

MAINTENANCE MANUAL

(HEAVY MAINTENANCE) FOR ROTAX[®] ENGINE TYPE 912 i SERIES



 **WARNING**

Before starting any maintenance work, please read the Maintenance Manual, as it contains important safety relevant information. Failure to do so may result in personal injuries including death. Consult the original equipment manufacturer's handbook for additional instructions!

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Approval of translation has been done to best knowledge and judgement - in any case the original text in german language is authoritative.

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Chapter: 00-00-00
GENERAL NOTE

Foreword

Before carrying out maintenance work on the engine, please read the Heavy Maintenance Manual carefully. See also the latest revision of the corresponding Line Maintenance Manual for the engine type 912 i Series. If any passages of this Manual are not clearly understood or if you have any questions, please contact an authorized distributor or Service Center for ROTAX aircraft engines.

Chapter structure

The structure of the Manual follows whenever it is possible the structure of the ATA (Air Transport Association) standards. The Maintenance Manual is subdivided into the following chapters:

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Chapter: TOA
TABLE OF AMENDMENTS

***Approval**

The technical content of this document is approved
under the authority DOA ref. EASA.21J.048

no.	chapter	page	date of change	remark for approval	date of approval from authorities	date of inclusion	signature
0	INTRO	all	07 01 2012	DOA*			
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Chapter: TOA
SUMMARY OF AMENDMENTS

Content Summary of the relevant amendments in this context, but without requirement on completeness.

Current No.	chapter	page	date of change	Comment
1	00-00-00	31 - 36	10 01 2013	Illustration (special tools) added.
1	24-20-00	3,7	10 01 2013	New illustrations, new tooling (see revision bars).
		13,14-20	10 01 2013	Illustration (special tools) added.
1	76-10-00	1-28	10 01 2013	Illustration (special tools) added,
		29-36	10 01 2013	Chapter ECU revision, New Text, New Illustration

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Chapter: 00-00-00

GENERAL NOTE

Introduction This manual describes maintenance of all ROTAX 912 i Series engines.
NOTE: ROTAX 912 i Series includes 912 iSc and 912 iS.

Table of contents This chapter of the Maintenance Manual contains general and safety information concerning a safe operation and maintenance of the aircraft engine.

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Inspection of parts and report of findings	Page 17
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1) General note

Purpose	The purpose of this Maintenance Manual is to acquaint maintenance service staff (iRMT) approved by the local aviation authorities with some basic maintenance and safety information for service work.
Documentation	For more detailed information regarding, maintenance, safety or flight operation, consult the documentation provided by the aircraft manufacturer and/or dealer. For additional information on engines, maintenance or parts, you can also contact your nearest authorized ROTAX-aircraft engine distributor.
ROTAX Distributors	For ROTAX Authorized Distributors for Aircraft Engines see latest Operators Manual or on the Internet at the official Website www.FLYROTAX.com .
Engine serial number	When making inquiries or ordering parts, always indicate the engine serial number, as the manufacturer makes modifications to the engine for product improvement. The engine serial number (1) is on the top of the crankcase, behind of the propeller gearbox. See Fig. 1 .

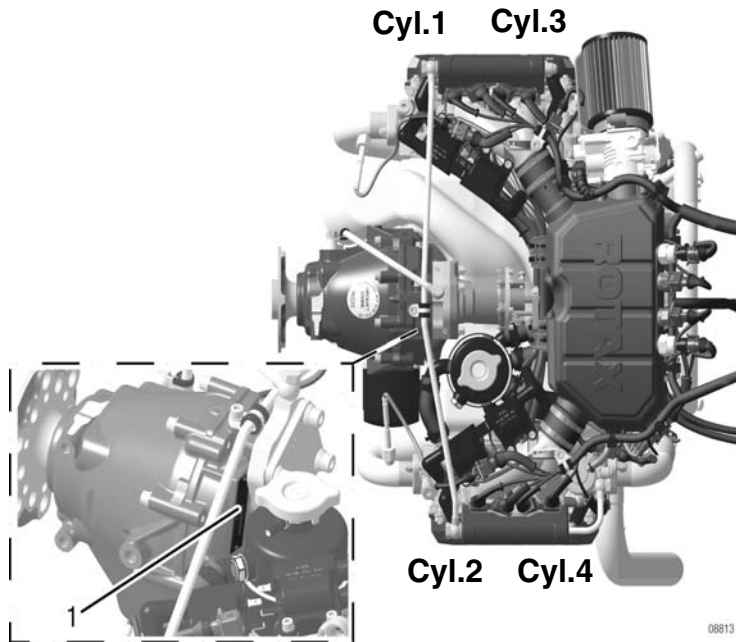


Fig. 1

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2) Abbreviations and terms used in this manual

Abbreviations

Abbreviation	Description
*	Reference to another section
	center of gravity
	The drop symbol indicates use of sealing agents, adhesives or lubricants (only in the Illustrated Parts Catalog).
°C	Degrees Celsius (Centigrade)
°F	Degrees Fahrenheit
912 iS	see OM (Type designation)
912 iSc	see OM (Type designation)
A	Ampere
AAPTS	Ambient Air Pressure Temperature Sensor
AC	alternating current
Ah	Ampere hour
A/C	Aircraft
AD	Airworthiness Directive
A/F	Across-flat dimension
ASB	Alert Service Bulletin
ACG	Austro Control GmbH
API	American Petrol Institute
ASTM	American Society for Testing and Materials
ATA	Air Transport Association
AWG	American Wire Gauge
CAN/CGSB	Canadian General Standards Board
CPS 1+2	Crankshaft Position Sensor 1+2
CSA	Constant Speed Actuator
CTS	Cooling Temperature Sensor
CS-E	Certification Specifications for Engines
CW	Clockwise
CCW	Counter-clockwise
DCDI	Dual Capacitor Discharge Ignition
DC	direct current
DOA	Design Organisation Approval
DOT	Department of Transport
EASA	European Aviation Safety Agency
ECU	Engine Control Unit
EGT	Exhaust Gas Temperature
EMS	Engine Management System

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Abbreviation	Description
EN	European Norm
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FUSE BOX	Fuse box
hr.	hours
HIC A	Human Interface Connector A
HIC B	Human Interface Connector B
IFR	Instrument Flight Rules
IM	Installation Manual
INJ 1-8	Injector 1-8
INTRO	Introduction
IPC	Illustrated Parts Catalog
iRMT	independent ROTAX Maintenance Technician
ISA	International Standard Atmosphere
kg	kilograms
LEP	List of Effective Pages
MAPS 1+2	Manifold Air Pressure Sensor 1+2
MATS 1+2	Manifold Air Temperature Sensor 1+2
MM	Maintenance Manual
MON	Motor Octane Number
MS	Magneto Side
N	new part (only Illustrated Parts Catalog)
n.a.	not available
nB	as necessary (only Illustrated Parts Catalog)
NDT	Non Destructive Testing
Nm	newtonmeter
OHM	Overhaul Manual
OM	Operators Manual
OPS	Oil Pressure Sensor
OTS	Oil Temperature Sensor
part no.	Part number
POA	Production Organisation Approval
PTO	power take off side
Rev.	Revision
RON	Research Octane Number
ROTAX	is a trade mark of BRP-Powertrain GmbH & Co KG
rpm	Revolutions per minute
SAE	Society of Automotive Engineers

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Abbreviation	Description
SB	Service Bulletin
SI	Service Instruction
SL	Service Letter
SMD	Surface Mounted Devices
S/N	Serial Number
s.v.	still valid (only Illustrated Parts Catalog)
TOA	Table of amendments
TC	Type certificate
TOC	Table of Contents
TSN	Time Since New
TSNP	Time Since New Part
TSO	Time Since Overhaul
V	Volt
VFR	Visual Flight Rules
XXX	shows the serial component number

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2.1) Conversion tabl

<p>Units of length: 1 mm = 0.03937 in 1 in = 25.4 mm 1 ft = 12 in = 0.3048 m</p>	<p>Units of power: 1 kW = 1.341 hp 1 hp = 0.7457 kW 1 kW = 1.3596 PS 1 PS = 0.7355 kW</p>																				
<p>Units of area: 1 cm² = 0.155 sq in (in²) 1 sq in (in²) = 6.4516 cm²</p>	<p>Units of temperature: K = °C - 273,15 °C = (°F - 32) / 1,8 °F = (°C x 1.8) + 32</p>																				
<p>Units of volume: 1 cm³ = 0.06102 cu in (in³) 1 cu in (in³) = 16.3871 cm³ (in³) 1 dm³ = 1 l 1 dm³ = 0.21997 gal (UK) 1 gal (UK) = 4.5461 dm³ 1 dm³ = 0.26417 gal (US) 1 gal (US) = 3.7854 dm³</p>	<p>Units of velocity: 1 m/s = 3.6 km/h 1 ft/min = 0.3048 m/min = 0.00508 m/sec 1 m/s = 196.85 ft/min 1 kt = 1.852 km/h 1 km/h = 0.53996 kn</p>																				
<p>Units of mass: 1 kg = 2.2046 lb 1 lb = 0.45359 kg</p>	<p>spec. fuel consumption: 1 g/kWh = 0.001644 lb/hph 1 lb/hph = 608.277 g/kWh</p>																				
<p>Density: 1 g/cm³ = 0.016018 lb/ft³ 1 lb/ft³ = 62.43 g/cm³</p>	<p>Units of torque: 1 Nm = 0.737 ft lb = 8.848 in lb 1 ft lb = 1.356 Nm 1 in lb = 0.113 Nm</p>																				
<p>Units of force: 1 N = 0.224809 lbf 1 lbf = 4.4482 N</p>	<p>Cable cross-section: Conversion table - Wire Gauge: AWG-mm²</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 10%;">AWG</td> <td>4</td> <td>6</td> <td>8</td> <td>10</td> <td>12</td> <td>14</td> <td>16</td> <td>18</td> <td>20</td> </tr> <tr> <td>mm²</td> <td>21</td> <td>13</td> <td>8.4</td> <td>5.3</td> <td>3.3</td> <td>2.1</td> <td>1.3</td> <td>0.8</td> <td>0.52</td> </tr> </table>	AWG	4	6	8	10	12	14	16	18	20	mm ²	21	13	8.4	5.3	3.3	2.1	1.3	0.8	0.52
AWG	4	6	8	10	12	14	16	18	20												
mm ²	21	13	8.4	5.3	3.3	2.1	1.3	0.8	0.52												
<p>Units of pressure: 1 Pa = 1 N/m² 1 bar = 100 000 Pa/1000 hPa/ 100 kPa 1 bar = 14.5037 lbf/in² (psi) 1 in Hg = 33.8638 hPa</p>																					

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3) Safety notice

General note Although the reading of such information does not eliminate the hazard, understanding the information will promote its correct use. Always use common workshop safety practice.

The information and components system descriptions contained in this Manual are correct at the time of publication. BRP-Powertrain, however, maintains a policy of continuous improvement of its products without imposing upon itself any obligation to install them on its products previously manufactured.

Revision BRP-Powertrain reserves the right at any time, and without incurring obligation, to remove, replace or discontinue any design, specification, feature or otherwise.

Measure Specifications are given in the SI metric system with the USA equivalent in parenthesis.

Symbols used This Manual uses the following symbols to emphasize particular information. This information is important and must be observed.

 **WARNING**

Identifies an instruction which, if not followed, may cause serious injury including the possibility of death.

 **CAUTION**

Identifies an instruction which, if not followed, may cause minor or moderate injury.

NOTICE

Denotes an instruction which, if not followed, may severely damage the engine or other component.

NOTE: Indicates supplementary information which may be needed to fully complete or understand an instruction.

ENVIRONMENT NOTE

Environment note gives you tips and behaviors to environmental protection.

| A revision bar outside of the page margin indicates a change to text or graphic.

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3.1) Safety information

General note	<p>This information relates to the preparation and use of ROTAX aircraft engines and has been utilized safely and effectively by BRP-Powertrain. However, BRP-Powertrain disclaims liability for all damage and/or injuries resulting from the improper use of the contents. BRP-Powertrain requires that any service be carried out and verified by a technician that has a current iRMT rating.</p> <hr/>
Manual	<p>This Manual has been prepared as a guide to correctly service and maintain all ROTAX 912 i Series engines.</p> <p>This edition was primarily published to be used by aircraft mechanics who are already familiar with all service procedures relating to ROTAX aircraft engines.</p> <p>This Manual uses technical terms which may be slightly different from the ones used in the Illustrated Parts Catalog.</p> <p>It is understood that this Manual may be translated into another language. In the event of any discrepancy the German version prevails.</p> <hr/>
Warning	<p>It is your responsibility to be completely familiar with the safety instructions including warnings and cautions described in this Manual. These warnings and cautions advise of specific operating and servicing methods that, if not observed, can cause a serious engine malfunction or cause the engine to lose power in flight which can result in loss of life, injury or damage to equipment.</p> <p>It is, however, important to understand that these warnings and cautions are not exhaustive. BRP-Powertrain could not possibly know, evaluate and advise the user of all conceivable ways in which service might be done or of the possible hazardous consequences of each way.</p> <hr/>
Safety instruction	<p>In addition to observing the instructions in our Manual, general safety and accident preventative measures, legal regulations and regulations of any aeronautical authority must also be observed.</p> <p>Where differences exist between this Manual and regulations provided by any authority, the more stringent regulation should be applied.</p> <hr/>
Illustration	<p>The content depicts parts and/or procedures applicable to the particular product at its time of manufacture. It does not include dealer and manufacturer modifications, whether authorized or not by BRP-Powertrain, after manufacturing the product.</p> <hr/>
Locking devices	<p>Locking devices (e.g. locking tab, self-locking fasteners, etc.) must be installed or replaced with new ones, where specified. If the efficiency of a locking device is impaired, it must be replaced.</p> <hr/>

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**Torque wrench
tightening**

NOTICE

If not specified otherwise, the threads are not lubricated when fastened.

Torque wrench tightening specifications must be strictly adhered to.

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3.2) Instruction

General note Engines require instructions regarding their application, use, operation, maintenance and repair.
Technical documentation and directions are useful and necessary complementary elements for personal instruction, but can by no means substitute theoretical and practical instructions.
These instructions should cover explanation of the technical context, advice for operation, maintenance, use and operational safety of the engine.

Safety notice In this technical Manual passages concerning safety are especially marked. Pass on safety warnings to other users!

Accessories This engine must only be operated with accessories supplied, recommended and released by BRP-Powertrain. Modifications are only allowed after consent by the engine manufacturer.

Spare parts

NOTICE

Spare parts must meet with the requirements defined by the engine manufacturer. This is only warranted by use of GENUINE ROTAX spare parts and/or accessories (see IPC) or suitable equivalent in the manufacturer's opinion otherwise, any limited warranty by BRP-Powertrain is null and void (see Warranty Conditions).
Spare parts are available at the authorized ROTAX Distributor and their Service Center. Any warranty by BRP-Powertrain becomes null and void if spare parts and or accessories other than GENUINE ROTAX spare parts and/or accessories are used (see latest Warranty Conditions).

Tools

NOTICE

In principle use only tools and appliances which are either cited in the Manual or in the Illustrated Parts Catalog.

Standstill After engine standstill (longer than 2 months) observe without fail the instructions for engine "out of use". Protect fuel system against contamination.

Returning When returning the engine or its components (e.g. propeller gearbox) to an authorized overhaul or repair company, ensure that the necessary documentation (log book, maintenance records etc.) are enclosed.

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3.3) Maintenance concept

General note	The maintenance functions detailed in this Manual fall into two categories: <ul style="list-style-type: none">- Maintenance I (Line Maintenance)- Maintenance II (Heavy Maintenance) Repairs beyond the levels detailed in this Manual are not recommended as maintenance functions and must be done by an authorized overhaul facility. <hr/>
Maintenance I (Line Maintenance)	Chapter 00,05 and 12 The scope of line maintenance consists of removal, installation and adjustment of engine components (including part wear). All procedures in this Manual are to be considered line maintenance. NOTE: Where applicable, you will be referred to the Heavy Maintenance Manual for work above and beyond line maintenance. <hr/>
Maintenance II (Heavy Maintenance)	Separate Manual Maintenance Manual II details removal, installation and repair of components or parts normally considered beyond the capabilities of the "Line Maintenance". NOTE: This Manual can only be used in combination with Maintenance Manual I (Line Maintenance), as it builds up on it. <hr/>

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3.4) Technical documentation

General note	<p>These documents form the instructions ensuring continued airworthiness of ROTAX aircraft engines.</p> <p>The information contained is based on data and experience that are considered applicable for authorized mechanics (iRMT) under normal conditions.</p> <p>Due to the fast technical progress and fulfilment of particular specifications of the customers it may occur that existing laws, safety prescriptions, constructional and operational regulations cannot be transferred completely to the object bought, in particular for special constructions, or may not be sufficient.</p> <hr/>
Documentation	<ul style="list-style-type: none">- Installation Manual- Operators Manual- Maintenance Manual (Line and Heavy Maintenance)- Overhaul Manual- Illustrated Parts Catalog- Alert Service Bulletin- Service Bulletin- Service Instruction- Service Letter <div style="text-align: right;"></div> <hr/>
Status	<p>The status of the Manuals can be determined with the aid of the table of amendments. The first column indicates the revision state. This figure should be compared with the revision provided on ROTAX Aircraft Engines Website: www.FLYROTAX.com.</p> <p>Amendments and current versions can be downloaded free of charge.</p> <hr/>

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Replacement pages

Furthermore the Manual is constructed in such a way that single pages can be replaced instead of the complete document. The list of effective pages is given in the chapter LEP. The particular edition and revision number is given on the footer of each page.

Reference

NOTICE

This Manual for maintenance is only part of the Technical Documentation and will be supplemented by the respective Operators Manual, Installation Manual, Overhaul Manual and Illustrated Parts Catalog.
Pay attention to references to other documentation, found in various parts of this Manual.

Any reference to a document refers to the latest edition issued by BRP-Powertrain, if not stated otherwise.

Illustrations

The illustrations in this Manual are mere sketches and show a typical arrangement. They may not represent in full detail or the exact shape of the parts which have the same or similar function. Therefore deduction of dimensions or other details from illustrations is not permitted.

NOTE: The Illustrations in this Manual are stored in a graphic data base system and are provided with a consecutive irrelevant number.
This number (e.g. 00277) is of no significance for the content.

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3.5) Use for intended purpose

General note

 **WARNING**

Explosion hazard.
Never run an engine without propeller. Flying components can cause serious injuries.

Use

The engine ROTAX 912 iSc is intended for use in certified aircraft. In case of doubt the regulations of the national authorities or the respective sportive federations have to be observed.

Certified engines

The certified aircraft engine ROTAX 912 iSc is tested as per aeronautical standards for safety and time between overhaul. It was developed to conform to the latest technological standards and rigorously tested.

Non certified engines

The engine ROTAX 912 iS is not certified. These engines have not received any aeronautical standards or regulatory safety or durability testing, and conform to no aircraft standards. These engines are for use in experimental, uncertificated aircraft and vehicles only in which an engine failure will not compromise safety.

NOTE: These engines are technically equivalent to certified engines and have been manufactured by BRP-Powertrain using the same quality assurance system.

Engine stoppage

The operator assumes all risk of use, and acknowledges by this use that he/she knows this engine is subject to sudden stoppage.

Maintenance and repair conditions

Use for intended purpose also includes observation of the operational, maintenance and repair conditions prescribed by the manufacturer. This is a crucial factor concerning the reliability of the engine and can increase the durability of the engine.

4) Inspection of parts and report of findings

General note

See [Fig. 2](#).

Measure all parts listed in the dimension sheets. These are attached directly after each section.

All measurements must be entered in the corresponding dimension sheets as shown.

Filling in the dimension sheets

Following the description how to fill in the dimension sheets.

NOTICE

If the engine is overhauled/repared before the end of the TBO, the 50 % specified values (3) for wear limits do not apply and must be calculated separately in accordance with section 5, „Classification of parts for maintenance/repair“.

- Look up the desired control point code (1) in the illustration in the specified section.
- The maximum limits for wear are divided into the columns maximum wear 100 % (2) and 50 % wear (3).
- The first line (4) gives the maximum permissible value in [mm], the second line (5) in [inches].
- The respective actual value must be entered in the corresponding box (6) in [mm] or [inches].
- The actual value for any part which has been replaced must be entered in the corresponding field (7) in [mm] or [inches].

NOTICE

Where measurement values are taken in hundredths of a millimeter or more precisely, the temperature of the part must be 20 to 25 °C (68 to 77 °F).

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Description	Code	Reading new		wear limit	wear limit	Readings				
		min	max	100%	50%					
Piston										
Piston red 79,5 mm / 3,1 in.	PI01	79,489 3,1274	79,5020 3,1300	79,3900 3,1256	79,4390 3,1275	actual				
						renewed				

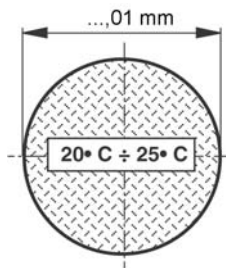


Fig. 2

07538, 07437

List of abbreviations

The following table shows the abbreviations used for the control points.

Abbreviation	Description
AL	alternator
CA	camshaft
CC	crankcase
CH	cylinder head
CR	conrod
CS	crankshaft
CY	cylinder
EL	electric
ES	electric starter
EX	exhaust
GB	gearbox
GO	governor
OP	oil pump
PI	piston
PP	piston pin
ST	stator
VT	valve train
WP	water pump

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5) Classification of parts for maintenance/repair

General note As for an overhaul, parts for maintenance/repair must be classified. They are classified either as „parts usable“ („On-Condition“) or as „parts to be replaced“ („100 % Parts“).

Criteria The classification is made on the basis of following criteria:

- Hours of operation (decisive are the total operating hours of the part/engine or hourse since the last overhaul)
- Determined (measured) actual dimension of the respective parts

Max. permissible wear Proceed as follows:

- Determine the hours of operation for the part in question (logbook etc.).
- Determine wear as a percentage of the wear tolerance (see the dimension sheets attached directly after each section for the wear limit (100 %) of the part in question).
- The classification is carried out as per following table:

TSN [h] Time Since New		max. permissible wear for repair [%]
from	to	TBO 2000 h - 912 i Series
0	50	4
51	100	12
101	150	18
151	200	24
201	250	30
251	300	36
301	350	42
351	400	46
401	450	52
451	500	56
501	550	60
551	600	62
601	700	67
701	800	72
801	900	76
901	1000	80
1001	1100	83
1101	1200	87
1201	1300	90
1301	1400	92
1401	1500	94

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TSN [h] Time Since New		max. permissible wear for repair [%]
from	to	TBO 2000 h - 912 i Series
1501	1600	96
1601	1700	98
1701	1800	98
1801	1900	99
1901	2000	100

Determination of actual wear [%]

- Determine actual dimension **F** of the part in question.
- For new dimension (max.) **B** and wear limit **C** see the corresponding dimension sheets attached after each section.
- Determine the actual wear [%] with following formula (Fig. 3):

$$\text{Actual wear} = \frac{\{\text{Actual dimension (F) - New dimension max. (B)}\} \times 100}{\{\text{Wear limit (C) - New dimension max. (B)}\}} \quad [\%]$$

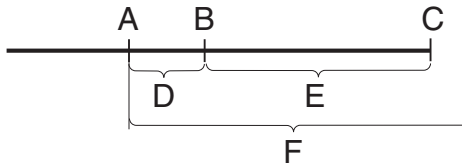


Fig. 3

08217, 07532

Legend:

- A** New dimension (min.)
- B** New dimension (max.)
- C** Wear limit
- D** New dimension tolerance
- E** Wear tolerance
- F** Actual dimension

NOTICE

New dimension (max.) B is always the dimension which is closest to wear limit C.

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Classification

Classification of „On-Condition“ parts at maintenance/repair:

Actual wear [%] is greater than or equal to the max. permissible wear [%] calculated from the table	Parts must be replaced
Actual wear [%] is smaller than the max. permissible wear [%] calculated from the table	Parts can be used again

Fig. 4

08219

NOTE: A negative result means that the actual dimension **F** is within the new dimension tolerance **D** and the part can be used again.

Example

The hours of operation are indicated with 300 h. The determined percentage of maximum permissible wear is therefore 36 %.

New dimension (max.)	B	28,03 mm (1.1035 in.)
Wear limit	C	28,10 mm (1.1062 in.)
Actual dimension	F	28,07 mm (1.1051 in.)
Actual wear		57,1 %

This part must be replaced because it is excessively worn for only 300 hours of operation.

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6) Maintenance

General note Beyond the maintenance and special checks (see therefore Line Maintenance Manual for 912 i Series), as well as the system descriptions hitherto, the following sections describe the maintenance procedures for 912 i Series. The description is subdivided into subsections and descriptions of the function of the various systems.

Some overlapping maintenance instructions are treated as generally valid information at the beginning of this section.

Troubleshooting In the Operators Manual possible problems as well as feasible remedies are listed. At the same time, brief reference is made to the necessary remedial action. See the respective section in the Operators Manual for 912 i Series.

Tightening torques In general, all screw connections on ROTAX aircraft engines must be tightened using a torque wrench.

If not specified otherwise for a component, tighten screw connections with following torque:

M4: 4 Nm (35 in.lb)

M5: 6 Nm (55 in.lb)

M6: 10 Nm (90 in.lb)

M8: 24 Nm (17.7 ft.lb)

M10: 35 Nm (25.8 ft.lb)

NOTICE

If not specified otherwise, the threads are not lubricated when fastened.

NOTE: Adhere the tightening torques specified - see also indications in the Illustrated Parts Catalogue.

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Consumable materials

⚠ WARNING

Use only the from BRP-Powertrain specified or **technically equivalent** materials for all maintenance work.

The materials listed have undergone longterm testing of BRP-Powertrain and are suitable for all operating conditions indicated by the manufacturer.

⚠ WARNING

When handling chemicals, comply with all the customary regulations and specifications of the producer, including the expiry date.

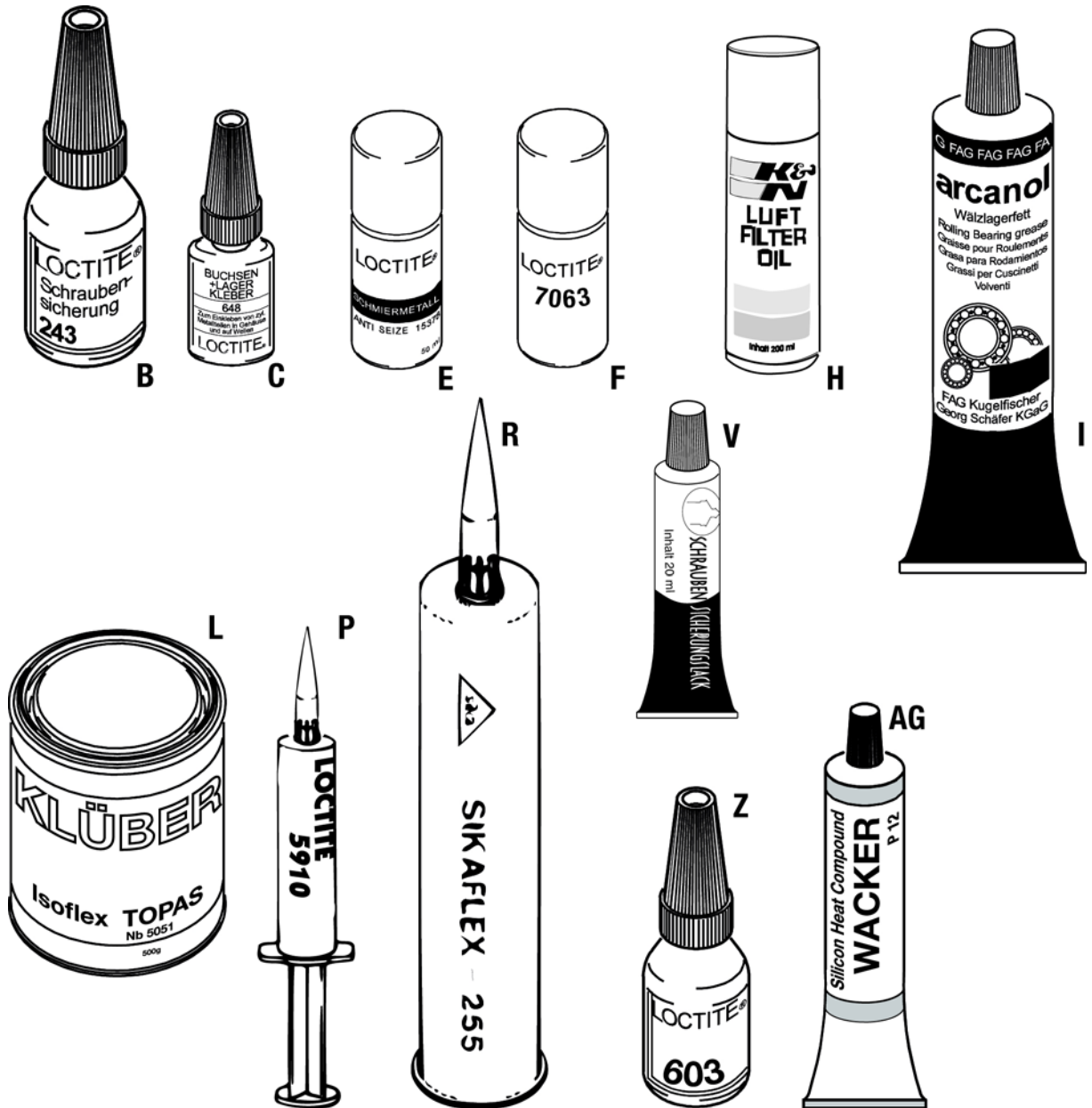
NOTE: Consider the curing time of the sealing surface compound as stated by the manufacturers instructions.

No.	Part no.	Description, application	Qty.
AG	897186	Silicone heat conduction compound Application of the heat conduction compound will reduce heat transfer resistance. The greaselike, temperature-resistant silicone compound fills cavities between components and cooling elements (e.g.: spark plug - cylinder head), which otherwise do not contribute to heat conduction	150 g
B	897651	LOCTITE 243 blue medium duty screw locking agent	10 ml
C	899788	LOCTITE 648 green high temperature screw locking agent	5 ml
E	297434	LOCTITE ANTI SEIZE Long-term lubricant for shaft seals	
F	n.a.	LOCTITE 7063 for degreasing and cleaning surfaces	as required
H	897870	K&N filter oil 99 - 11312 for optimum filter efficiency and moisture protection	14.8 ml
I	897330	Lithium-base grease to avoid leakage current	250 g
L	898351	KLUEBER ISOFLEX TOPAS Nb5051 to prevent fretting corrosion	500 g
O	n.a.	Engine oil for easier assembly of components or for first lubrication before first engine start	
P	899791	LOCTITE 5910 flange sealant provides flexibility and adhesion	50 ml

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No.	Part no.	Description, application	Qty.
R	297710	PU-glue for shock absorption	310 ml
V	898570	Screw securing paint seals screws	20 ml
Z	899789	LOCTITE 603 green oil tolerant retaining compound, heavy-duty	10 ml



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No.	Part no.	Description, application	Qty.
1	n.a.	<p>Cleaning agent</p> <div style="background-color: orange; text-align: center; padding: 5px;">⚠ WARNING</div> <p>Use only approved cleaning agents (e.g. varsol etc.) for cleaning metal parts. Do not use lyebased cold cleaners or degreasing agents. Do not clean coolant and oil hoses with aggressive solutions. Clean off residues of sealing compound with sealant remover. Soak combustion chamber, piston and cylinder head with cleaning agent and remove combustion residues with a bronze brush. CASTROL „Clenvex 2000“ has proved very effective. It is a solvent - cold cleaner, free of halogen, on the basis of selected fuel fractions and is biodegradable. Never use caustic or corrosive cleaning agents.</p>	as required
2	n.a.	<p>Multipurpose grease LZ</p> <p>Generally usable, neutrally colored multipurpose grease, water resistant and highly adherent. Usable for temperatures from -35 °C to +120 °C (-31 °F to 248 °F) and can be subjected to high mechanical loads.</p>	as required
3	n.a.	<p>Preservation oil</p> <p>This special oil has excellent penetrating capabilities and reaches even tiny gaps, it is highly effective additives protect against corrosion of metal surfaces.</p>	as required
4	n.a.	<p>Flexible web for surface finishing 3M Scotch-Brite Multi Flex - very fine or ultra fine</p> <p>Is sold by the meter and used for manual removal of smaller rust spots or oxidation, especially for optimum ground connections. It is particularly suitable for removing LOCTITE from surfaces or threads to make them metallic clean. Before re-applying LOCTITE, clean surfaces with nitrothinner or degreasing agent (CASTROL ZA 30 or OMV - SOFT SOL). When using solvents, observe the safety regulations for persons and the environment.</p>	as required

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No.	Part no.	Description, application	Qty.
5	n.a.	Valve lapping paste This paste, produced by various manufacturers, is a fine granulate lapping paste for manual lapping of valve seats and valves. The paste is usually available in 3 different granulate sizes. Use as per manufacturers instructions.	as required
6	n.a.	MICRONORM abrasive This abrasive is suitable for local and gradual very fine treatment of steel parts with rust film (propeller shaft). The MICRONORM abrasive contains no harmful substances, is approved by the competent authorities and guarantees optimum cleaning. The granulates used are of sizes 40 to 60 μ . The achievable surface roughness is between 0.5 and 1 μ , which corresponds to ultrafine machining of surfaces.	as required

Auxiliary tools

- Compression tester or 2 pressure gauges with calibrated orifice, adapter for dial gauge in spark plug thread
- Valve spring mounting pliers
- Step punch for valve guide
- Adjustable reamer 6.5 to 7.5 mm (0.256 to 0.295 in.)
- Valve seat machining device, valve lapping paste
- Gearbox support plate
- Stud extraction tool
- Scraper, very fine emery cloth, grinding tool, cover sheet, adhesive tape
- Cleaning agent, approved cleaners, funnel, graphite marker
- Magnetic holder
- Cable extractor set
- Box wrench set with torque wrench 5 Nm to 50 Nm (44 in.lb to 37 ft.lb)

Magnetic particle tester

Magnetic particle tester DEUTROFLUX, series UHW, or equivalent. See 72-00-00, section 5.1.1.

These testers are suitable for complete combined magnetic particle crack inspection of all ferromagnetic materials. For this purpose **an A.C. field circulation** can be combined with a **shifted phase A.C. circulation**. The two magnetizing methods are independent from each other and can be applied separately.

To achieve the direction changes of the magnetic field vector necessary for indication of cracks in any direction, the alternating currents serving as the current supply for the different methods of magnetizing are dephased by 120° to each other.

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a	Current circulation for indication of longitudinal cracks.
b	Field circulation for indication of transverse cracks.
c	Auxiliary circulation for indication of axial and radial cracks on parts with bores right through by using an electric auxiliary conductor (copper bar).

Measure tangential field intensity with field intensity tester Deutrometer 3870 or with an equivalent field intensity tester. The target value is 10 - 50 A/cm. If cracks are detected then the affected part must be replaced. Clean and demagnetize the part. The maximum remaining magnetism must not exceed 1.2 A/cm. The inner bore of the propeller shaft is excluded from magnetic particle crack inspection.

NOTICE

Observe the manufacturers instructions.

Disassembly device

- Disassembly device for propeller gearbox
Fig. 5 shows one possible tensioning device for the disassembly of the propeller gearbox. The dimensions given are only intended for easier orientation and are not binding.

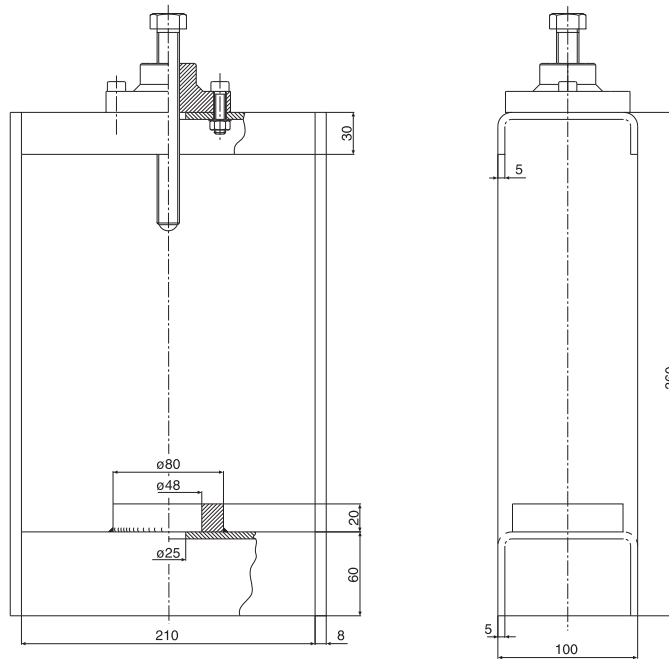


Fig. 5

07525

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- Measuring tools** Calliper rule, dial gauge indicator, micrometer, inner micrometer, inner fine measuring device, feeler gauge, spring scale up to 50 kp (500 N) (112.5 lbf)
- Multimeter: Fluke Series 70, Series 80 or equivalent
Electronic, 3 1/2 digit indication
Current range 10 A
Direct voltage range 200 V minimum
Resistance range 200 Ω to 2 M Ω
Acoustic continuity tester
- Oscilloscope: Tektronix 2225 or equivalent
2 channels
Analog
Sensitivity 5 mV to 5 V/div
Frequency limit 50 MHz

NOTICE

When using these instruments, observe the manufacturers instructions.

