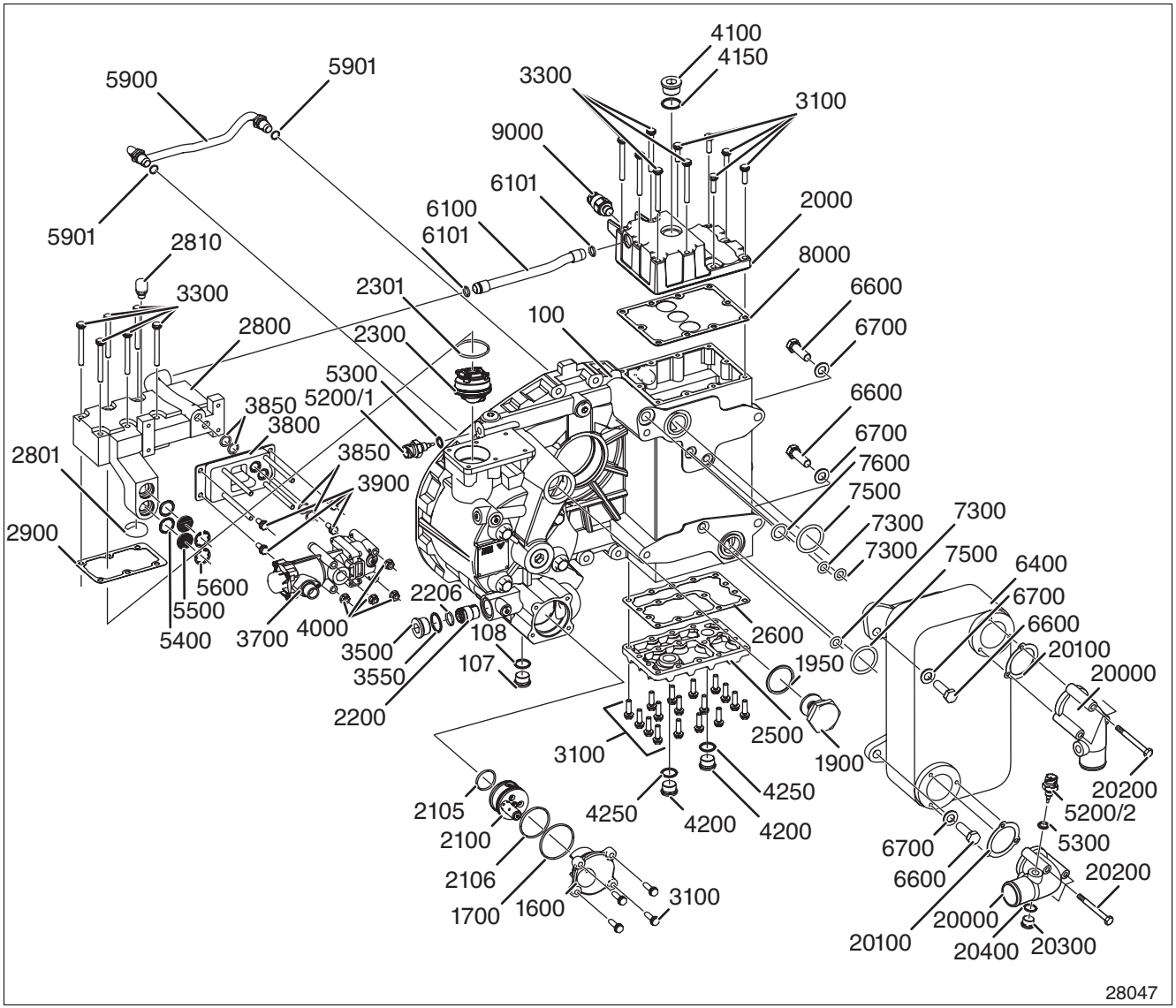
NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.

NOTE

⇨ Observe the reduced tightening torque with the integrated sealing ring.

The copper sealing ring variant is described in the instructions.



Item No.	Designation
3550	Sealing ring A30x36, replace
3700	Proportional valve
3800	Damping plate
3850	O-ring 16x3, replace
3900	Combined hex head screw M8x20, hexagon insert bit, w.a.f. 13, 30 Nm
4000	Hex head nut M8, hexagon insert bit, w.a.f. 13, 18 Nm
4100	Screw plug M30x1.5, hexagon socket head, w.a.f. 17, with copper sealing ring: 130 Nm with integrated sealing ring: 100 Nm
4150	Sealing ring A30x36, replace

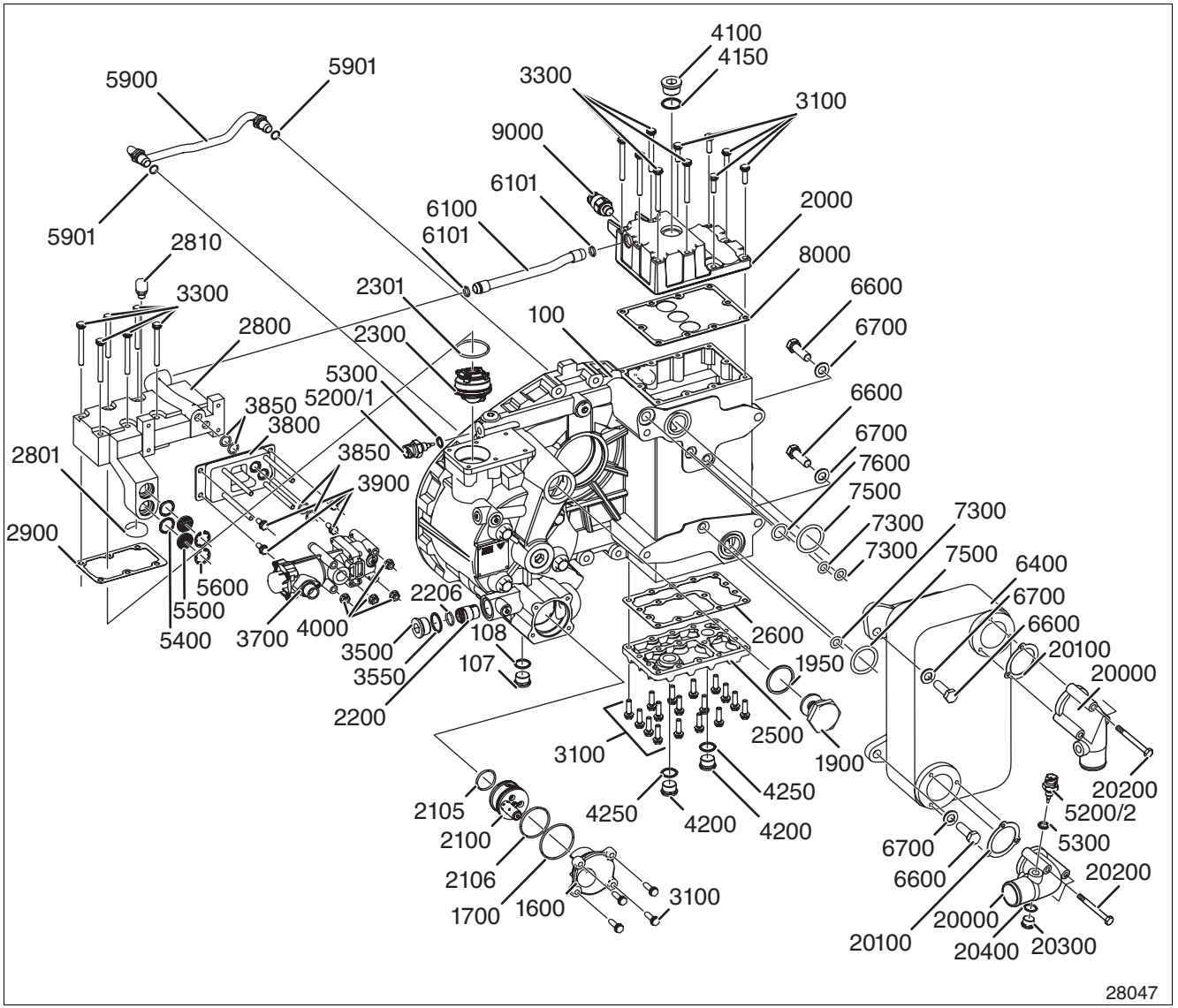
NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.

NOTE

⇨ Observe the reduced tightening torque with the integrated sealing ring.

The copper sealing ring variant is described in the instructions.



Item No.	Designation
4200	Screw plug M24x1.5, hexagon socket head, w.a.f. 12, with copper sealing ring: 80 Nm with integrated sealing ring: 47 Nm
4250	Sealing ring A24x29, replace
5200/1	Oil temperature sensor M14x1.5, hexagon insert bit, w.a.f. 21, 32 Nm
5200/2	Coolant temperature sensor M14x1.5, hexagon insert bit, w.a.f. 21, 32 Nm
5300	Sealing ring A14x20, replace
5400	Corrugated spring
5500	Disc silencer
5600	Circlip JL30x1.2

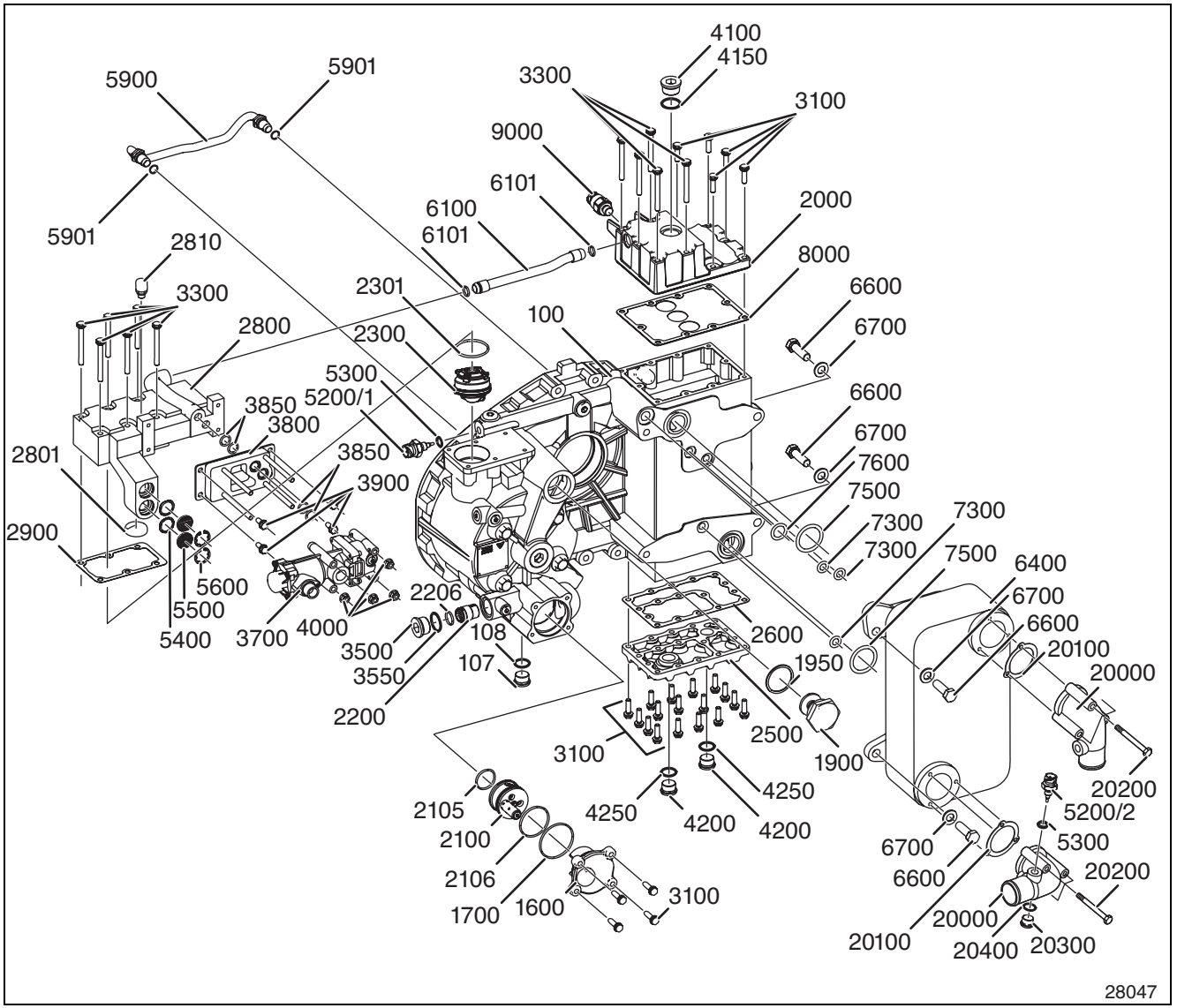
NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.

NOTE

⇨ Observe the reduced tightening torque with the integrated sealing ring.

The copper sealing ring variant is described in the instructions.