Special tools and devices

Die folgenden Werkzeuge und Vorrichtungen sind auch im Ersatzteilkatalog angeführt.

No.	Part no.	Description, application	Qty.
1-4	877615	extractor assy. for propeller shaft, roller bearing 25x52x15 and oil seal 30x52x7	1
2	877580	pull-in spindle M24x1.5	1
3	276155	handle lever 12x250	1
4	842585	hex. nut M24x1.5, length 19	1
5	877605	press-out mushroom for propeller shaft F2	1
6	877600	press-out mushroom for propeller shaft F3 and F4	1
7	877594	press-in insert for roller bearing 25x52x15 and oil seal 30x52x7, for F2	1
8	877590	press-in mushroom for roller bearing 25x52x15 and oil inlet flange, for F3	1
9	941180	stud M10x45/20 for roller bearing 25x52x15 and oil seal 30x52x7	1
10	877561	pull-out plate for roller bearing 25x52x15, oil seal 30x52x7 and oil inlet cover	1
11	242091	hex. nut M10 for roller bearing 25x52x15, oil seal 30x52x7 and oil feed line cover	1

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No.	Part no.	Description, application	Qty.
12	876885	mounting yoke to compress dog gear	1
13	877660	puller assy. for gearbox	1
14	877540	puller assy. for gearbox	1
15-18	876489	puller assy. for ball bearing 15x32x8, needle sleeve 22x28x12, oil inlet flange and oil inlet cover	1
16	941730	hex. screw M6x80	1
17	827305	washer 6.2/18/2	1
18	242211	hex.nut M6	1
19	877597	press-in mushroom for ball bearing 15x32x8, vacuum pump and governor drive	1
20	877595	press-in mushroom for needle sleeve 22x28x12, vacuum pump and fovernor drive	1
21	876470	ring spanner a/f 10/13	1
22	242661	distance nut M8x33 locking device for vacuum pump drive sleeve	1
23	276332	insertion jig assy. for pressing out needle sleeve 22x28x12 and ball bearing 15x32x8, vacuum pump	1
24	877276	insertion jig assy. for oil seal 22x32x7, vacuum pump	1
25	876518	insertion jig for oil seal 40x55x7, gear cover	1
26	877650	handle for insertion jig for several applications	1
27	240880	thread bolt M8x50 for crankshaft locking	1
28	877320	press-in ring for ball bearing 35-72-17 propeller shaft, use together with insertion jig 876518	1
29	877445	socket wrench assy. 41x12.5 for hex. nut 41 a/f, crankshaft power take off side	1
30	877440	socket wrench a/f 41x20 L	1
31	877460	reducing socket wrench 3/4"-1/2"	1
32	877802	installation tool assy. for piston pin circlip installation	
33-34	877091	piston pin extractor assy. for assembly and disassembly of the piston pin	1

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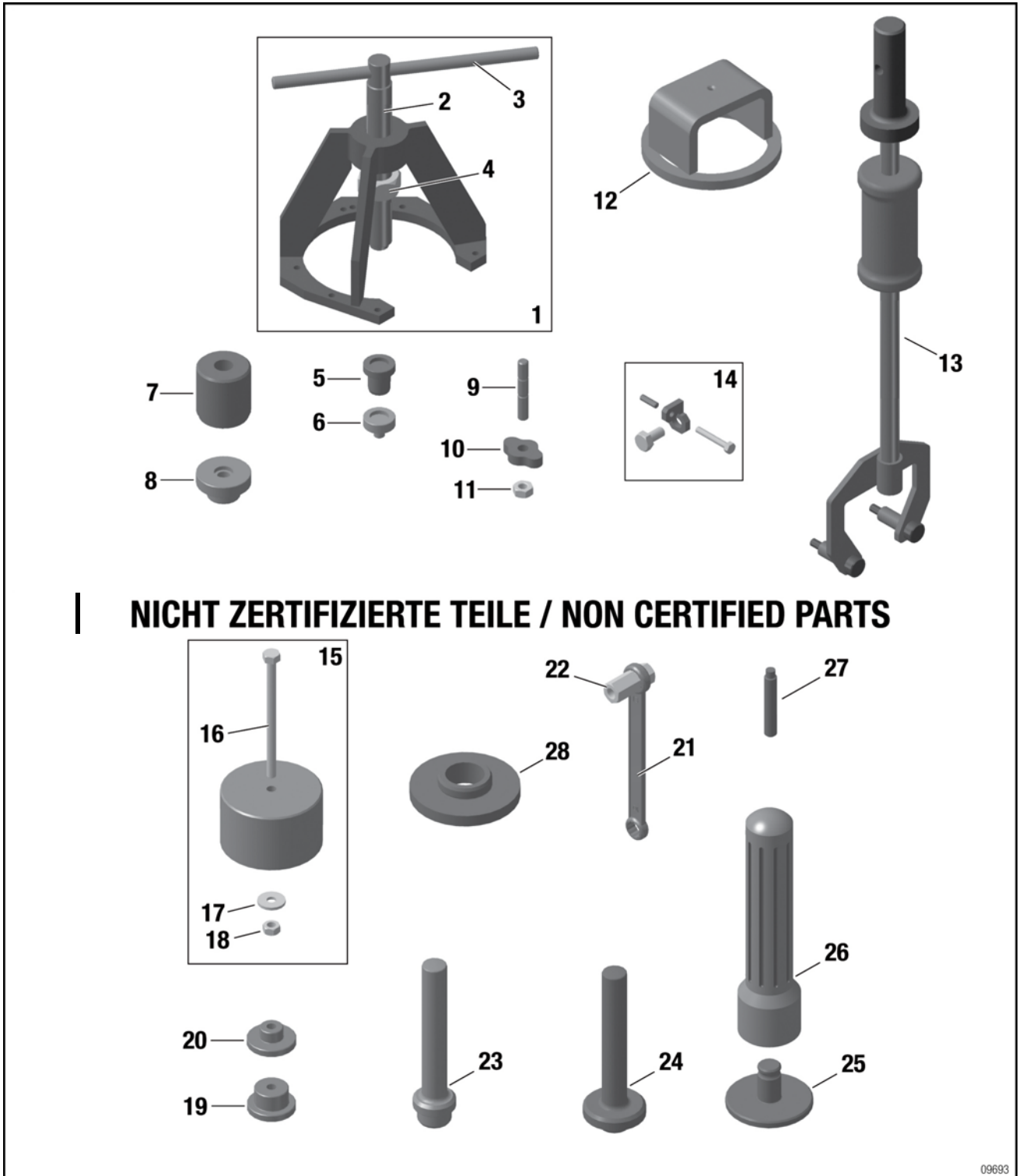
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No.	Part no.	Description, application	Qty.
34	877155	extracting nut M6 assy. for piston pin extractor	1
35	976380	mono hook circlip puller for piston pin circlip	1
36	876967	piston ring retainer 84 mm (3.31 in.)	1
37-38	877375	puller assy. for flywheel hub	1
38	940755	hex. screw M16x120 for puller	1
39	876557	protection piece for crankshaft magneto side	
40	877262	cylinder alignment tool for alignment of the cylinder	1
41	877380	valve spring mounting device for removal of the valve springs	1
42	877387	valve spring mounting device assy.	
43	877620	oil filter wrench 80-110 for oil filter removal	1
44	877295	impeller wrench assy. for water pump impeller	1
45	877258	insertion jig for rotary seal	1
46	876510	insertion jig for oil seal (12x30x7), water pump shaft	1
47	877840	hose clamp pliers for spring band hose clip 28	1
48	877390	pin wrench A 90 for slipper clutch	1
49		crankcase splitting tool	1
50	876010	puller assy. for ignition housing	1
51	876020	insertion jig for oil seal 28x38x7, ignition housing	1
52	876070	socket wrench 38x20 for nut, sprag clutch housing	1
53	876075	socket wrench 21x12.5 for oil pressure sensor and airbox pressure sensor	1
54	876130	socket wrench 19x12.5 for coolant temperature sensor and temperature sensor	1
55	876180	socket driver T30 ball head for screws of intake manifold	1
56	876240	socket driver hex. 8 ball head for cyl. screws	1

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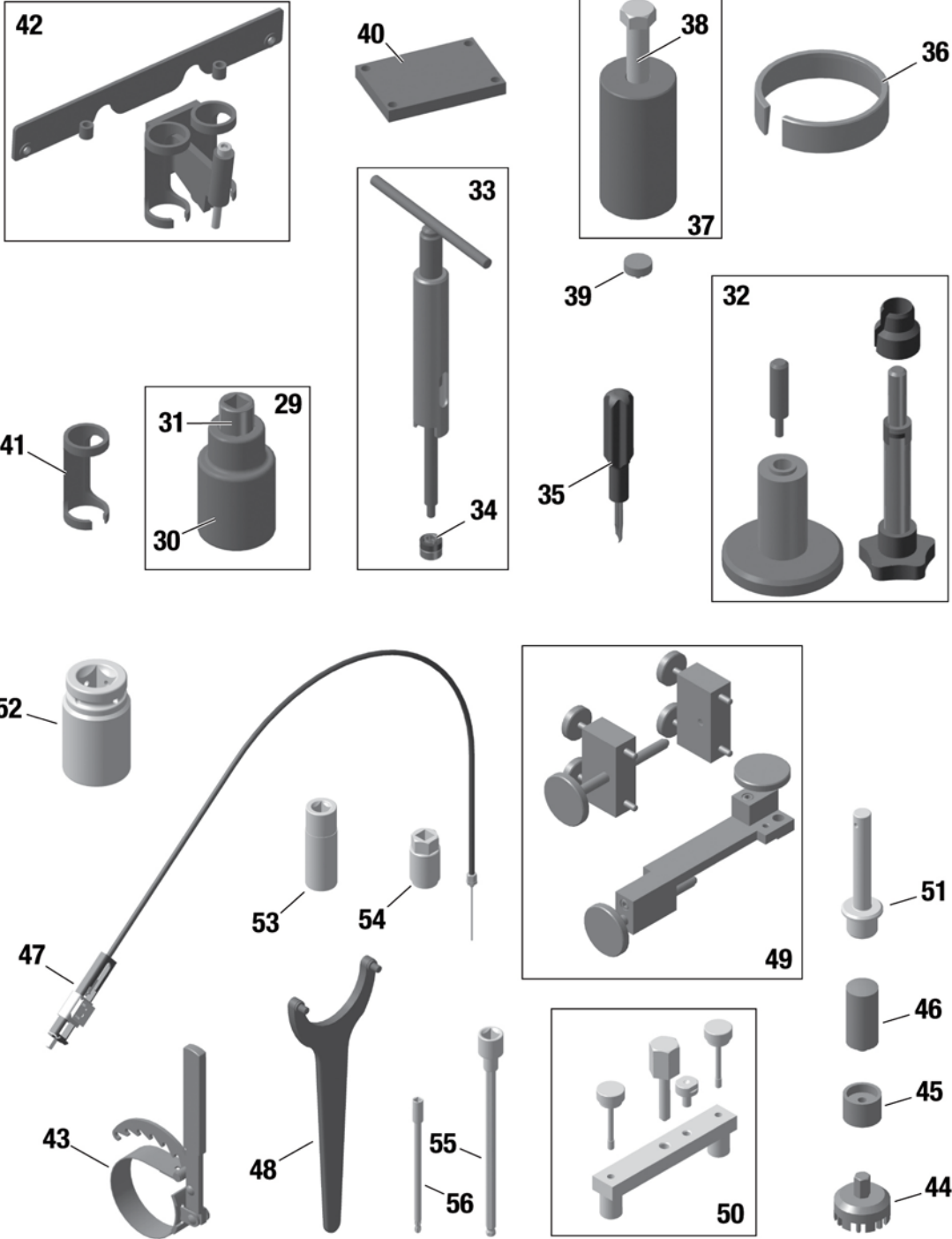
No.	Part no.	Description, application	Qty.
57	877690	check lever for removal of rocker arms	1
58	877316	measuring bar assy. for inspection of plain bearing excess length	1
59	877710	dial gauge holder assy.	1
60	876950	precision dial gauge	1
61	877300	joggling plate	
62	976140	dial gauge adapter assy. for checking valve seating	1
63		trestle adapter assy. for fixation of engine type 912 iS	1
64	876040	engine lift set assy. for engine 912 iS	1
65	877930	trestle support assy.	1
66	877570	tapping drill M18x1 for cleaning of fine thread when replacing the coolant fitting	1
67	877670	exhaust pipe trimmer to slice the oil filter	1
68	877520	measuring tool - crankshaft torsion	1



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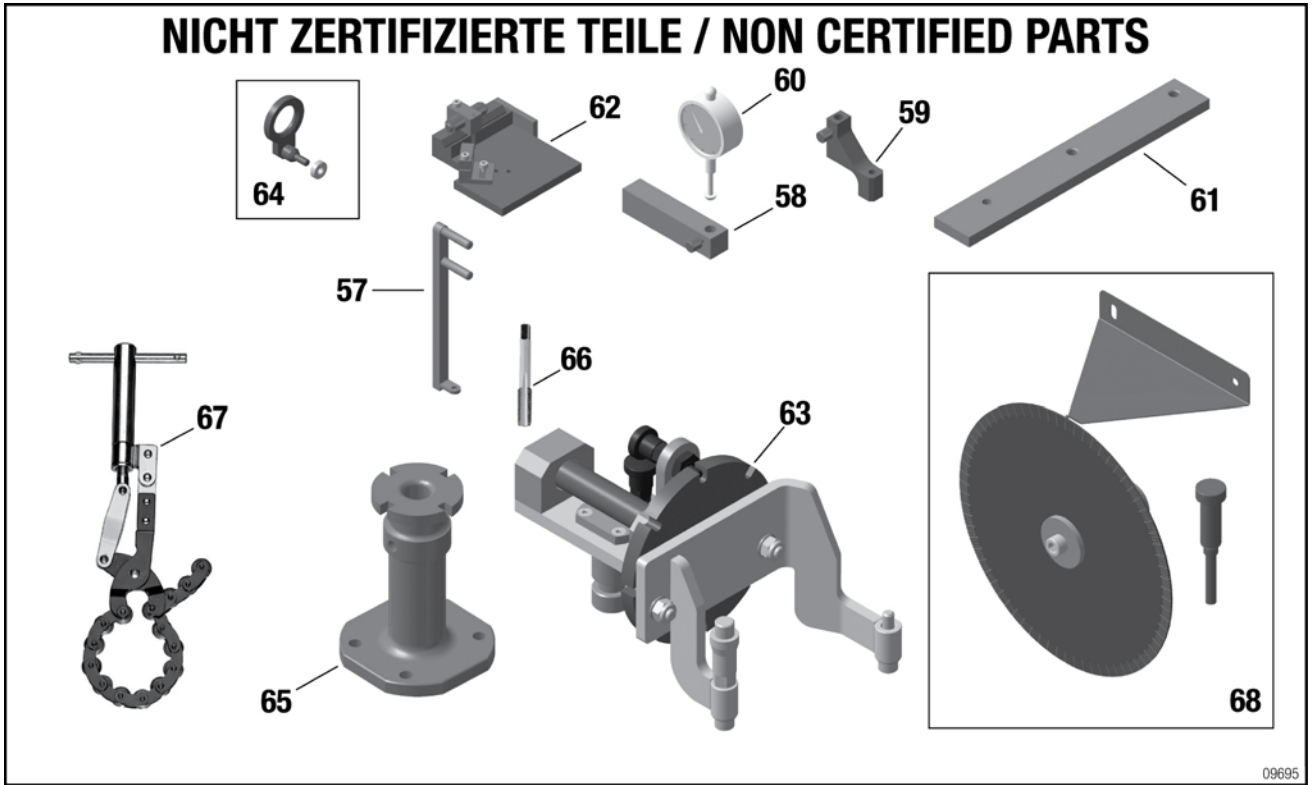
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NICHT ZERTIFIZIERTE TEILE / NON CERTIFIED PARTS



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NOTES

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MAINTENANCE MANUAL

Chapter: 24-20-00
INTERNAL GENERATOR

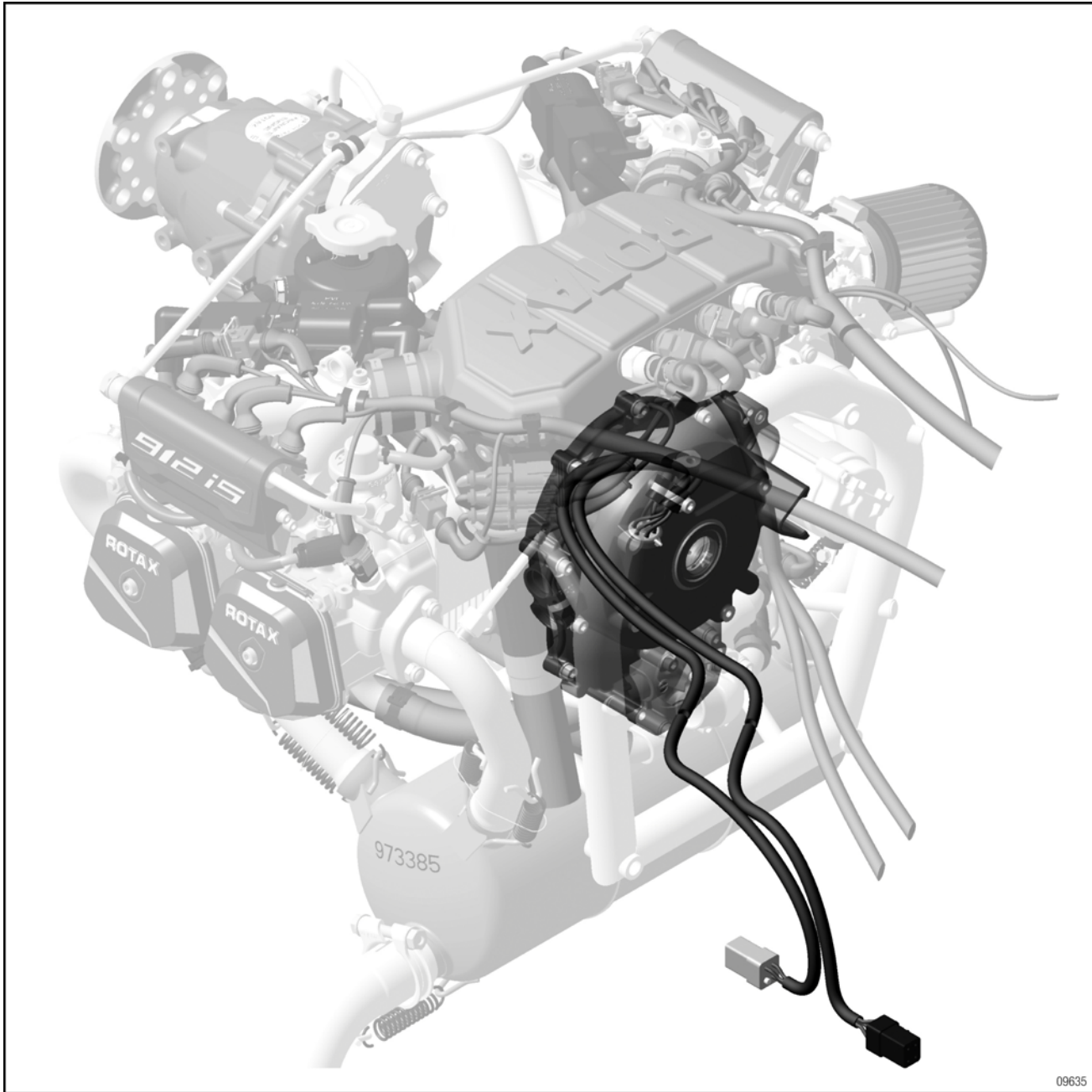
Introduction

This section describes the maintenance of the internal generator assembly of the ROTAX 912 i Series engine. The description is divided into sub-sections and explanations of system functions.

Subject	Page
1. Introduction	Seite 1
2. Special tools	Seite 3
3. Service products	Seite 3
4. System description	Seite 5
5. Safety information	Seite 5
6. Removal	Seite 6
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B. Ignition housing - removal	Seite 6
C. Fly wheel assy. - removal	Seite 8
D. Stator assy. - removal	Seite 8
7. Inspection	Seite 11
A. Ignition housing single parts check	Seite 11
(1) Ignition housing - check	Seite 11
(2) Bearing bushing - check	Seite 11
(3) Oil seal replacement	Seite 12
(4) Stator assy. - inspection	Seite 12
8. Wear limits	Seite 13
9. Assembly	Seite 14
A. Ignition housing - assembly	Seite 14
(1) Oil seal - installation	Seite 14
(2) Stator assy. - installation	Seite 14
(3) Controller connector - assembly	Seite 15
10. Installation	Seite 17
A. Fly wheel - installation	Seite 17
B. Ignition housing assy. - installation	Seite 17
11. Finishing work	Seite 19

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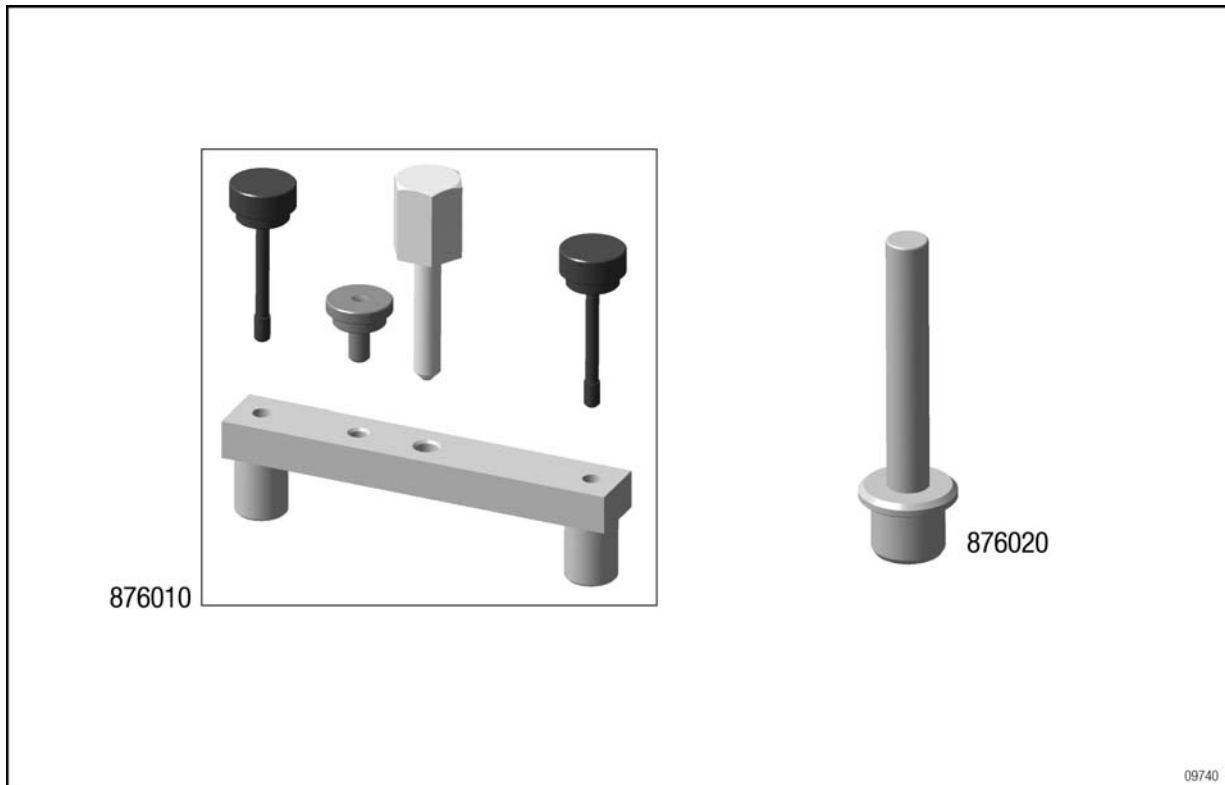
Chapter: 24-20-00
INTERNAL GENERATOR

| SPECIAL TOOLS

Description	Part number
Puller assy.	876010
Insertion jig	876020

SERVICE PRODUCTS

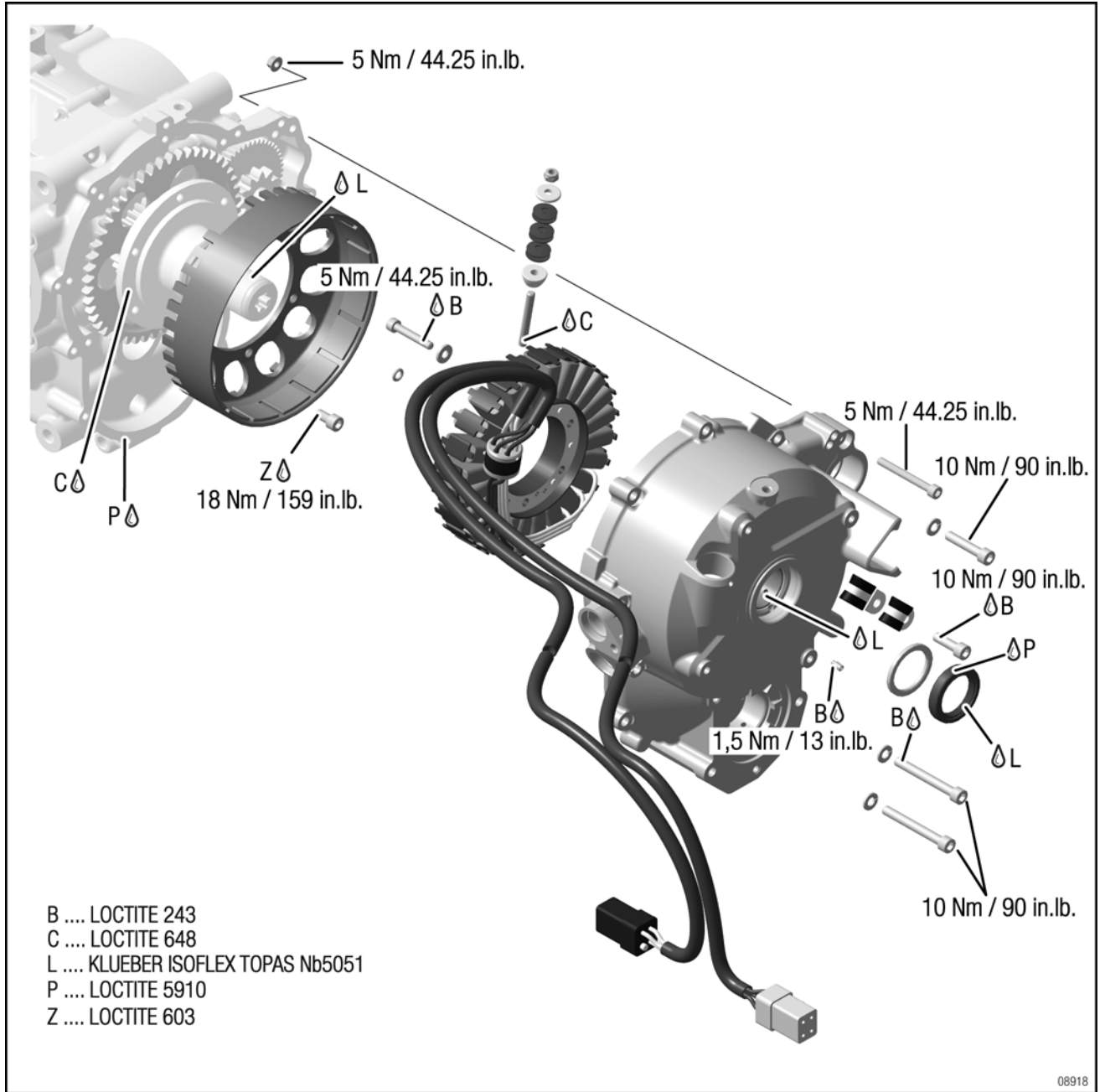
Description	Part number
LOCTITE 243	897651
LOCTITE 648	899788
LOCTITE 603	899789
LOCTITE 5910	899791
KLUEBER ISOFLEX TOPAS Nb5051	898351
Polishing cloth	n.a.



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Internal generator



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SYSTEM DESCRIPTION

The ROTAX 912 iSc/iS has an electronically controlled double-ignition system with an integrated generator.

EMS POWER SUPPLY

The EMS power supply consists essentially of 2 permanent magnet generators. The two 3-phase AC generators are physically separate power supplies which are integrated in the engine. One of the generators is used for the ECU and the other is available to the aircraft frame.

DRIVE

They are driven by the crank drive and do not need an external power supply once the engine has reached idle speed.

NOTE: Until idle speed is reached, a 12 V external power supply of the EMS from the aircraft's on-board power system.

SAFETY INFORMATION

 **WARNING**

Danger of damage to engine!
There is a risk of short circuits and cable fires during work on the electric system.
All installation work on the electric system should be carried out with the engine switched off and the battery (negative terminal) disconnected.
Ignition, main and LANE selector switches must be "OFF"!

MAINTENANCE

As well as the maintenance and special checks, see the relevant Maintenance Manual Line for the respective 912 i Series engine type.

INTERNAL GENERATOR - REMOVAL

Before the internal generator is removed, the work described below must be carried out to identify any further faults in the internal generator and rectify them as part of repair work.

NOTICE

If these checks are omitted, it may be necessary to dismantle the internal generator again to rectify any faults after repair work.

- General visual inspection. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Engine cleaning. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Carry out an engine test run. See relevant Maintenance Manual Line for the 912 i Series engine type.

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MAINTENANCE MANUAL

REMOVAL

Preparation

NOTICE

Use appropriate protective coverings to prevent the ingress of foreign bodies into all disconnected lines and connections.

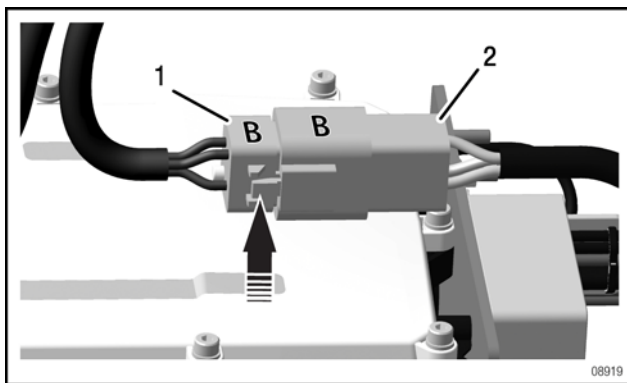
- Drain coolant. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Remove adjacent assemblies (electric starter, water pump).
- Remove coolant hoses from cylinder head.
- Remove rev counter assy. To do this, see section 76-70-00 Sensors and actuators.

NOTE: The assemblies and lines are only to be removed if necessary and only as far as is necessary!

IGNITION HOUSING - REMOVAL

Step	Procedure
1	Detach the electrical connection to the stator by disconnecting the controller connector. Mark before detaching!
2	Press on the catch and disconnect the connector.

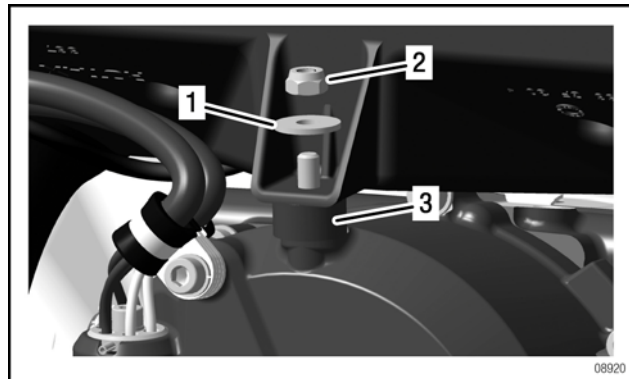
Fig. 1



1. Controller connector 2. Connection socket

Step	Procedure
3	Loosen the airbox bracket. Loosen the hex. nut and remove it along with the washer.

Fig. 2

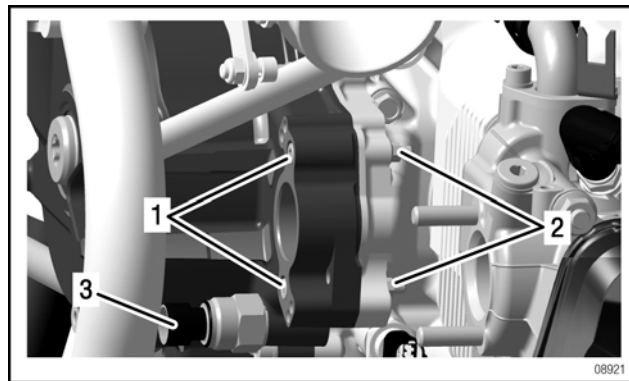


1. Washer A 6.4 2. M6 hex. nut
3. Rubber buffer 20x10xM6

NOTE: Push airbox upwards and wedge in place.

Step	Procedure
4	Loosen 2 Allen screws M5x45 and hex. nuts M5 on electric starter.

Fig. 3



1. M5x45 Allen screw 2. M5 hex. nut
3. OPS pressure sensor (oil)

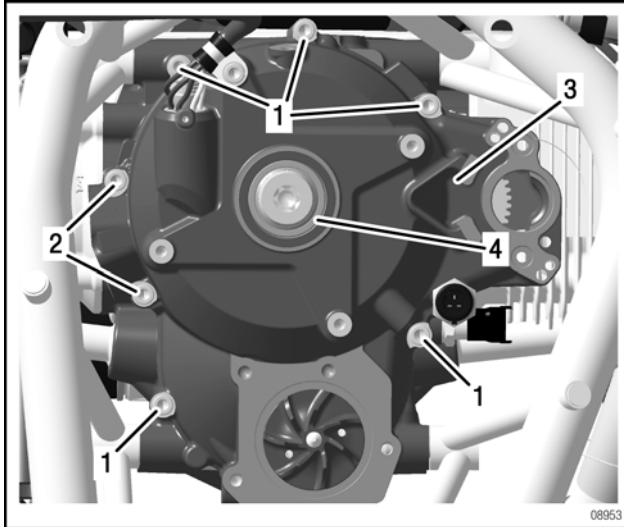
Step	Procedure
5	Loosen 5 M6x30 and 2 M6x50 Allen screws with washers 6.4.
6	Disconnect OPS pressure sensor.

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NOTE: The M6x50 Allen screw goes into the crankcase in the case of cylinder 4 (at CPS_1) and is secured with LOCTITE 243.

Fig. 4

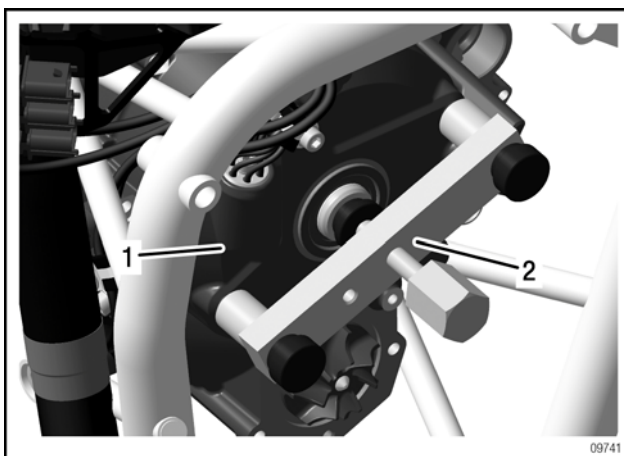


- 1. M6x30 Allen screws 2. M6x50 Allen screws
- 3. Ignition housing assy. 4. Oil seal

Step	Procedure
7	Place the protective piece on the crankshaft and use a puller to take off the ignition housing.

NOTE: The ignition housing has 2 cylinder head dowel pins.

Fig. 5

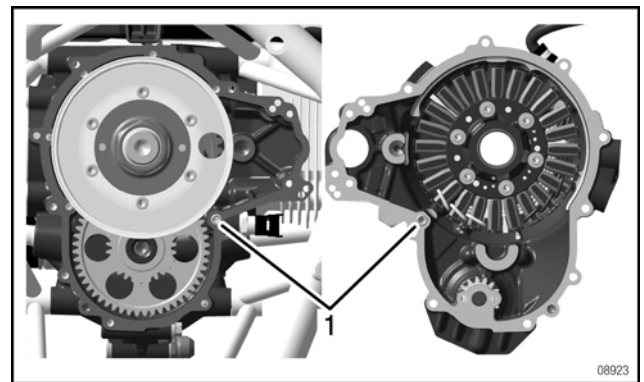


- 1. Ignition housing assy. 2. Puller assy.
part.no. 876010

Step	Procedure
8	Remove O-rings from the crankcase or the ignition housing.
9	The plug screws must be removed and degreased for possible leaks. NOTE: Only for the first engine series.

NOTE: The crankshaft bearing in the ignition housing is lubricated through the oil duct. The oil duct at the contact surface between the crankcase and the ignition housing is sealed using O-ring 5X2.

Fig. 6



- 1. O-ring 5x2

SEALING OF THE PLUG SCREWS

Step	Procedure
9a	The plug screws must be removed and degreased.
9b	Secure plug screws with LOCTITE 243 and tighten it. Tightening torque 6 Nm (.53 in.lb.).
10	Remove Oil seal with a screwdriver.

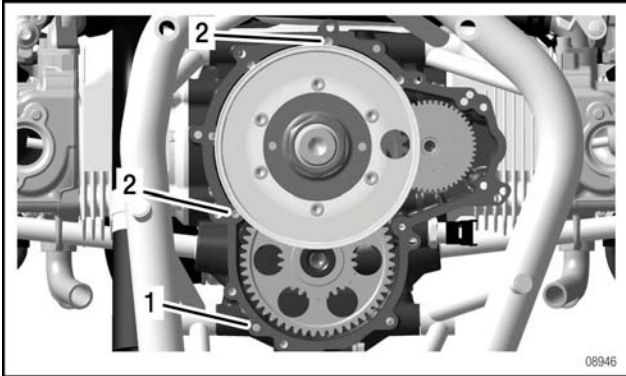
NOTICE

Take care not to damage the Oil seal contact surface in the ignition housing.

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| Fig. 7



- |** 1. Dowel pin 2. Plug screws

FLY WHEEL ASSY. REMOVAL

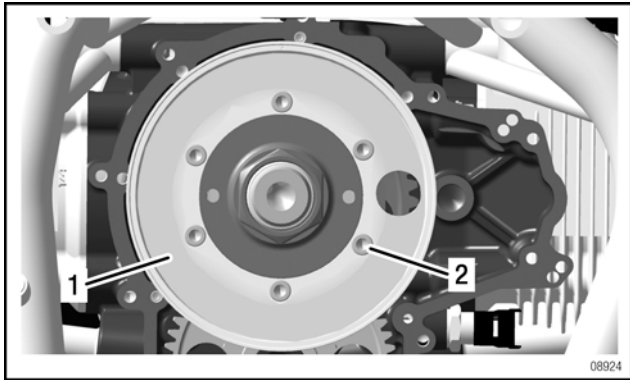
Preparation

- Fix the crankshaft into place. See relevant Maintenance Manual Line for the 912 i Series engine type.

Step	Procedure
1	Loosen 6 M6x12 Allen screws.
2	Remove the fly wheel.

NOTE: The location of the fly wheel does not have to be marked on the freehub body.

Fig. 8



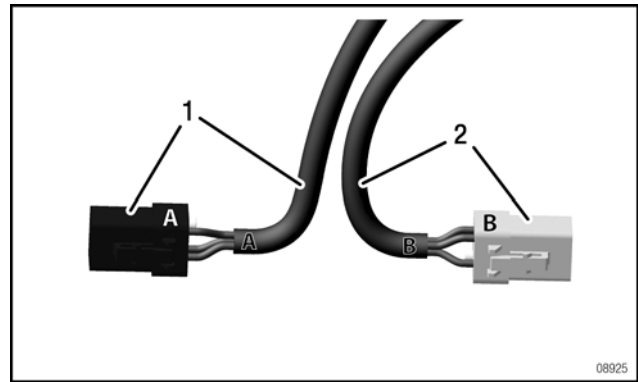
1. Fly wheel 2. M6x12 Allen screw

STATOR ASSY. - REMOVAL

NOTICE	
Mark cables before removing the connector receptacle. The generator coils A and B have different sizes and powers.	

Step	Procedure
1	Mark cables.

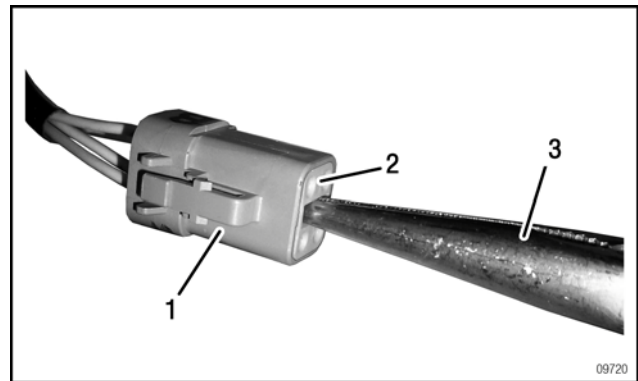
Fig. 9



1. Generator coil A mark (black connector)
2. Generator coil B mark (gray connector)

Step	Procedure
2	Pull out the orange latch with a pair of long-nose pliers.

Fig. 10

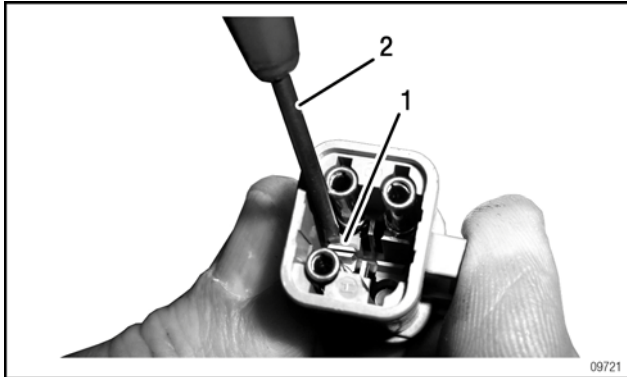


1. Connector 2. Latch
3. Long-nose pliers

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Step	Procedure
3	Prise back the retaining tab and at the same time carefully pull on the line until the terminal is detached.

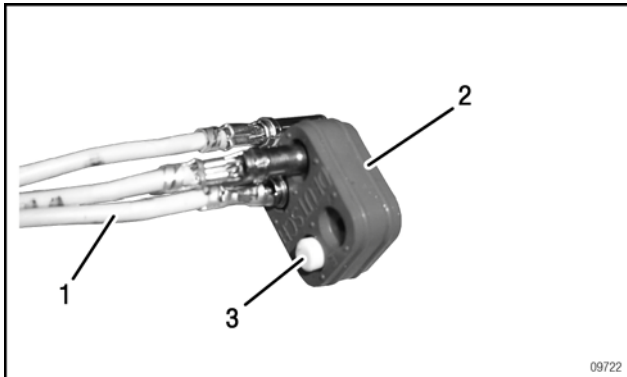
Fig. 11



1. Retaining tab 2. Screwdriver

Step	Procedure
4	Pull off the rubber seal.

Fig. 12

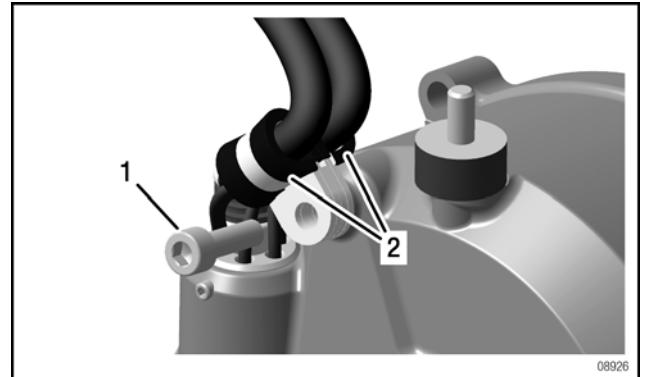


1. Cable 2. Rubber seal
3. Filler plug

Step	Procedure
5	Remove cable clamps.
6	Unscrew lock nut and remove the washer, disk springs and distance sleeve.
7	Remove the adjustment screw and lead-through seal.

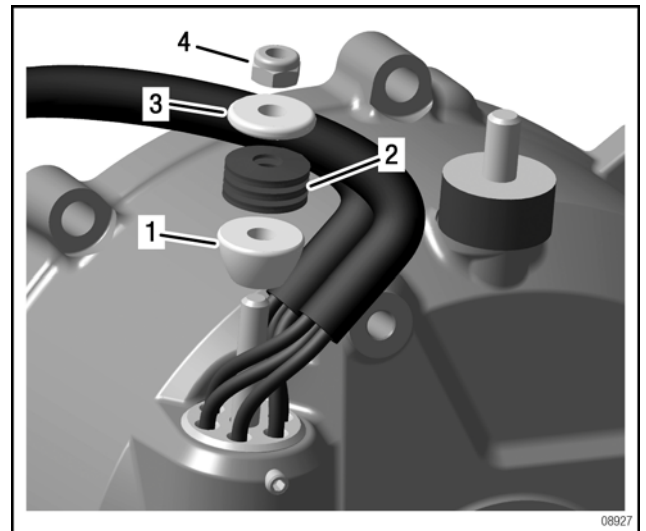
NOTE: Note the location of the cable clamps for reassembly!

Fig. 13



1. M6x16 Allen screw 2. Cable clamp 8/M6

Fig. 14

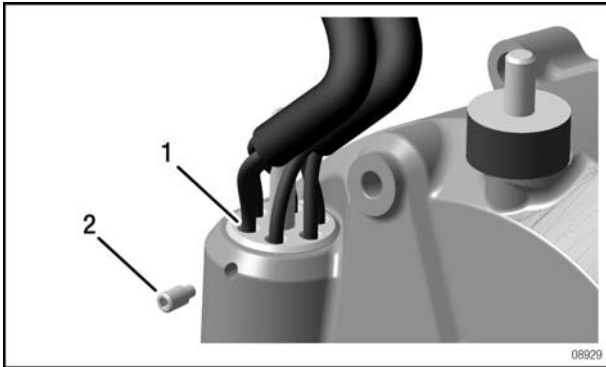


1. Distance sleeve 2. Disk springs
3. Washer 5.1/15.5/2.5 4. Lock nut M5

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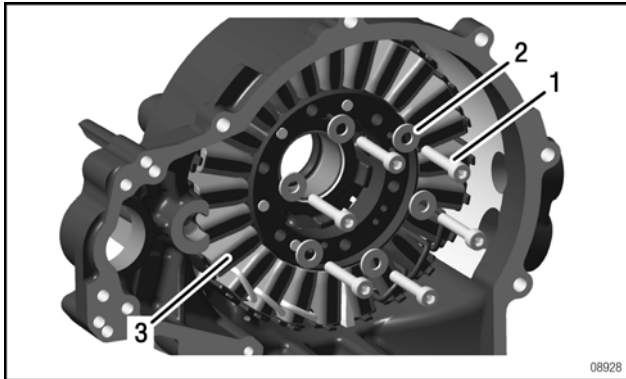
Fig. 15



1. Lead-through seal 2. Adjustment screw M4x8

Step	Procedure
8	Loosen 6 M5x30 Allen screws and remove stator assy.

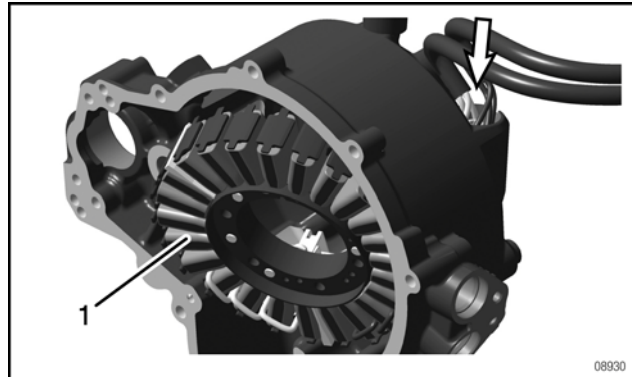
Fig. 16



1. M5x30 Allen screw 2. Washer A 5.5
 3. Stator assy.

Step	Procedure
9	Push the lead-through seal in and pull the cable out.

Fig. 17



1. Stator assy.

INSPECTION

**IGNITION HOUSING -
SINGLE PARTS CHECK**

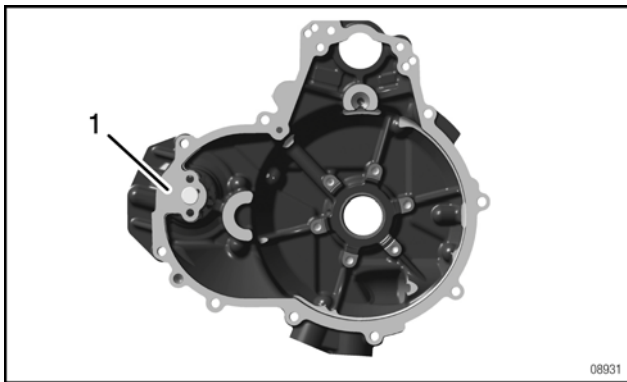
Preparation

- Clean all parts carefully. See also section 05-00-00 Procedures

IGNITION HOUSING - CHECK

Step	Procedure
1	Carry out visual inspection of sealing surfaces.
2	Unscrew pressure sensor (oil). To do this, see section 76-70-00 Sensors and actuators.

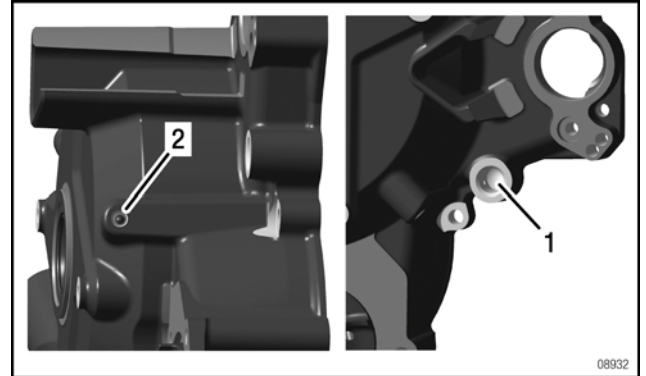
Fig. 18



1. Sealing surface

Step	Procedure
3	Blow compressed air through the lubrication bore and check it is clear.
4	Check that the caulked ball is leakproof.

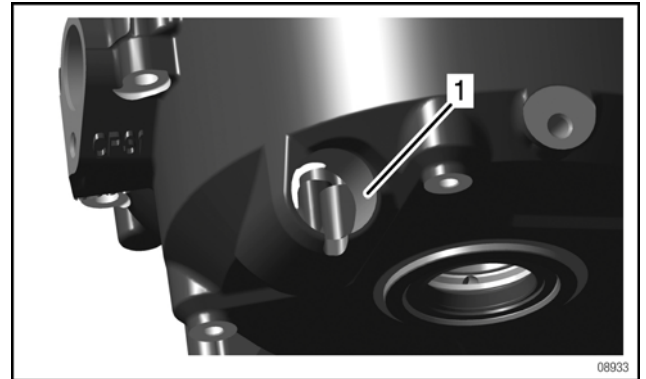
Fig. 19



1. Lubrication bore 2. Caulked ball

Step	Procedure
5	Check the sealing surface of the rubber grommet for striations (especially lengthways).

Fig. 20



1. Sealing surface for rubber grommet

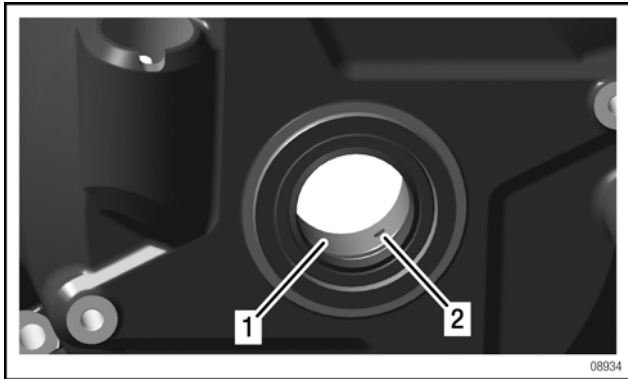
BEARING BUSHING - CHECK

NOTE: It is not possible for the bearing bushing to be replaced, as the inner bore and the lubrication bore are machined after the bushing has been pressed. If the bearing bushing is worn, the entire ignition cover with the pressed and machined bushing must be replaced.

Step	Procedure
1	Check the bearing bushing for damage and wear.
2	Check that the oil bore is clear.

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Fig. 21



1. Bearing bushing 2. Oil bore

OIL SEAL REPLACEMENT

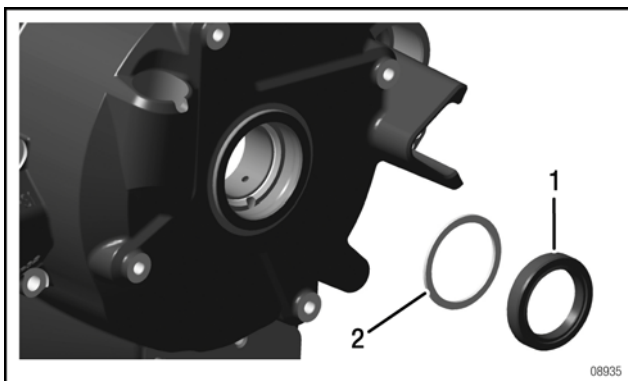
NOTICE

The oil seal must be replaced!

NOTE: There is a 1.5 mm (0.06 in.) washer behind the oil seal.

Step	Procedure
1	If the crankshaft is damaged or worn in the vicinity of the oil seal sealing lip, the channel in the sealing lip can be moved 1.5 mm (0.06 in.) by omitting the washer.

Fig. 22



1. Oil seal 2. Washer

STATOR ASSY. - INSPECTION

NOTICE

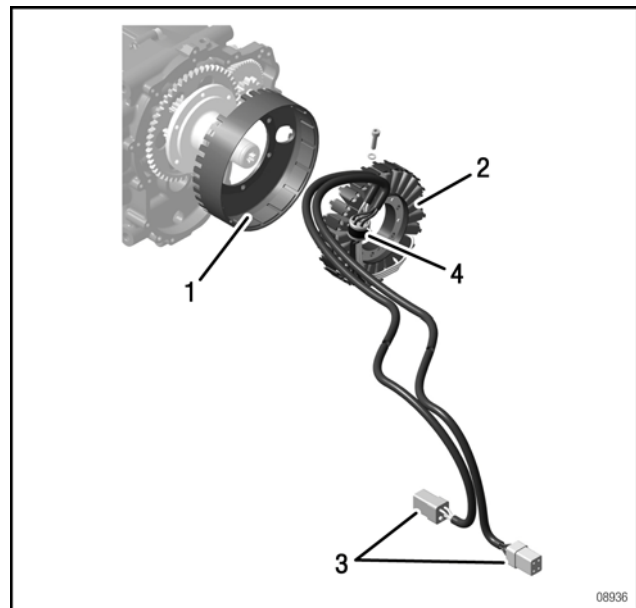
Danger of consequent damage to engine!
 The stator may not be post-machined! If the stator or its wiring is damaged or worn, it must be replaced with a new part.

NOTICE

Signs of wear on the magnet are not permissible!
 Damaged parts on the fly wheel are not permissible!

Step	Procedure
1	Carry out a visual inspection of the stator assy. and wiring, checking for damage and wear.

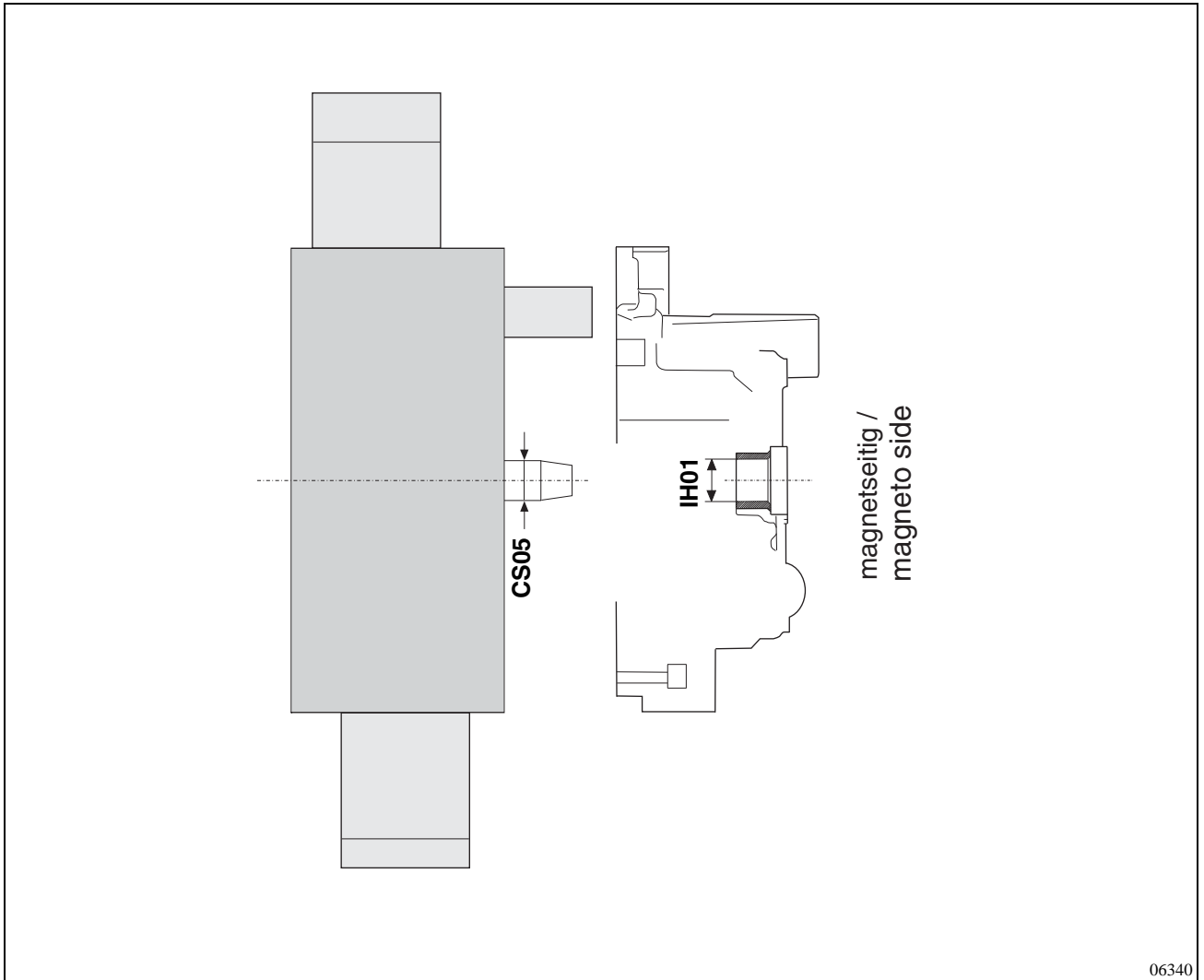
Fig. 23



1. Fly wheel assy. 2. Stator assy.
 3. Controller connectors A, B 4. Lead-through seal

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WEAR LIMITS



Ignition housing

Description	Code	Current measurement value		Tolerance limit	Tolerance limit		Measurements
		min	max	100 %	50 %		
Bearing bushing in ignition housing	IH01	28.04 mm 1.104 in.	28.05 mm 1.1044 in.	28.11 mm 1.1067 in.	28.08 mm 1.1055 in.	current replaced	
Radial clearance	IH01/ CS05	0.03 mm 0.0012 in.	0.05 mm 0.0020 in.	0.12 mm 0.0047 in.	0.09 mm 0.0033 in.	current replaced	
Crankshaft end	CS05	27.970 mm 1.1012 in	28.000 mm 1.103 in	27.930 mm 1.0996 in	27.950 mm 1.1004 in	current replaced	

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ASSEMBLY

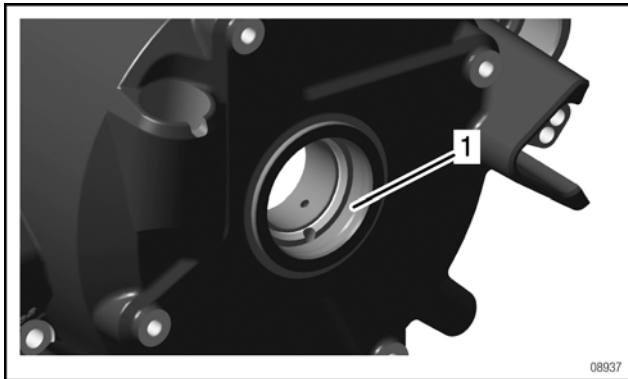
IGNITION HOUSING - ASSEMBLY

NOTE: Whenever the ignition housing is installed or assembled, new, acid-free greased o-rings and other sealing elements must always be used correctly!

Step	Procedure
1	Polish and then clean the contact surface for the oil seal.

OIL SEAL - INSTALLATION

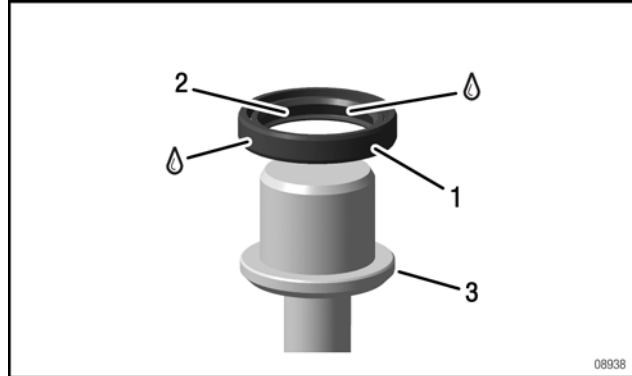
Fig. 24



1. Contact surface

Step	Procedure
2	Place new oil seal on insertion jig part no. 876020 and lubricate. Outer: LOCTITE 5910. Inner: KLUEBER ISOFLEX TO-PAS.

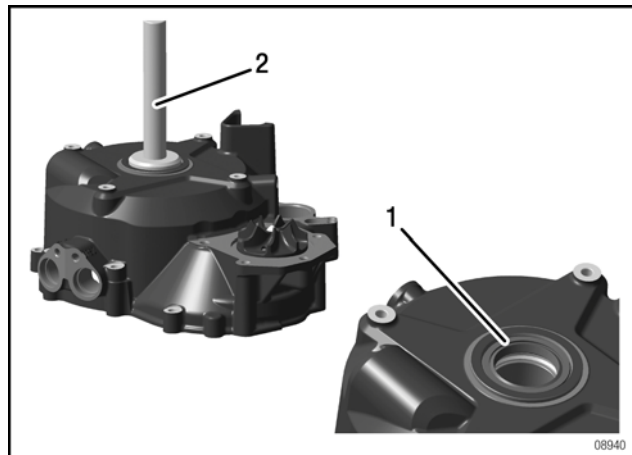
Fig. 25



1. Outer oil seal 2. Inner oil seal
3. Insertion jig part no. 876020

Step	Procedure
3	Using a soft-faced hammer, tap the oil seal with the insertion jig to press it in to the ignition housing as far as it will go.

Fig. 26



1. Oil seal positioned 2. Insertion jig

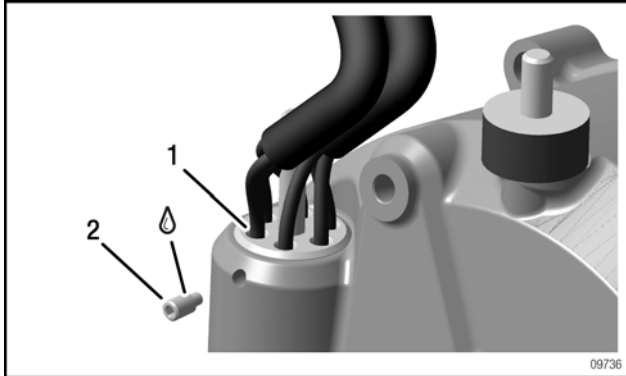
STATOR ASSY. - INSTALLATION

Step	Procedure
1	Thread in the cable and then secure M4x8 adjustment screw with LOCTITE 243 and tighten them.

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Fig. 27

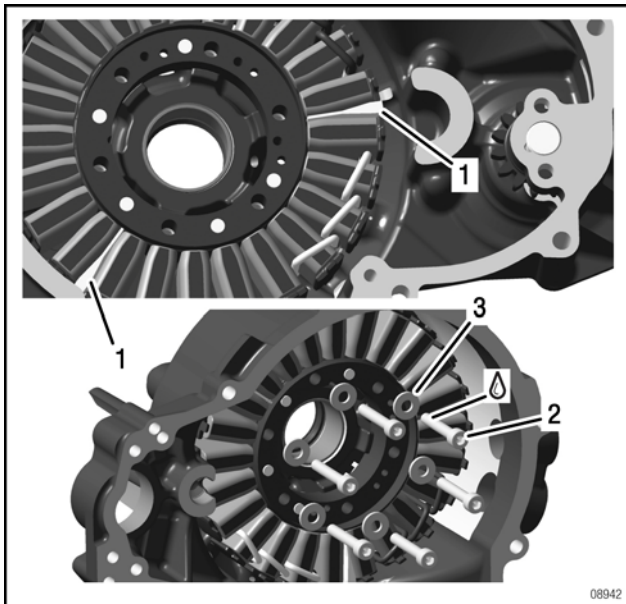


1. Lead-through seal 2. Adjustment screw M4x8

Step	Procedure
2	Position the stator assy. Then secure 6 M5x30 Allen screws including A 5.5 washers with LOCTITE 243 and tighten them. Tightening torque 6 Nm (53 in.lb.).

NOTE: When positioning, make sure there is as little spacing possible between the cable lead-through in the ignition cover and the cable connection to the coils.

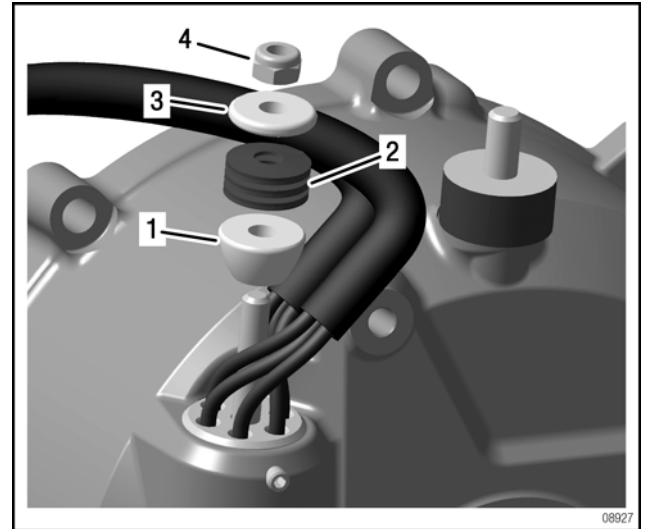
Fig. 28



1. Separation between the two generator coils
 2. M5x30 Allen screw 3. Washer A 5.5

Step	Procedure
3	Install the distance sleeve, disk springs and washer.
4	Tighten lock nut M5. Tightening torque 6 Nm (53 in.lb.).
5	Slip on the full length of the black protection hoses.

Fig. 29



1. Distance sleeve 2. Disk springs 15x5.2x0.7
 3. Washer 5.1/15.5/2.5 4. Lock nut M5

CONTROLLER CONNECTOR - ASSEMBLY

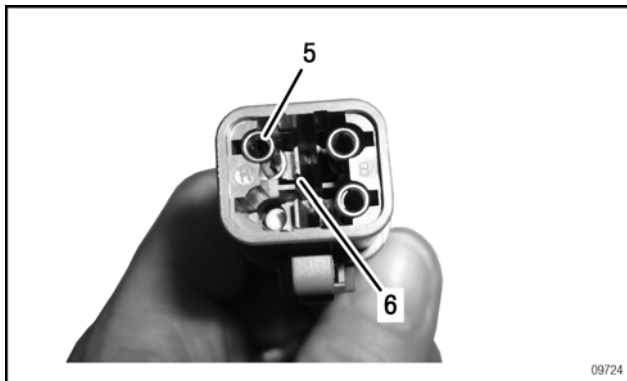
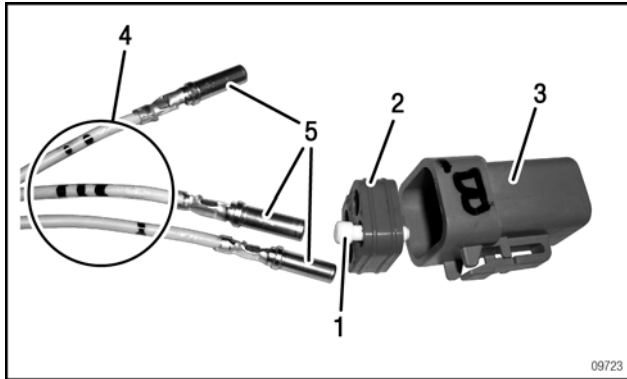
Step	Procedure
1	Position the filler plug correctly.
2	Thread the lines through the insulator (rubber).
3	Make the cable sleeves latch.

NOTE: When assembling the controller connector, note the marks made.

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Fig. 30

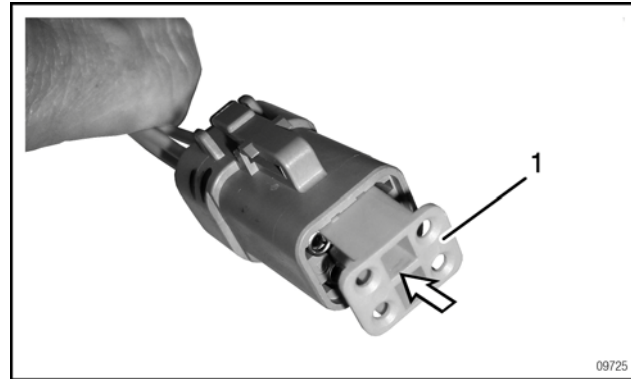


- 1. Filler plug
- 2. Insulator (rubber)
- 3. Connector receptacle
- 4. Marks
- 5. Cable sleeves
- 6. Latch

Step	Procedure
4	Install the lock

NOTE: At malfunctions such as wire breakage and faulty plugs, the particular damage can be repaired. Cable must be long enough when plug is removed. Repair of malfunctions with the tools mentioned here must conform to the aircraft standards of the respective country.

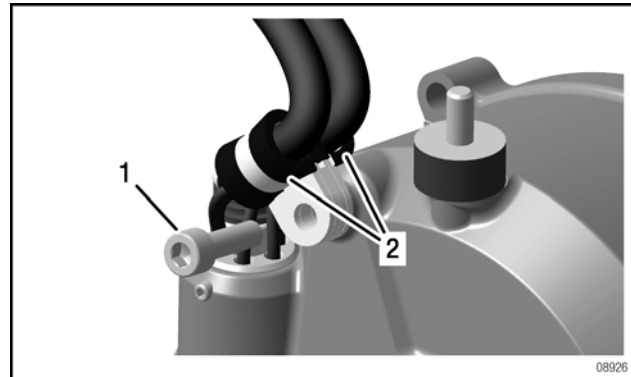
Fig. 31



- 1. Lock

Step	Procedure
5	Install 8/M6 cable clamps. NOTE: The bends of the cable clamps must be installed in a diametrically opposed manner.
6	Adjust cables. Tighten M6x20 Allen screw. Tightening torque 10 Nm (88.48 in. lb.).

Fig. 32



- 1. M6x20 Allen screw
- 2. Cable clamp 8/M6

Part no. of connector set	Corresponding tool
866420	DEUTSCH HDT- 48 - 00
866422	

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INSTALLATION

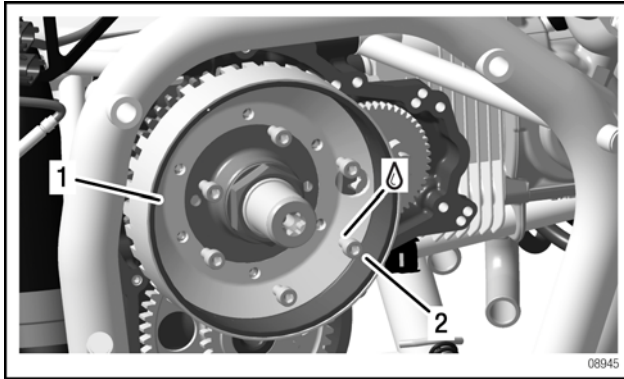
FLY WHEEL ASSY. - INSTALLATION

Preparation

NOTE: Clean all flat surfaces

Step	Procedure
1	Lubricate the flat surface of the sprag clutch housing with LOCTITE 648.
2	Place fly wheel on top.
3	Secure 6 M6x12 Allen screws (12.9 screw strength) with LOCTITE 603 and tighten them. Tightening torque 18 Nm (159.3 in. lb.).