Item No.	Designation
5900	Pipe
5901	O-ring 15.3x2.4, replace
6100	Pipe
6101	O-ring 15.3x2.4, replace
6400	Heat exchanger
6600	Hex head screw M14x45, hexagon insert bit, w.a.f. 22, 150 Nm
6700	Washer A14
7300	O-ring 15x4, replace
7500	O-ring 45x5, replace
7600	O-ring 25x4, replace
8000	Intermediate washer 196x144x2

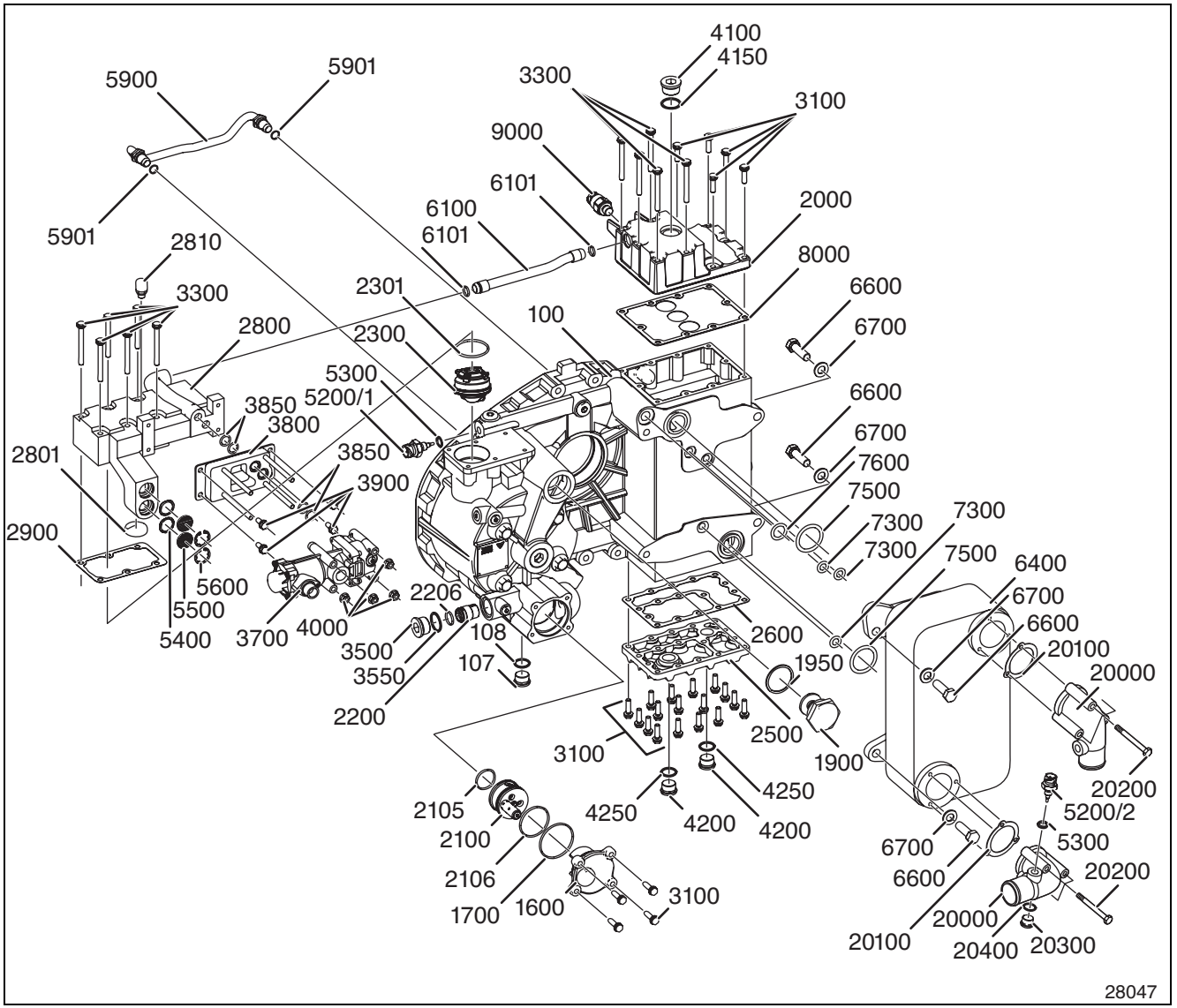
NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.

NOTE

⇨ Observe the reduced tightening torque with the integrated sealing ring.

The copper sealing ring variant is described in the instructions.



Item No.	Designation
9000	Pressure sensor M16x1.5, hexagon insert bit, w.a.f. 27, 32 Nm
20000	Water neck
20100	Gasket, replace
20200	Combined hex head screw M8x80, hexagon insert bit, w.a.f. 13, 30 Nm
20300	Screw plug M14x1.5, hexagon insert bit, w.a.f. 13, 32 Nm
20400	Sealing ring A14x20, replace

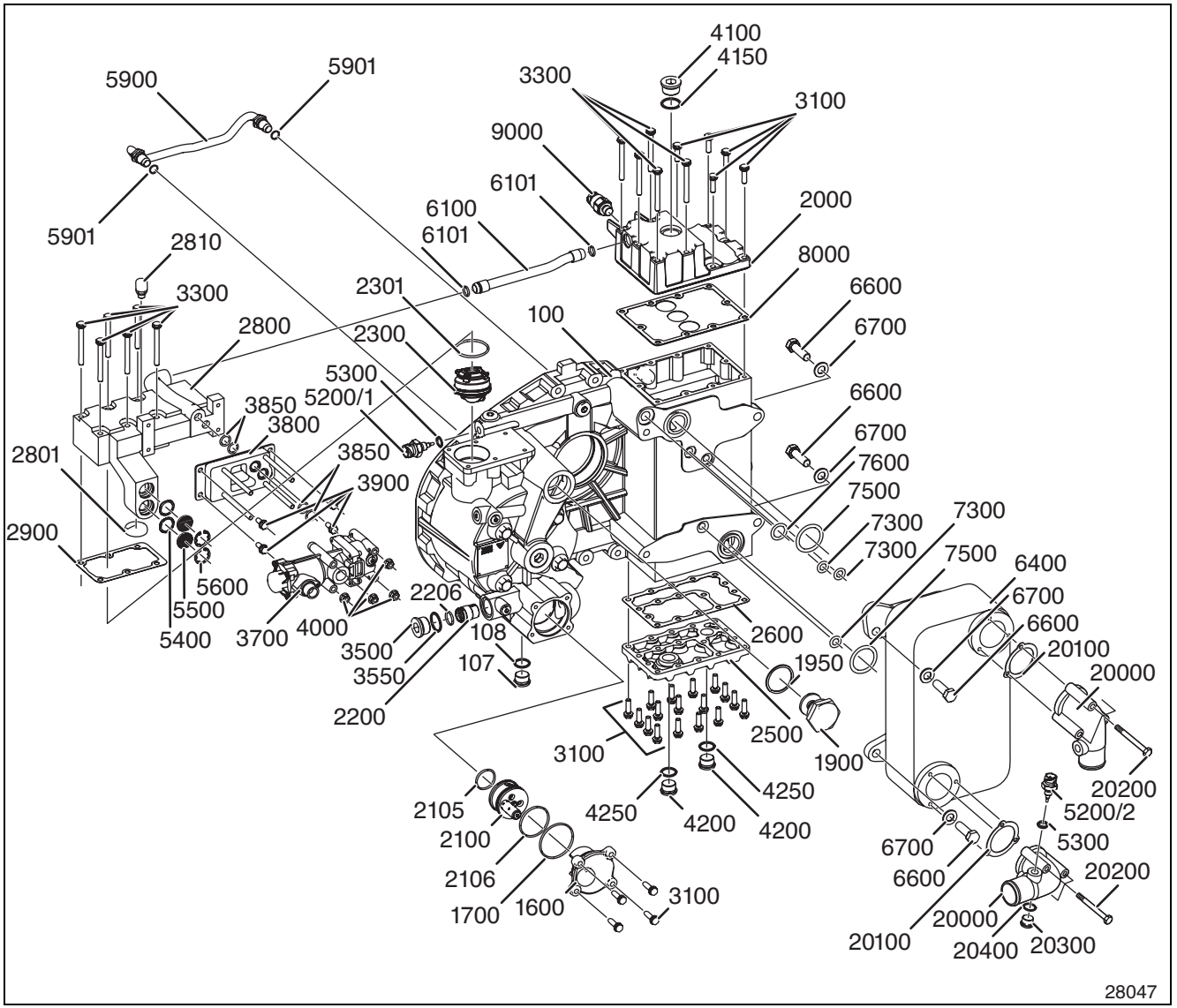
NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.

NOTE

⇨ Observe the reduced tightening torque with the integrated sealing ring.

The copper sealing ring variant is described in the instructions.



7.2 Top Oil Tank Cover

Item No.	Designation
2000	Top oil tank cover
3100	Combined hex head screw M8x30, hexagon insert bit, w.a.f. 13, 30 Nm
3300	Combined hex head screw M8x80, hexagon insert bit, w.a.f. 13, 30 Nm
6100	Pipe, mind mounting position
6101	O-ring 15.3x2.4, replace
8000	Intermediate plate 196x144x2, replace
9000	Pressure sensor M16x1.5, hexagon insert bit, w.a.f. 27, 32 Nm

NOTE

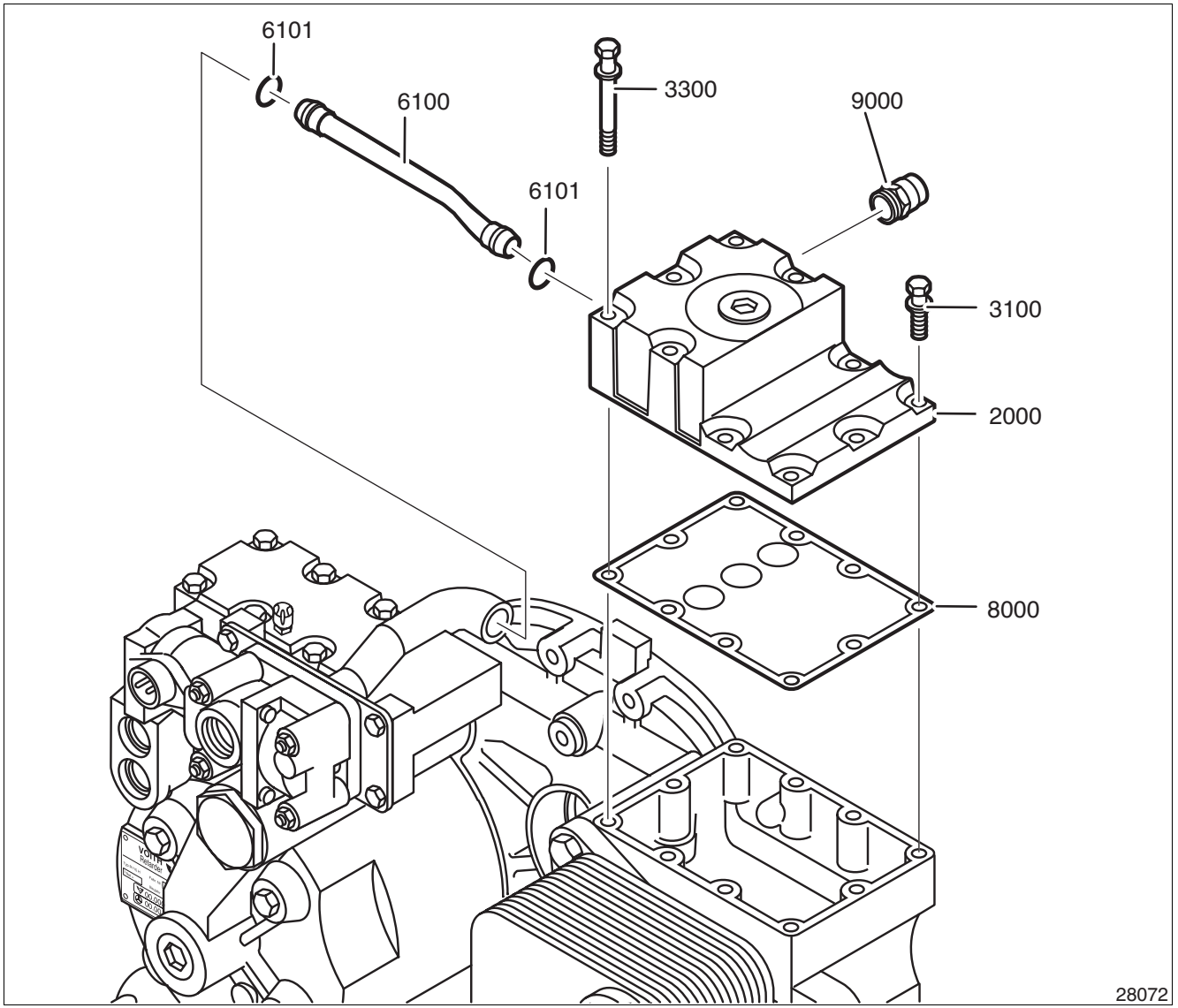
⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.

Sealing agent

Thread seal	Loctite 572

Requirements

- Retarder switched off
- Ignition switched off



CAUTION

Hot parts!

Hands could be burned.

⇨ Work carefully.

⇨ Wear protective gloves or use cloths if necessary.

Removal

1. Unscrew the combined hex head screws (3100 and 3300).
2. Remove top oil tank cover (2000).
3. Remove the intermediate washer (8000).
4. Remove the pipe (6100).

Installation

NOTE

Use sealing agent Loctite 572 with retarders starting with Voith item No. H67.1500.30.

1. Clean sealing surface on retarder housing (100) and top oil tank cover (2000).
2. Apply sealing agent inside the holes of the combined hex head screws (3100 and 3300).
3. Insert new intermediate washer (8000).
4. Lubricate the new O-rings (6101) with silicone-free, non-corrosive grease and pull them on the pipe (6100).

NOTE

Ensure proper installation position of the pipe (6100) in the top oil tank cover (2000).

5. Insert pipe (6100) into top oil tank cover (2000) and cover of casing ventilation (2800).
6. Screw on top oil tank cover (2000) with the combined hex head screws (3100 and 3300).
7. Tighten combined hex head screws (3100 and 3300) crosswise to 30 Nm.