Fig. 33



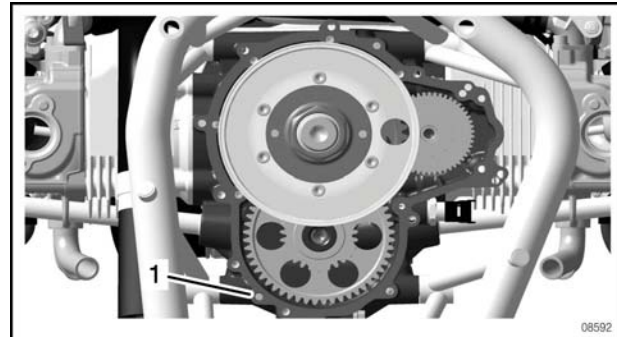
1. Fly wheel 2. M6x12 Allen screw

IGNITION HOUSING ASSY. - INSTALLATION

Preparation

- Check whether dowel pins have been inserted

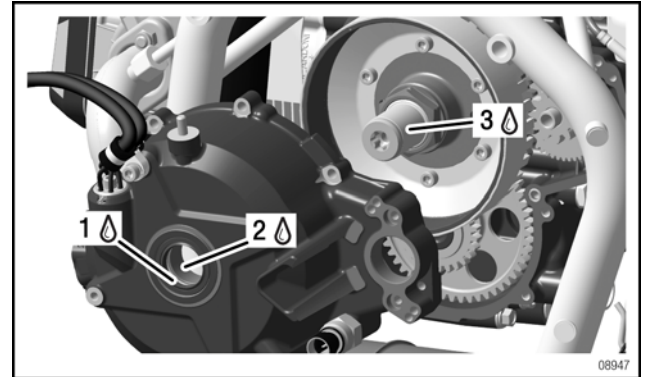
Fig. 34



1. Dowel pins

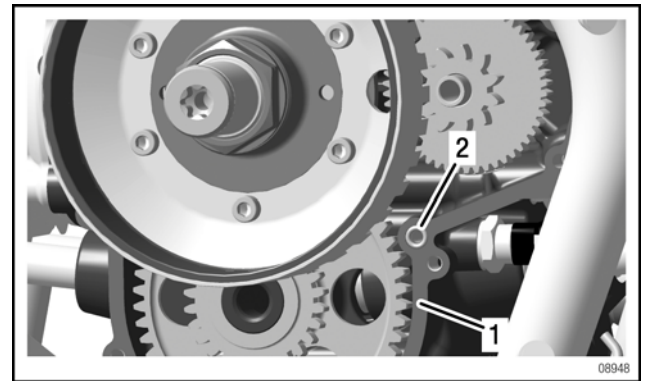
Step	Procedure
1	Lubricate oil seal, bearing bushing and crankshaft stub with KLUEBER ISOFLEX TOPAS Nb5051.
2	Insert 5x2 O-ring into the crankcase and lubricate with KLUEBER ISOFLEX TOPAS Nb5051 to hold in position.

Fig. 35



1. Oil seal 2. Bearing bushing
 3. Crankshaft stub

Fig. 36



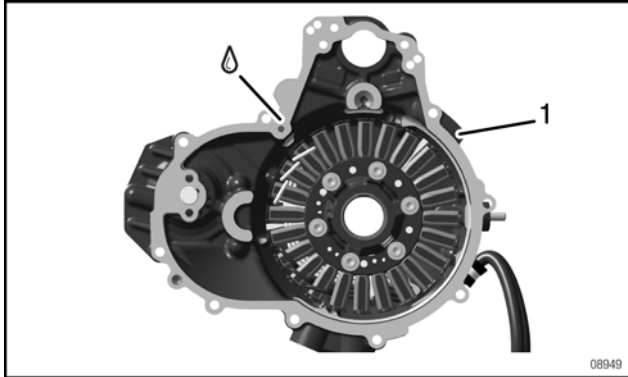
1. Crankcase 2. O-ring 5x2

Step	Procedure
3	Install puller assy. part no. 876010 on ignition housing. Lubricate the sealing surface of the ignition housing with LOCTITE 5910.

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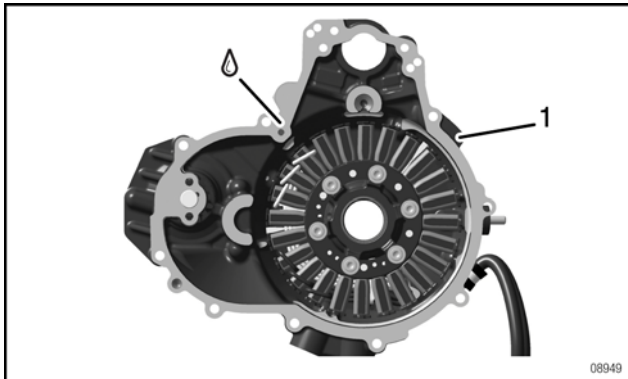
Fig. 37



1. Ignition housing

Step	Procedure
4	Install ignition housing on the crankcase with puller assy. part no. 876010.

Fig. 38



1. Ignition housing

⚠ WARNING

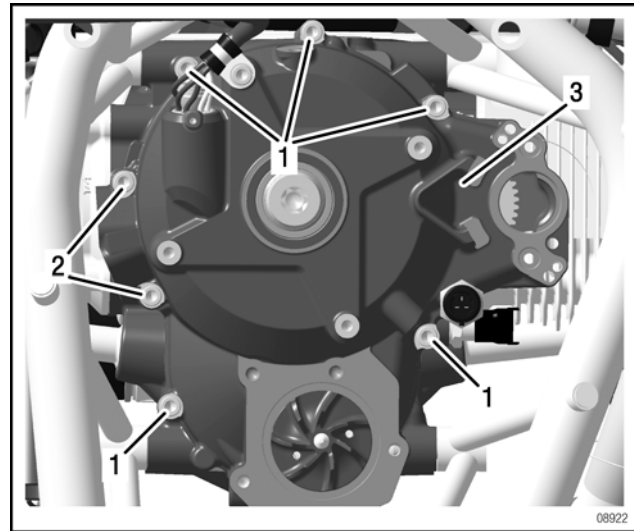
Danger of injury!
 The magnet of the fly wheel pulls the ignition cover towards the engine/sealing surface with great force.
 Fingers can be crushed.

Step	Procedure
5	Turn the water pump wheel slightly so that the gear wheels can mesh.
6	Fasten the ignition housing to the crankcase using Allen screws. Tightening torque 10 Nm (88.48 in. lb.)

NOTICE

The ignition housing must be attached manually without tapping.

Fig. 39



Ignition housing screw diagram

- 1. M6x30 Allen screws 2. M6x50 Allen screws
- 3. Ignition housing assy.

Step	Procedure
7	Secure M6x50 Allen screw with LOCTITE 243 and tighten it. Tightening torque 10 Nm (88.48 in. lb.)

NOTICE

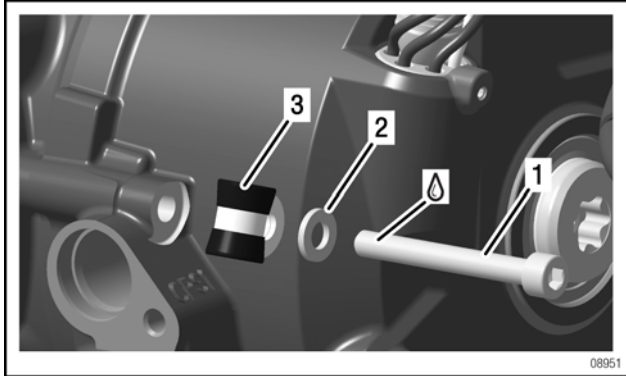
Do not use a longer screw!
 The screw would press on the cylinder shroud and cause damage to piston and cylinder.

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NOTE: The through-bore of the screw penetrates as far as the crankcase. The engine is not leakproof if this screw is not glued.

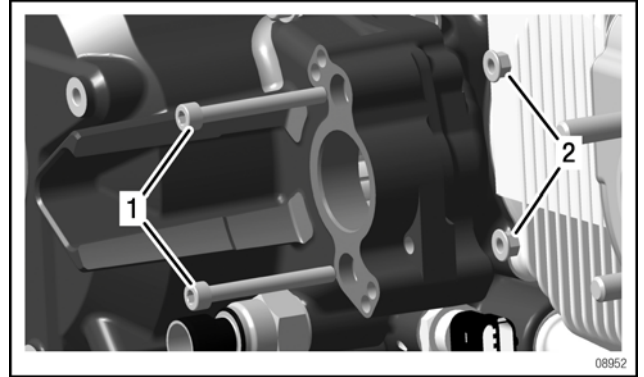
Fig. 40



1. M6x50 hex. screw 2. Washer A 6.4
3. Cable clamp

NOTE: No washers are used for these screws, as otherwise the starter does not lie flat on the flange surface. See Fig. 42.

Fig. 42

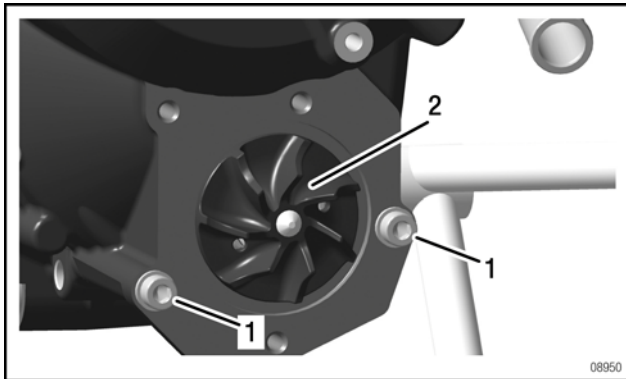


1. M5x45 hex. screw 2. M5 hex. collar nut

NOTICE

If the water pump is not installed straight away, then 2 M6x65 auxiliary screws with washers must be screwed in so that the sealing surface is evenly clamped.

Fig. 41



1. M6x65 Allen screw 2. Water pump wheel

FINISHING WORK

- Install water pump housing with a new seal. See also section 75-00-00 Cooling system.
- Install electric starter. See also section 80-00-00 Electric starter.
- Install pressure sensor. See section 76-70-00 Sensors and actuators.
- Install airbox on ignition housing. See also section 73-10-00 Fuel system.
- Release crankshaft. See relevant Maintenance Manual Line for the 912 i Series engine type.

Step	Procedure
8	Fasten M5x45 hex. screws for the starter. Tightening torque 6 Nm (53 in. lb.)

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NOTES

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Chapter: 24-30-00
EXTERNAL ALTERNATOR

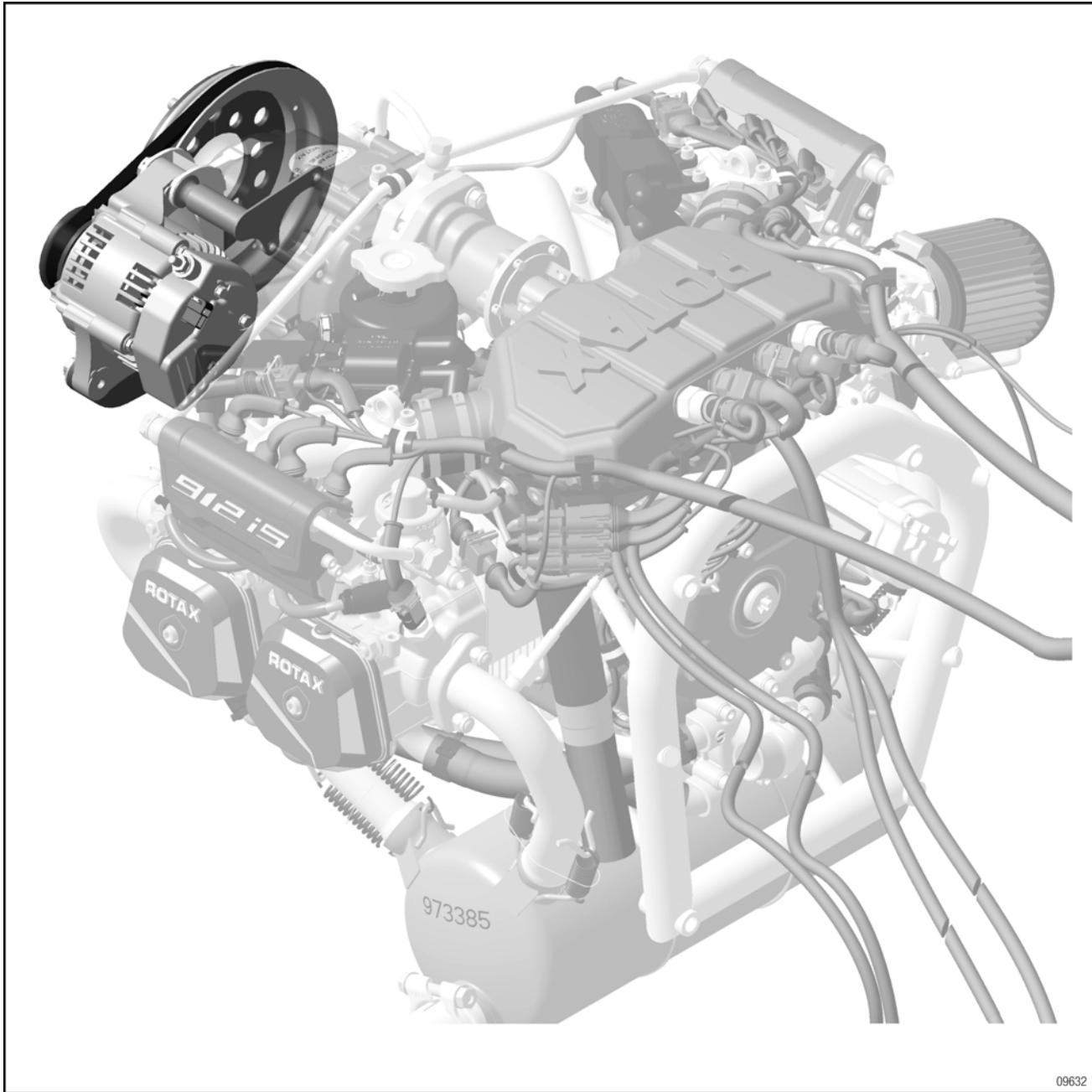
Introduction

This section describes the maintenance of the external alternator assembly of the ROTAX 912 i Series engine. The description is divided into sub-sections and explanations of system functions.

Subject	Page
1. Introduction	Seite 1
2. System description	Seite 3
3. Safety information	Seite 3
4. Removal	Seite 5
A. Preparation	Seite 5
B. V-belt pulley - removal	Seite 5
C. Alternator - removal	Seite 5
5. Installation	Seite 7
A. V-belt pulley - installation	Seite 7
B. Alternator - installation	Seite 7
6. Finishing work	Seite 9

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Location on the engine



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SYSTEM DESCRIPTION

The ROTAX 912 i Series can optionally be equipped with an external alternator. This is a state-of-the-art, electromechanical three-phase generator (compact generator) with small outer dimensions. It has the task of supplying the electric consumers with energy and charging the starter battery with the least possible fuel consumption and low noise levels during operation of the aircraft.

DRIVE

Drive is provided by the engine by means of a V-belt.

SAFETY INFORMATION

 WARNING
Danger of damage to engine! There is a risk of short circuits and cable fires during work on the electric system. All installation work on the electric system should be carried out with the engine switched off and the battery (negative terminal) disconnected. Ignition, main and LANE selector switches must be "OFF"!

MAINTENANCE

As well as the maintenance and special checks, see the relevant Maintenance Manual Line for the respective 912 i Series engine type.

EXTERNAL ALTERNATOR - REMOVAL

Before the external generator is removed, the work described below must be carried out to identify any further faults in the external generator and rectify them as part of repair work.

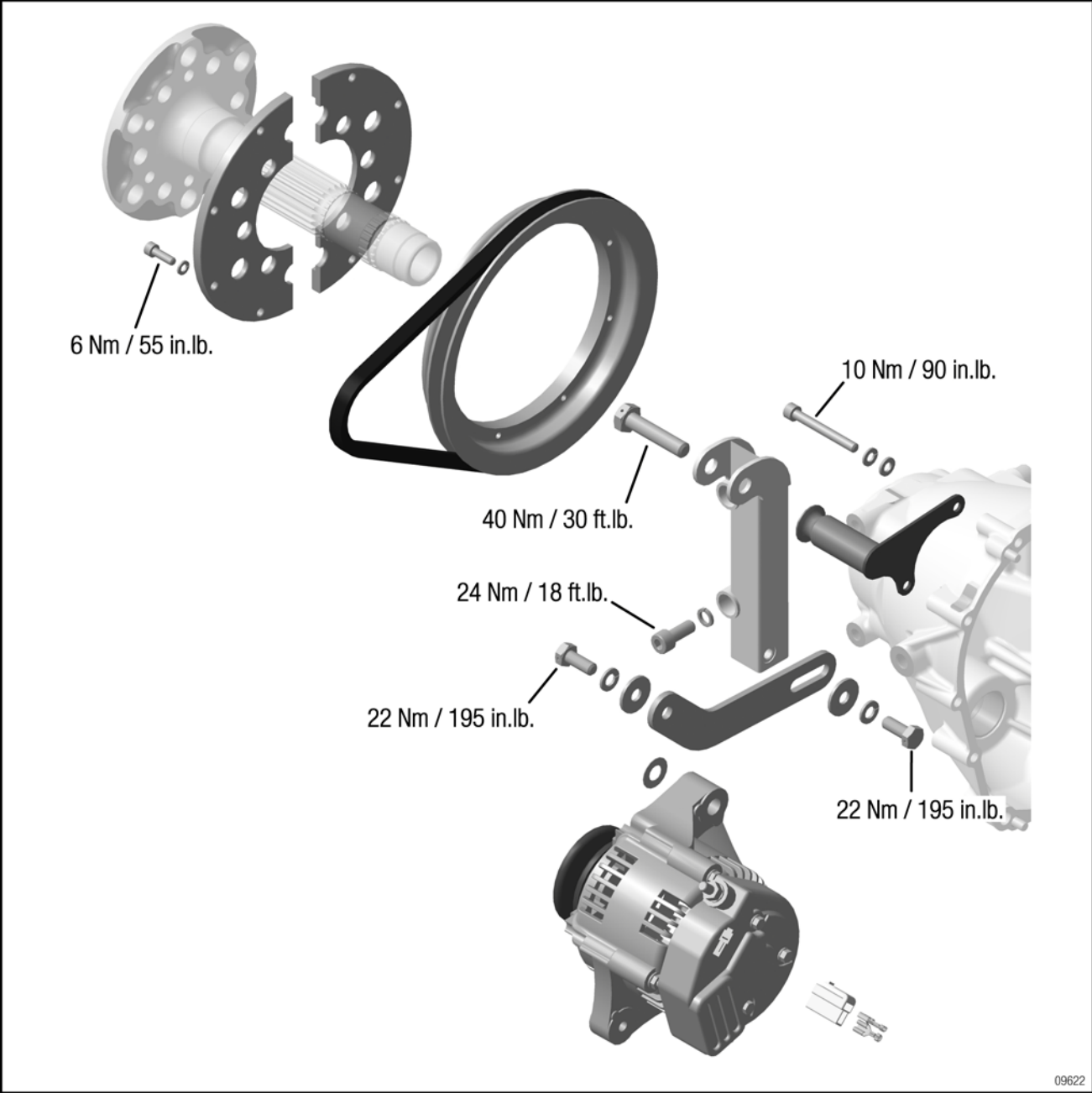
NOTICE
If these checks are omitted, it may be necessary to dismantle the internal generator again to rectify any faults after repair work.

- General visual inspection. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Carry out a generator inspection during an engine test run. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Output voltage check. See "Documentation of aircraft manufacturer"

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External alternator



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REMOVAL

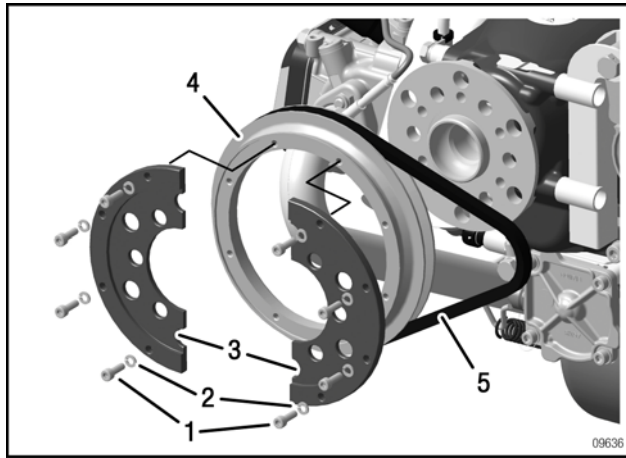
Preparation

- Loosen pulley tension. See the most recent Maintenance Manual Line.
- Remove the propeller. See "Documentation of aircraft manufacturer"

V-BELT PULLEY - REMOVAL

Step	Procedure
1	Loosen 8 M5x16 Allen screws with lock washers.
2	Remove pulley carriers, v-belt pulley and v-belt.

Fig. 1

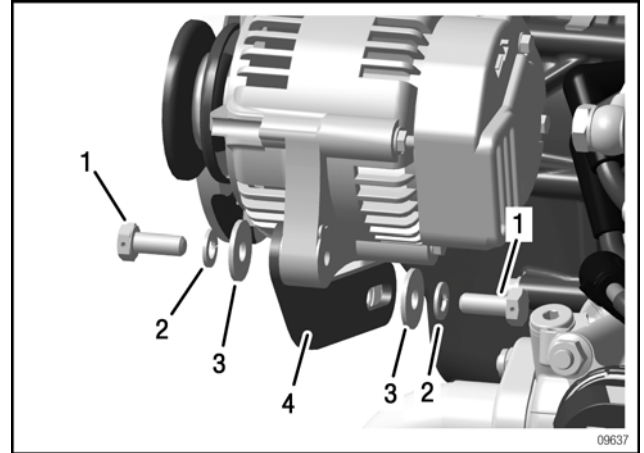


- 1. M5x16 hex, screws
- 2. Lock washers
- 3. Pulley carrier
- 4. V-belt pulley
- 5. V-belt

ALTERNATOR - REMOVAL

Step	Procedure
1	Loosen 2 M8x20 hex. screws along with lock washers and washers.
2	Remove the tension bar underneath the external generator.

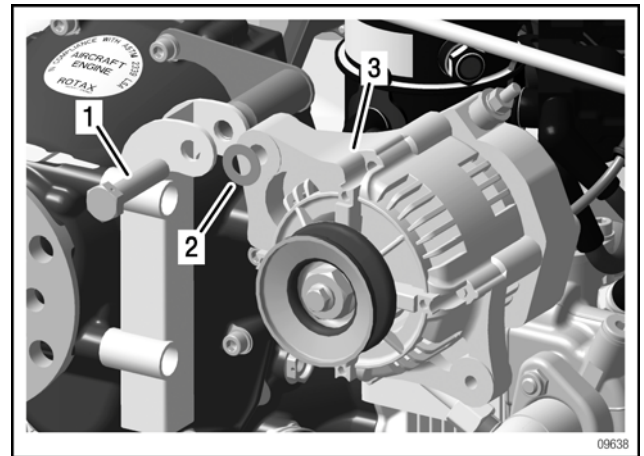
Fig. 2



- 1. M8x20 hex. screws
- 2. Lock washers
- 3. Washers
- 4. Tension bar

Step	Procedure
3	Loosn M10x45 hex. screw and remove the alternator and washer.

Fig. 3



- 1. M10x45 hex. screw
- 2. Washer
- 3. External alternator

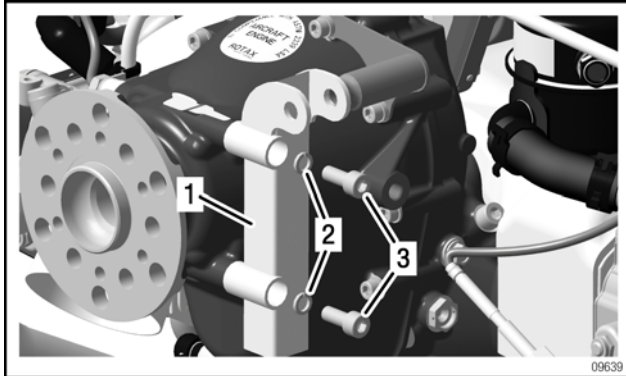
See Fig. 4

Step	Procedure
4	Loosen 2 M8x20 Allen screws along with lock washers and remove the alternator bracket.

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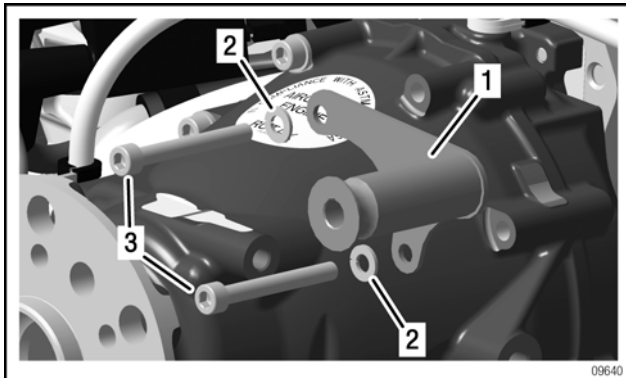
Fig. 4



- 1. Alternator bracket
- 2. Lock washer
- 3. M8x20 Allen screws

Step	Procedure
5	Remove 2 M6x50 Allen screws along with lock washers and washers from the gear-box housing and alternator support.

Fig. 5



- 1. Alternator support
- 2. Lock washers
- 3. M6x50 Allen screws

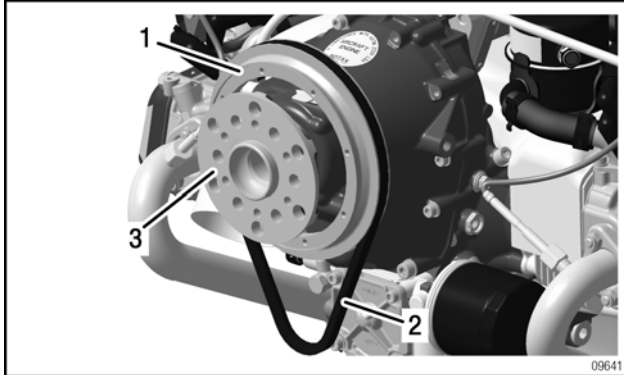
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INSTALLATION

V-BELT PULLEY - INSTALLATION

Step	Procedure
1	Push the v-belt pulley completely over the propeller flange and insert the 9.5x675 v-belt loosely into the v-belt pulley.

Fig. 6



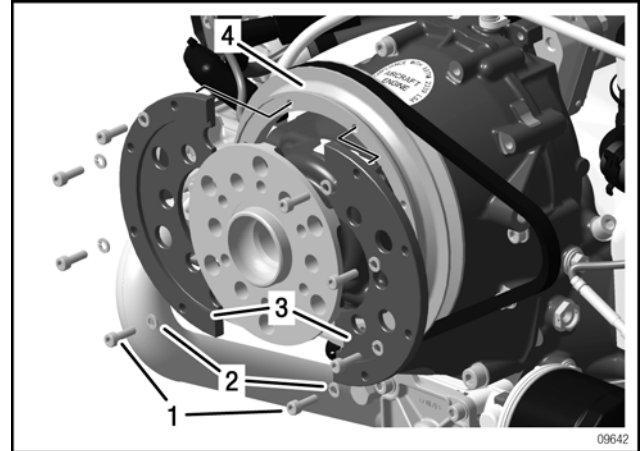
- 1. V-belt pulley
- 2. V-belt
- 3. Propeller flange

NOTICE

The two pulley carriers must sit with the centring exactly on the inner side of the propeller flange.

Step	Procedure
2	Insert both pulley carriers with the centring towards the inner side of the propeller flange.
3	Push the v-belt pulley onto the two pulley carriers and tighten with 8 M5x16 Allen screws and lock washers. Tightening torque 6 Nm (53.09 in. lb.)

Fig. 7

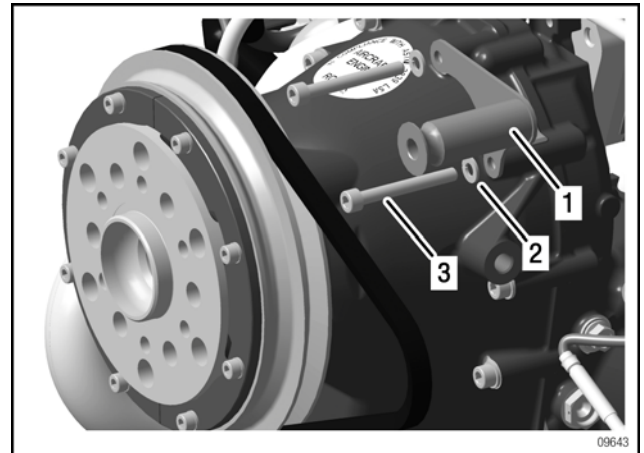


- 1. M5x16 Allen screws
- 2. Lock washers
- 3. Pulley carrier
- 4. V-belt pulley

ALTERNATOR - INSTALLATION

Step	Procedure
1	Fix the alternator support finger-tight by means of 2 M6x50 Allen screws and lock washers.

Fig. 8



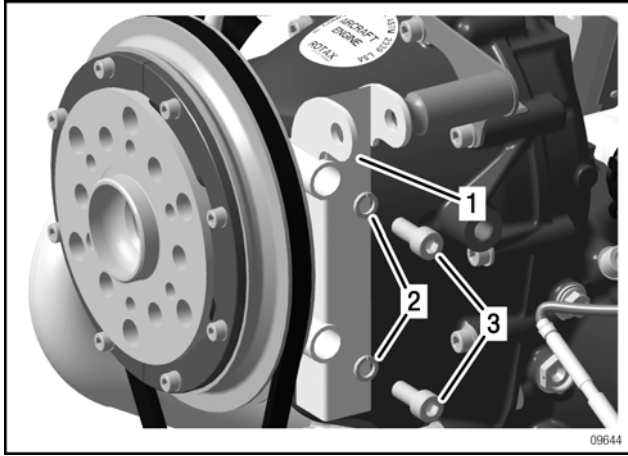
- 1. Generator support
- 2. M8x20 Allen screw
- 3. M6x50 Allen screws

Step	Procedure
2	Attach the alternator bracket finger-tight to the gearbox housing using the two M8x20 Allen screws and VHZ8 lock washers.

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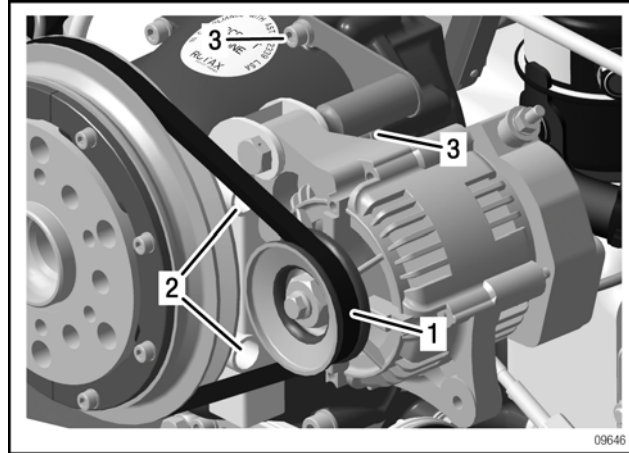
Fig. 9



- 1. Alternator bracket
- 2. Lock washers
- 3. M8x20 Allen screw

Step	Procedure
3	Push the alternator into the lug of the alternator bracket and fix initially finger-tight with M10x45 hex. screw and 10.1/20/0.5 washer.

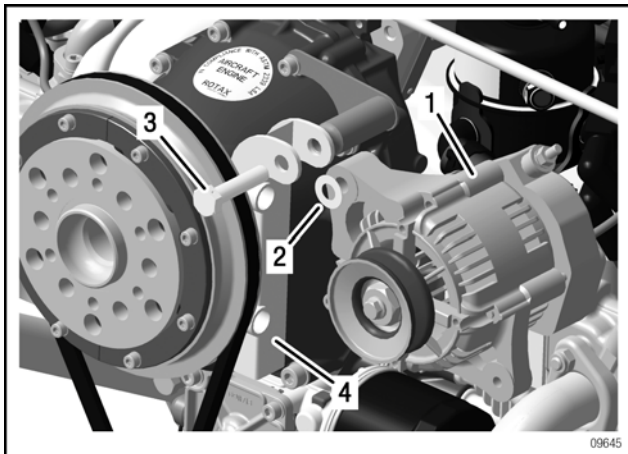
Fig. 11



- 1. V-belt
- 2. M8x20 Allen screw
- 3. M6x50 Allen screw

Step	Procedure
6	Attach the tension bar finger-tight to the alternator bracket using 2 M8x20 hex. screws with a lock washer and a washer.

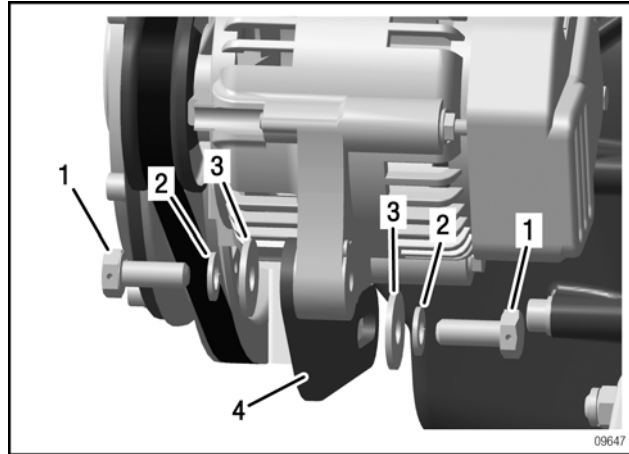
Fig. 10



- 1. Alternator
- 2. 10.1/20/0.5 washer
- 3. M10x45 hex. screw
- 4. Alternator bracket

Step	Procedure
4	Tighten the pre-mounted M6 and M8 Allen screws. Tightening torque 10 Nm (88.48 in. lb.)
5	Place the v-belt in the v-belt pulley of the alternator.

Fig. 12



- 1. M8x20 hex. screws
- 2. Lock washer
- 3. Washer

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Step	Procedure
7	Adjust the pulley tension and tighten M10 and M8 hex. screws. Tightening torque M10: 40 Nm (354 in.lb.) Tightening torque M8: 22 Nm (194.7 in.lb.) See the most recent Line Maintenance Manual for the respective engine type.

FINISHING WORK

- Install the propeller. See "Documentation of aircraft manufacturer"

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Chapter: 37-00-00
VACUUM SYSTEM

Introduction

This section describes the vacuum system of the ROTAX 912 i series engine. The description is divided into sub-regions and explanations of system functions.

Subject	Section
1. Introduction	Kapitel 37-00-00
2. Vacuum pump	Kapitel 37-10-00

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NOTES

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Chapter: 37-10-00
VACUUM PUMP

Introduction

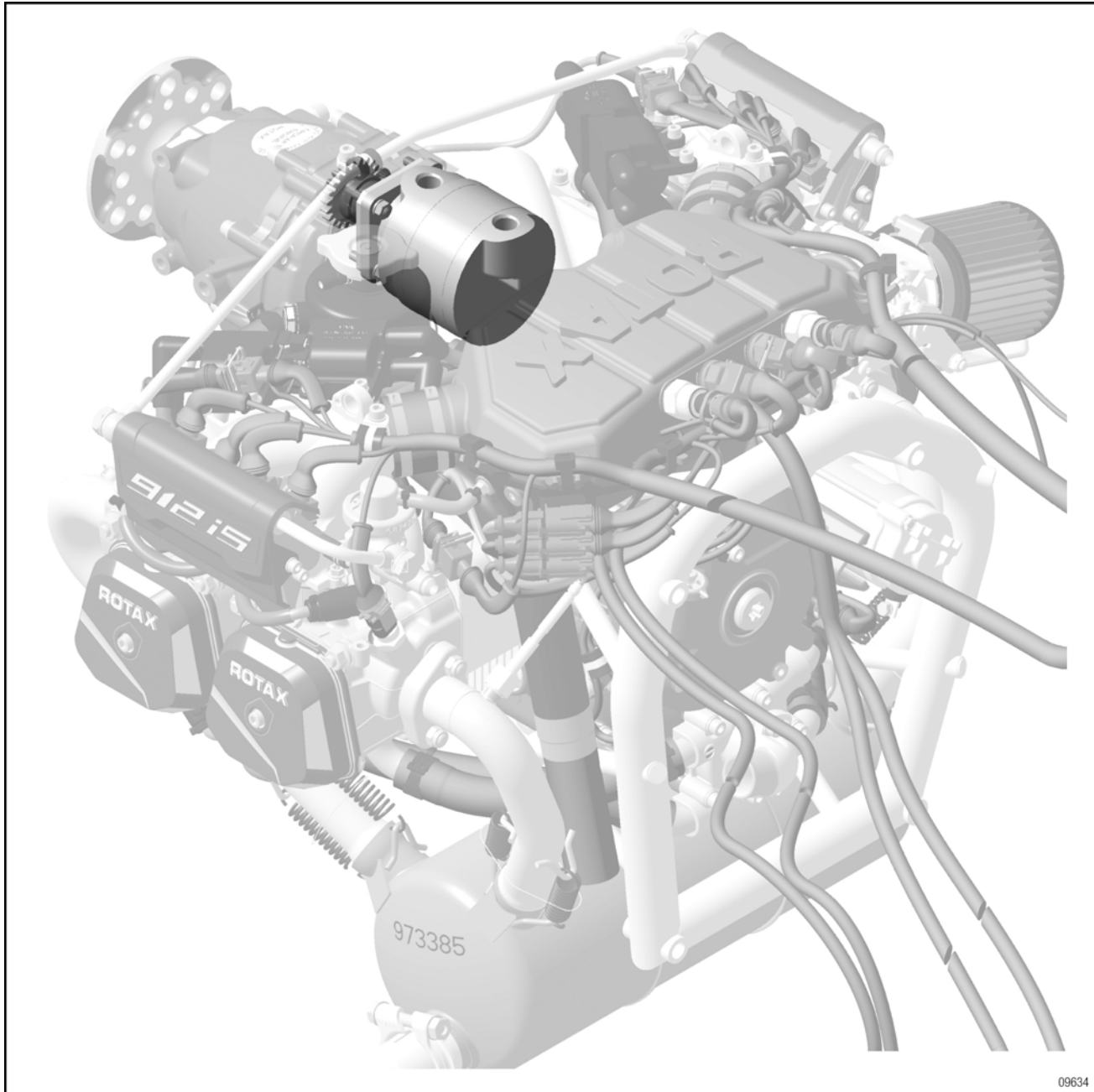
This section describes the system, the removal and the installation of the vacuum pump assembly of the ROTAX 912 i Series engine. The description is divided into sub-sections and explanations of system functions.

Subject	Section
1. Introduction	Page 1
2. Special tools	Page 3
3. Service products	Page 3
4. System description	Page 5
5. Safety information	Page 5
6. Removal	Page 5
A. Preparation	Page 5
B. Vacuum pump - removal	Page 5
7. Inspection	Page 7
A. Drive sleeve - inspection	Page 7
B. Vacuum pump - inspection	Page 7
8. Installation	Page 7
A. Needle sleeve - installation	Page 7
B. Ball bearing - installation	Page 7
C. Oil seal - installation	Page 8
D. Vacuum pump gear - installation	Page 8
E. Vacuum pump - installation	Page 8
9. Finishing work	Page 9

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Location on the engine



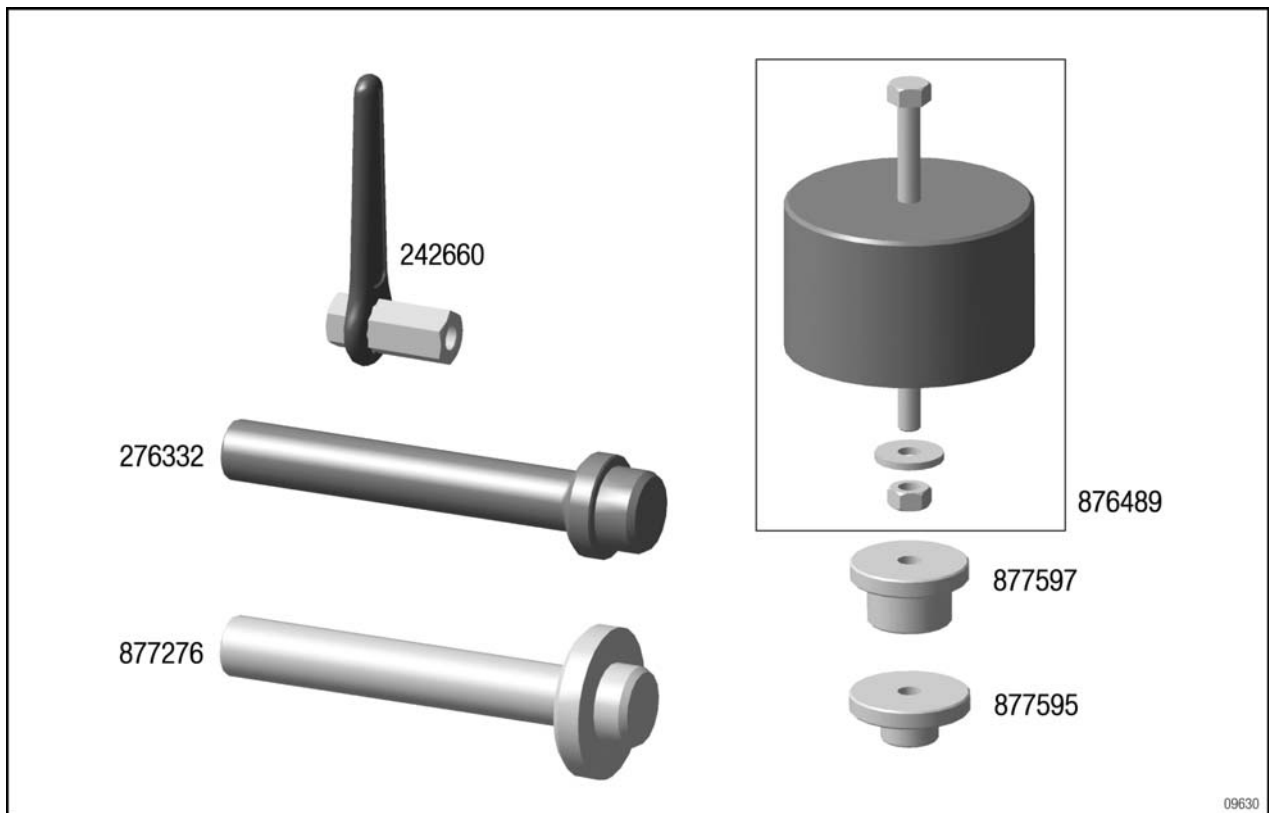
Chapter: 37-10-00
VACUUM PUMP

SPECIAL TOOLS

Description	Part number
Insertion jig assy.	276332
Retaining tool	242660
Puller assy.	876489
Press-in mushroom	877597
Press-in mushroom	877595
Insertion jig assy.	877276

SERVICE PRODUCTS

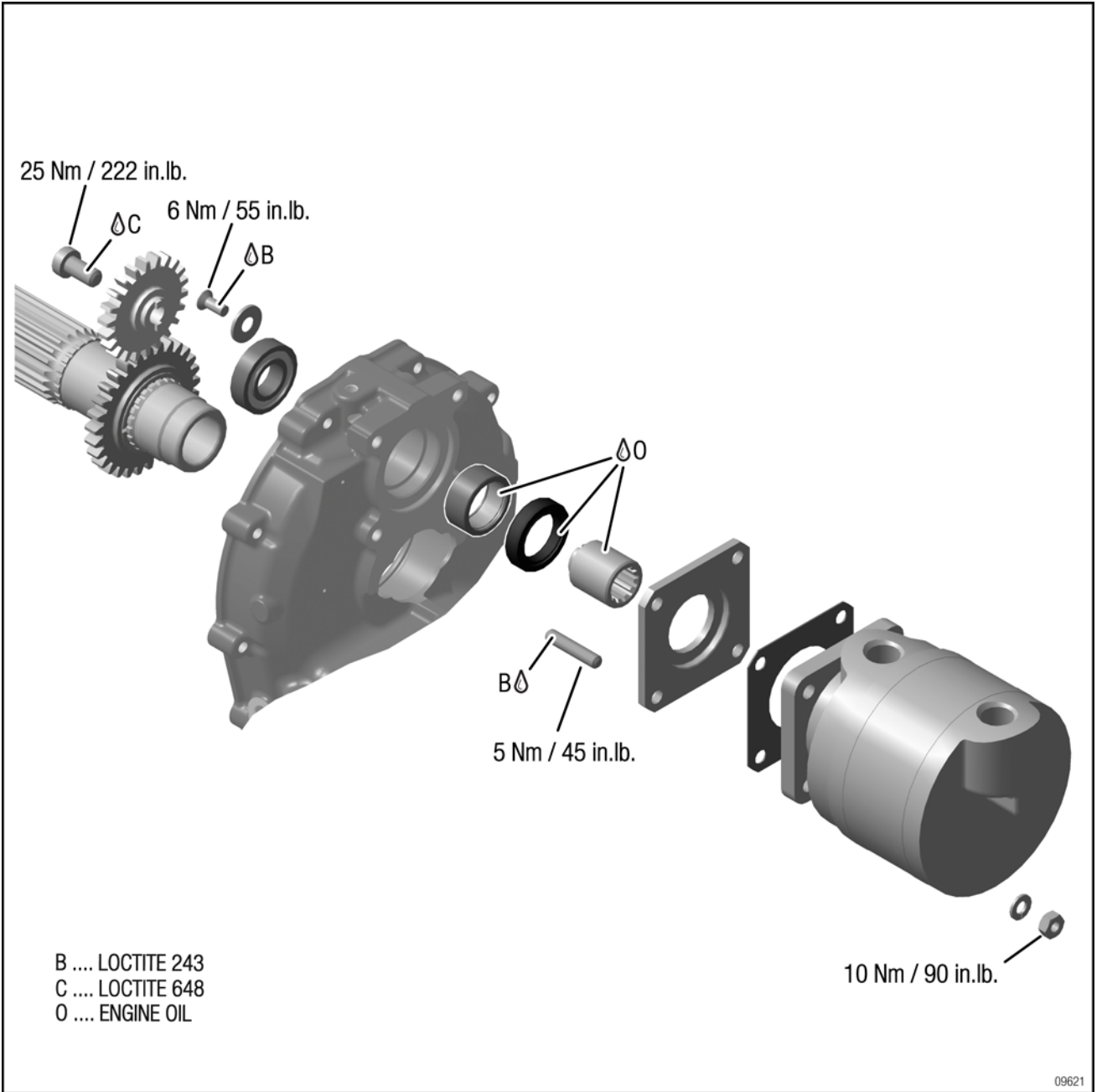
Description	Part number
Engine oil	n.a.
LOCTITE 243	897651
LOCTITE 648	899788



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Vacuum pump



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SYSTEM DESCRIPTION

The vacuum pump should be considered an accessory which is used to drive inertia instruments installed in the aircraft.


There is the option of installing a vacuum pump. To do this, the drive for the vacuum pump should be retrofitted in the propeller gearbox and crankcase.

NOTE: Simultaneous use of the vacuum pump and governor is not possible.

Gear ratio

The vacuum pump and the governor have the same drive and therefore an equal gear ratio.

SAFETY INSTRUCTIONS

 WARNING
<p>Follow the general safety instructions during all work on the engine and the assemblies around it.</p>

MAINTENANCE

As well as the maintenance and special checks, see the relevant Maintenance Manual Line for the respective 912 i Series engine type.

REMOVAL

VACUUM PUMP - REMOVAL

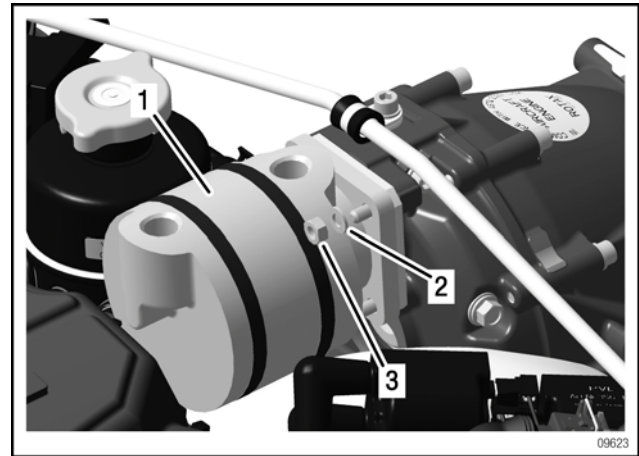
Preparation

- General visual inspection. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Carry out a functional test run to identify any damage. See "Documentation of aircraft manufacturer"
- The propeller gearbox must be removed so that the governor drive can be removed. See section 72-10-00.

Step	Procedure
1	Loosen the 4 M6 hex. nuts with lock washers.

<p>NOTICE</p>
<p>Follow the vacuum pump manufacturer's instructions for maintenance, inspection and repair.</p>

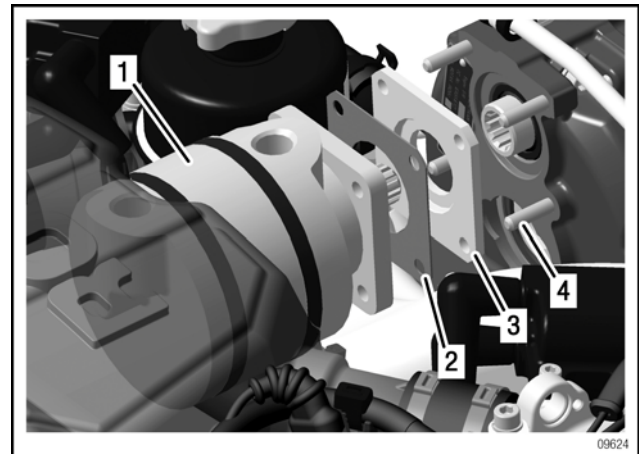
Fig. 1



- | | |
|----------------|--------------------|
| 1. Vacuum pump | 2. 6.4 lock washer |
| 3. M6 hex. nut | |

Step	Procedure
2	Remove the vacuum pump including the gasket and the attachment flange from the crankcase.

Fig. 2



- | | |
|----------------|----------------------|
| 1. Vacuum pump | 3. Attachment flange |
| 2. Gasket | 4. M6 stud |

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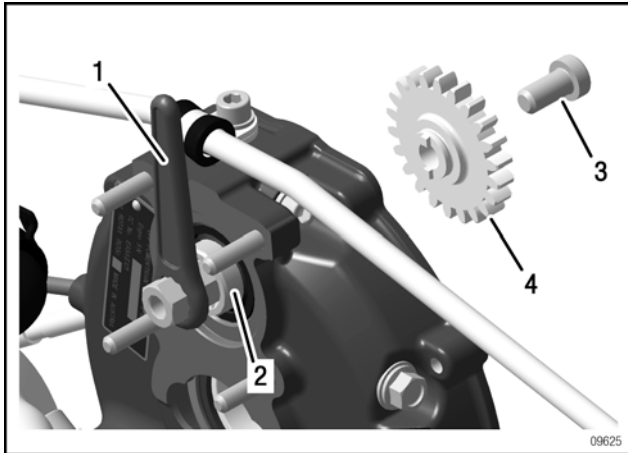
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Step	Procedure
3	Fix the drive sleeve with retaining tool part no. 242660.
4	Loosen the M8x16 Allen screw and remove the vacuum pump gear with the drive sleeve.

NOTICE

The M8 fastening screw for the vacuum pump gear is **16 mm (0.63 in.)** long and has a low screw head in the governor drive. However, for the vacuum pump drive it is **only 14 mm (0.55 in.)** long with a normal screw head.

Fig. 3

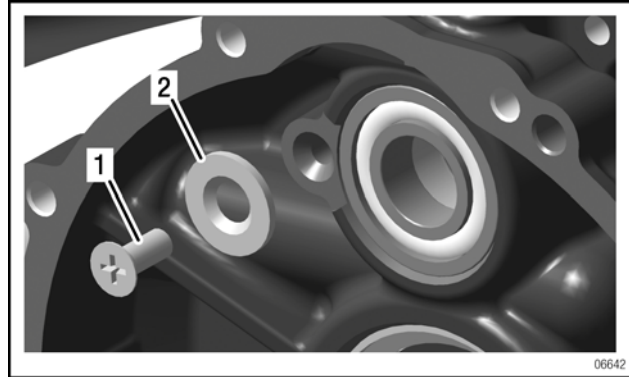


1. Retaining tool part no. 242660
 2. Drive sleeve
 3. M8x16 Allen screw
 4. Vacuum pump gear

Step	Procedure
5	Loosen the M5x12 countersunk screw with retaining washer for the ball bearing fastening.
6	Lift out the oil seal and press the needle sleeve along with the ball bearing towards the gearbox with a suitable insertion jig part no. 276332.

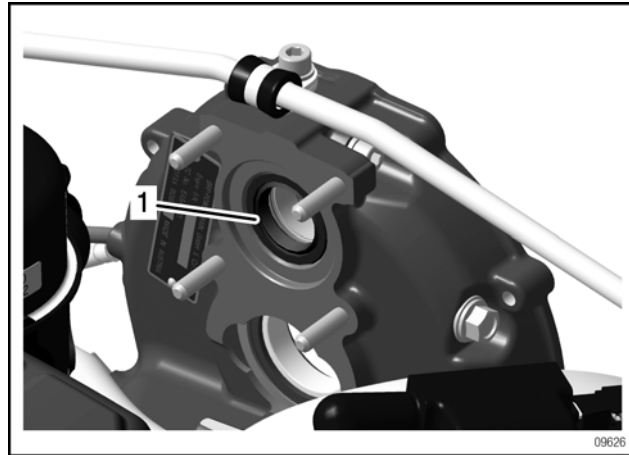
NOTE: The needle sleeve, oil seal and ball bearing are damaged by this and must be replaced.

Fig. 4



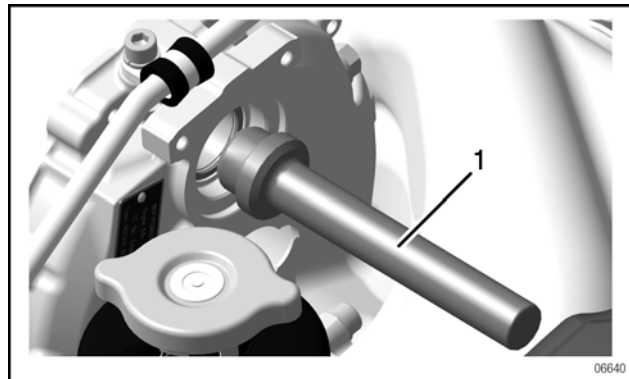
1. M5x12 countersunk screw 2. Retaining washer

Fig. 5



1. Oil seal

Fig. 6



1. Insertion jig assy. part no. 276332

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INSPECTION

DRIVE SLEEVE - INSPECTION

Step	Procedure
1	Check the gear-tooth system of the drive sleeve for damage.

VACUUM PUMP - INSPECTION

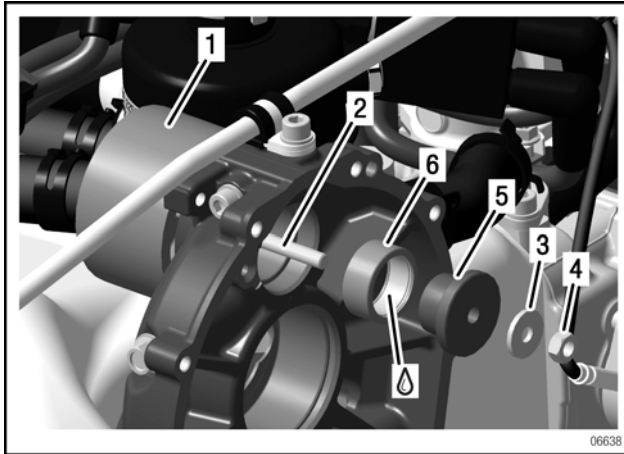
See "Documentation of aircraft manufacturer"

INSTALLATION

NEEDLE SLEEVE - INSTALLATION

Step	Procedure
1	Lubricate the new needle sleeve.
2	Apply the puller part no. 876489 on the vacuum pump side.
3	Place the press-in mushroom part no. 877597 on the needle sleeve and fix it with the hex. nut.

Fig. 7



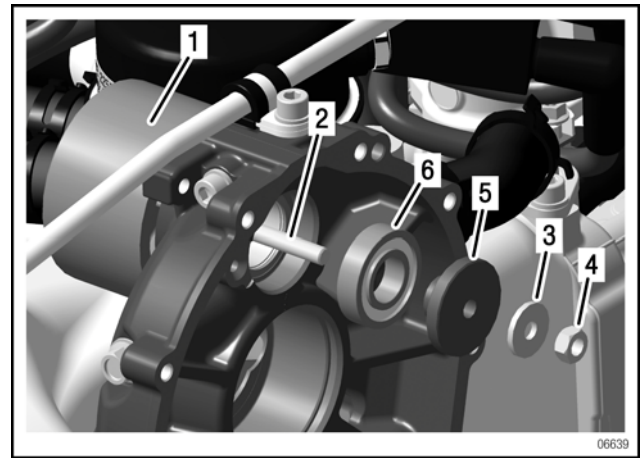
- 1. Puller part no. 876489
- 2. Hex. screw
- 3. Washer
- 4. Hex. nut
- 5. Press-in mushroom part no. 877597
- 6. Needle sleeve

Step	Procedure
4	The needle sleeve is pressed in as far as it will go by turning the hex. screw clockwise.

BALL BEARING - INSTALLATION

Step	Procedure
1	Apply the puller part no. 876489 on the vacuum pump side.
2	Insert the press-in mushroom part no. 877595 into the roller bearing and fix it with the hex. nut.
3	The ball bearing is pressed in as far as it will go by turning the hex. screw clockwise.

Fig. 8



- 1. Puller part no. 876489
- 2. Hex. screw
- 3. Washer
- 4. Hex. nut
- 5. Press-in mushroom part no. 877595
- 6. Ball bearing

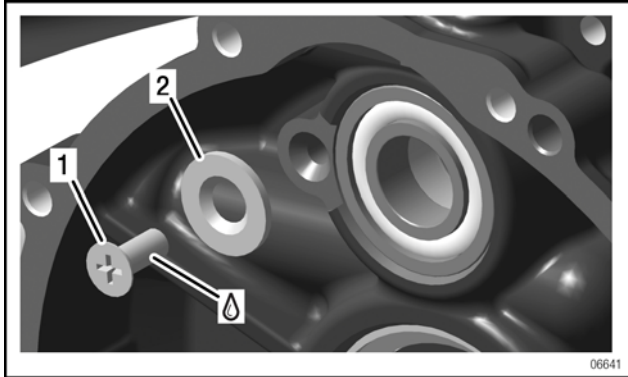
See Fig. 9.

Step	Procedure
3	Secure M5x12 countersunk screw including the retaining washer with LOCTITE 243 and tighten it. Tightening torque 6 Nm (53.09 in.lb.)

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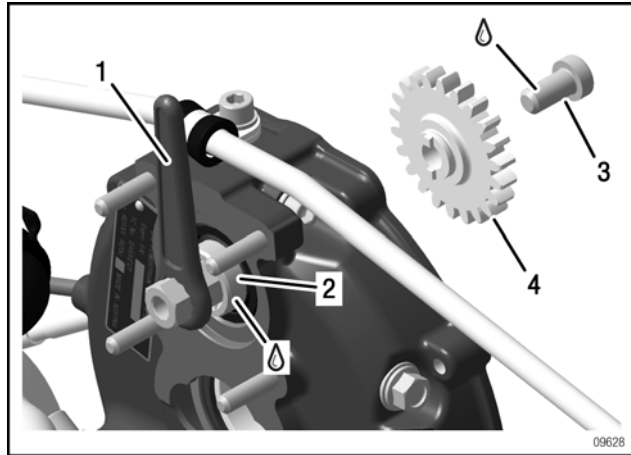
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Fig. 9



1. M5x12 countersunk screw 2. Retaining washer

Fig. 11

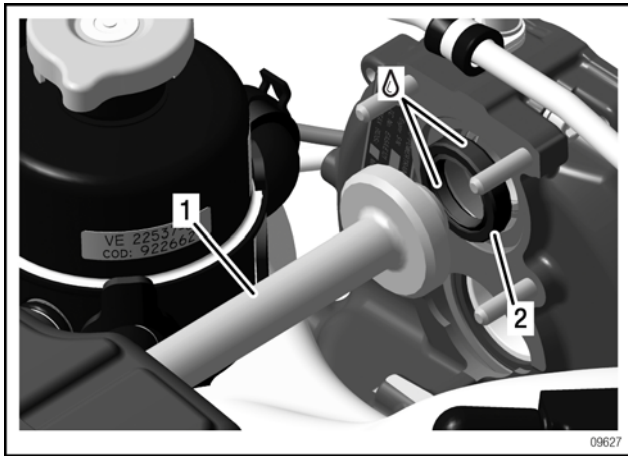


1. Retaining tool part no. 242660 2. Drive sleeve
3. M8x16 Allen screw 4. Vacuum pump gear

OIL SEAL - INSTALLATION

Step	Procedure
1	Press in a new oil seal with insertion jig part no. 877276 and lubricate with engine oil.

Fig. 10

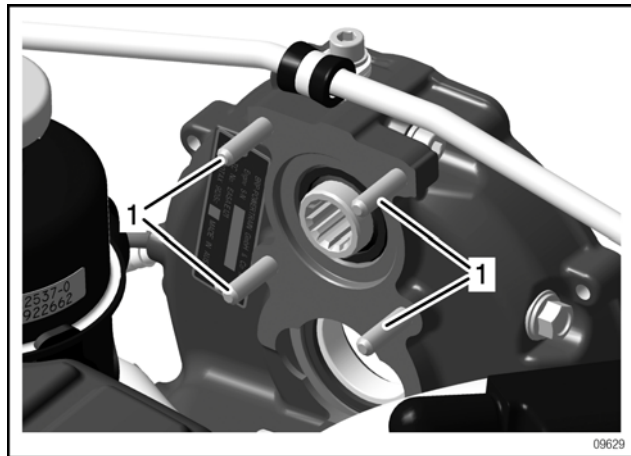


1. Insertion jig part no. 877276 2. Oil seal

VACUUM PUMP - INSTALLATION

Step	Procedure
1	Check that the studs are firmly in place. If necessary, apply LOCTITE 243 and tighten. Tightening torque 5 Nm (44.25 in.lb.).

Fig. 12



1. M6 studs

VACUUM PUMP GEAR - INSTALLATION

Step	Procedure
1	Place on the vacuum pump gear and fix the lubricated drive sleeve with the retaining tool part no. 242660.
2	Secure M8x16 Allen screw with LOCTITE 648 and tighten it. Tightening torque 25 Nm (18.44 ft.lb.)

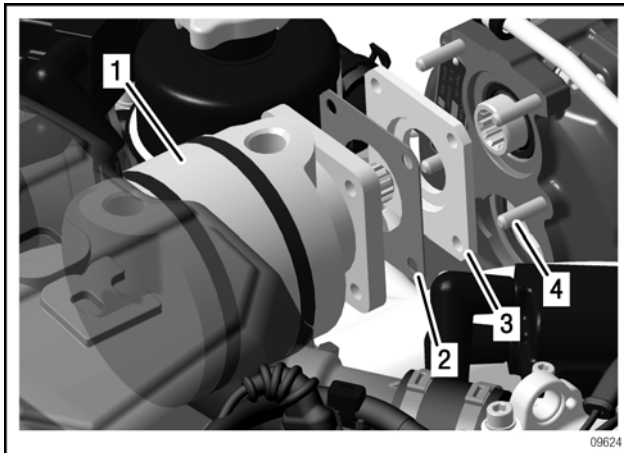
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Step	Procedure
2	Position the vacuum pump including the gasket and the attachment flange on the crankcase.
3	Screw 4 M6 hex. nuts including lock washers onto M6 studs and tighten them. Tightening torque 25 Nm (18.44 ft.lb.)

FINISHING WORK

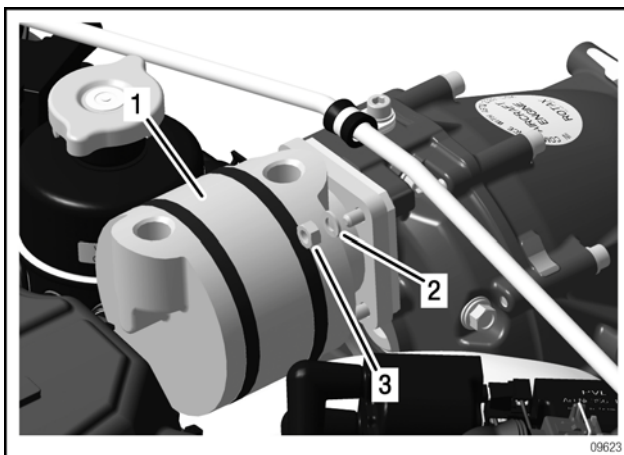
- Install the propeller gearbox, see section 72-10-00.

Fig. 13



- | | |
|----------------|----------------------|
| 1. Vacuum pump | 3. Attachment flange |
| 2. Gasket | 4. M6 stud |

Fig. 14



- | | |
|----------------|--------------------|
| 1. Vacuum pump | 2. 6.4 lock washer |
| 3. M6 hex. nut | |

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Chapter: 61-00-00
PROPELLER

Introduction

This section describes the maintenance of the ROTAX 912 i series propeller. The description is divided into sub-regions and explanations of system functions.

Subject	Section
1. Introduction	Kapitel 1
2. Governor	Kapitel 61-20-00

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Chapter: 61-20-00
GOVERNOR

Introduction

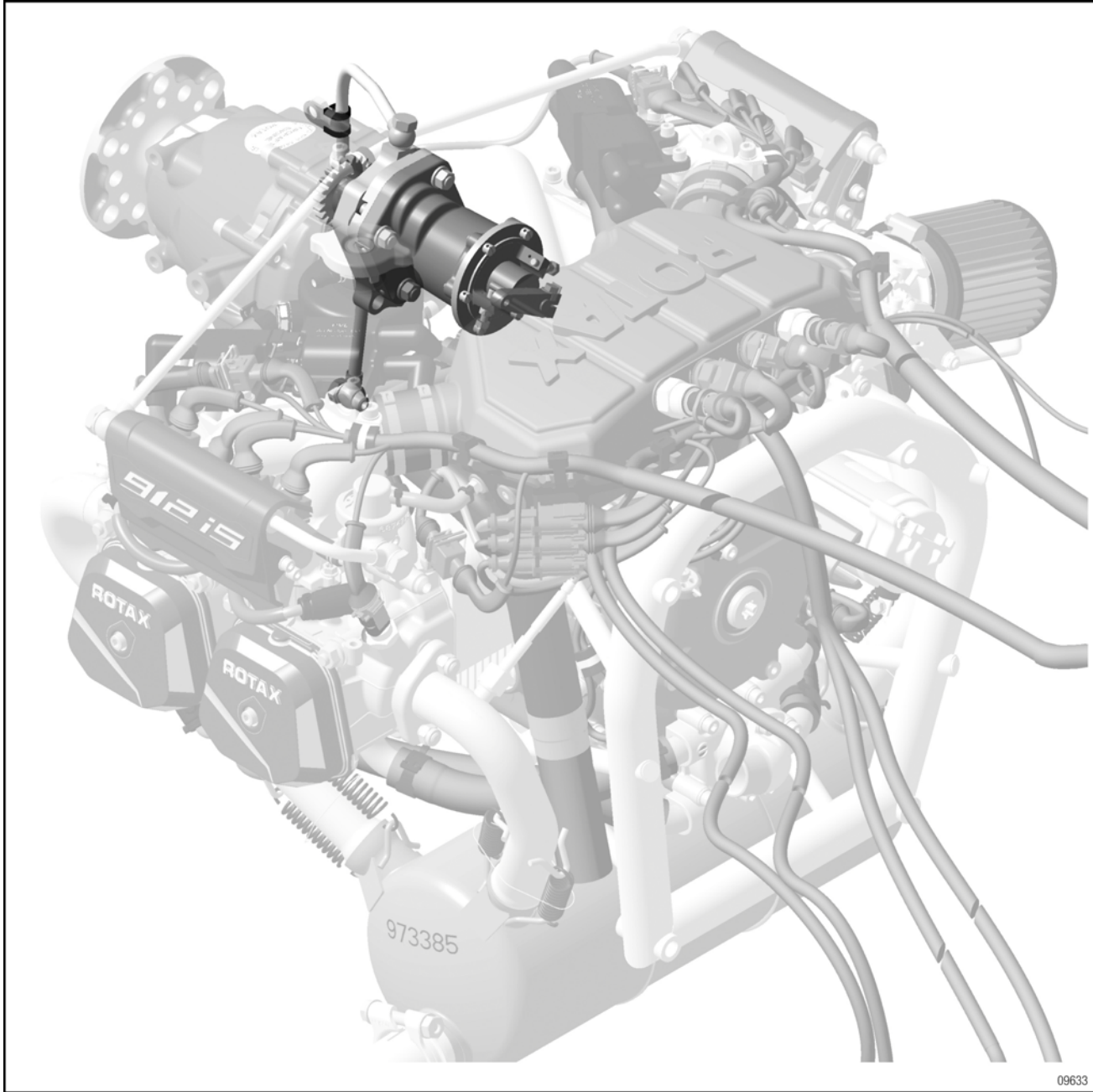
This section describes the system, the removal and the installation of the governor assembly of the ROTAX 912 i Series engine. The description is divided into sub-regions and explanations of system functions.