7.3 Bottom Oil Tank Cover

Item No.	Designation
2500	Bottom oil tank cover
2600	Cover gasket bottom, replace
3100	Combined hex head screw M8x30, hexagon insert bit, w.a.f. 13, 30 Nm
4200	Screw plug M24x1.5, hexagon socket head, w.a.f. 12, with copper sealing ring: 80 Nm with integrated sealing ring: 47 Nm
4250	Sealing ring A24x29, replace

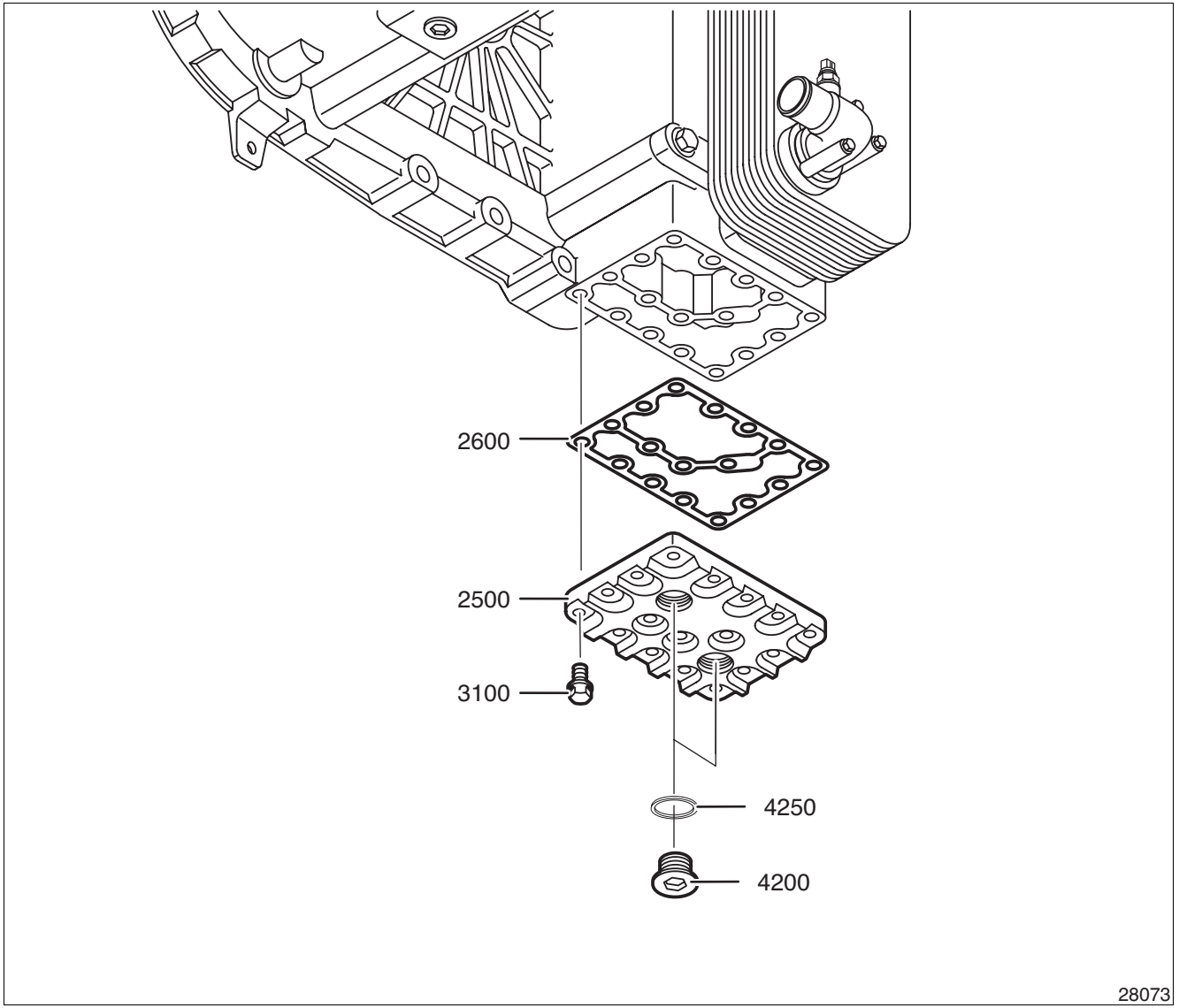
NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.

NOTE

⇨ Observe the reduced tightening torque with the integrated sealing ring.

The copper sealing ring variant is described in the instructions.



Requirements

- Retarder switched off
- Ignition switched off
- Retarder oil discharged (see page 22)

CAUTION

Hot parts!
Hands could be burned.
⇨ Work carefully.
⇨ Wear protective gloves or use cloths if necessary.

Removal

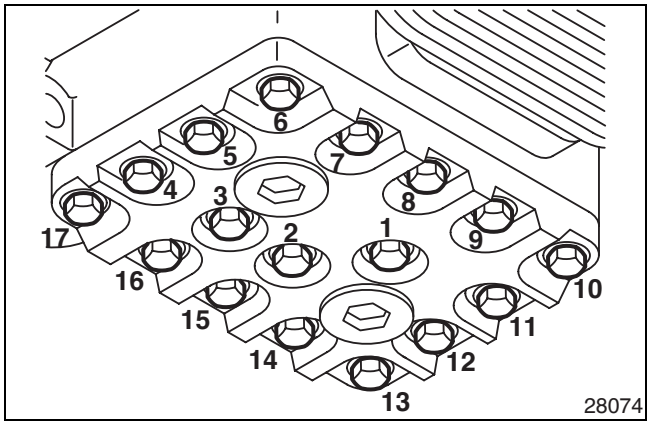
1. Unscrew the combined hex head screws (3100).
2. Remove bottom oil tank cover (2500).
3. Remove cover gasket bottom (2600).

Installation

1. Clean sealing surface on retarder housing (100) and bottom cover (2500).
2. Insert new cover gasket bottom (2600).
3. Screw on cover (2500) with the combined hex head screws (3100).

CAUTION

Incorrect sequence when tightening the combined hex head screws!
Cover can buckle.
⇨ Screw tight combined hex head screws in the prescribed sequence.



4. Screw tight combined hex head screws in the prescribed sequence to 30 Nm.

7.4 Casing Ventilation

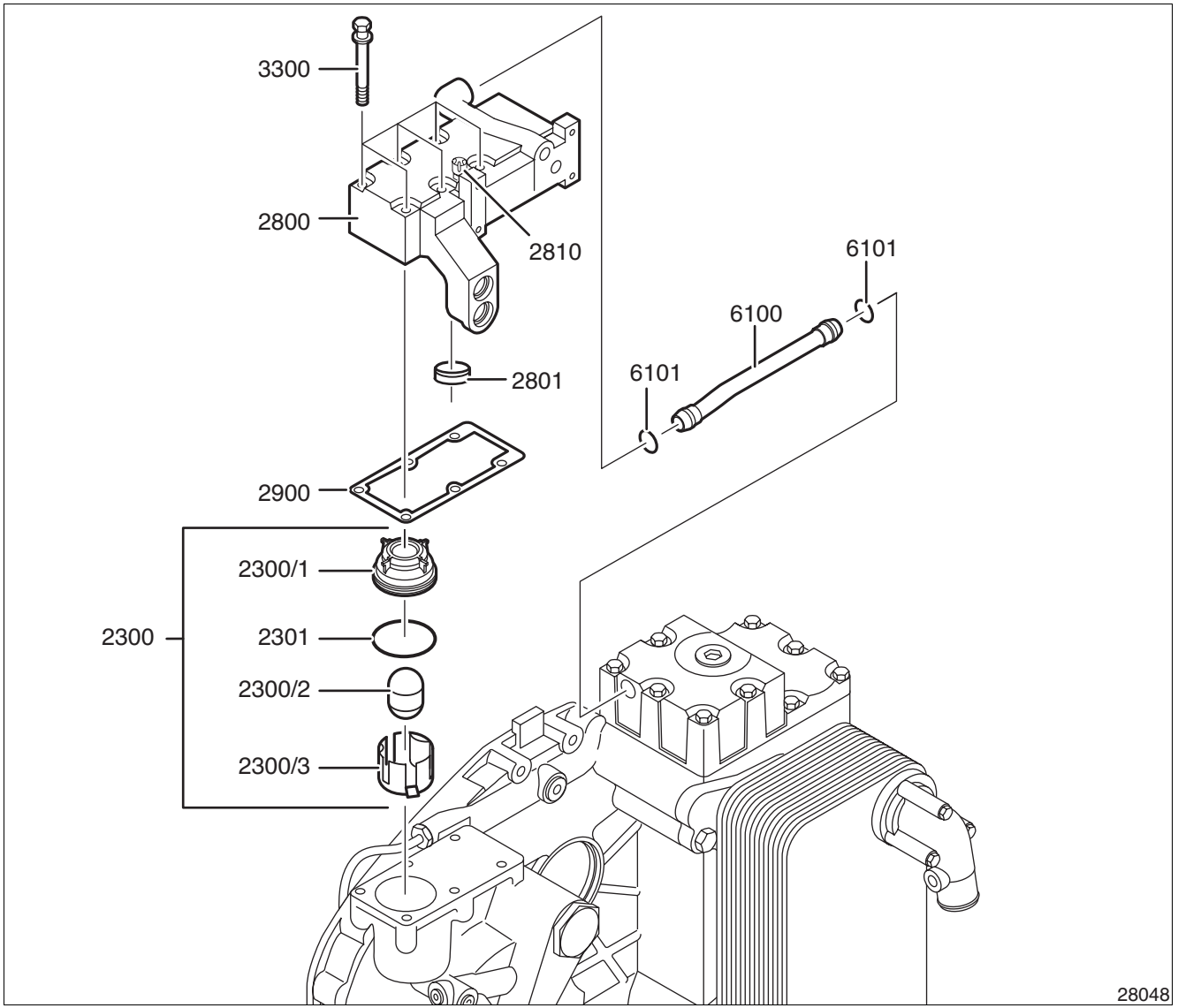
Item No.	Designation
2300	Casing ventilation
2301	O-ring 55x3, replace
2300/1	Valve insert
2300/2	Float, specified weight max. 12 g
2300/3	Float cage
2800	Cover of casing ventilation
2801	Cover
2810	Vent and air filter
2900	Casing ventilation cover gasket, replace
3300	Combined hex head screw M8x80, hexagon insert bit, w.a.f. 13, 30 Nm
6100	Pipe, mind mounting position
6101	O-ring 15.3x2.4, replace

NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.

Cleaning agent

Float	Spirit



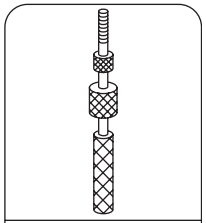
CAUTION

Incorrect adapter!

Damage to casing ventilation.

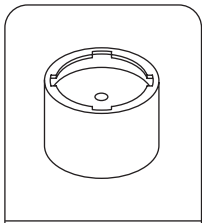
⇨ Use only the adapter (98/9) as from item number H53.942811.

Special tools



Impact puller

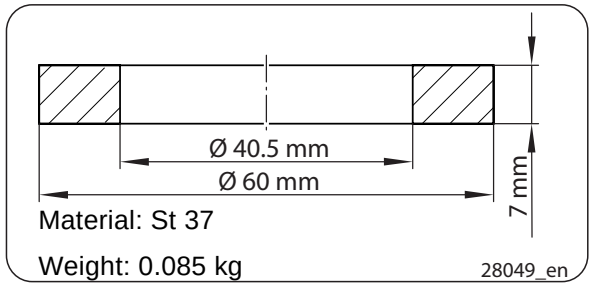
99/5



Adapter

98/9

Tools for self-fabrication



Test ring

99/4

The test ring (99/4) can be ordered from Voith Turbo: item No. H67.2757xx.

Requirements

- Retarder switched off
- Ignition switched off
- Proportional valve and damping plate removed (see page 89)

CAUTION

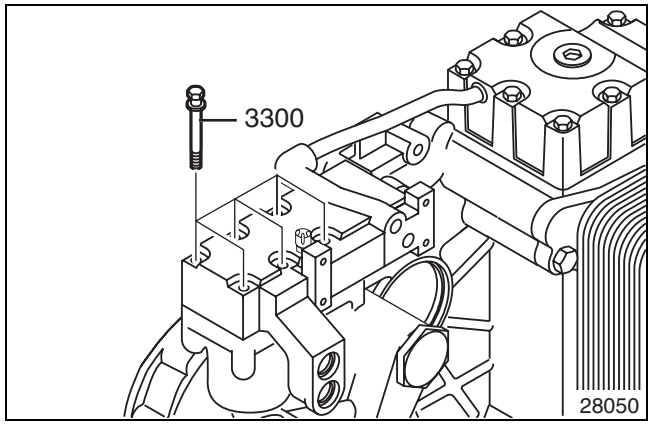
Hot parts!

Hands could be burned.

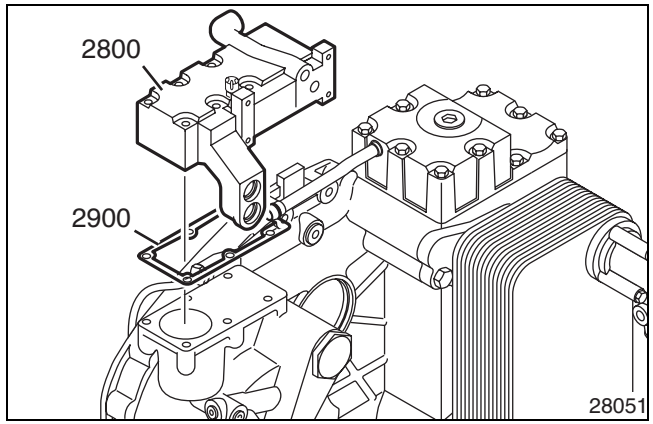
⇨ Work carefully.

⇨ Wear protective gloves or use cloths if necessary.

Removal

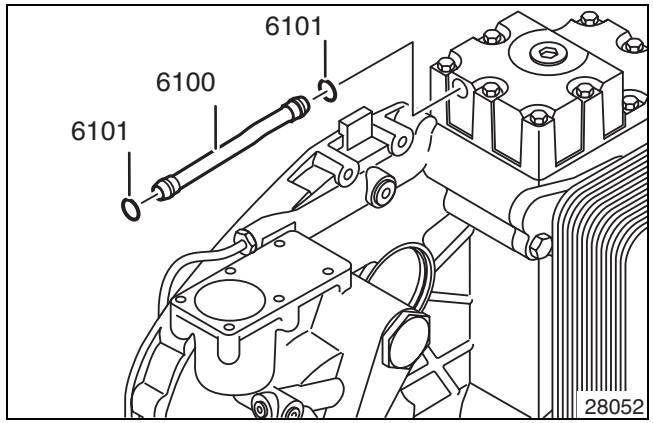


1. Unscrew the combined hex head screws (3300).

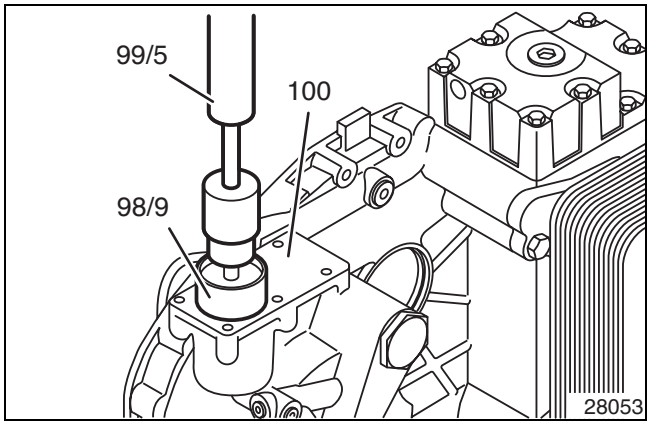


2. Remove cover of casing ventilation (2800).

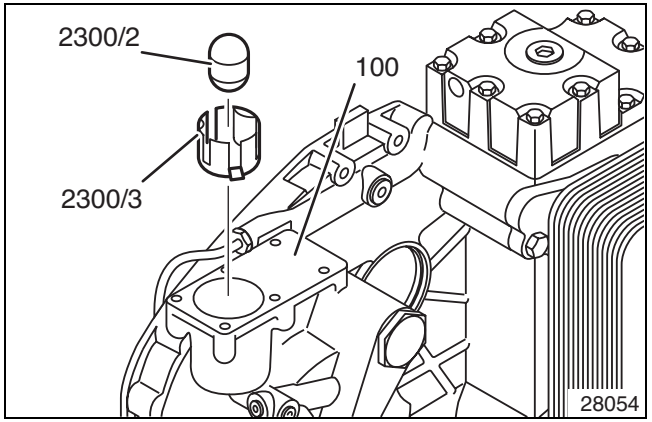
3. Remove casing ventilation cover gasket (2900).