Subject	Section
1. Introduction	Page 1
2. Special tools	Page 3
3. Service products	Page 3
4. System description	Page 5
5. Safety information	Page 5
6. Removal	Page 5
A. Preparation	Page 5
B. Governor - removal	Page 5
C. Governor flange - removal	Page 6
D. Governor drive - removal	Page 6
E. Roller bearing Version 3 - removal	Page 8
7. Inspection	Page 9
A. Governor drive - inspection	Page 9
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A. Governor drive - installation	Page 11
B. Needle sleeve - installation	Page 11
C. Ball bearing - installation	Page 11
D. Roller bearing - installation	Page 12
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Location on the engine



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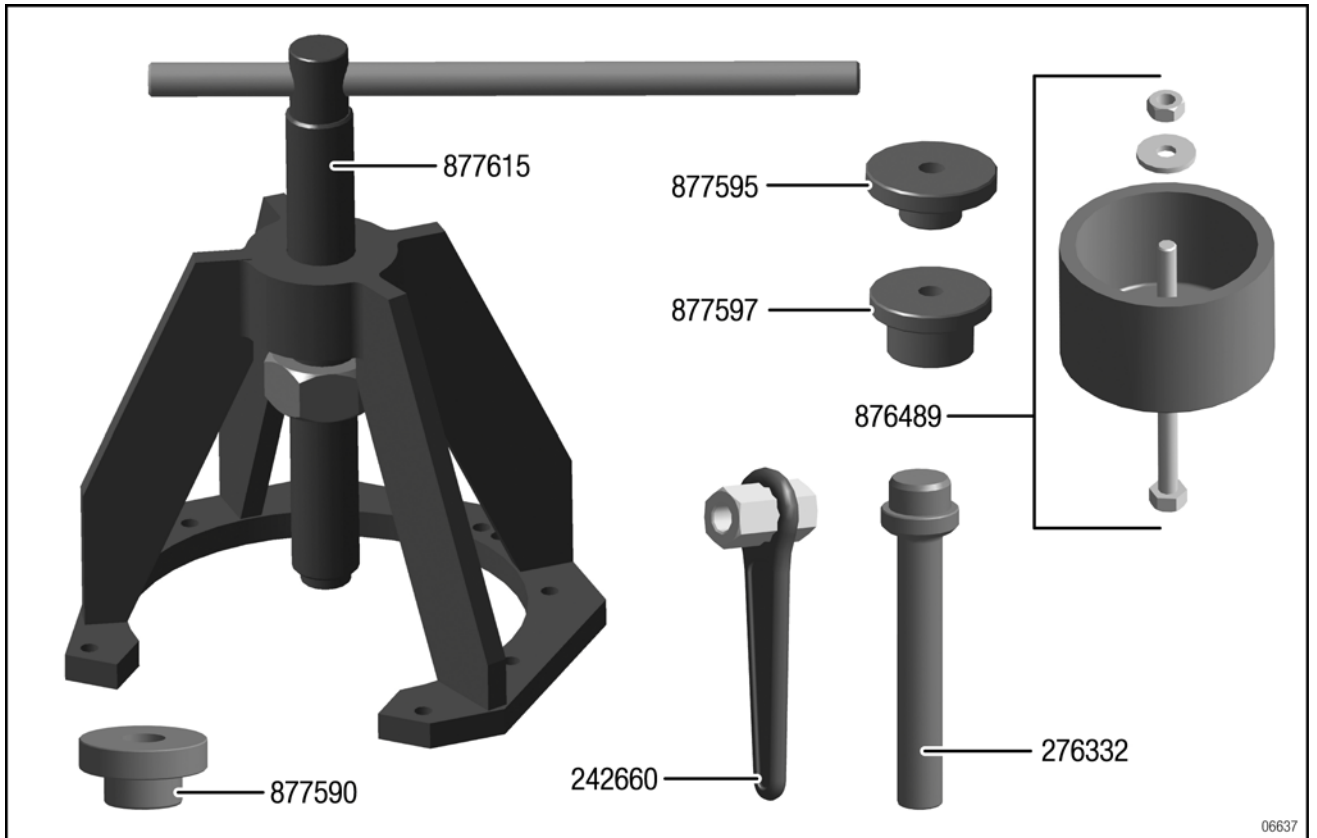
Chapter: 61-20-00
GOVERNOR

SPECIAL TOOLS

Description	Part number
Puller	876489
Extractor	877615
Press-in mushroom	877590
Press-in mushroom	877595
Press-in mushroom	877597
Insertion jig assy.	276332
Retaining device	242660

SERVICE PRODUCTS

Description	Part number
LOCTITE 243	897651
LOCTITE 648	899788

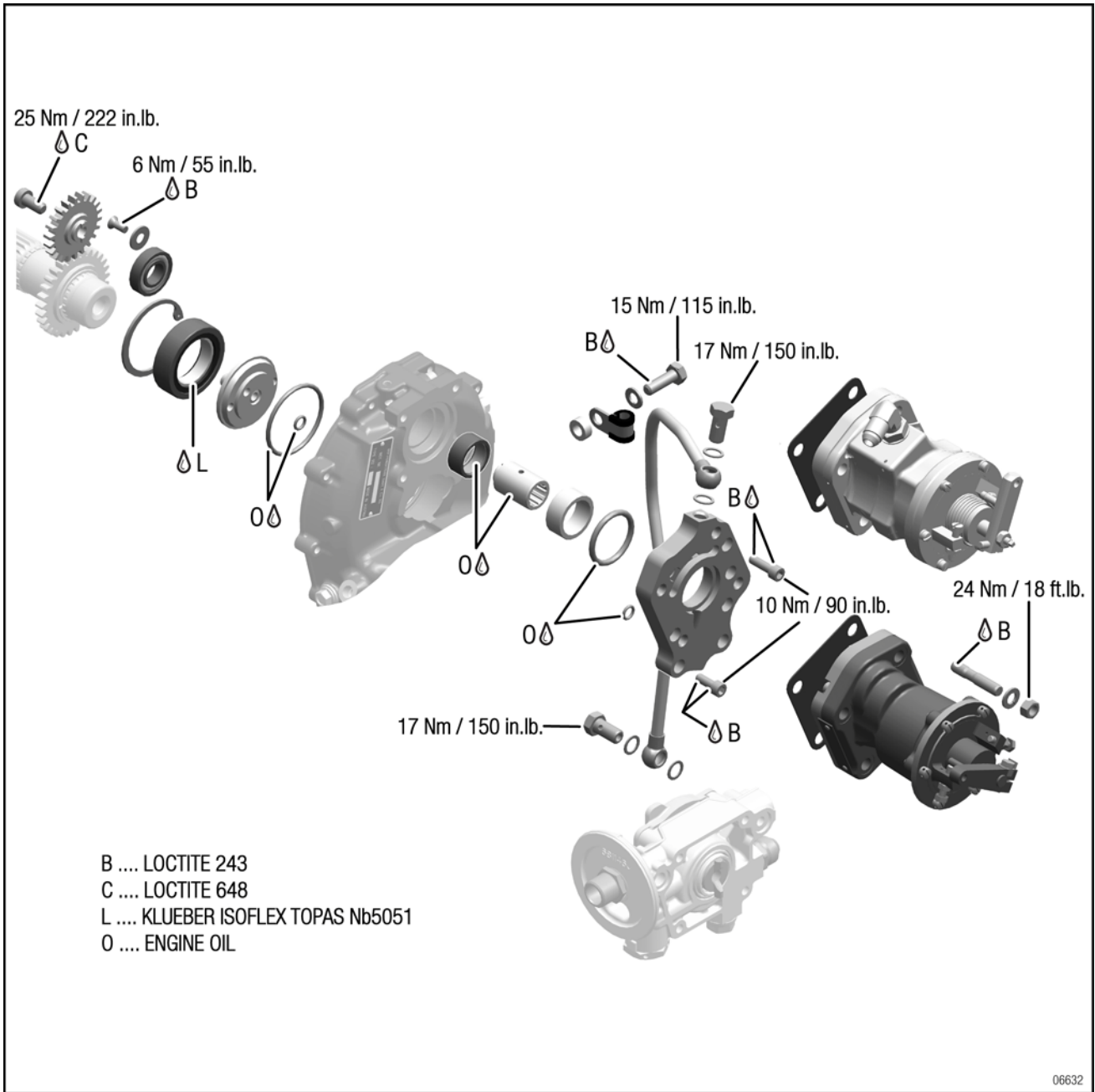


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Hydraulic governor



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SYSTEM DESCRIPTION

For operation with a hydraulic constant-speed propeller on version 3 of the 912 i Series engine, a hydraulic governor can be attached to control the propeller. Version 2 can be retrofitted for this purpose, i.e. the drive for the governor in the propeller gearbox and crankcase, its connection cable and the oil feed line to the propeller shaft should be retrofitted.

- For version 912 i -2, the hollow propeller shaft should also be replaced.

Gear ratio (i)	912 i	
Crankshaft: Propeller shaft	51: 21	2.429
Propeller shaft: Governor	22: 29	0.759
Total	1.842	

SAFETY INFORMATION

⚠ WARNING

Follow the general safety instructions during all work on the engine and the assemblies around it.

MAINTENANCE

As well as the maintenance and special checks, see the relevant Maintenance Manual Line for the respective 912 i Series engine type.

REMOVAL

GOVERNOR - REMOVAL

Preparation

- General visual inspection. See relevant Maintenance Manual Line for the 912 i Series engine type.

- Carry out engine test run to check proper functioning of the governor. See section 71-00-00.!

NOTICE

Follow the governor manufacturer's instructions for maintenance, inspection and repair.

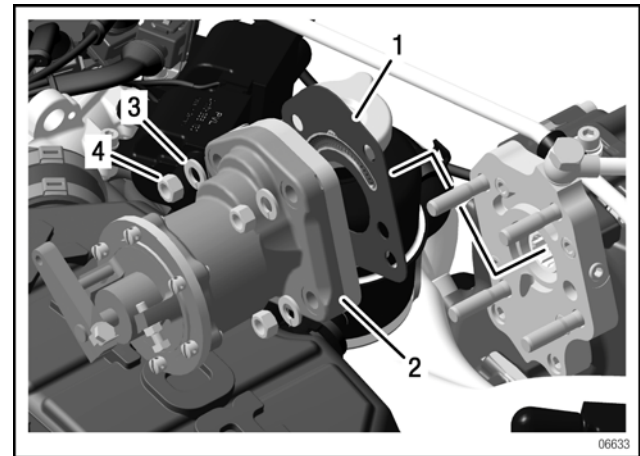
NOTICE

If these checks are omitted, it may be necessary to dismantle the governor again to rectify any faults after it has been repaired.

Step	Procedure
1	Loosen the Allen screws on the governor and remove the governor along with the gasket.

NOTE: Various screws and nuts are required, depending on the manufacturer of the governor. See the current edition of SB-912-052 "Installation/use of governors".

Fig. 1



- | | |
|-------------------|----------------|
| 1. Gasket | 2. Governor |
| 3. A8 lock washer | 4. M8 hex. nut |

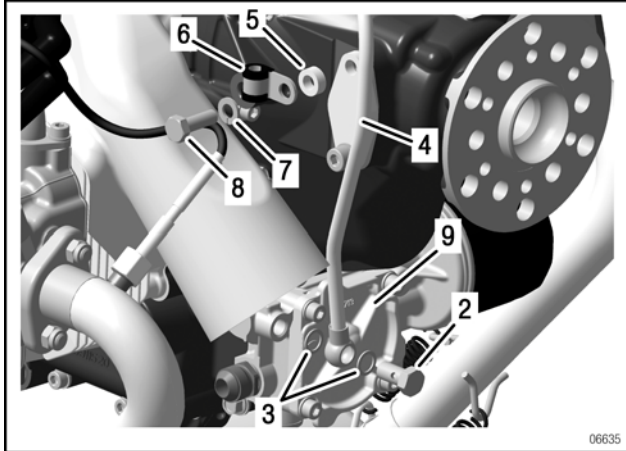
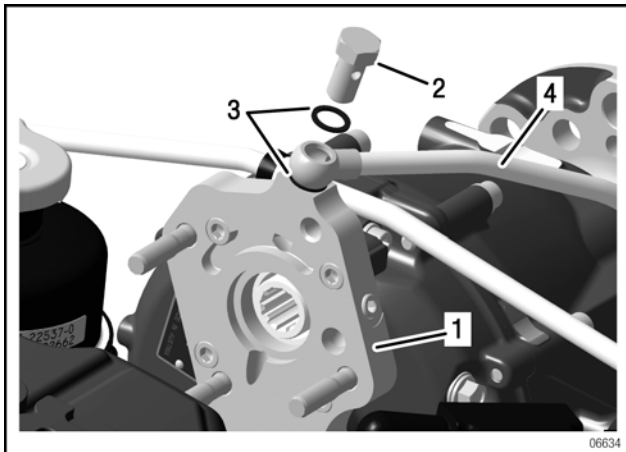
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GOVERNOR FLANGE - REMOVAL

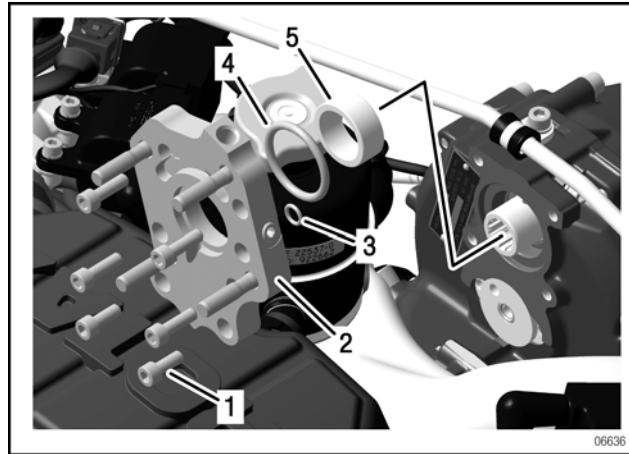
Step	Procedure
1	Loosen M10x1x19 banjo bolts with gasket rings on both sides of the governor flange and oil pump housing and remove the oil line.
2	Loosen 4 M6x20 Allen screws and 2 M6x16 Allen screws for the flange fastening of the oil feed line.
3	Remove the governor flange with the O-ring and distance sleeve behind it.

Fig. 2



- | | |
|-----------------------------|-------------------------------------|
| 1. Governor flange | 2. M10x1x19 banjo bolt |
| 3. A10x14 gasket rings | 4. Governor pressure oil line assy. |
| 5. 8.4/15/6 distance sleeve | 6. 8/M8 cable clamp |
| 7. A8 lock washer | 8. M8x25 hex. screw |
| 9. Oil pump housing | |

Fig. 3



- | | |
|------------------------------|--------------------|
| 1. M6x20, M6x16 Allen screws | 2. Governor flange |
| 3. O-ring | 4. O-ring |
| 5. Distance sleeve | |

GOVERNOR DRIVE - REMOVAL

Preparation

- The propeller gearbox must be removed so that the governor drive can be removed.
- Remove the propeller gearbox, see section 72-10-00 Gearbox.

See Fig. 4

Step	Procedure
1	Fix the drive sleeve with retaining tool part no. 242660.
2	Loosen the M8x16 Allen screw and remove the vacuum pump gear with the drive sleeve.

NOTICE

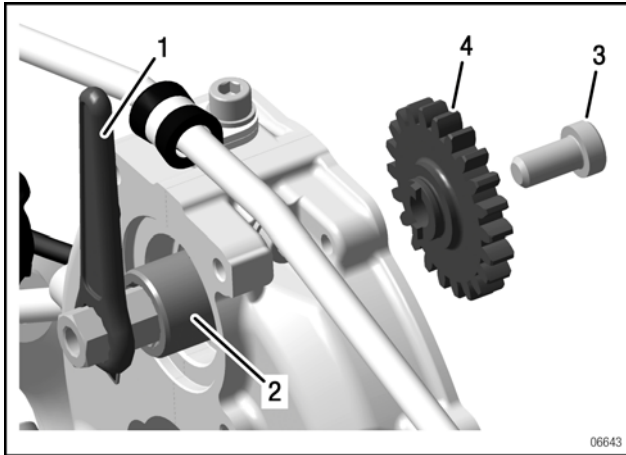
The M8 fastening screw for the vacuum pump gear is **16 mm (0.63 in.)** long and has a low screw head in the governor drive. However, for the vacuum pump drive it is **only 14 mm (0.55 in.)** long with a normal screw head.

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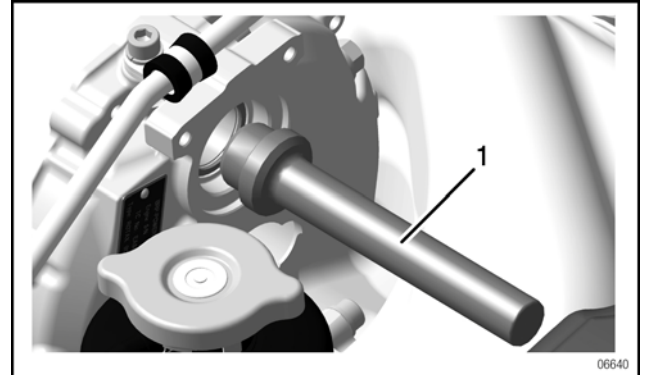
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Fig. 4



1. Retaining tool part no. 242660 2. Distance sleeve
 3. M8x16 Allen screw 4. Vacuum pump gear

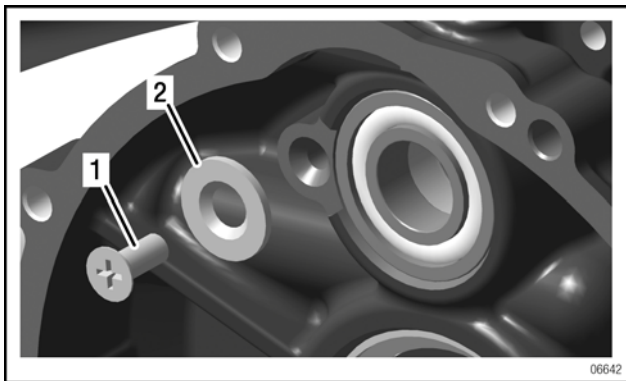
Fig. 6



1. Insertion jig part no. 276332

Step	Procedure
3	Loosen the M5x12 countersunk screw with retaining washer for the ball bearing fastening.
4	Press the needle sleeve along with the ball bearing out towards the gearbox with a suitable insertion jig part no. 276332.
NOTE: The needle sleeve and ball bearing are damaged by this and must be replaced.	

Fig. 5



1. M5x12 countersunk screw 2. Retaining washer

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**ROLLER BEARING VERSION 3 -
 REMOVAL**

Preparation

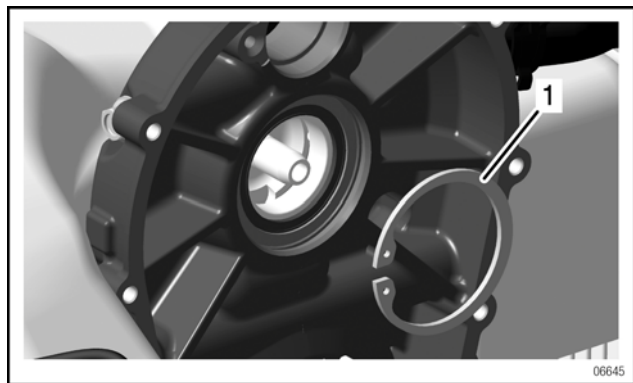
- The propeller gearbox must be removed so that the roller bearing can be removed. See section 72-10-00.
- Remove the governor flange.

NOTICE	
The pressing out process for version 3 with the hydraulic governor is different from that for versions 2 and 4. The roller bearing is pressed out together with the oil inlet flange.	

See Fig. 7 to Fig. 8.

Step	Procedure
1	Remove the retaining ring with the circlip pliers.
2	Put on puller part no. 876489 and push the hex. screw through the cap, roller bearing and oil inlet flange.

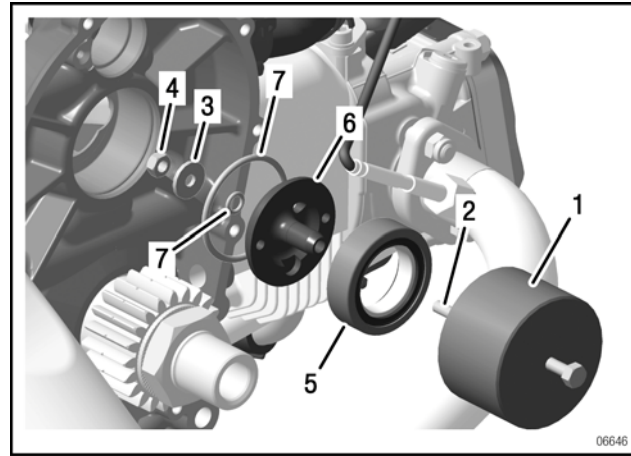
Fig. 7



1. Retaining ring

Step	Procedure
3	Install the washer and nut on the rear.
4	The roller bearing is pressed out together with the oil inlet flange by turning the hex. screw clockwise.
5	Remove the O-rings.

Fig. 8



- | | |
|---------------------------|---------------------|
| 1. Puller part no. 876489 | 2. Hex. screw |
| 3. Washer | 4. Hex. nut |
| 5. Roller bearing | 6. Oil inlet flange |
| 7. O-rings | |

INSPECTION

GOVERNOR DRIVE CHECK

Preparation

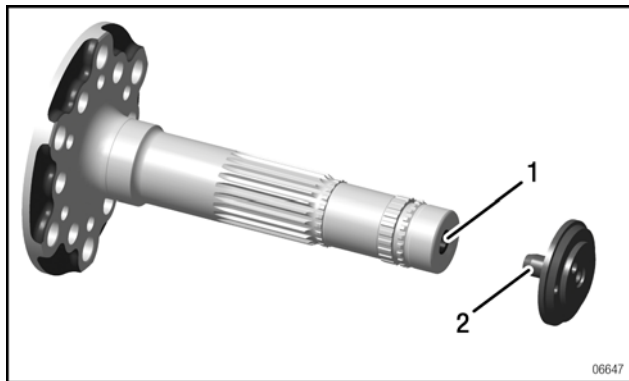
- General visual inspection. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Clean all parts carefully.

NOTICE
<p>The M8 fastening screw for the vacuum pump gear is 16 mm long and has a flat screw head for the governor drive, but only 14 mm long and with a normal screw head for the vacuum pump drive!</p>

NOTE: If repair work is necessary on the governor, it should be sent to the manufacturer.

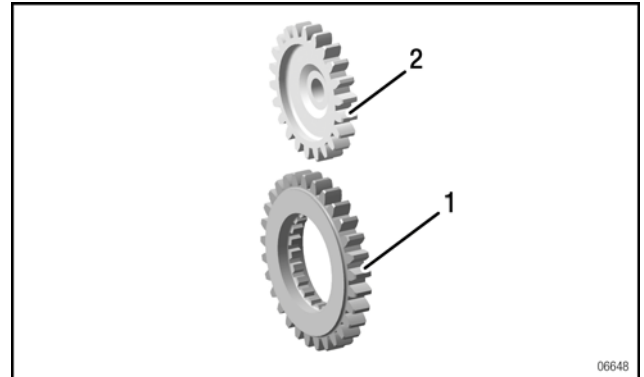
Step	Procedure
1	Measure the inner diameter of the propeller shaft. See wear limits.
2	Measure the journal of the oil inlet flange. See wear limits.
<p>NOTE: Wear usually appears as a flattened area on the journal.</p>	

Fig. 9



1. Propeller shaft inner diameter
2. Oil inlet flange

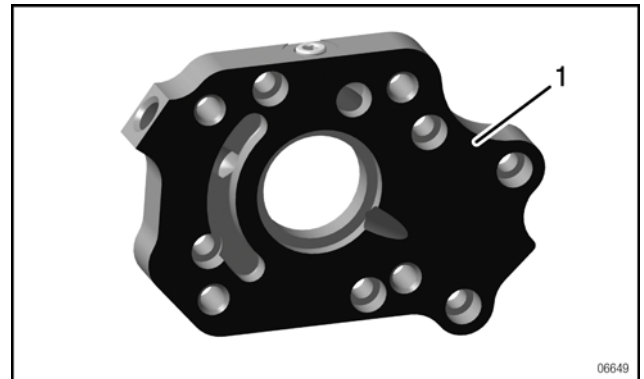
Fig. 10



1. Drive gear
2. Vacuum pump gear

Step	Procedure
4	Check that all the oil bores in the governor flange are clear.

Fig. 11



1. Governor flange

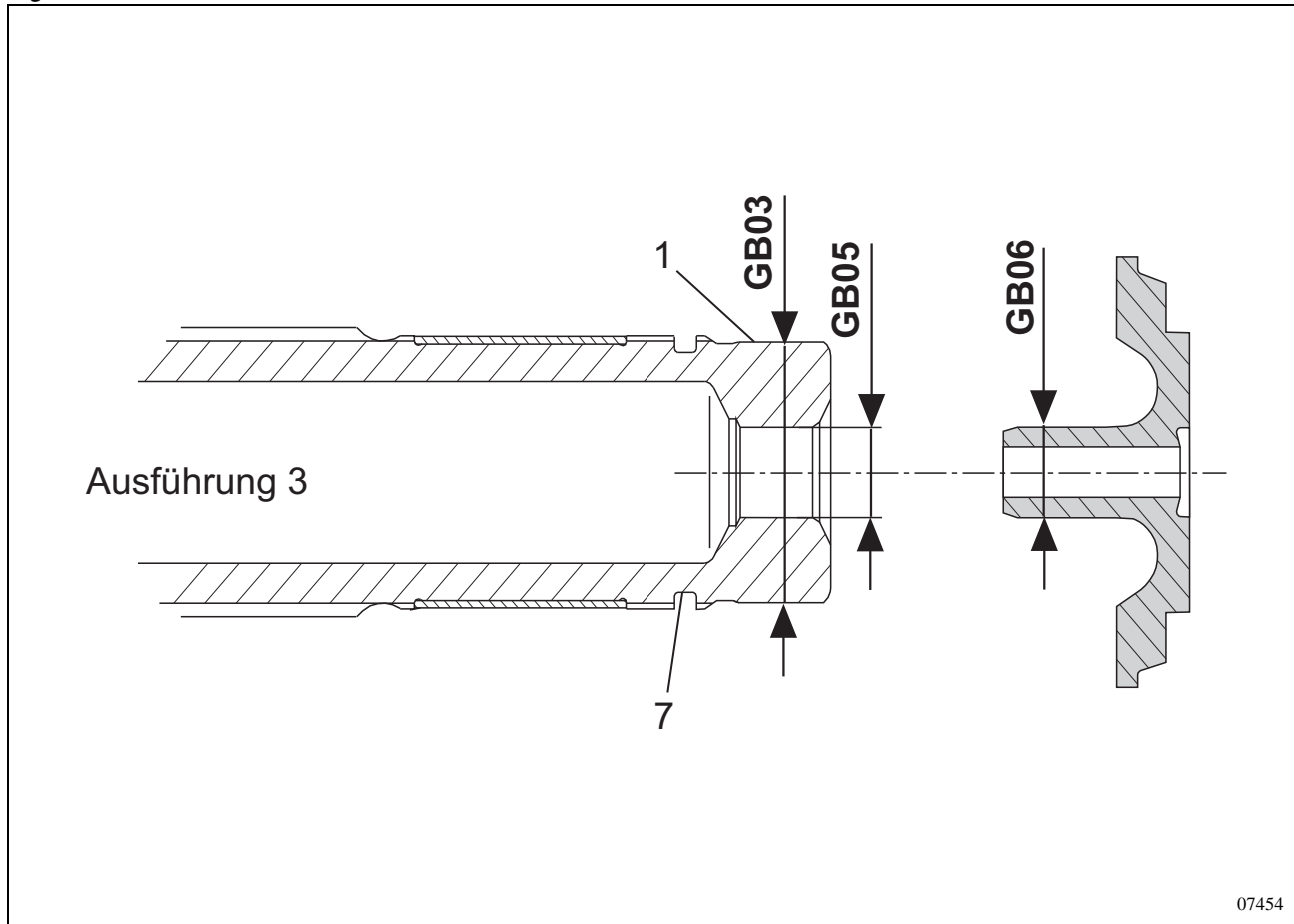
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Step	Procedure
3	Check the gear-tooth system of the drive gear and vacuum pump gear.

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WEAR LIMITS

Fig. 12



Propeller gearbox

Description	Code	Current measurement value		Tolerance limit	Tolerance limit	actual	Measu- re-ment
		min	max	100 %	50 %		
Propeller shaft dia. 35 mm	GB03	31.470 mm 1.2390 in.	31.481 mm 1.2394 in.	31.460 mm 1.2386 in.	31.465 mm 1.2388 in.	renewed	
Bore at back end of prop shaft (on version 3 only)	GB05	11.00 mm 0.4331 in.	11.02 mm 0.4339 in.			renewed	
Spigot dia. On oil inlet flange (on version 3 only)	GB06	10.935 mm 0.4305 in.	10.960 mm 0.4315 in.			renewed	

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INSTALLATION

GOVERNOR DRIVE - INSTALLATION

NOTICE

The flange (oil feed line) must not be installed tilted and the O-ring must not be caught.

NOTICE

Longer screws on the flange of the oil feed line could destroy it.

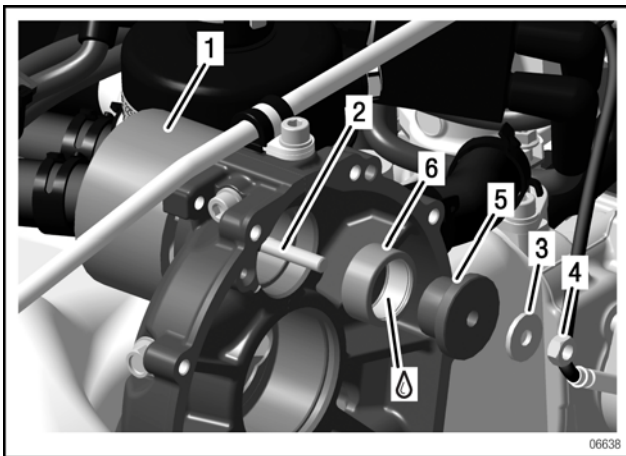
NOTICE

All gaskets, O-rings and oil seals must be replaced!

NEEDLE SLEEVE - INSTALLATION

Step	Procedure
1	Lubricate the new needle sleeve.
2	Apply the puller part no. 876489 on the vacuum pump side.
3	Place the press-in mushroom part no. 877597 on the needle sleeve and fix it with the hex. nut.

Fig. 13



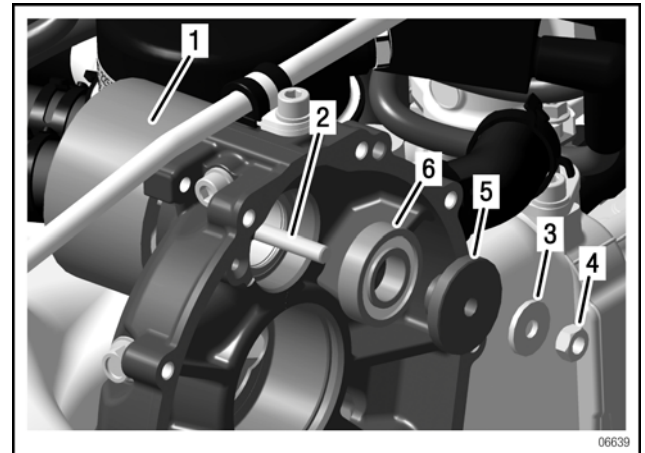
- 1. Puller part no. 876489
- 2. Hex. screw
- 3. Washer
- 4. Hex. nut
- 5. Press-in mushroom part no. 877597
- 6. Needle sleeve

Step	Procedure
4	The needle sleeve is pressed in as far as it will go by turning the hex. screw clockwise.

BALL BEARING - INSTALLATION

Step	Procedure
1	Apply the puller part no. 876489 on the vacuum pump side.
2	Insert the press-in mushroom part no. 877595 into the roller bearing and fix it with the hex. nut.
3	The ball bearing is pressed in as far as it will go by turning the hex. screw clockwise.

Fig. 14



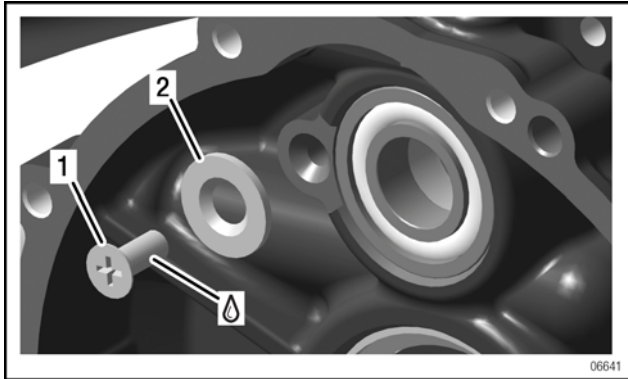
- 1. Puller part no. 876489
- 2. Hex. screw
- 3. Washer
- 4. Hex. nut
- 5. Press-in mushroom part no. 877595
- 6. Ball bearing

Step	Procedure
3	Secure M5x12 countersunk screw including the retaining washer with LOCTITE 243 and tighten it. Tightening torque 6 Nm (53.09 in.lb.)

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Fig. 15



1. M5x12 countersunk screw 2. Retaining washer

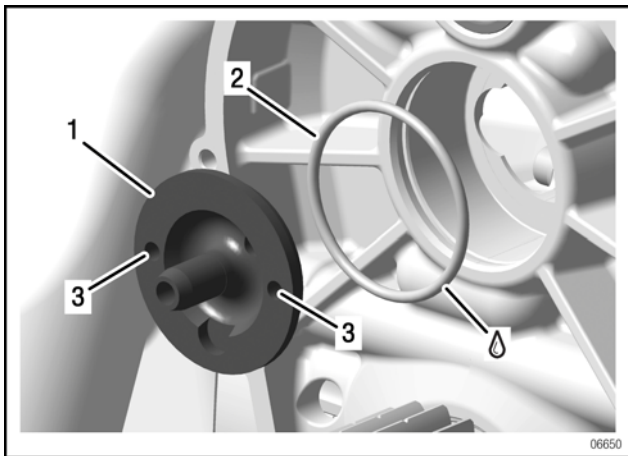
ROLLER BEARING - INSTALLATION

Step	Procedure
1	Lubricate a new O-ring and push it into the crankcase with the oil inlet flange.

NOTE: Ensure that the two M6 threads are horizontal and the recess is suitable for the scavenge oil.

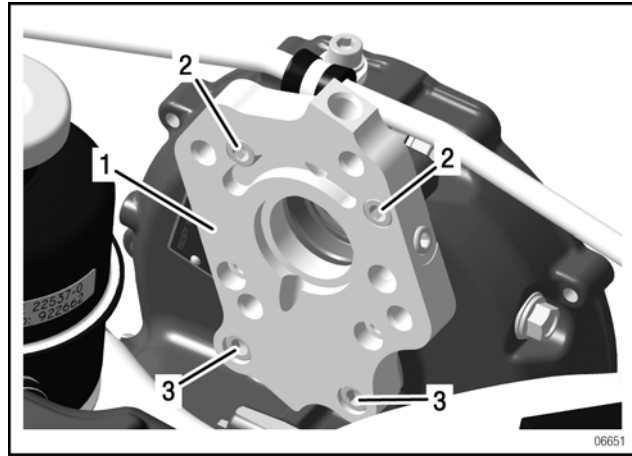
Step	Procedure
2	Install the governor flange with two M6x20 Allen screws and the oil inlet flange with two M6x16 Allen screws lightly at first for better positioning.

Fig. 16



1. Oil inlet flange 2. O-ring
 3. M6 threaded bores

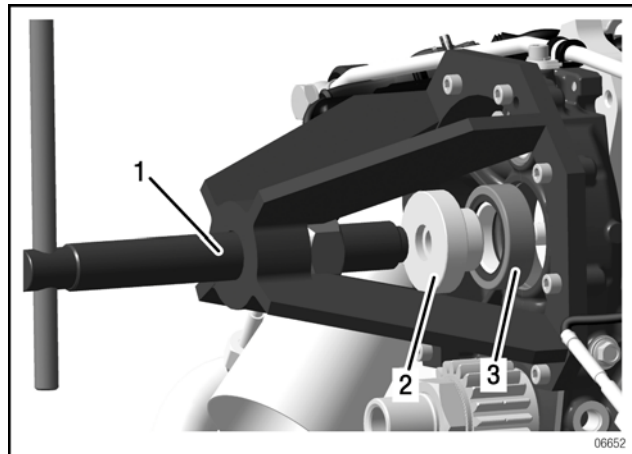
Fig. 17



1. Governor flange 2. M6x20 Allen screws
 3. M6x16 Allen screws

Step	Procedure
3	Install the extractor part no. 877615 onto the crankcase, place the press-in mushroom part no. 877590 in the roller bearing, put it on the centring and press it with the spindle into the crankcase as far as it will go.
NOTE:	Place the circlip in the groove with the sharp edge pointing outwards.

Fig. 18



1. Extractor part no. 877615 2. Press-in mushroom part no. 877590
 3. Roller bearing

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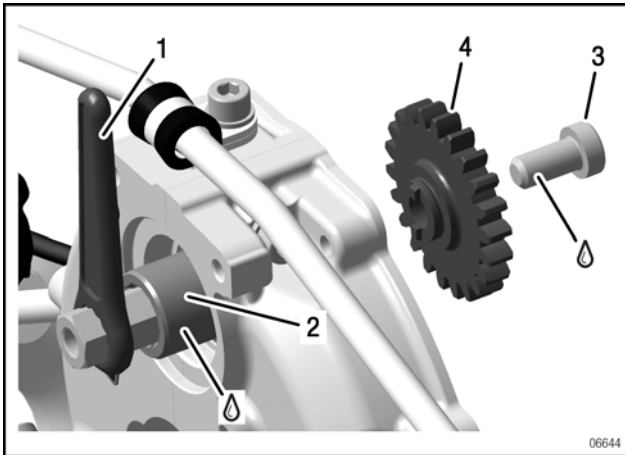
Fig. 19



1. 52x2 retaining ring

Step	Procedure
4	Place on the vacuum pump gear and fix the lubricated drive sleeve with the retaining tool part no. 242660.
5	Secure M8x16 Allen screw with LOCTITE 648 and tighten it. Tightening torque 25 Nm (221.2 in. lb.)

Fig. 20

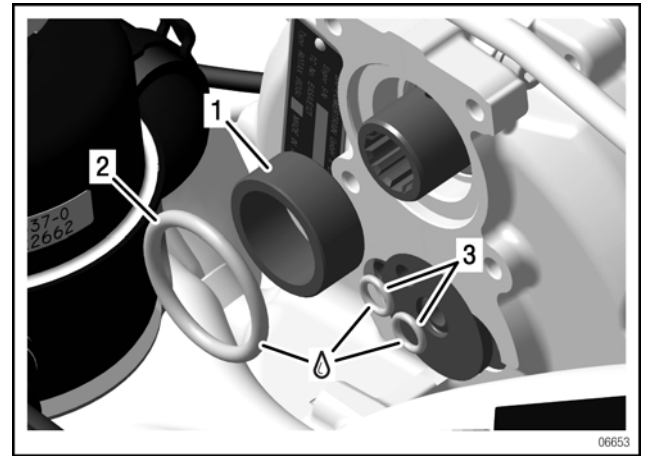


1. Retaining tool part no. 242660
2. Drive sleeve
3. M8x16 Allen screw
4. Vacuum pump gear

GOVERNOR FLANGE - INSTALLATION

Step	Procedure
1	Install the governor flange including the distance sleeve in the crankcase with a new 32x4 O-ring.
2	Place one 7x2 O-ring each in the flange (oil feed line) and governor flange and hold them in position with a little grease.

Fig. 21



1. Distance sleeve
2. 32x4 O-ring
3. 7x2 O-ring

Step	Procedure
3	Place on the governor flange, secure it using LOCTITE 243 with 4 M6x20 Allen screws on the crankcase and with 2 M6x16 Allen screws on the flange (oil feed line), and tighten the screws. Tightening torque 10 Nm (88.48 in. lb.).

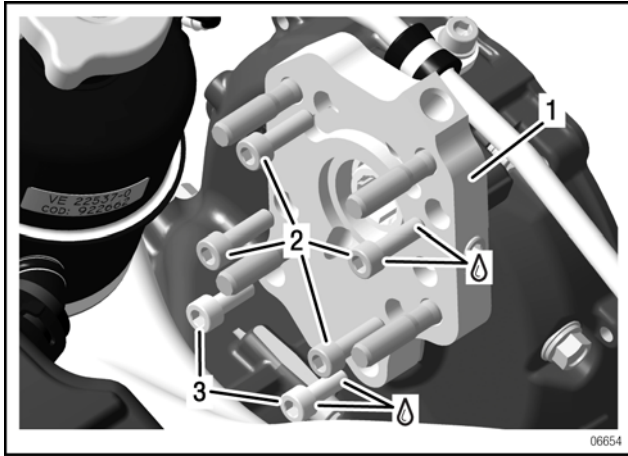
NOTICE

Longer screws destroy the oil feed line flange.

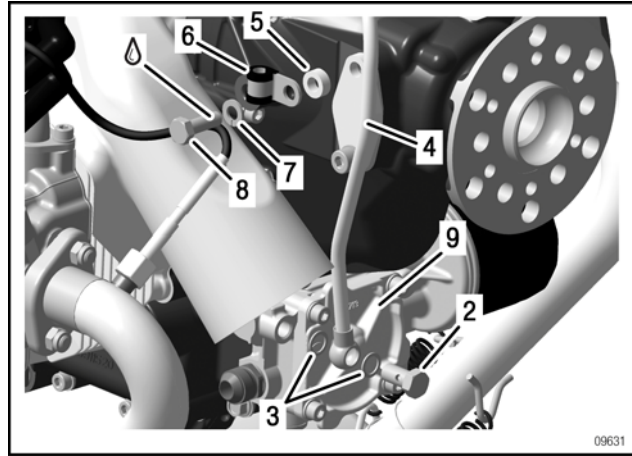
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Fig. 22



- 1. Governor flange
- 2. M6x20 Allen screw
- 3. M6x16 Allen screw



- 1. Governor flange
- 2. M10x1 banjo bolt
- 3. A10x14 gasket ring
- 4. Governor pressure oil line assy.
- 5. 8.4 distance sleeve
- 6. 8/M8 cable clamp
- 7. A8 lock washer
- 8. M8x25 hex. screw
- 9. Oil pump

Step	Procedure
4	Install the propeller gearbox. See also section 72-00-00 Gearbox.
5	Install the governor pressure oil line on the governor flange and on the oil pump housing. Tightening torque 17 Nm (150.42 in.lb.)
6	Fasten the governor pressure oil line with the cable clamp using the M8x25 hex. screw and LOCTITE 243. Tightening torque 15 Nm (132.72 in.lb.)

Step	Procedure
7	The plug screws usually remain closed. If necessary, a manometer can be connected to check the governor pressure.
8	Secure the M8x1 plug screws with LOCTITE 243.

Fig. 23

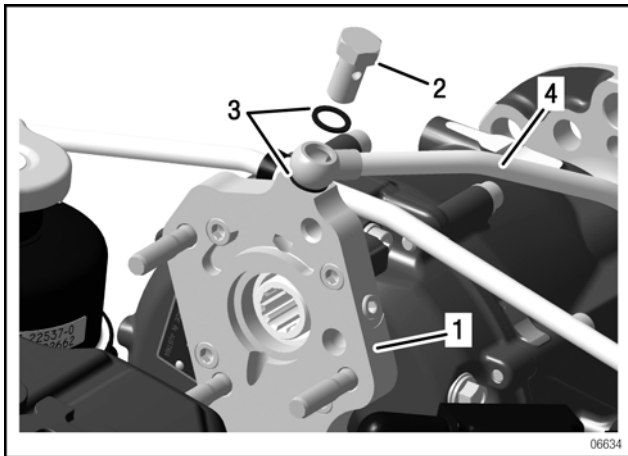
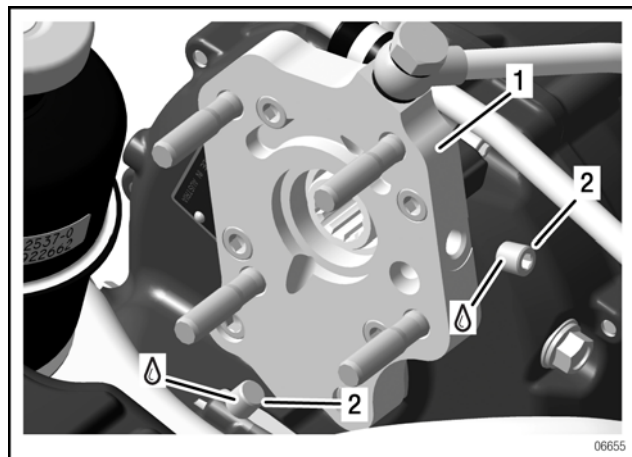


Fig. 24



- 1. Governor flange
- 2. M8x1 plug screw

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GOVERNOR INSTALLATION

Various screws and nuts are required, depending on the manufacturer of the governor. See the current edition of SB-912-052 "Installation/use of governors".

NOTE: Governors manufactured by McCAULEY and WOODWARD **cannot** be installed in the 912 i Series engine type due to their length.

NOTICE

The gear-tooth system of the governor must mesh when installed!

The governor is installed in the same way as it is removed. See [Chapter 61-20-00](#)

FINISHING WORK

- Install the propeller gearbox, see section 72-10-00.

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NOTES

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Chapter: 71-00-00
POWER PLANT

Introduction

This section describes installation and removal during maintenance or overhauling of the ROTAX 912 i Series engine.

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B. Engine preservation	Page 8
C. Return to service	Page 9
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C. Technical data	Page 10
D. Serial and part no.	Page 11
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B. Disconnecting the lines to the aircraft	Page 15
C. Removal of the power plant from the aircraft	Page 18
7. Installation	Page 20
A. Preparation	Page 20
B. Installation of the power plant in the aircraft	Page 20
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11. Finishing work	Page 24

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MAINTENANCE MANUAL

NOTES

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Chapter: 71-00-00
POWER PLANT

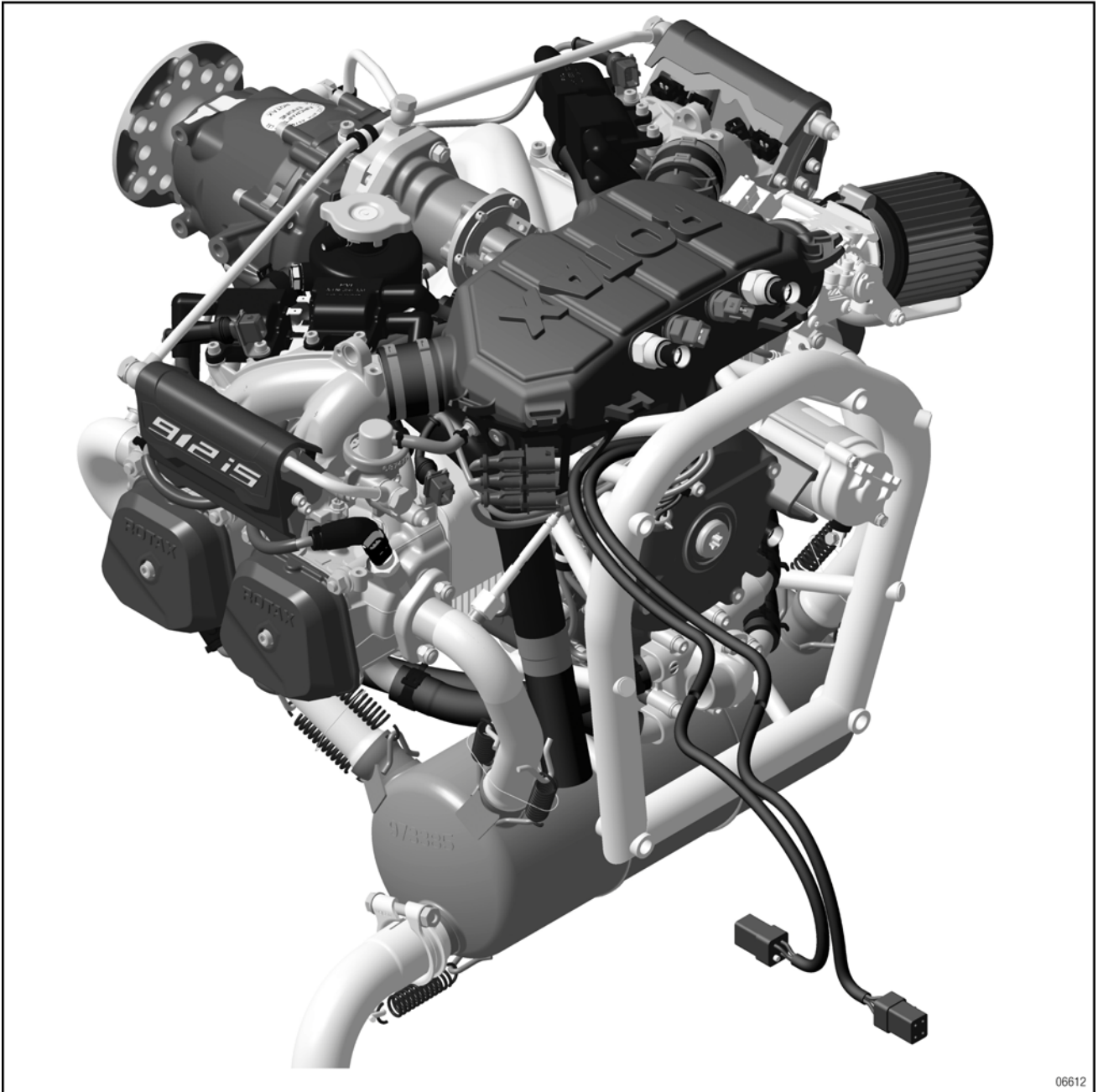
SPECIAL TOOLS

Description	Part no.
Engine lifting kit assy.	876040

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Power plant



06612

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MAINTENANCE MANUAL

INSTALLATION CHECKLIST

The following installation checklist must be copied and filled in during power plant/engine installation.

Installation checklist for power plant assy./engine 912 iSc	
Aircraft	
Type	
Serial number	
Registration number	
Manufacturer	
Engine	
Type	
Serial number	
FUSE BOX serial number	
ECU part no. (S/N)	
Manufacturer	BRP-Powertrain GmbH&Co KG, 4623 Gunskirchen, Austria
Specifications/version	
Miscellaneous data	
Installation date	
Mechanic (surname and forename)	

Installation-related point	OK	Remark
Control unit (ECU) checked for damage and corrosion. Insulated construction checked.		
Fuse unit (FUSE BOX) checked for damage and corrosion. Fuses checked.		
Fuse unit (FUSE BOX) connections checked for secure connection. See also section 71-00-00 Power plant.		
Protective coverings removed.		
Fuel filters/prefilters on the aircraft frame side cleaned.		
All fuel tanks and fuel lines cleaned. See "Documentation of aircraft manufacturer". See also section 12-20-00 Planned maintenance.		
Checking the engine for contamination and damage. See also section 05-00-00 Maintenance.		
Installation of the engine and its components. See also section 71-00-00 Power plant.		

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Installation-related point	OK	Remark
Control unit (ECU) connections checked for secure connection. Connector lock! See also section 71-00-00 Power plant.		
Laying of wiring harness checked.		
Grounding cable checked according to aircraft manufacturer's specifications. Allocation checked. See documentation of aircraft manufacturer.		
Fuel pump connection checked. See also section 71-00-00 Power plant.		
Fuel system checked for leaks. See section 12-20-00 Planned maintenance.		
Fuel filter checked for blockages. See section 12-20-00 Planned maintenance.		
Propeller installed according to the aircraft manufacturer's and propeller manufacturer's specifications. See "Documentation of aircraft manufacturer".		
Lubrication system filled. To do this, see section 12-10-00 Adding operating fluids.		
Engine test run/functional test. See also section 12-20-00 Planned maintenance.		

General notes/remarks:

(Please fill in using block capitals!)

(Please fill in using block capitals!)

Location: _____ **Date:** _____ **Signature:** _____

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GENERAL NOTE

DELIVERY OF THE ENGINE

Delivery and handling of the engine and assemblies

- When the engine is delivered, check that the original ROTAX packaging is not damaged.
- If the packaging is damaged, contact the authorised sales and service partner for ROTAX aircraft engines.
- If the packaging is not damaged, the engine can be unpacked according to the instructions below.

Unpacking the engine

To unpack the new, repaired or overhauled engine, proceed as follows:

Step	Procedure
1	Remove the wooden lid.
2	Remove the protective packaging.
3	Remove the protective foil packaging of the engine.

NOTICE

Use the engine lifting kit part no. 876040 to lift the engine out.

Checking the state of delivery

NOTICE

Danger of consequent damage to the engine and aircraft due to corrosion and damage. In the event of any kind of negative diagnosis of the engine after the packaging has been removed, immediately contact an authorised sales or service partner for ROTAX aircraft engines. A corroded or damaged engine must never be installed in an aircraft!

After the engine has been unpacked, carry out the following steps to check the state of delivery:

Step	Procedure
1	Check that the serial number and engine type description on the type plate match the data on the delivery note.
2	Check the engine for damage or corrosion. If everything is found "OK", the engine can be accepted.

Removal of protective coverings and preservation

Step	Procedure
1	Remove protective foil, waxed paper or something similar.
2	The protective coverings attached for transport or preservation must be removed.

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ENGINE PRESERVATION

Storage and preservation requirements for a new engine

The manufacturer BRP Powertrain guarantees satisfactory corrosion protection of the 912 i Series aircraft engines for at least 12 months from the BRP Powertrain delivery date. This warranty is subject to the following conditions:

- The engine must be stored in the original packaging delivered by BRP-Powertrain.
- The covers must not be removed.
- The engine must be kept in suitable storage (closed, clean and dry).

If the engine is stored for a period longer than 12 months, the following checks must be carried out every 3 months.

Step	Procedure
1	Remove 1 spark plug per cylinder and turn the crankshaft manually through 2 full revolutions.
2	Re-install the spark plug.
3	Visual inspection for rust (e.g. propeller shaft). If rust is found, the engine must immediately be sent to an authorised overhauling company for inspection.

⚠ WARNING

Non-compliance can result in serious injuries or death!
The engine must not be put into operation.

NOTE: The maximum possible storage period of the engine is limited to 24 months.

If this limit is exceeded, the engine must be sent to an authorised sales or service partner for ROTAX aircraft engines.

Expired engine preservation

Thanks to the special cylinder wall coating, the ROTAX aircraft engine does not generally need any special anti-corrosion measures.


NOTICE

Storage is possible for up to 12 months if the listed measures are observed!

- For oil change, see the current Maintenance Manual Line for the 912 i Series engine type.
- Seal all openings, exhaust pipe and air filters on the cold engine to prevent ingress of contamination and damp air.
- Spray steel parts on the outside with preservation oil.
- If the engine is out of service for longer periods, the whole preservation process must be repeated annually.

RETURN TO SERVICE

Return to service

 WARNING
Non-compliance can result in serious injuries or death! Work on the engine must be carried out by authorised personnel and certified. See the current Maintenance Manual Line for the 912 i Series engine type.

Step	Procedure
1	Remove all plugs.
2	Clean the spark plugs with solvent and a plastic brush.
3	If preservation has been carried out less than a year ago, it is not necessary to change the oil again.
4	If the engine has been out of service for more than a year, the 100-hour inspection must be carried out.

TREATING RUST AND SURFACE DAMAGE

During longer out-of-service periods, flash rust can form on various metal parts. In the event of considerable corrosion or severely rusted screws, nuts, washers, bearings, bushings etc. replacement is absolutely necessary.

- Propeller shaft - To prevent surface rust, the flange should be lightly greased, see section 72-00-00.
 - For the electric system, see section 74-00-00.
-

SYSTEM DESCRIPTION

DESCRIPTION OF DESIGN

A ROTAX 912 i Series engine consists basically of several main components and add-on assemblies, which are described in more detail in the Operators Manual (section 1).

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TYPE DESCRIPTION

e.g. ROTAX 912 i Sc 3

NOTE: The type description is composed as follows.

ROTAX 912 iSc 3

Type
(type)

Zulassung
(certification)

Ausführung
(configuration)

Description		Description
Type	912	4-cyl. horizontally opposed, normal aspirated engine.
Certification	iSc	Certified according to EASA CS-E (TC No. EASA.E121).
	iS	Non-certified aircraft engines.
Version	2	Propeller shaft with flange for fix pitch propeller.
	3	Propeller shaft with flange for variable pitch propeller and drive for constant speed propeller governor system.

NOTE: The exact type descriptions can be found in the current Operators Manual for your engine.

TECHNICAL DATA

NOTICE

Detailed technical data relevant for operation is listed in the Operators Manual and must be observed.

OPERATING LIMITS

See the current 912 i Series Operators Manual, "Operating instructions".

OPERATING FLUIDS/CAPACITIES

See the current 912 i Series Operators Manual, "Operating fluids".

WEIGHTS

See the current 912 i Series Operators Manual, "Technical data".

ENGINE/COMPONENTS, GENERAL

Design	4-cylinder normal aspirated engine
Bore	84 mm
Stroke	61.0 mm
Displacement	1352 cm ³
Cylinders	Light alloy cylinder with Nikasil plating
Pistons	Light alloy piston with 3 piston rings
Cylinder head	4 single cylinder heads
Compression	10.8:1
Intake valve	38 mm, valve seat plated
Exhaust valve	32 mm NIMONIC, valve seat stellite-plated
Valve clearance	Automatic valve clearance compensation by means of hydraulic valve tappet
Valve drive	OHV, hydraulic valve tappet, push-rods and rocker arms
Camshaft	Steel, heat- and surface-treated
Crankshaft	Mounted in 5 places on plain bearings, carburised
Cooling system	Liquid-cooled cylinder heads, ram air cooled cylinders
Lubrication	Oil pump: Dry sump forced lubrication with trochoid pump, drive from the camshaft, blow-by oil return
Oil pressure	Min.: 0.8 bar (under 3500 rpm) Normal: 3 to 5 bar (over 3500 rpm) Max.: 7 bar

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Firing order	1-4-2-3
Spark plugs	12 mm, DCPR8E
Electrode gap	See section 74-00-00
Integrated generator	Permanent magnet single-phase generator
Rectifier regulator	12 V 20 A DC
External generator (optional extra)	Full-wave rectifier with 12 V 40 A DC serial regulator
Fuel pumps	2 electric fuel pumps
Starter	Electric starter, 12 V/0.8 kW
Propeller gearbox	Integrated gearbox with mechanical vibration damping and overload clutch
Gear transmission	2.43

SERIAL AND PART NO.

The parts are labelled with serial and part numbers.

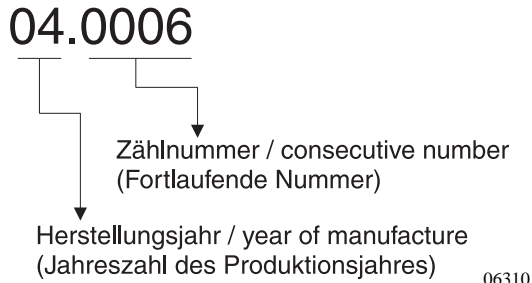
NOTE: If additional parts are purchased, part of the serial and part numbering of the aeronautical equipment manufacturer is included.

SERIAL NUMBER

The number system for the serial number consists of a two-digit number block and a four-digit number block with a point separating them.

The first number block of the serial number indicates the year of manufacture, the second is a consecutive number.

e.g. serial number



PART NO.

The part number consists of a simple six-digit number block.


This number block is a consecutive number. e.g. part no.

899742

Zählnummer / consecutive number (Fortlaufende Nummer)

06311

ENGINE COMPONENTS, ENGINE VIEWS, CYLINDER DESIGNATION AND DEFINITION OF MAIN AXES

- PTO** Power take off side
- MS** Magneto side
- A** Suspension point (for transport)
-  Center of gravity
- P** Zero reference point (starting point for all dimensions)

NOTE: Allow ± 1 mm on all stated dimensions as manufacturing tolerance.

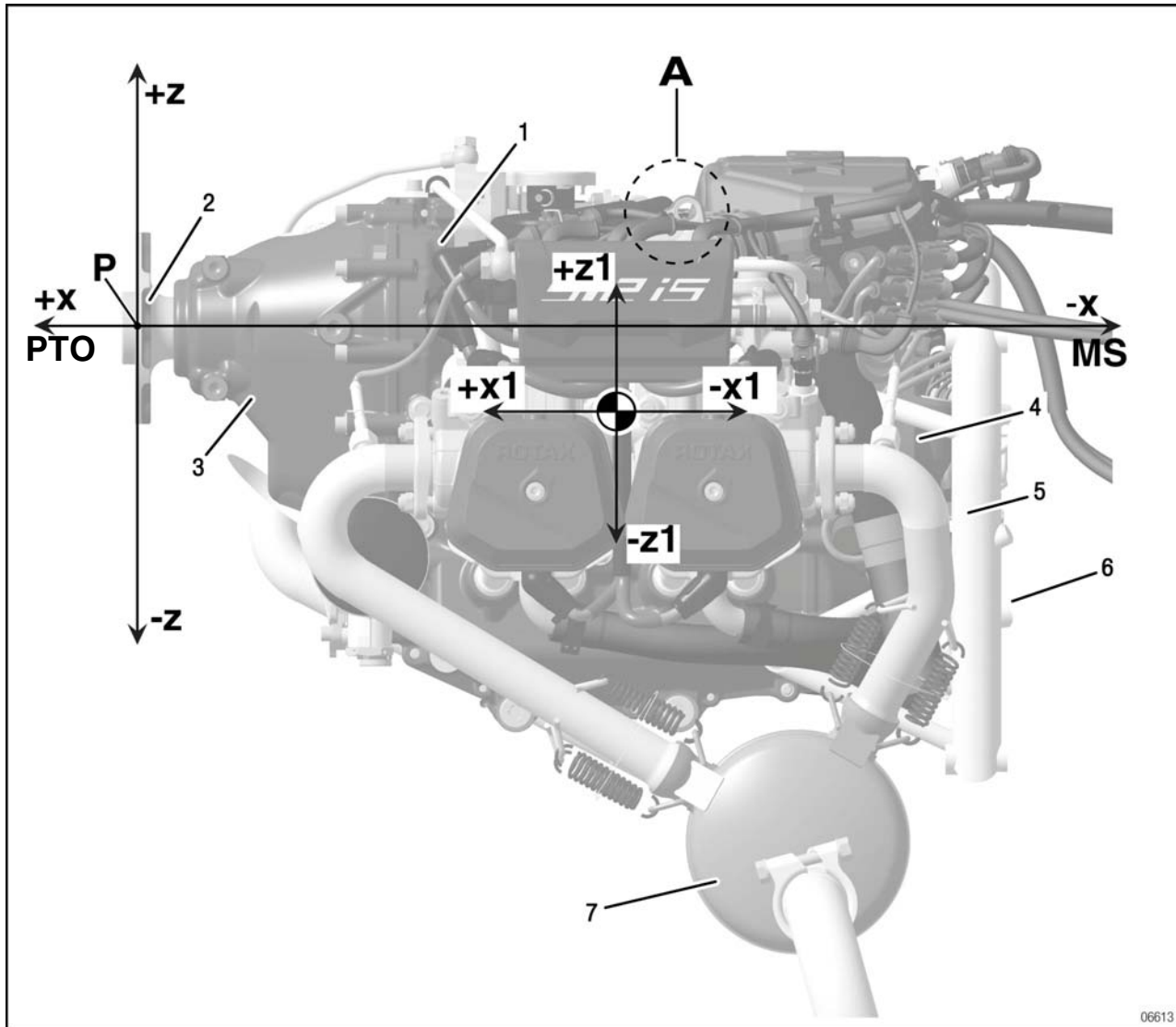
- x, y, z** Coordinate system axes
- Cyl. 1** Cylinder 1
- Cyl. 2** Cylinder 2
- Cyl. 3** Cylinder 3
- Cyl. 4** Cylinder 4

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Components, engine views

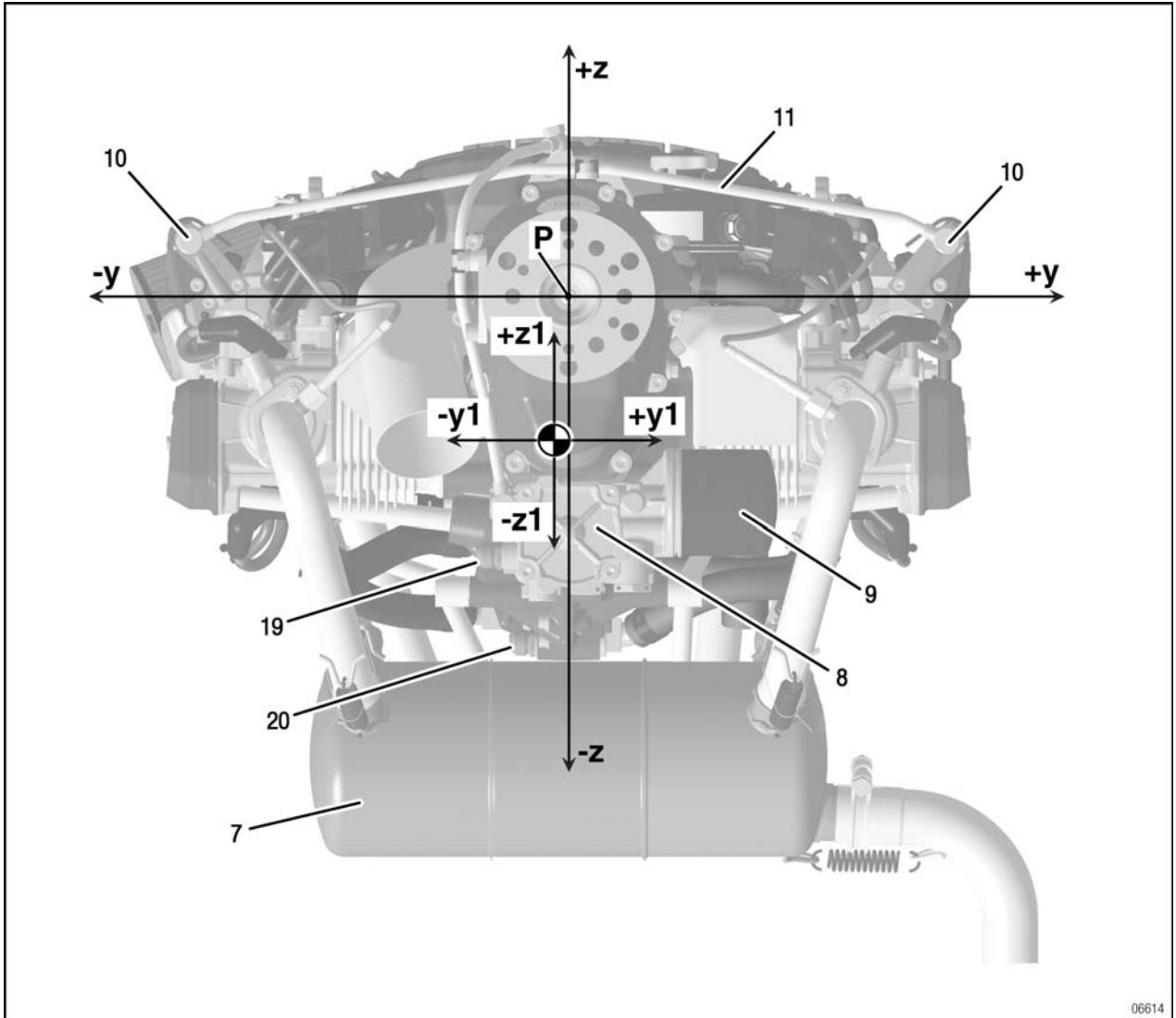
Fig. 1



- | | | | |
|--|-----------------------|----------------------|---------------------|
| 1. Engine number | 2. Propeller flange | 3. Propeller gearbox | 4. Ignition housing |
| 5. Engine suspension frame
(optional) | 6. Water pump housing | 7. Muffler assy. | |

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Fig. 2



8. Oil pump housing

9. Oil filter

10. Fuel rail left/right

11. Fuel hose assy.

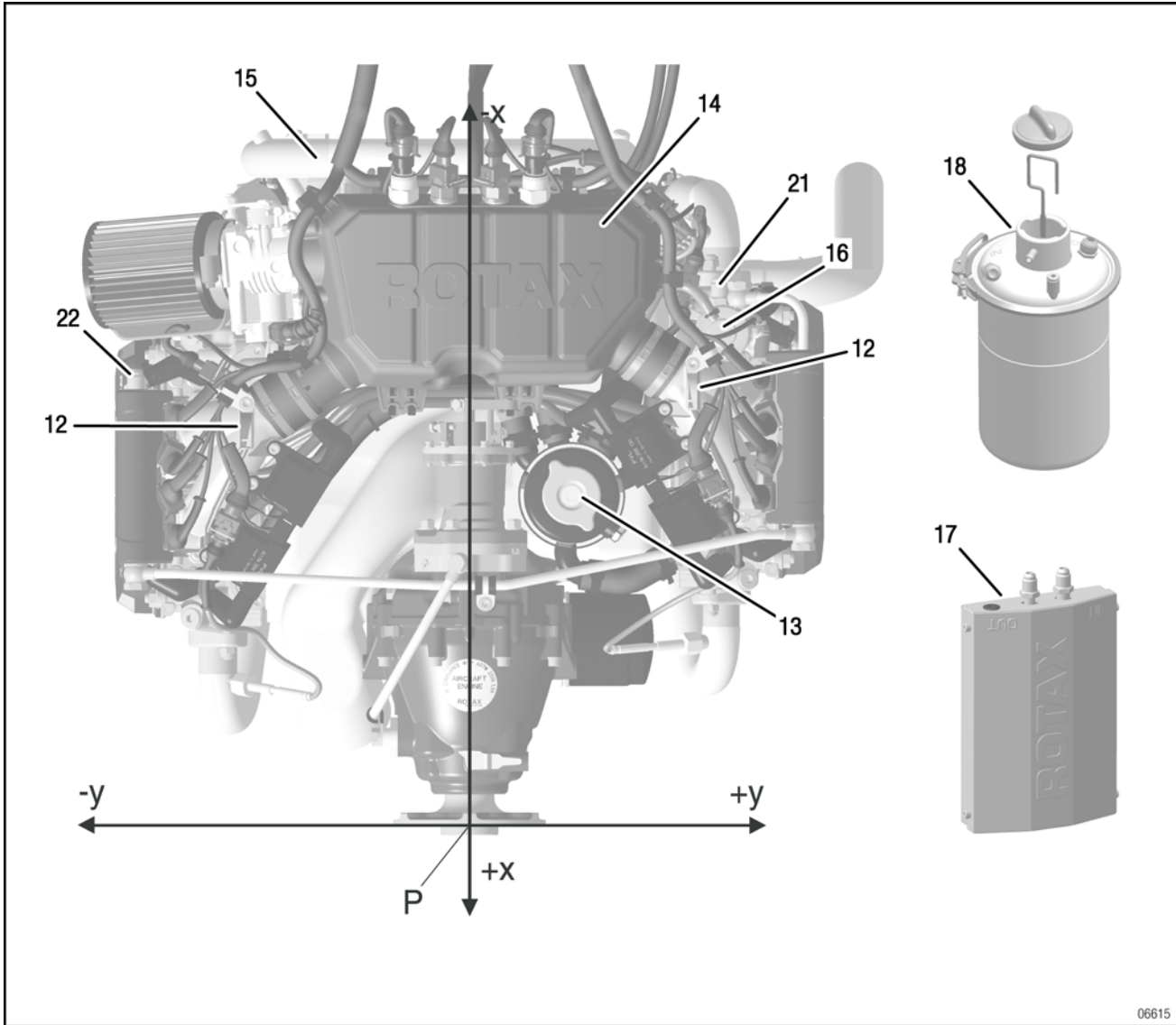
19. Connection for oil feed line

20. Connection for oil return line

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Fig. 3



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- | | | | |
|--|----------------------------|--------------------|-------------------------------------|
| 12. Intake manifold, left (cyl. 1/3), right (cyl. 2/4) | 13. Expansion tank assy. | 14. Airbox | 15. Electric starter assy. |
| 16. Fuel pressure regulator | 17. Fuel pump module assy. | 18. Oil tank assy. | 21. Connection for fuel return line |
| 22. Connection for fuel feed line | | | |

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MAINTENANCE

As well as the maintenance and special checks, see the relevant Maintenance Manual Line for the respective 912 i Series engine type.

REMOVAL

POWER PLANT - REMOVAL

Preparation

To remove the engine, carry out the following steps. If these steps are included and listed in the instructions of the aircraft manufacturer (see "Documentation of the aircraft manufacturer"), then the steps given here should be treated as additional information.

- Secure the aircraft appropriately
- Switch the ignition key OFF
- Disconnect the battery
- Switch the tank selector switch OFF
- Remove cowling
- Disconnect fuel lines
- Drain the residual fuel out of the lines and seal the lines
- Drain the coolant
- Drain the oil

DISCONNECTING THE LINES TO THE AIRCRAFT

Disconnect all the extension lines between the engine and the aircraft.

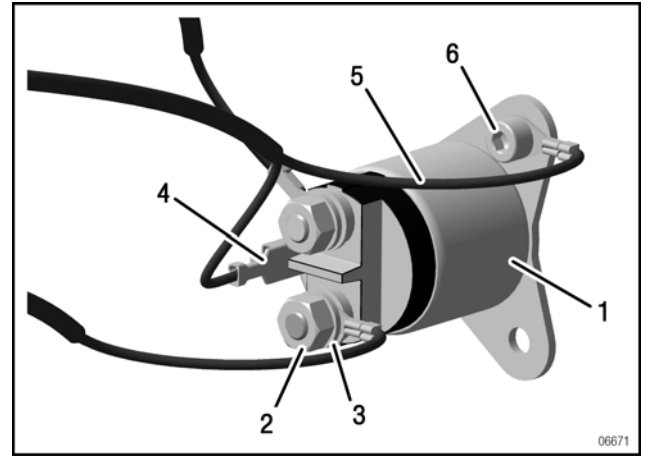
Step	Procedure
1	Remove the spinner and propeller (see section 61-00-00).

Starter relay:

See Fig. 4.

Step	Procedure
1	Loosen M6 hex. nut and remove it along with the 6.4 washer. Pull off faston connector. Press the lock to pull off the faston connector.
2	Loosen the earthing Allen screw.

Fig. 4



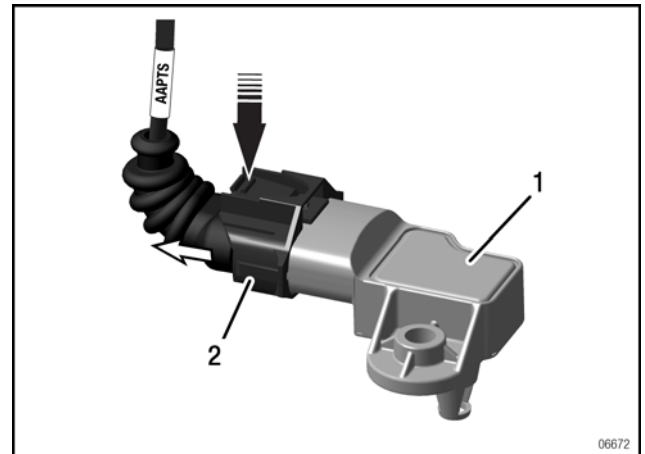
- | | |
|------------------|---------------------|
| 1. Starter relay | 2. M6 hex. nut |
| 3. 6.4 washer | 4. Faston connector |
| 5. Earthing | 6. Allen screw |

Ambient pressure sensor:

See Fig. 5.

Step	Procedure
1	Push in the tab on the top of the connector and at the same time pull the connector out of the connection socket.