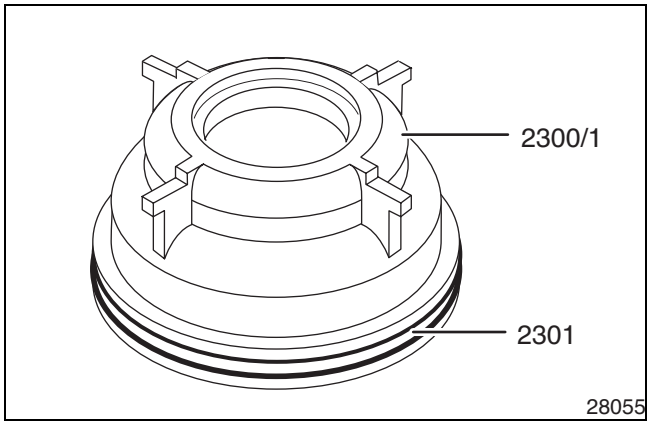
4. Remove the pipe (6100).



5. Knock valve insert (2300/1) with the impact puller (99/5) and the adapter (98/9) upward from the retarder housing (100).



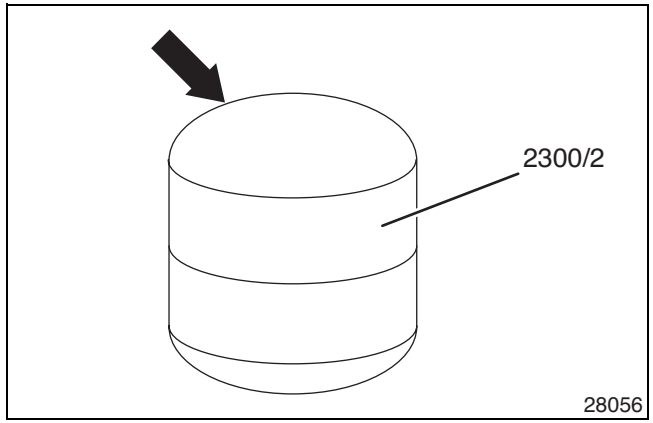
6. Remove float (2300/2) and float cage (2300/3) from the retarder housing (100)



7. Take O-ring (2301) out of the groove in the valve insert (2300/1).

Checking

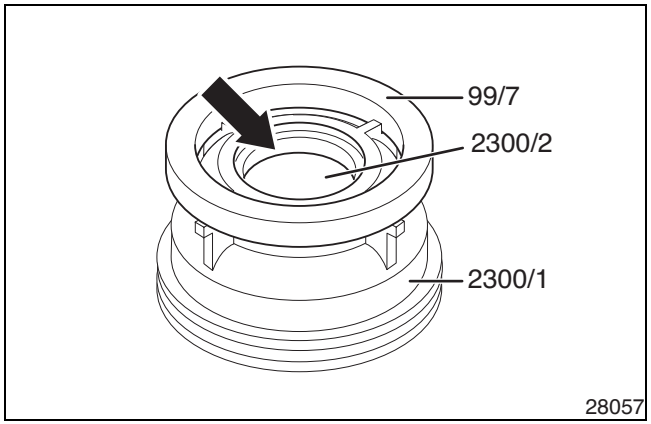
1. Check the casing ventilation (2300) for dirt/sludge and clean it.



2. Check the float (2300/2) for damaged surfaces and sealing areas (arrow).

3. Weight float (2300/2): Specified weight: max. 12 g.

4. For exceeded specified weight: replace the entire casing ventilation (2300).



5. Check the sealing edge of the radial shaft sealing ring (arrow) in the valve insert (2300/1):

- For this purpose, place the float (2300/2) on a suitable object (e.g. hex head nut).
- Place the valve insert (2300/1) on the float (2300/2) and weigh it down using the test ring (99/4).
- Fill empty space between float (2300/2) and upper edge of valve insert with spirit.

If the sealing edge is undamaged, the fluid level remains constant over 1 minute.

6. Replace casing ventilation (2300) if sealing edge is damaged.

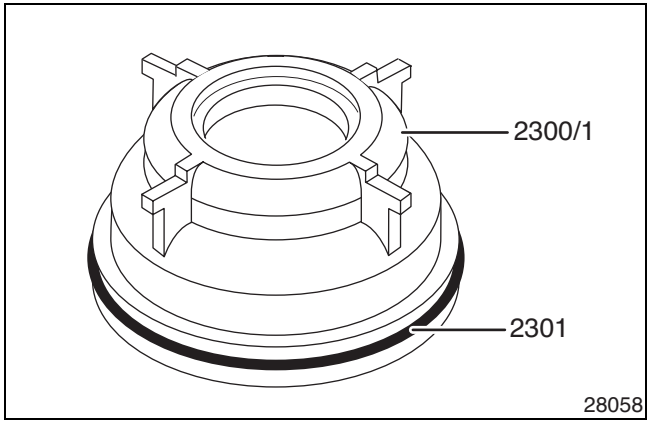
Installation

CAUTION

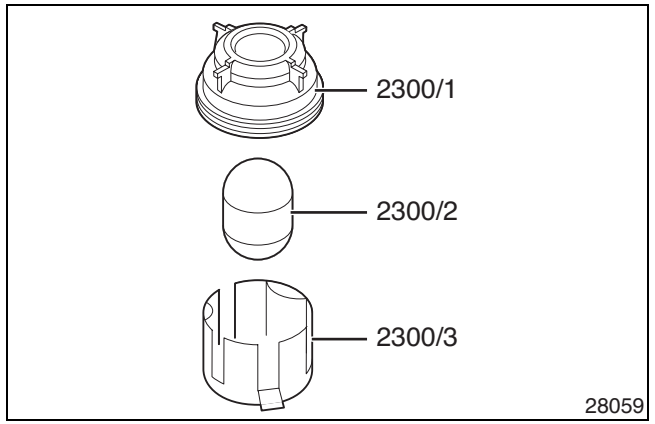
Lubrication of the radial shaft sealing ring!

Retarder fault.

⇨ Do not lubricate the radial shaft sealing ring.



1. Apply silicone-free and non-corrosive grease to a new O-ring (2301) and pull it onto the valve insert (2300/1).



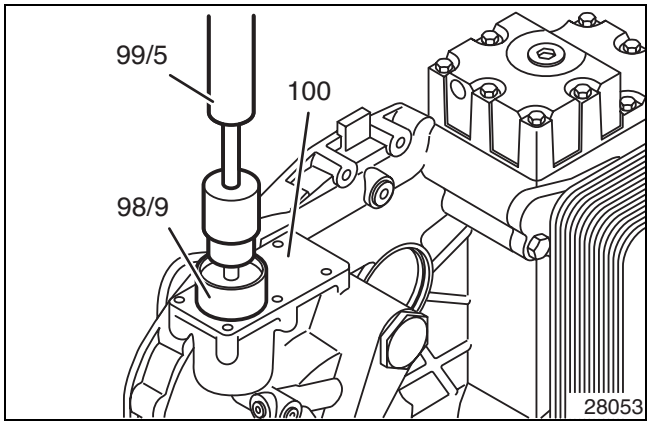
2. Clean float with spirit.

3. Insert float (2300/2) into the float cage (2300/3).

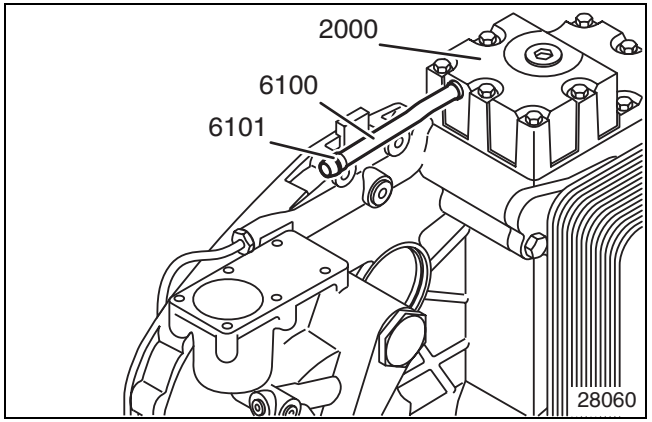
4. Place valve insert (2300/1) on float cage (2300/3).

5. Clean sealing surface on retarder housing (100) and cover of casing ventilation (2800).

6. Coat hole of casing ventilation in the retarder housing with silicone-free and non-corrosive grease.



7. Press valve insert (2300/1) **carefully** into the retarder housing with the impact puller (99/5) and the adapter (98/9).

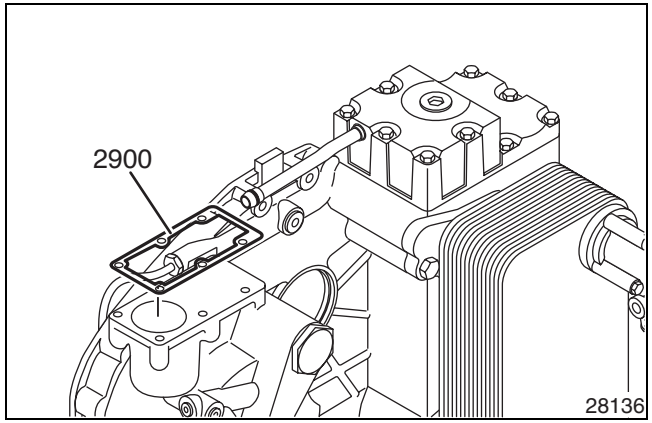


8. Lubricate the new O-rings (6101) with silicone-free, non-corrosive grease and pull them on the pipe (6100).

NOTE

Ensure proper installation position of the pipe (6100) in the top oil tank cover (2000).

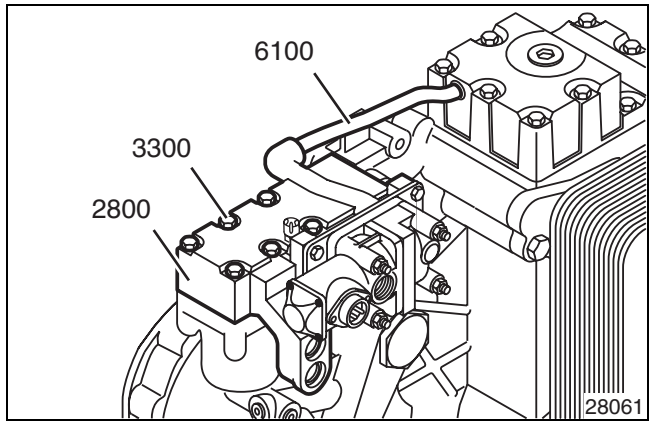
9. Insert pipe (6100) into top oil tank cover (2000).



10. Insert new gasket (2900).

11. Lubricate hole for the pipe (6100) in the cover of casing ventilation (2800) with silicone-free, non-corrosive grease.

12. Slide cover of casing ventilation (2800) onto the pipe (6100).

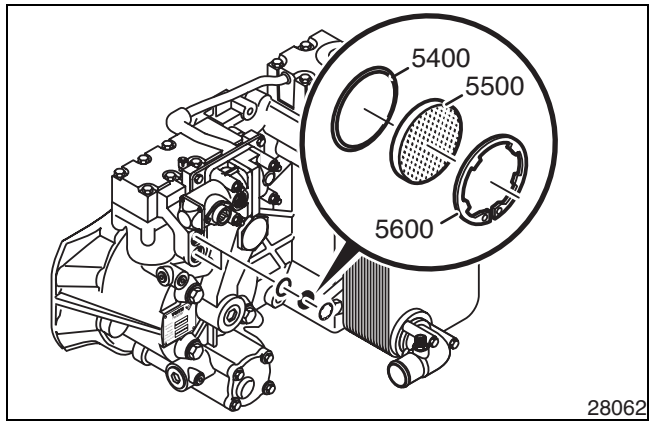


13. Screw on cover of casing ventilation (2800) with the combined hex head screws (3300).

14. Tighten combined hex head screws (3300) crosswise to 30 Nm.

7.5 Retarder Ventilation

Item No.	Designation
5400	Corrugated spring
5500	Check, clean and blow out disc silencer with compressed air
5600	Circlip



Cleaning agent

Retarder ventilation	Benzine

DANGER

Heavily soiled or painted-over retarder ventilation!

Retarder reduces braking power after a delay.

⇨ Replace retarder ventilation.

CAUTION

Retarder ventilation mechanically defective!

Retarder fault.

⇨ Replace retarder ventilation.

Requirements

- Retarder switched off
- Ignition switched off

7.6 Water Neck

Item No.	Designation
20000	Water neck
20100	Gasket, replace
20200	Combined hex head screw M8x80, hexagon insert bit, w.a.f. 13, 30 Nm

NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.

Requirements

- Retarder switched off
- Ignition switched off
- Coolant drained (see page 28)

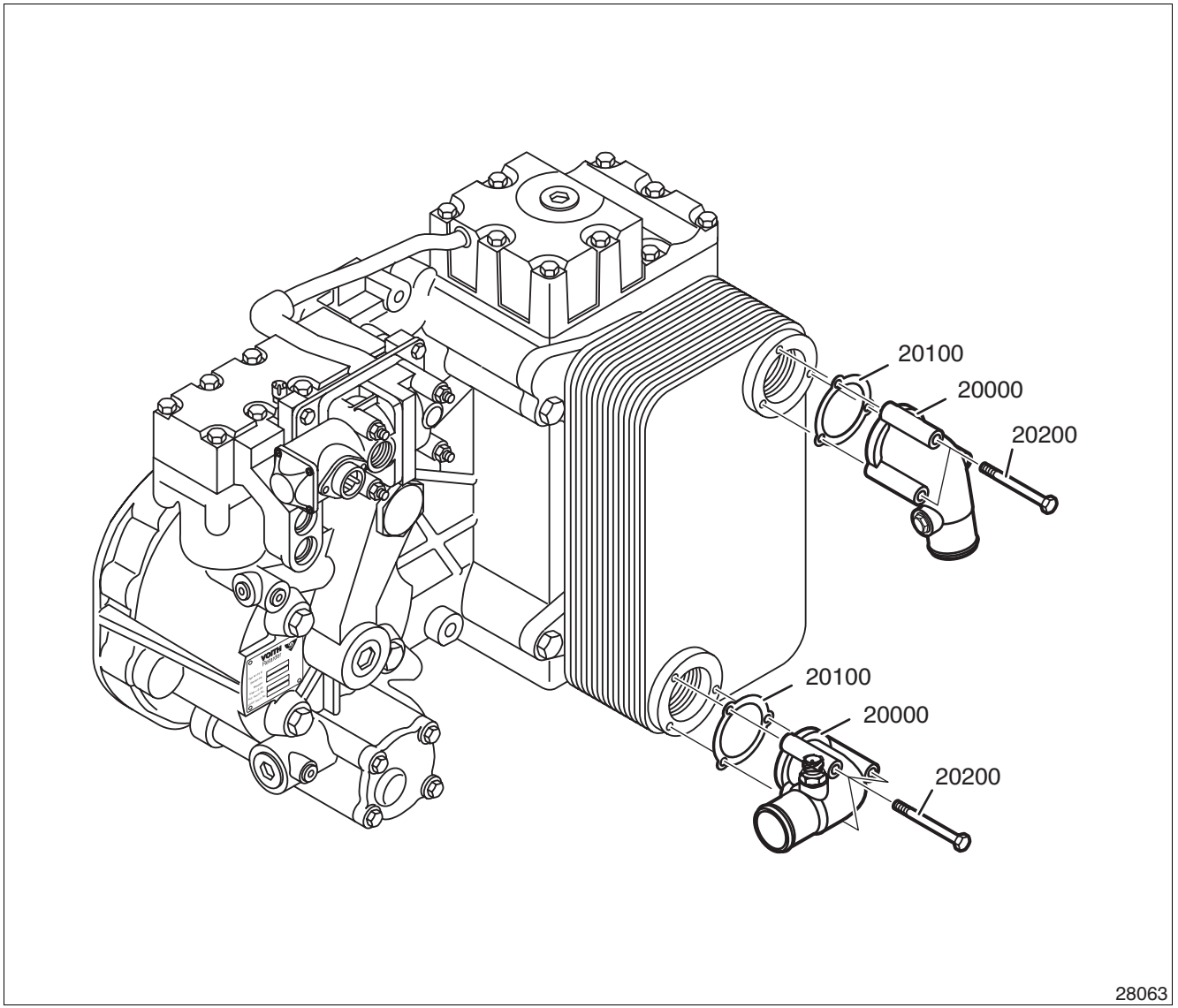
⚠ CAUTION

Hot parts!

Hands could be burned.

⇨ Work carefully.

⇨ Wear protective gloves or use cloths if necessary.

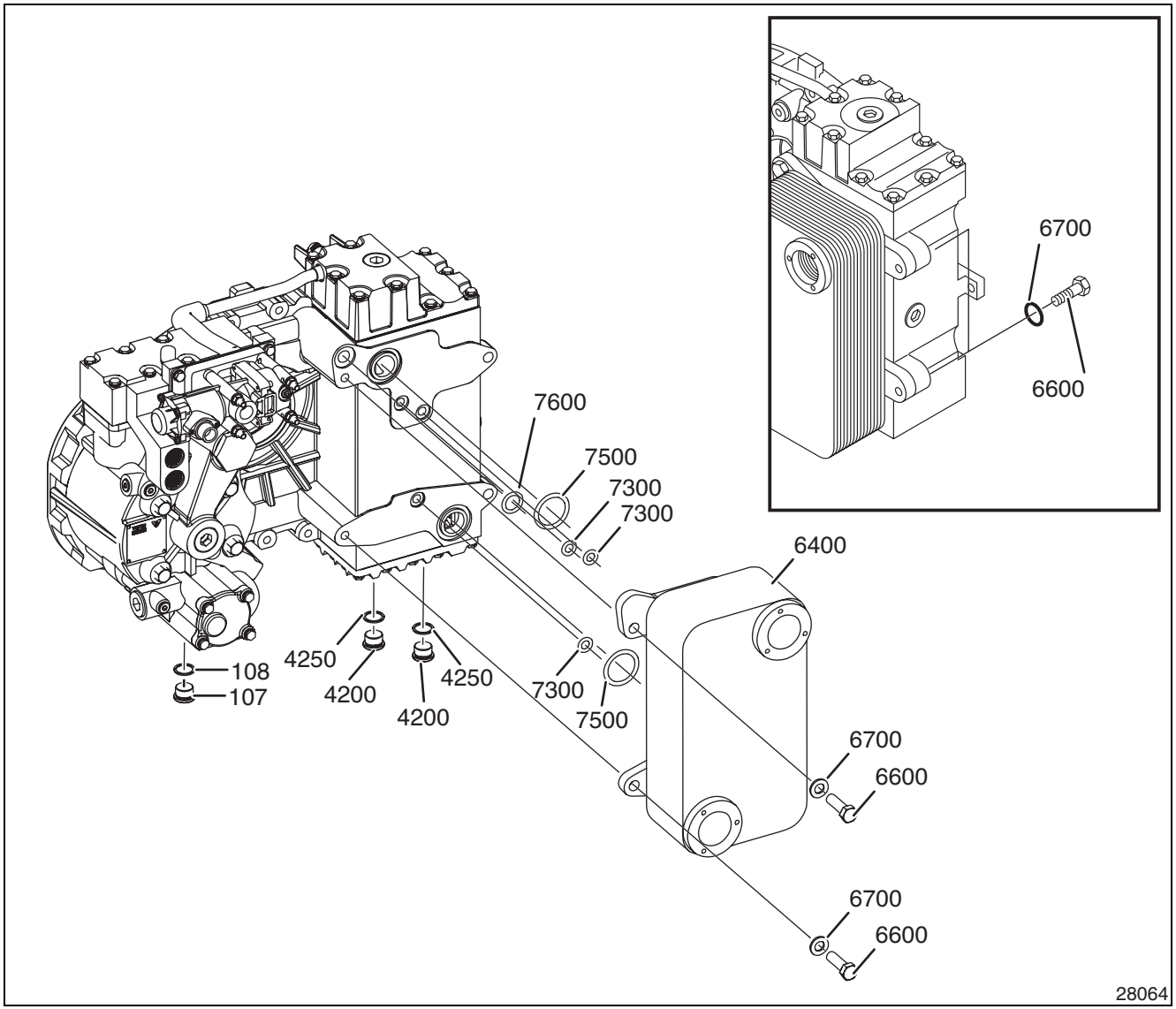


7.7 Heat Exchanger

Item No.	Designation
107	Screw plug M24x1.5, hexagon socket head, w.a.f. 12, with copper sealing ring: 80 Nm with integrated sealing ring: 47 Nm
108	Sealing ring A24x29, replace
4200	Screw plug M24x1.5, hexagon socket head, w.a.f. 12 with copper sealing ring: 80 Nm with integrated sealing ring: 47 Nm
4250	Sealing ring A24x29, replace
6400	Heat exchanger
6600	Hex head screw M14x45, hexagon insert bit, w.a.f. 22, 150 Nm
6700	Washer A14
7300	O-ring 15x4, replace
7500	O-ring 45x5, replace
7600	O-ring 25x4, replace

NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.

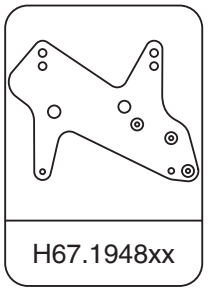


NOTE

⇨ Observe the reduced tightening torque with the integrated sealing ring.

The copper sealing ring variant is described in the instructions.

Special tools



Pressure test equipment

50/22

Sealing agent

Heat exchanger	Elring Sealing Mass Dirko-S Profi press HT; black; temperature resistant from –50 °C ... 250 °C; Elring No. 129.400; Voith item No. 190.00169710

Requirements

- Retarder switched off
- Ignition switched off
- Supply-air pressure discharged
- Retarder oil discharged (see page 23)
- Coolant drained (see page 28)
- Water neck removed (see page 70)

CAUTION

Hot parts!

Hands could be burned.

⇨ Work carefully.

⇨ Wear protective gloves or use cloths if necessary.

DANGER

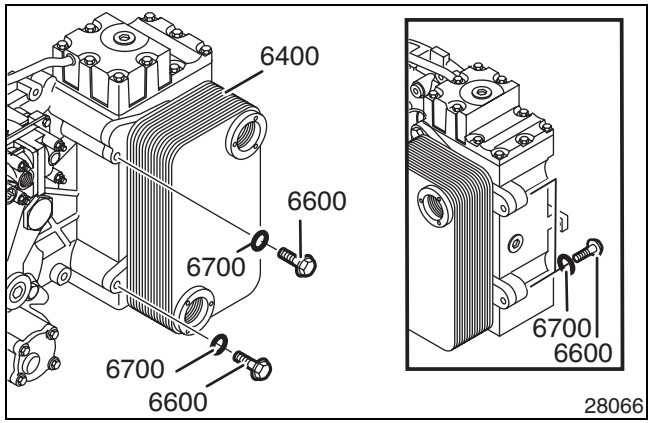
Heat exchanger can fall!

Your body can be crushed severely.

⇨ Secure heat exchanger against falling.

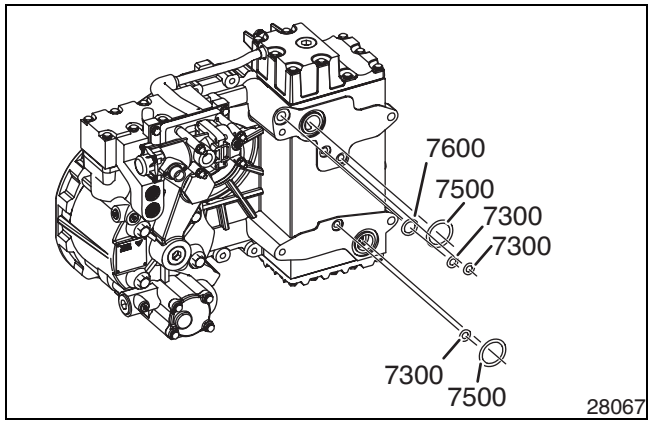
⇨ Use a suitable device for hanging it up.

Removal



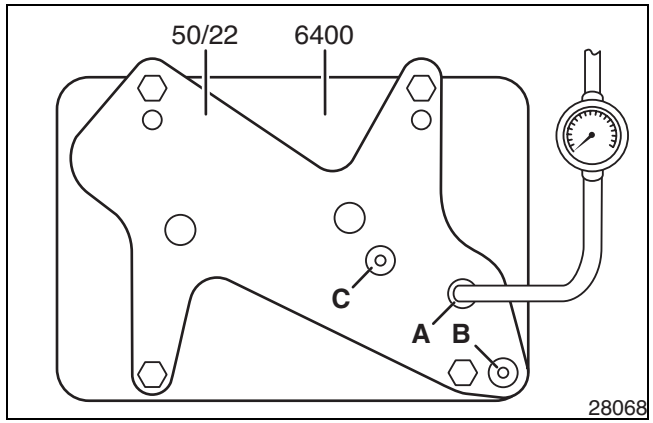
1. Unscrew the hex head screws (6600).

2. Remove the heat exchanger (6400).



3. Remove the O-rings (7300, 7500 and 7600).

Checking



CAUTION

Heat exchanger leaky!

Retarder fault.

⇨ If air bubbles appear in the water or an external leak is detected, replace the heat exchanger.

1. Attach pressure test equipment (50/22) to heat exchanger (6400) with O-rings and attach the compressed-air line to the connection.
2. Fill cooling water section of heat exchanger (6400) with hot water (approx. 70 °C).
3. Slowly pressurize heat exchanger (6400) with compressed air from 0 to max. 10 bar.
4. Repeat Steps 1 through 3 at connections "B" and "C".

Installation

NOTE

The water and oil section of new heat exchangers are coated with anti-corrosion oil.

⇨ Before installing, discharge any anti-corrosion oil which as accumulated and rinse with hot water on the water side.

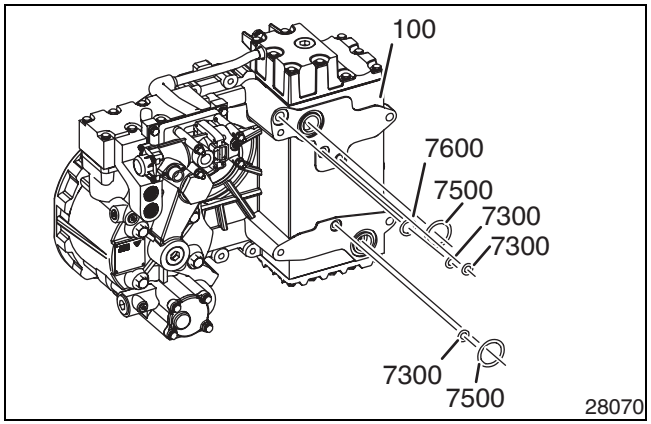
CAUTION

Possible water residue in retarder!

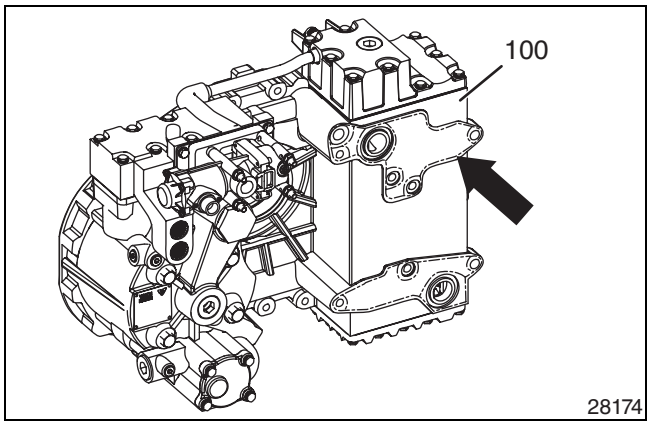
Oil ejection via ventilation.
Retarder fault.

⇨ Fill retarder with 7.0 litres of engine oil or flush oil. Apply brakes lightly several times to flush the retarder system. Discharge flush oil. Repeat 2 to 3 times.

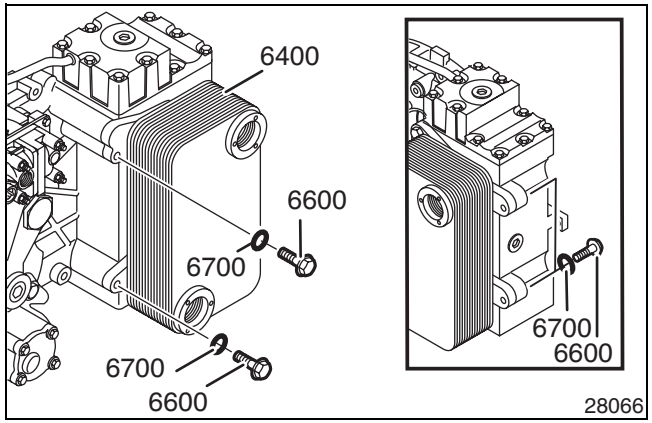
⇨ De-oil the cooling circuit and heating system according to the vehicle manufacturer's instructions.



1. Lubricate the new O-rings (7300, 7500 and 7600) with silicone-free, non-corrosive grease and insert into retarder housing (100).



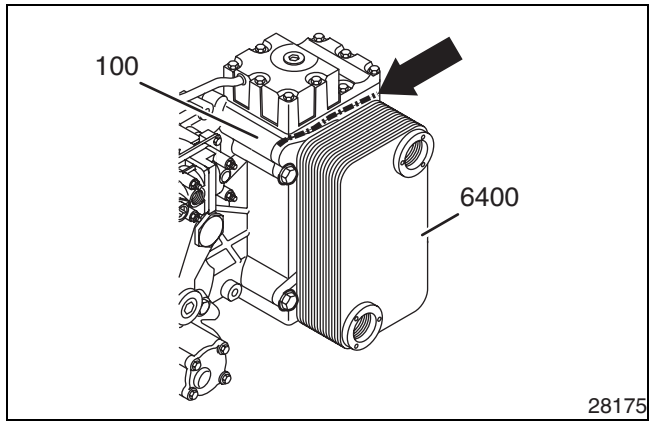
2. Apply sealing agent (arrow) to the retarder housing (100) near the heat exchanger (6400) (see dashed line/figure).



3. Place the heat exchanger (6400) onto the retarder housing (100).

4. Screw in hex head screws (6600) with washers (6700).

5. Tighten hex head screws (6600) crosswise to 150 Nm.



6. With housing models up to retarder serial number 963 690, the gap at the top between the heat exchanger (6400) and the retarder housing (100) must be sealed with sealing agent (arrow) (see dashed line/figure).

7.8 Pressure Control Valve

Item No.	Designation
2200	Complete pressure control valve
2206	O-ring 21.5x2.5, replace
3500	Screw plug M30x1.5, hexagon socket head, w.a.f. 17, with copper sealing ring: 130 Nm with integrated sealing ring: 100 Nm
3550	Sealing ring A30x36, replace

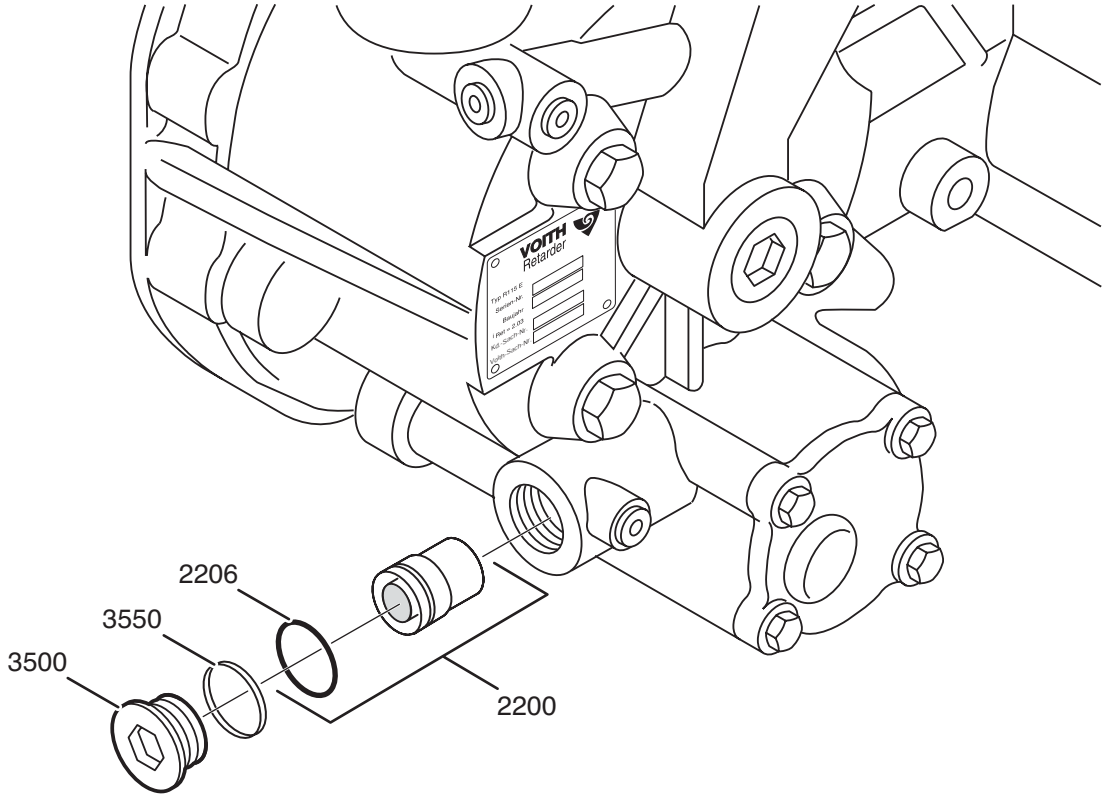
NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.

NOTE

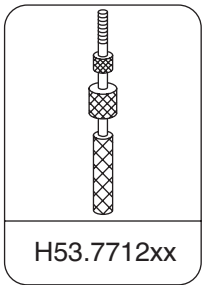
⇨ Observe the reduced tightening torque with the integrated sealing ring.

The copper sealing ring variant is described in the instructions.



28075

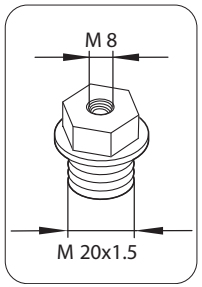
Special tool



Impact puller

99/5

Tools for self-fabrication



Screw plug

50/43

Requirements

- Retarder switched off
- Ignition switched off
- Retarder oil discharged (see page 22)

CAUTION

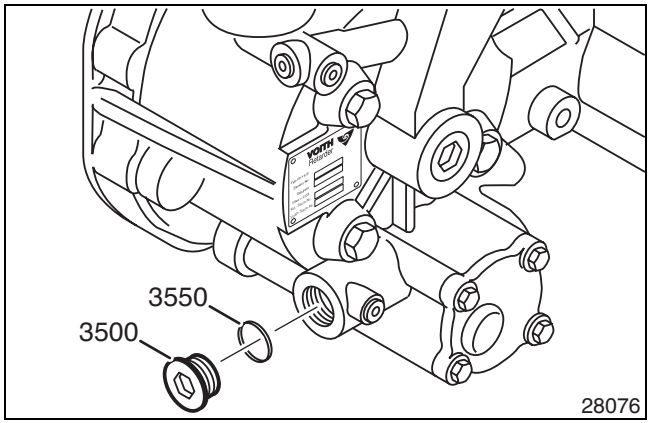
Hot parts!

Hands could be burned.

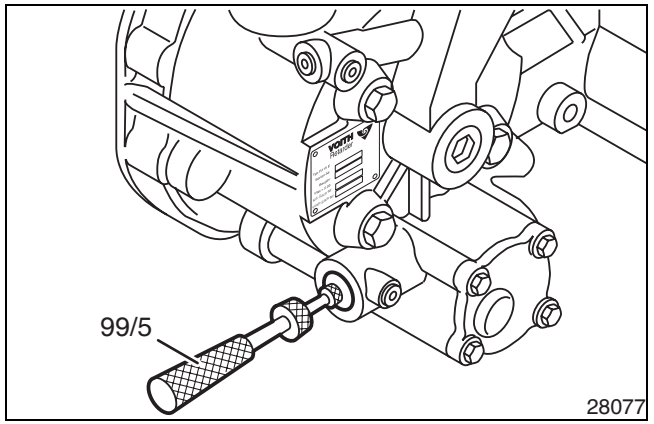
⇨ Work carefully.

⇨ Wear protective gloves or use cloths if necessary.

Removal



1. Unscrew the screw plug (3500).



NOTE

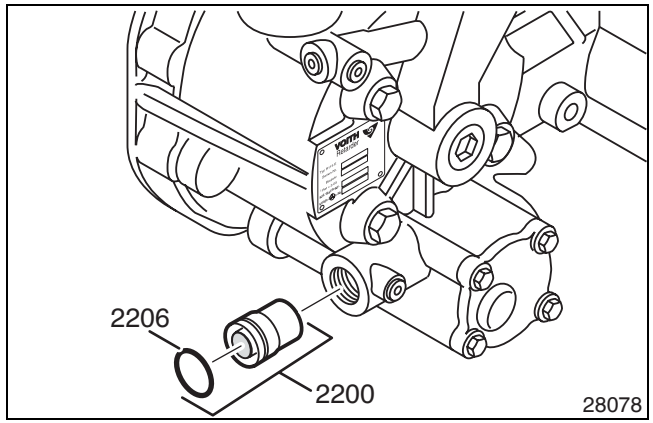
There are two variants of the pressure control valve.

- Pressure control valve variant 1 without sieve. Sieve is at the screw plug (3500)
- Variant 2; sieve is located directly in the pressure control valve

⇨ With variant 1, the pressure control valve (2200) is only removed with the impact puller (99/5).

2. Knock out pressure control valve (2200) with the impact puller (99/5) and the screw plug (50/43) from the retarder housing.

Installation



1. Lubricate the new O-ring (2206) with silicone-free, non-corrosive grease and pull it onto the pressure control valve (2200).
2. **Carefully** press pressure control valve (2200) with the impact puller (99/5) and the screw plug (50/43) into the retarder housing.
3. Lubricate the new sealing ring (3550) with silicone-free, non-corrosive grease.
4. Screw in the screw plug (3500) with sealing ring (3550) and tighten to 130 Nm.

7.9 Non-Return Valve Inlet

Item No.	Designation
1900	Non-return valve inlet, complete
1900/1	Guide M48x1.5, hexagon insert bit, w.a.f. 55, with copper sealing ring: 280 Nm with integrated sealing ring: 280 Nm
1900/2	Spring
1900/3	Piston
1950	Sealing ring A48x55, replace

NOTE

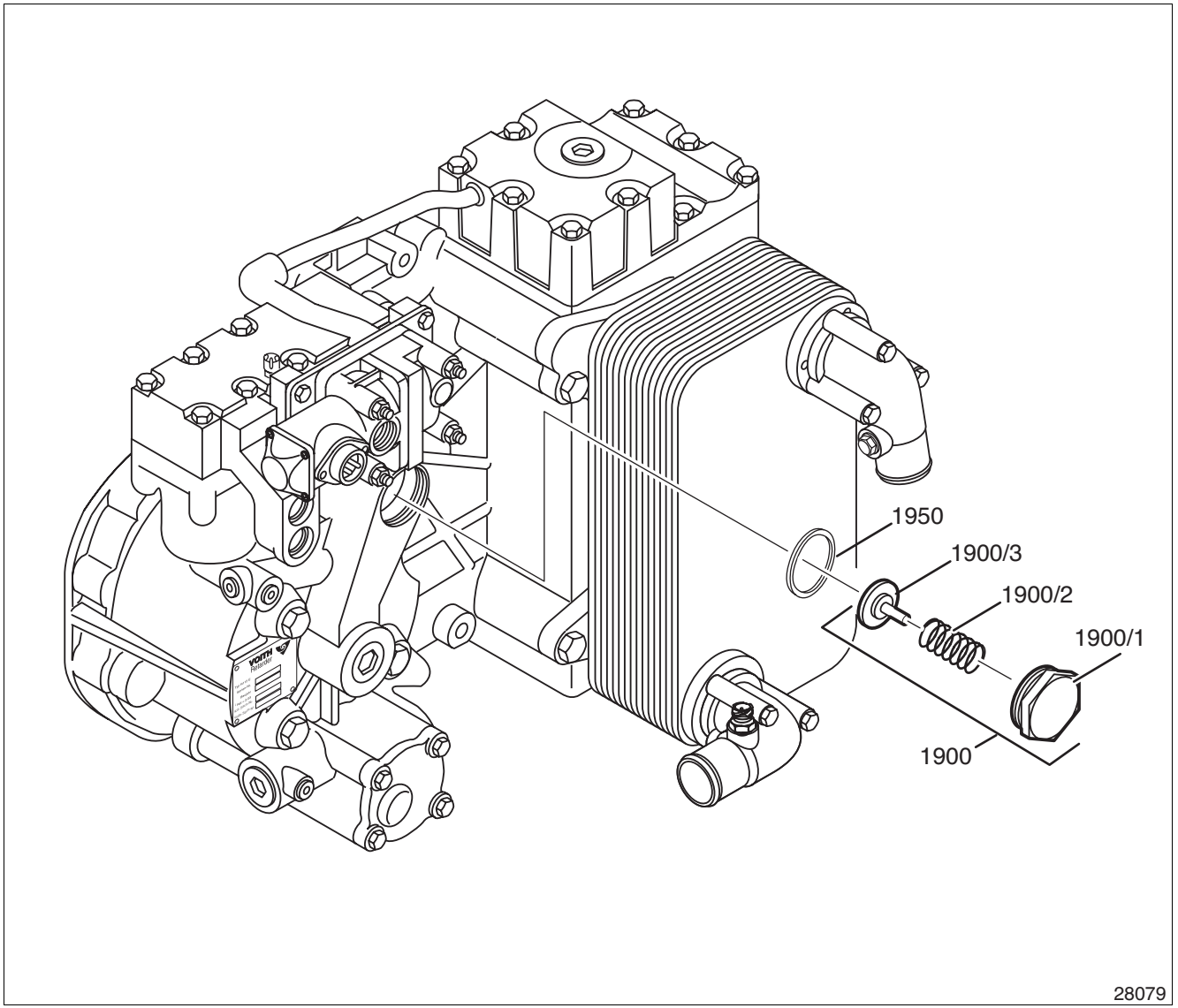
⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.

Sealing agent

Thread seal	Loctite 572

Requirements

- Retarder switched off
- Ignition switched off



CAUTION

Hot parts!

Hands could be burned.

⇨ Work carefully.

⇨ Wear protective gloves or use cloths if necessary.

Removal

1. Screw out guide (1900/1).
2. Remove spring (1900/2) and piston (1900/3) from retarder housing.

Checking

1. Check rubber coating of the piston (1900/3) for damage.
   Replace the complete non-return valve inlet (1900) if necessary.
2. Check guide (1900/1) and spring (1900/2) for wear.
   Replace the complete non-return valve inlet (1900) if necessary.

Installation

NOTE

⇨ Use sealing agent Loctite 572 with retarders starting with Voith item No. H67.1500.30.
Only in conjunction with copper sealing ring.

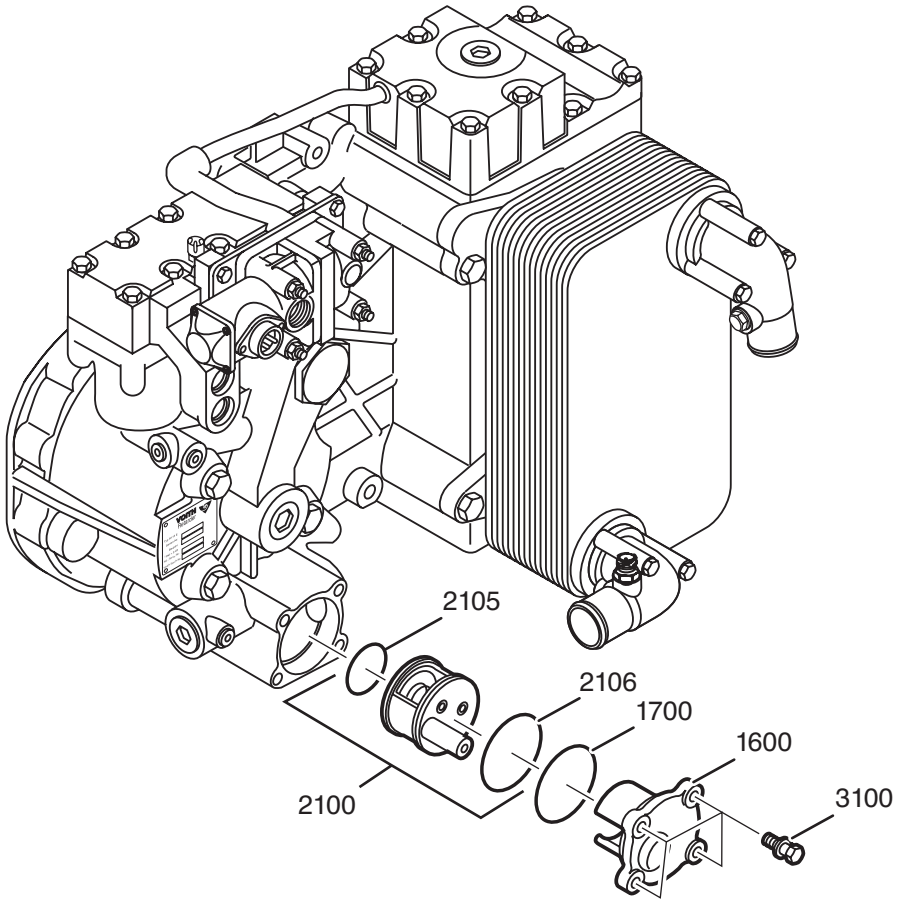
1. Apply sealing agent to the thread of the guide (1900/1).
2. Lubricate the new sealing ring (1950) with silicone-free, non-corrosive grease.
3. Screw in the non-return valve inlet (1900) complete with sealing ring (1950).
4. Tighten non-return valve inlet (1900) with 280 Nm.

7.10 Non-Return Valve Outlet

Item No.	Designation
1600	Valve cover, mind mounting position
1700	O-ring 60x3, replace
2100	Non-return valve outlet, complete. Mind mounting position
2105	O-ring 34x3, replace
2106	O-ring 54x3, replace
3100	Combined hex head screw M8x30, hexagon insert bit, w.a.f. 13, 30 Nm

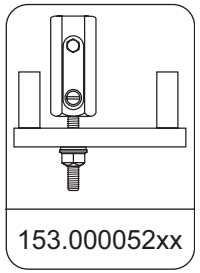
NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.



28080

Special tool



Puller
for non-return
valve outlet

50/1

Requirements

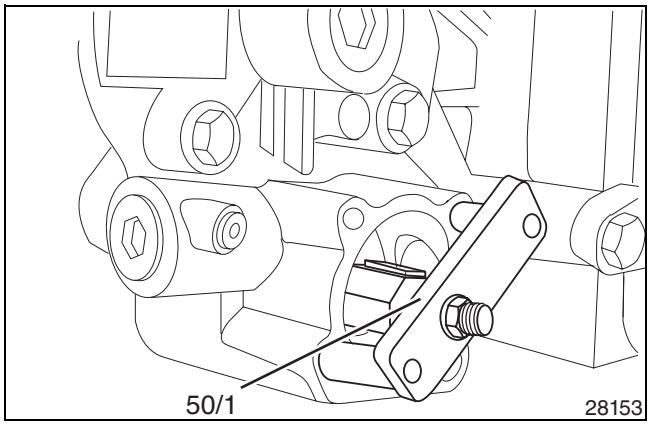
- Retarder switched off
- Ignition switched off
- Retarder oil discharged (see page 22)

CAUTION

Hot parts!
Hands could be burned.
⇨ Work carefully.
⇨ Wear protective gloves or use cloths if necessary.

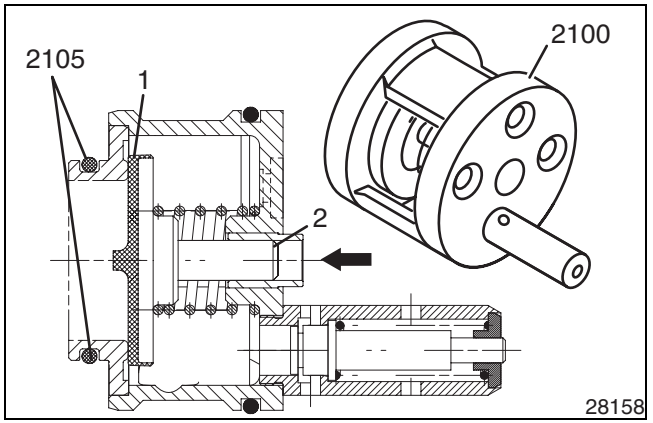
Removal

1. Unscrew the combined hex head screws (3100).
2. Remove the valve cover (1600).



3. Slide the puller for the non-return valve (50/1) onto the non-return valve outlet (2100) until it engages.
4. Pull the non-return valve outlet (2100) out of the retarder housing.
5. Remove the O-rings (1700, 2105 and 2106).

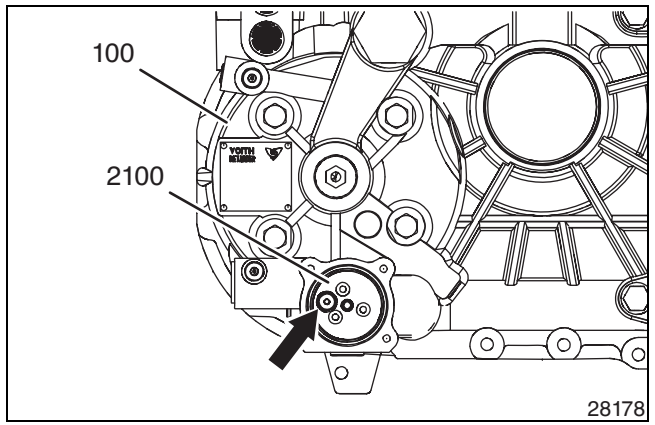
Checking



1. Check rubber coating of the valve plate (1) for damage.
   Replace the complete non-return valve outlet (2100) if necessary.
2. Check the hole or sleeve (arrow) for wear and uncircularity.
   Replace the complete non-return valve outlet (2100) if necessary.
3. Press the valve plate (1) flush in and check the guide piston (2) for wear.
   Replace the complete non-return valve outlet (2100) if necessary.

Installation

1. Apply silicone-free and non-corrosive grease to the new O-rings (2105 and 2106) and pull them onto the non-return valve outlet (2100).



2. Press the non-return valve outlet (2100) into the retarder housing (100) in the correct installation position (arrow) with a suitable tool.

3. Apply silicone-free and non-corrosive grease to O-ring (1700) and pull it onto the valve cover (1600).

4. Screw on valve cover (1700) with the combined hex head screws (3100).

5. Tighten combined hex head screws (3100) crosswise to 30 Nm.

7.11 Oil Temperature Sensor

Item No.	Designation
5200/1	Oil temperature sensor M14x1.5, hexagon insert bit, w.a.f. 21, with copper sealing ring: 32 Nm
5300	Sealing ring A14x20, replace

NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.

Requirements

- Retarder switched off
- Ignition switched off

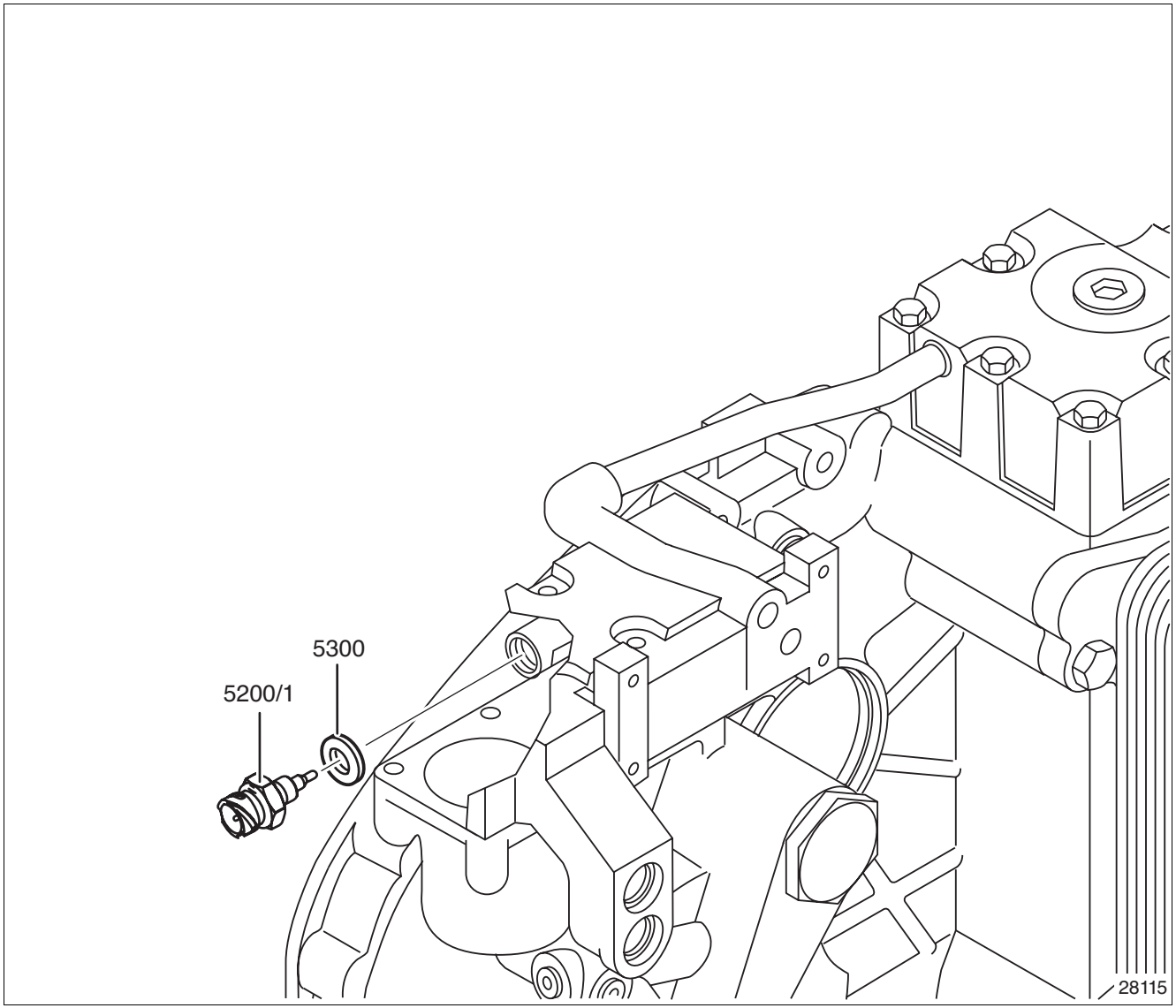
CAUTION

Hot parts!

Hands could be burned.

⇨ Work carefully.

⇨ Wear protective gloves or use cloths if necessary.



Checking the internal resistance

NOTE

Measuring in one temperature range is usually sufficient.
Polarity is irrelevant.

Temperature	Resistance
20 °C ± 10 °C	1039–1117 Ω
60 °C ± 10 °C	1194–1271 Ω
80 °C ± 10 °C	1271–1347 Ω

7.12 Coolant Temperature Sensor

Item No.	Designation
5200/2	Coolant temperature sensor M14x1.5, hexagon insert bit, w.a.f. 21, with copper sealing ring: 32 Nm
5300	Sealing ring A14x20, replace

NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.

Requirements

- Retarder switched off
- Ignition switched off
- Coolant drained (see page 28)

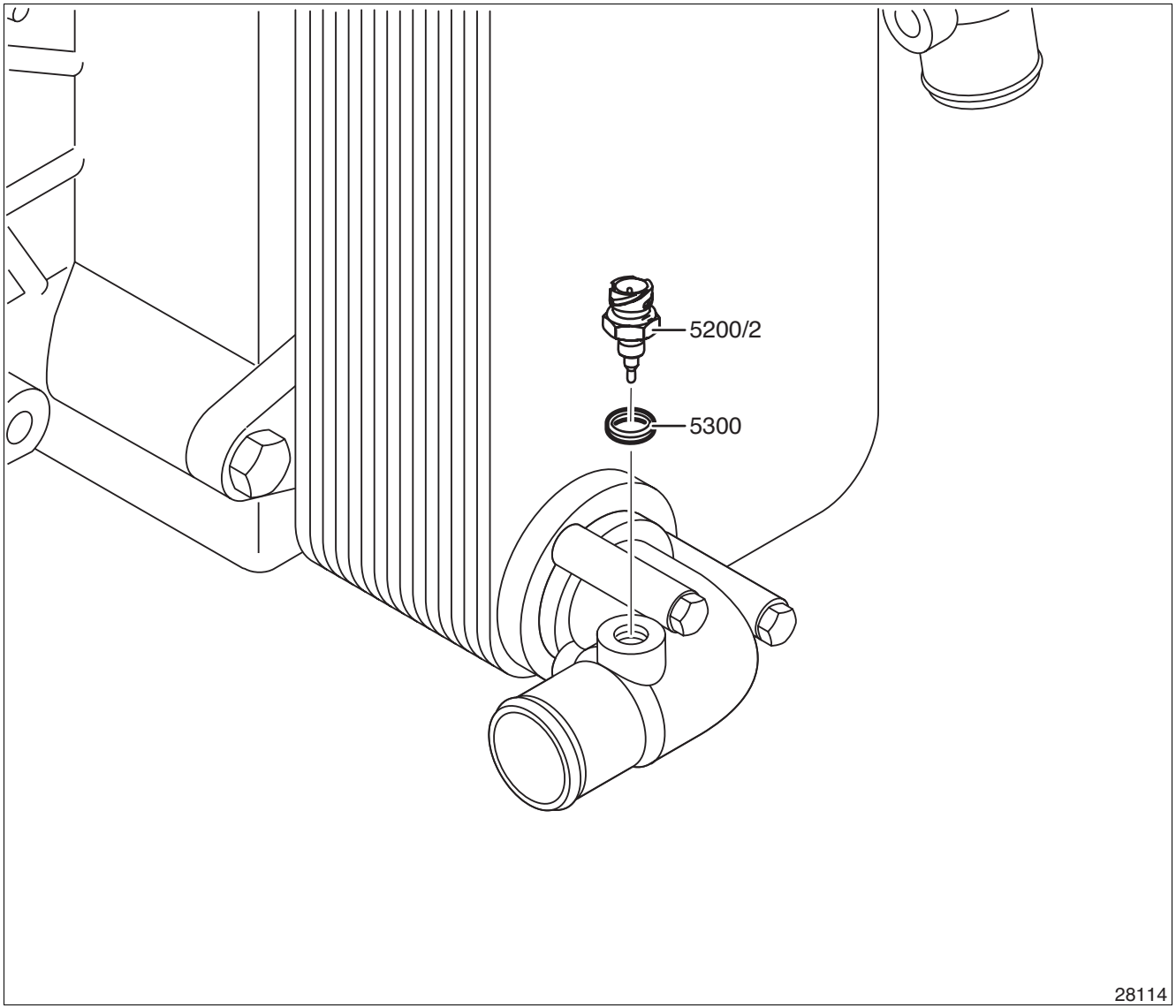
⚠ CAUTION

Hot parts!

Hands could be burned.

⇨ Work carefully.

⇨ Wear protective gloves or use cloths if necessary.



Checking the internal resistance

NOTE

Measuring in one temperature range is usually sufficient.
Polarity is irrelevant.

Temperature	Resistance
20 °C ± 10 °C	1039–1117 Ω
60 °C ± 10 °C	1194–1271 Ω
80 °C ± 10 °C	1271–1347 Ω

7.13 Pressure Sensor

Item No.	Designation
9000	Pressure sensor M16x1.5, hexagon insert bit, w.a.f. 27, with integrated sealing ring: 32 Nm

NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.

Requirements

- Retarder switched off
- Ignition switched off

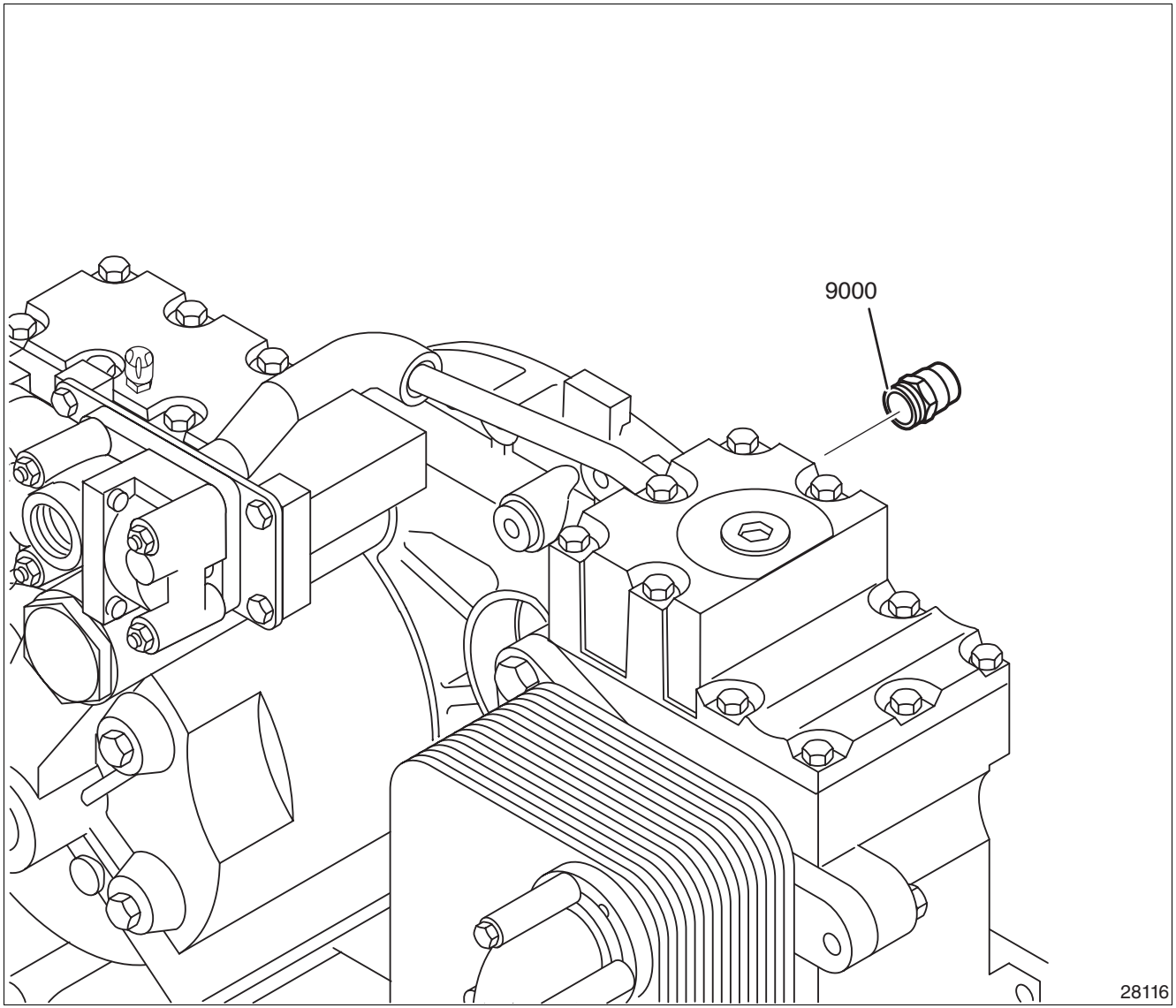
⚠ CAUTION

Hot parts!

Hands could be burned.

⇨ Work carefully.

⇨ Wear protective gloves or use cloths if necessary.

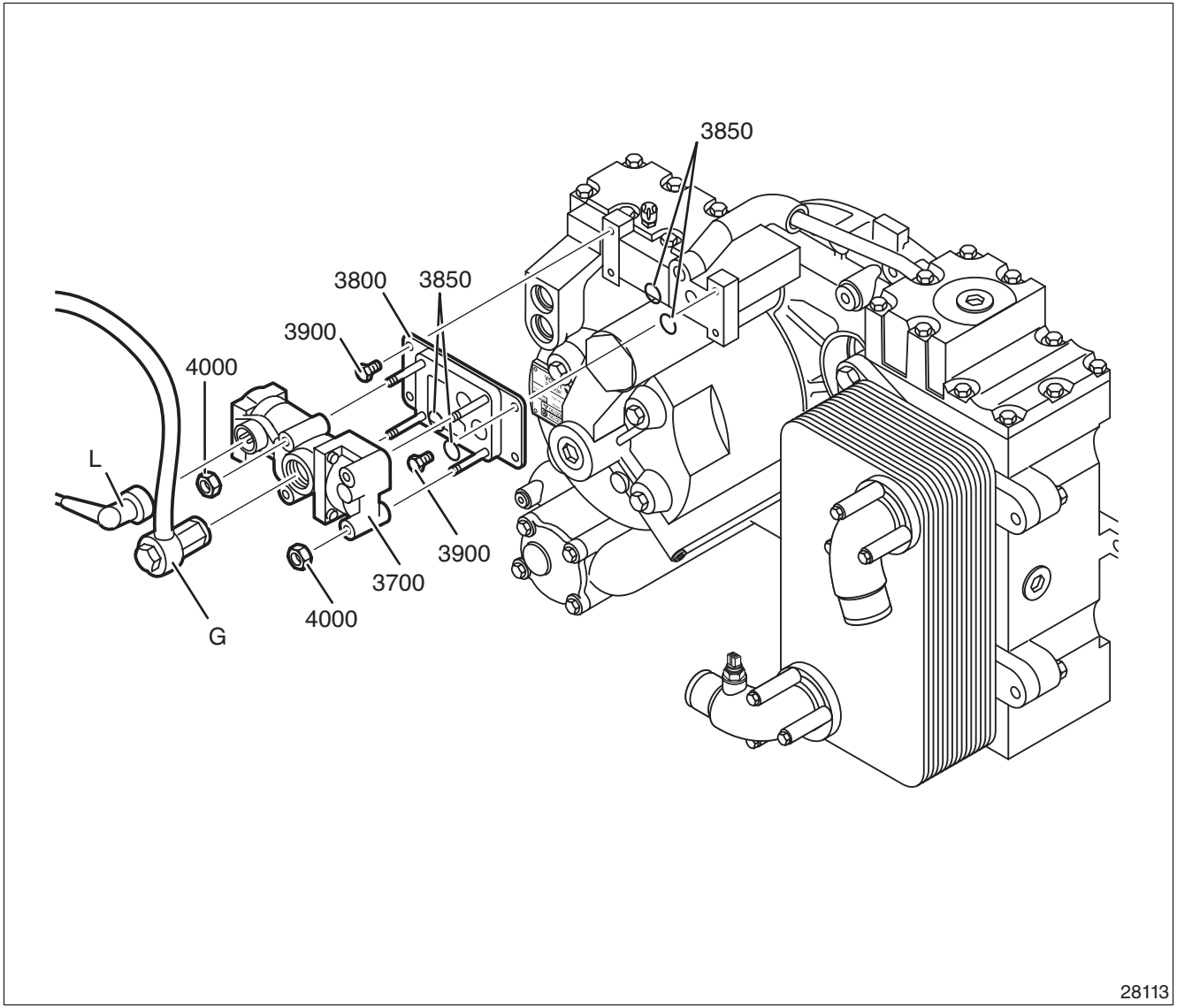


7.14 Proportional Valve and Damping Plate

Item No.	Designation
G	Supply-air pressure (p_v)
L	Electrical connecting lead
3700	Proportional valve
3800	Damping plate, replace if damaged
3850	O-ring 16x3, replace
3900	Combined hex head screw M8x20, hexagon insert bit, w.a.f. 13, 30 Nm
4000	Hex head nut M8, hexagon insert bit, w.a.f. 13, 18 Nm

NOTE

⇨ Lubricate sealing rings, O-rings and shaft sealing rings with silicone-free, non-corrosive grease before installation.



Requirements

- Retarder switched off
- Ignition switched off
- Supply-air pressure discharged
- Compressed-air line disconnected
- Electrical connection lead disconnected from proportional valve. Male and female connector checked for damage or wear (notch scratches)

NOTE

⇨ Check damping plate (3800) for mechanical and aging damage and replace if necessary.

8. Appendix

8.1 Tightening Torques

Item No.	Designation	Dimensions	Tightening torque
102	Throttle	M14x1.5	–
103	Screw plug	M12x1.5, hexagon socket head, w.a.f. 6	With copper sealing ring: 20 Nm With integrated sealing ring: 13 Nm
105	Screw plug	M22x1.5, hexagon socket head, w.a.f. 10	With copper sealing ring: 70 Nm With integrated sealing ring: 35 Nm
107	Screw plug	M24x1.5, hexagon socket head, w.a.f. 12	With copper sealing ring: 80 Nm With integrated sealing ring: 47 Nm
109	Screw plug	M24x1.5, hexagon socket head, w.a.f. 12	With copper sealing ring: 80 Nm With integrated sealing ring: 47 Nm
1400	Dodecagonal nut	M38x1.5, SW55	426 Nm
1900/1	Guide of non-return valve inlet	M48x1.5, hexagon insert bit, w.a.f. 55	With copper sealing ring: 280 Nm With integrated sealing ring: 280 Nm
2810	Vent and air filter	M12x1.5, hexagon insert bit, w.a.f. 17	10 Nm
3100	Combined hex head screw	M8x30, hexagon insert bit, w.a.f. 13	30 Nm
3300	Combined hex head screw	M8x80, hexagon insert bit, w.a.f. 13	30 Nm
3400	Dowel screw	M14x48, hexagon insert bit, w.a.f. 19	Observe tightening sequence: Initial torque: 50 Nm Final torque: 30° Angle
3500	Screw plug	M30x1.5, hexagon socket head, w.a.f. 17	With copper sealing ring: 130 Nm With integrated sealing ring: 100 Nm
3900	Combined hex head screw	M8x20, hexagon insert bit, w.a.f. 13	30 Nm
4000	Hex head nut	M8, hexagon insert bit, w.a.f. 13	18 Nm

Item No.	Designation	Dimensions	Tightening torque
4100	Screw plug	M30x1.5, hexagon socket head, w.a.f. 17	With copper sealing ring: 130 Nm With integrated sealing ring: 100 Nm
4200	Screw plug	M24x1.5, hexagon socket head, w.a.f. 12	With copper sealing ring: 80 Nm With integrated sealing ring: 47 Nm
5200/1	Oil temperature sensor	M14x1.5, hexagon insert bit, w.a.f. 21	32 Nm
5200/2	Coolant temperature sensor	M14x1.5, hexagon insert bit, w.a.f. 21	32 Nm
5700	Combined hex head screw	M8x25, hexagon insert bit, w.a.f. 13	30 Nm
6600	Combined hex head screw	M14x45, hexagon insert bit, w.a.f. 22	150 Nm
9000	Pressure sensor	M16x1.5, hexagon insert bit, w.a.f. 27	32 Nm
20200	Screw plug	M8x80, hexagon insert bit, w.a.f. 13	30 Nm
20300	Screw plug	M14x1.5, hexagon insert bit, w.a.f. 13	32 Nm
25200	Hex head screw	M10x70, hexagon insert bit, w.a.f. 16	58 Nm
25300	Hex head screw	M10x60, hexagon insert bit, w.a.f. 16	58 Nm

Voith Turbo
Produktgruppe Retarder

Postfach 1555
74555 Crailsheim
Deutschland

Phone: 00 49 79 51 / 32-0
Fax: 00 49 79 51 / 32-756
service-retarder@voith.com
www.voith.com

VOITH

Engineered reliability.