Fig. 5



- | | |
|--------|----------------------|
| 1. Tab | 2. Connection socket |
|--------|----------------------|

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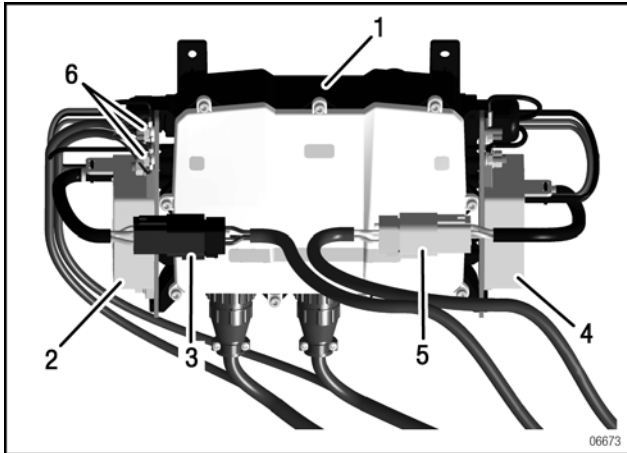
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Fuse box (FUSE BOX)

See section 76-50-00.

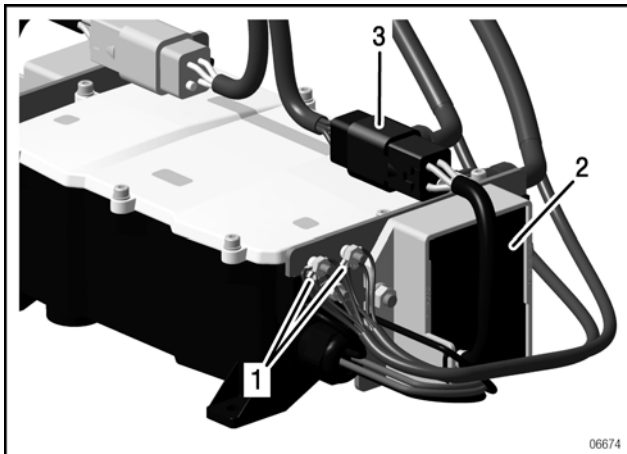
Step	Procedure
1	Loosen M5 hex. nut from the earthing cable on controller A.

Fig. 6



- 1. FUSE BOX
- 2. Controller LANE A
- 3. Controller connector A
- 4. Controller LANE B
- 5. Controller connector B
- 6. Earthing cable harness

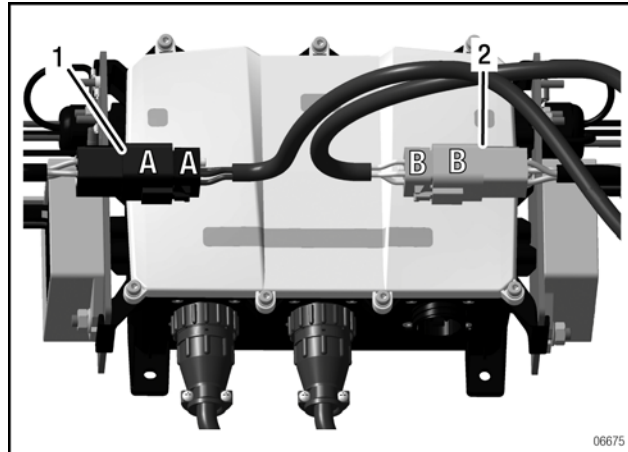
Fig. 7



- 1. Earthing cable
- 2. Controller LANE A
- 3. Controller connector A

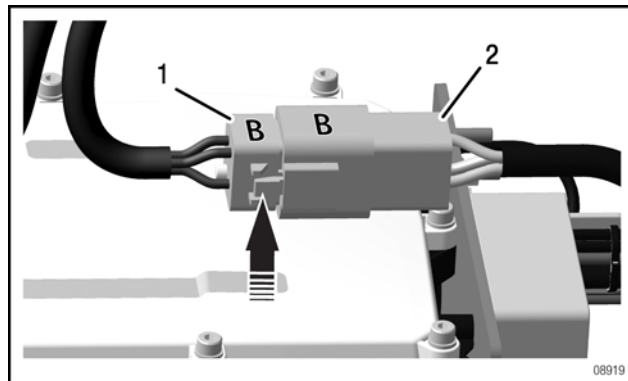
Step	Procedure
2	Mark the controller connector before detaching.
3	Push in the tab on the top of the connector and at the same time pull the connector out of the connection socket.

Fig. 8



- 1. Controller connector A
- 2. Controller connector B

Fig. 9



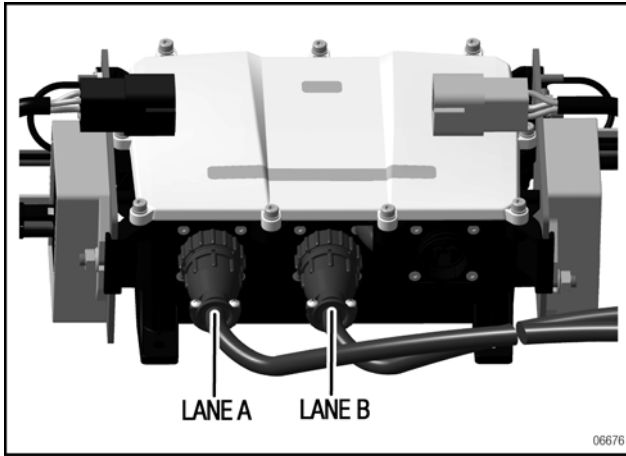
- 1. Connection socket
- 2. Controller connector

Step	Procedure
4	Remove the two round connectors (labelled LANE A, LANE B) of the fuse box. NOTE: Loosen the connector cap nut anti-clockwise.
5	Pull the connectors in the two grooves out of the connector socket.

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Fig. 10



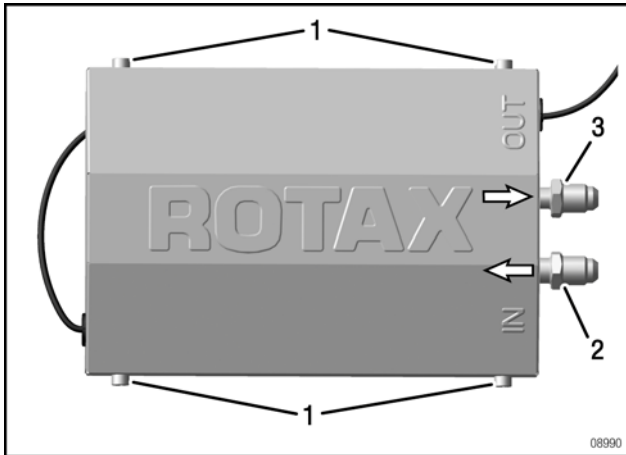
NOTE: Round connectors have different grooves and cannot be confused.

Fuel pump

See also section 73-10-00 Fuel pump.

Step	Procedure
1	Loosen M5x12 Allen screws from the cover of the fuel pump assy.

Fig. 11



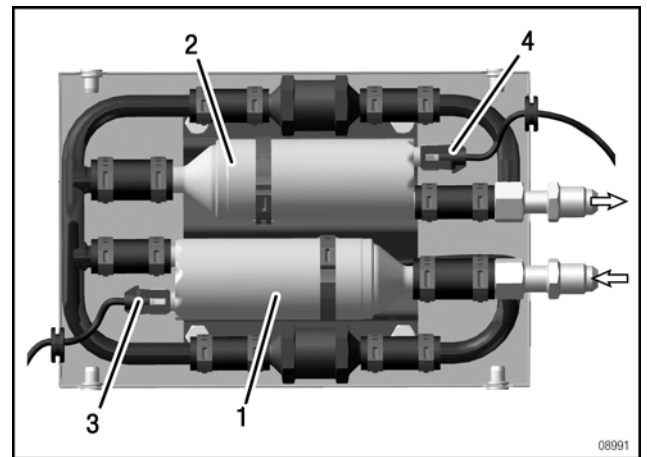
1. M5x12 Allen screws 2. LANE IN 3. LANE OUT

Step	Procedure
2	Detach the connectors (Fuel pump 1, Fuel pump 2) from the fuel pumps. NOTE: First lift one side with a screwdriver, fix the tab and then lift the lower tab with the screwdriver and pull out the connector.

NOTICE

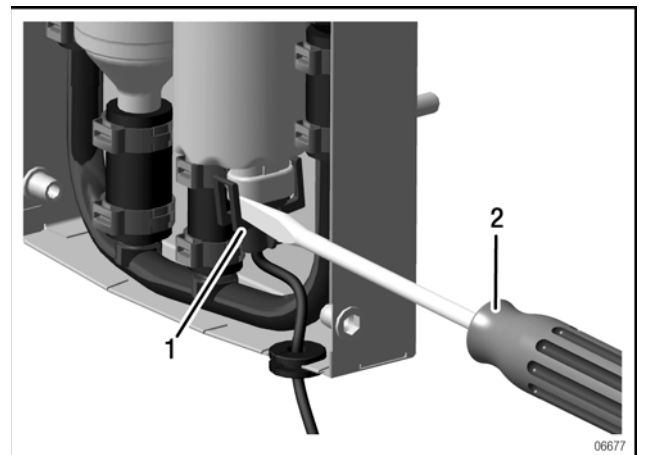
Do not pull on the cable!

Fig. 12



1. Fuel pump (main) 2. Fuel pump (auxiliary)
 3. Connector (fuel pump 1) 4. Connector (fuel pump 2)

Fig. 13



1. Connector (fuel pump 1) 2. Screwdriver

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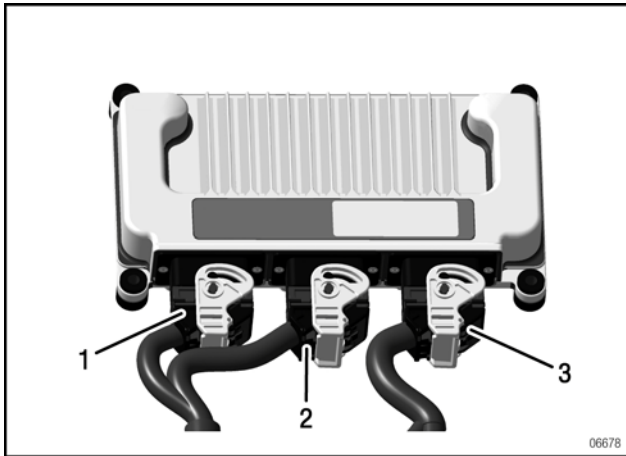
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Control unit (ECU)

See also section 76-10-00 Control unit (ECU).

Step	Procedure
1	Detach the couplers (ECU LANE A1, ECU LANE A2 and ECU LANE B).

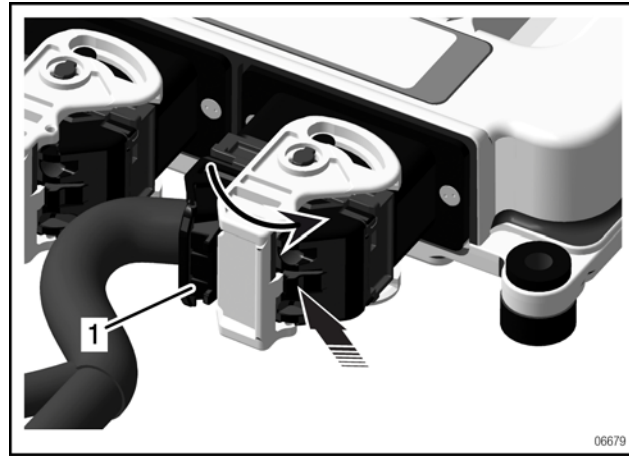
Fig. 14



- 1. Coupler (LANE A1)
- 2. Coupler (LANE A2)
- 3. Coupler (LANE B)

Step	Procedure
2	Press in the lock so that the clamp can be rotated.
3	Press the clamp down until it latches.
4	Remove the coupler.

Fig. 15



- 1. Lock

REMOVAL OF THE POWER PLANT FROM THE AIRCRAFT

Lift the engine from the aircraft using a crane or similar lifting gear.

⚠ WARNING

Danger of injury due to falling parts!
 When the engine is removed there is a risk of injury due to the engine or its assemblies falling!
 Only use permitted lifting gear and special tools for this work!
 Fasten the lifting gear only to the transport brackets. Note center of gravity!
 Do not walk under the lifted engine!
 Wear protective footwear!

NOTICE

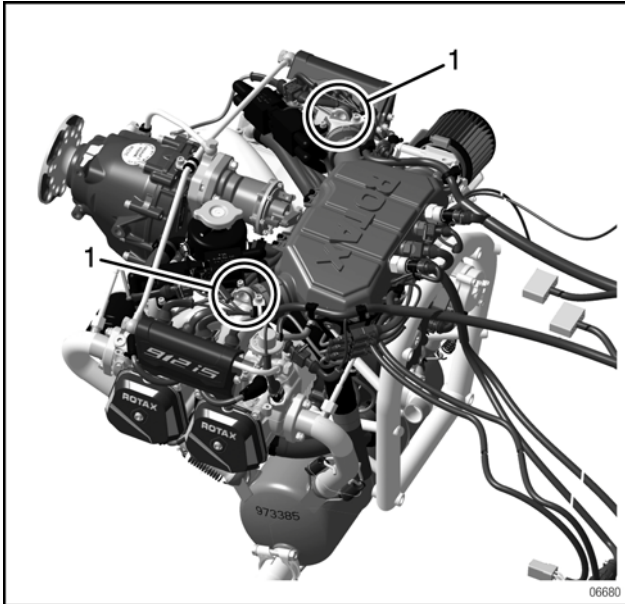
Danger of damage to the engine and aircraft!
 Before the engine is removed, ensure that all detachable connections between the engine and the aircraft, i.e. hoses, lines, cables, cable ties and clamps have been disconnected and moved out of position so that they do not obstruct removal!

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Step	Procedure
1	Fasten the straps properly to the suspension points and to the lifting gear/crane.

Fig. 16



1. Suspension points

Step	Procedure
2	Slowly tauten the straps by moving the crane upwards.
3	Loosen the screw connections between the engine suspension and the fire wall.
4	Using the crane, gradually move the engine vertically and carefully into the horizontal position to take the weight from the engine suspension frame bolts.
5	Completely loosen the screw connections between the engine suspension and the fire wall.
6	Lift the engine out of the aircraft, clean it and prepare it.

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INSTALLATION

ENGINE - INSTALLATION

As well as the instructions given, the installation graphics with the major dimensions are useful.

⚠ WARNING

Danger of injury due to falling parts!
 When the engine is installed there is a risk of injury due to the engine or its assemblies falling!
 Only use permitted lifting gear and special tools for this work!
 Do not walk under the lifted engine!
 Wear protective footwear!

NOTICE

Danger of damage to the engine!
 If the fuel system has not been cleaned sufficiently, irregularities in the injection system and malfunctions of its components can result!

- Clean the whole fuel system (including the fuel filters, all the fuel tanks and fuel lines on the aircraft frame side) according to the instructions of the aircraft and aeronautical equipment manufacturers to remove dirt before the fuel lines of the engine are installed.
- Clean the whole coolant system (including all the coolant tanks, and lines on the aircraft frame side) according to the instructions of the aircraft and aeronautical equipment manufacturers to remove dirt before the coolant lines of the engine are installed

NOTICE

Danger of damage to the power plant and aircraft!
 All precautions specified by the aircraft manufacturer in its documentation must be followed!

Preparation

- Secure the aircraft appropriately
- Complete the installation checklist
- Install the fuse box (FUSE BOX)
- Install the control unit (ECU)

NOTE: Must have an insulated construction. No earthing to engine or aircraft frame!

NOTICE

Danger of damage to the engine and aircraft!
 Before the Allen screws (engine suspension frame screws) are installed, ensure that all detachable connections between the engine and the aircraft, i.e. hoses, lines, cables, cable ties and clamps have been disconnected and moved out of position so that they do not obstruct removal!

INSTALLATION OF THE POWER PLANT IN THE AIRCRAFT

Lift the engine into the aircraft using a crane or similar lifting gear.

See [Fig. 17](#) to [Fig. 18](#)

Step	Procedure
1	Fasten the straps properly to the suspension points and to the lifting gear/crane.
2	Slowly tauten the straps by moving the crane upwards.
3	Using the crane or a similar lifting gear, position the engine slowly and carefully on the installation points of the engine suspension frame fastening on the fire wall of the aircraft.

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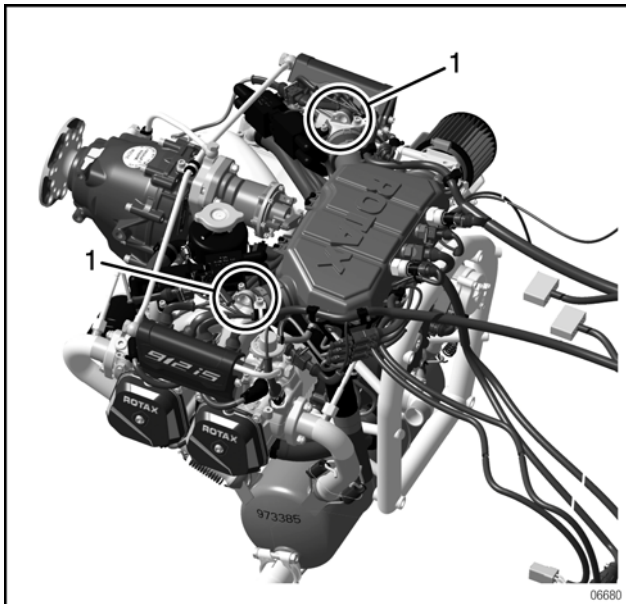
Step	Procedure
4	Install the screw connections of the engine suspension to the fire wall according to the aircraft manufacturer's instructions and tighten them diagonally from each other.
5	Reduce the tension of the installation position of the engine by lowering it slightly and tighten the four screw connections likewise diagonally from each other according to the tightening torque values of the aircraft manufacturer.
6	Remove the lifting gear.

CONNECTING THE LINES

Connect all the supply lines between the engine and the aircraft.

The supply lines are connected and disconnected the same way. See also section 71-00-00 Removal

Fig. 17



1. Suspension points

REMOVAL

REMOVAL OF THE ENGINE SUSPENSION FRAME

WARNING

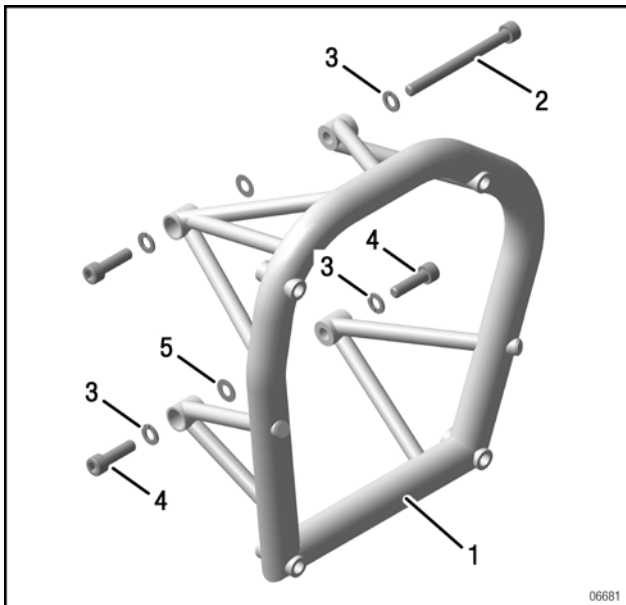
Danger of severe burns and scalds!
 Always allow the engine to cool down to ambient temperature before starting any work.

Preparation

- Remove the coolant hoses (feed and return) according to the aircraft manufacturer's instructions.
 See also section 72-30-00 Cylinder head.
- Remove the water pump housing. See section 75-00-00.

Step	Procedure
1	After the Allen screws (1x M10x110 and 3x M10x35) have been removed along with their lock washers, the engine suspension frame can be removed.

Fig. 18

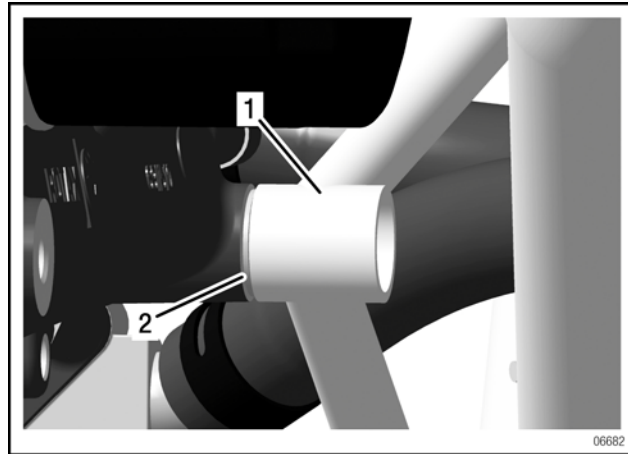


1. Engine suspension frame 2. M10x110 Allen screw
 3. DIN 128-A10 lock washer 4. M10x35 Allen screw
 5. 10.1/20/0.5 thrust washer

NOTICE

On the left-hand side (cylinders 2/4), thrust washers can be built in for tension-free assembly. Do not lose them!

Fig. 19

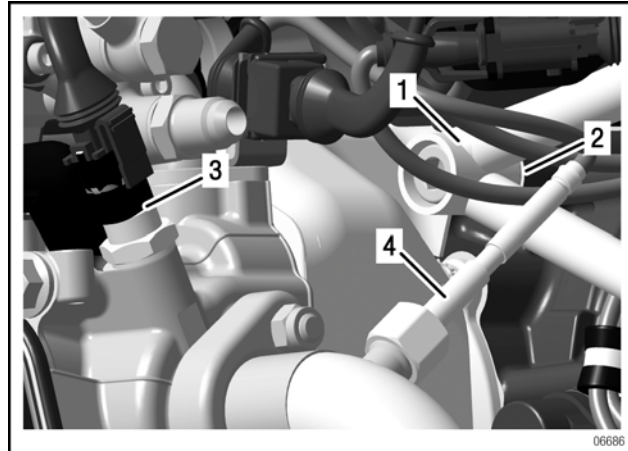


1. Engine suspension frame 2. 10.1/20/0.5 thrust washer frame

NOTICE

Do not damage the temperature sensor and EGT temperature sensor on cylinder 4!

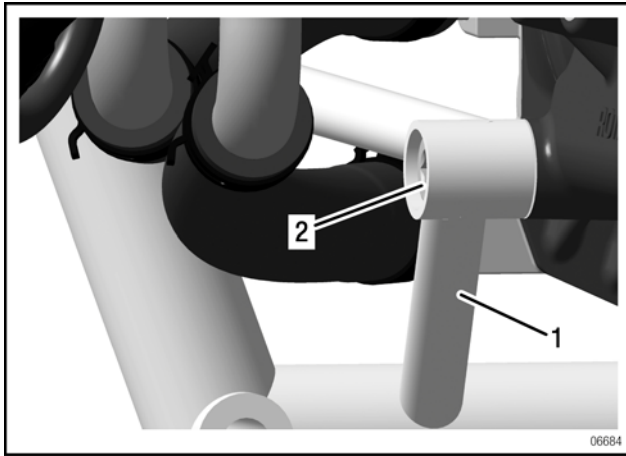
Fig. 20



1. Engine suspension frame 2. M10x35 Allen screw
 3. Temperature sensor 4. EGT temperature sensor (coolant)

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Fig. 21

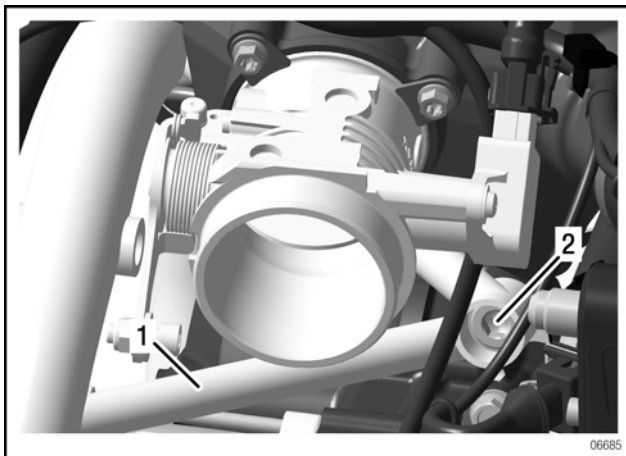


1. Engine suspension frame 2. M10x35 Allen screw

NOTICE

Remove air filter!

Fig. 22



1. Engine suspension frame 2. M10x35 Allen screw

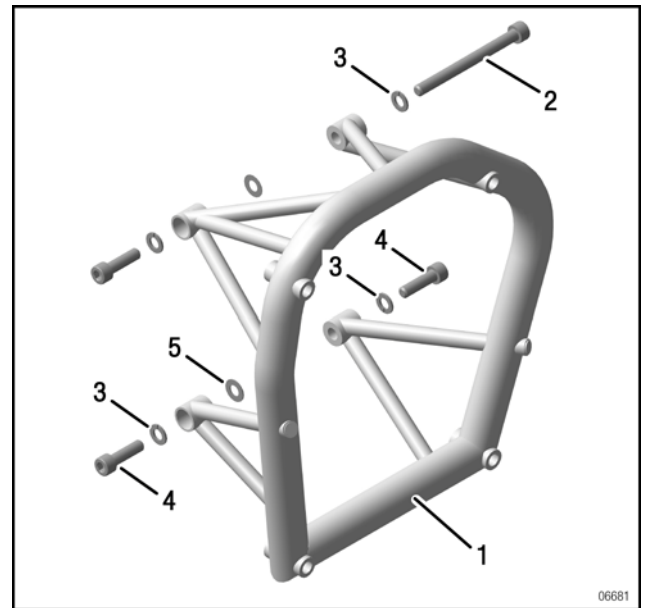
INSPECTION

ENGINE SUSPENSION FRAME CHECK

Step	Procedure
1	All components must be visually inspected.

NOTE: Detailed visual inspection of the engine suspension frame in the vicinity of all welded connections between the tube and the struts.

Fig. 23



1. Engine suspension frame 2. M10x110 Allen screw
3. DIN 128-A10 lock washer 4. M10x35 Allen screw
5. 10.1/20/0.5 thrust washer

NOTE: If necessary, a transfer flight to a repair company is permissible, as long as the tube or strut is not more than 50% detached. If they are completely detached, immediate replacement is necessary.

INSTALLATION

INSTALLATION OF THE ENGINE SUSPENSION FRAME

NOTICE

The engine suspension frame must be installed in a tension-free manner. Space out the engine suspension frame with thrust washers.

NOTE: The M10x110 Allen screws must conform to strength class 10.9.

The engine suspension frame are installed and removed in the same way. See Removing the engine suspension frame. Note:

- Tightening torque of the M10x110 and M10x35 hex screws is 40 Nm (353.92 in. lb.)

FINISHING WORK

- Install the water pump. See section 75-00-00.
 - Install the coolant hoses. See section 75-00-00.
-

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Chapter: 72-00-00
ENGINE

Introduction

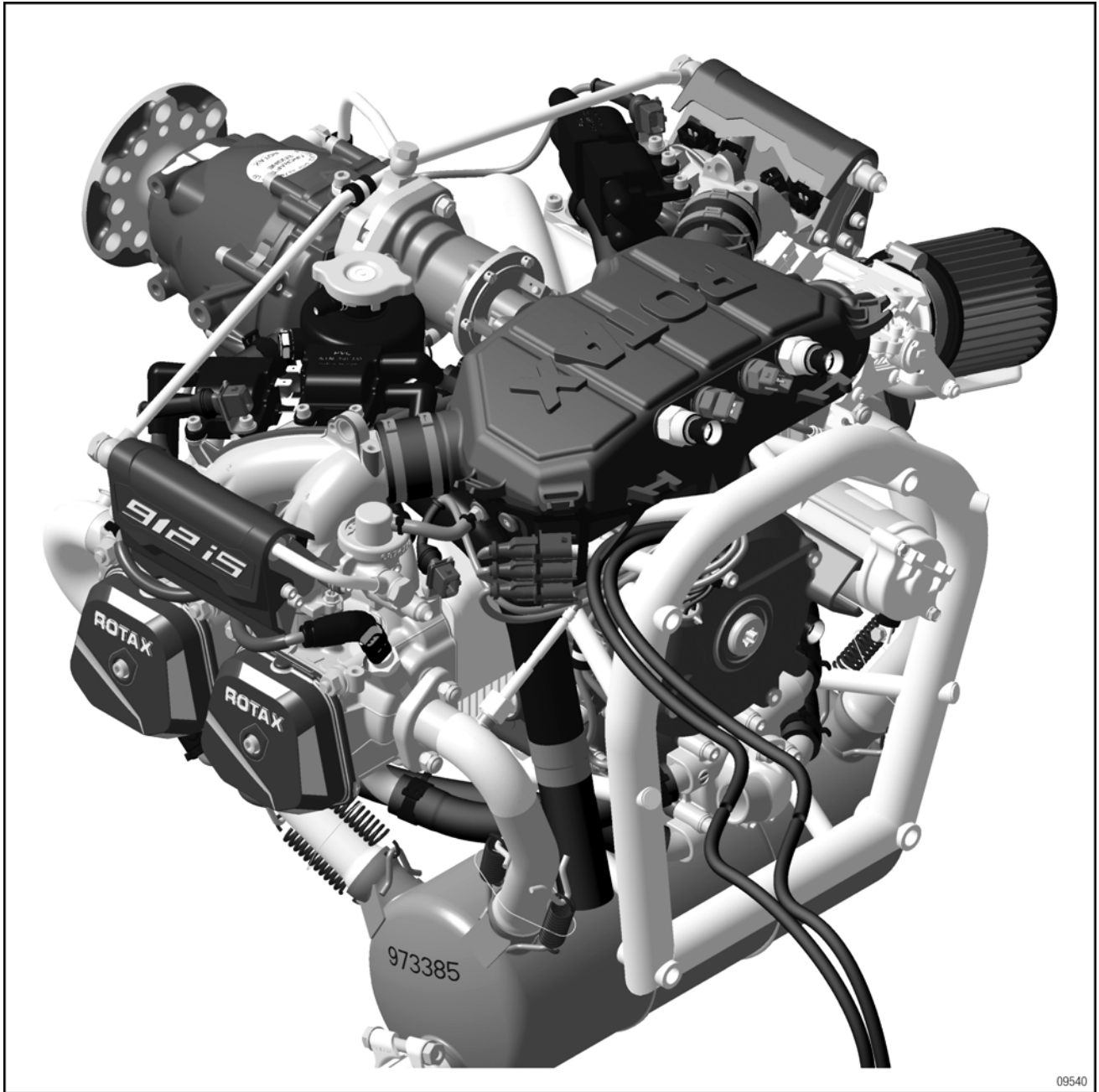
This section describes the maintenance of the ROTAX 912 i Series engine. The description is divided into sub-sections and explanations of system functions.

Subject	Section
1. Introduction	Chapter 72-00-00
2. System description	Page 3
3. Safety information	Page 3
4. Propeller gearbox	Chapter 72-10-00
5. Engine block	Chapter 72-20-00
6. Cylinder head	Chapter 72-30-00

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MAINTENANCE MANUAL

Engine



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SYSTEM DESCRIPTION

The 912 i Series engine is a 4-cylinder, four-stroke, horizontally opposed engine with manifold injection.

The 912 i Series has liquid cooled cylinder heads and ram air cooled cylinders; this engine also has a fully redundant, electronic engine management system (EMS) including fuel injection, map-controlled ignition etc. Dry sump forced lubrication ensures constant oil pressure.

SAFETY INFORMATION

 **WARNING**

Danger of severe burns and scalds!
Allow the engine to cool to ambient temperature before starting work.

 **WARNING**

Risk of injury due to spring-loaded parts!

NOTICE

- Ensure that the ignition is switched off!
- Disconnect the battery!
- Prevent the engine from being unintentionally switched on!

NOTE: Precautions for escaping oil must be taken at the installation site.

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NOTES

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Chapter: 72-10-00
PROPELLER GEARBOX

Introduction

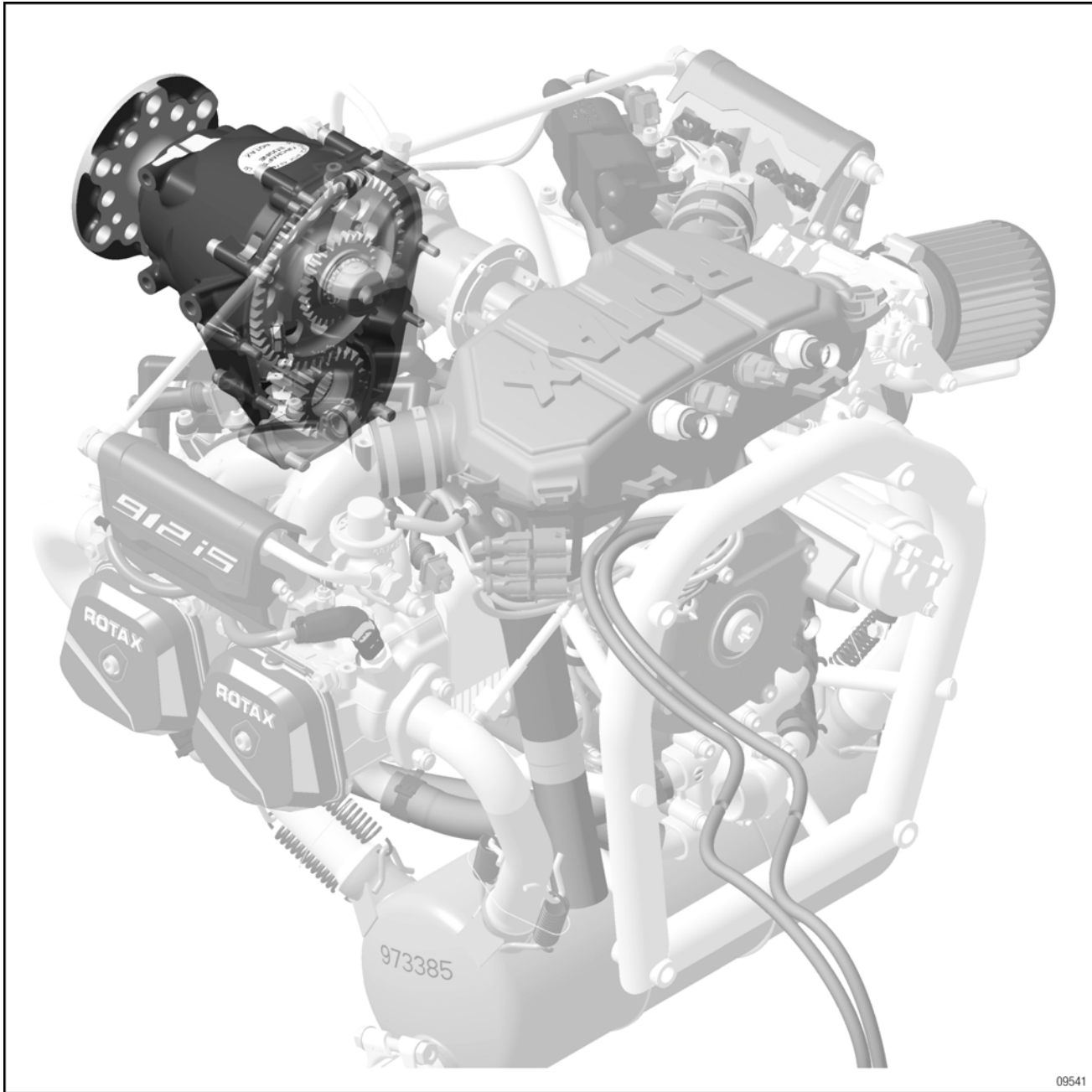
This section describes the maintenance of the ROTAX 912 i Series gearbox. The description is divided into sub-regions and explanations of system functions.

Subject	Page
1. Introduction	Page 1
2. Special tools	Page 3
3. Service products	Page 3
4. System description	Page 5
5. Removal	Page 5
A. Preparation	Page 5
B. Removal of the propeller gearbox	Page 5
6. Disassembly	Page 7
C. Disassembly of the propeller gearbox	Page 7
7. Inspection	Page 10
D. Propeller gearbox parts check	Page 10
(1) Gear cover assy. check	Page 10
(2) Propeller shaft check	Page 10
(3) Dog hub check	Page 12
(4) Thrust washer check, bearing bushing check	Page 12
(5) Step collar check, disc spring check	Page 12
(6) Checking the splines	Page 13
(7) Gear set check	Page 13
8. Wear limits	Page 17
9. Assembly	Page 21
E. Assembly of propeller gearbox parts	Page 21
(1) Installation of the deep groove ball bearing	Page 21
(2) Propeller shaft - installation	Page 21
(3) Adjustment of the disc spring pretension	Page 23
(4) Assembly of the propeller gearbox assy.	Page 23
10. Installation	Page 25
F. Propeller gearbox - installation	Page 25
11. Finishing work	Page 26

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Location on the engine



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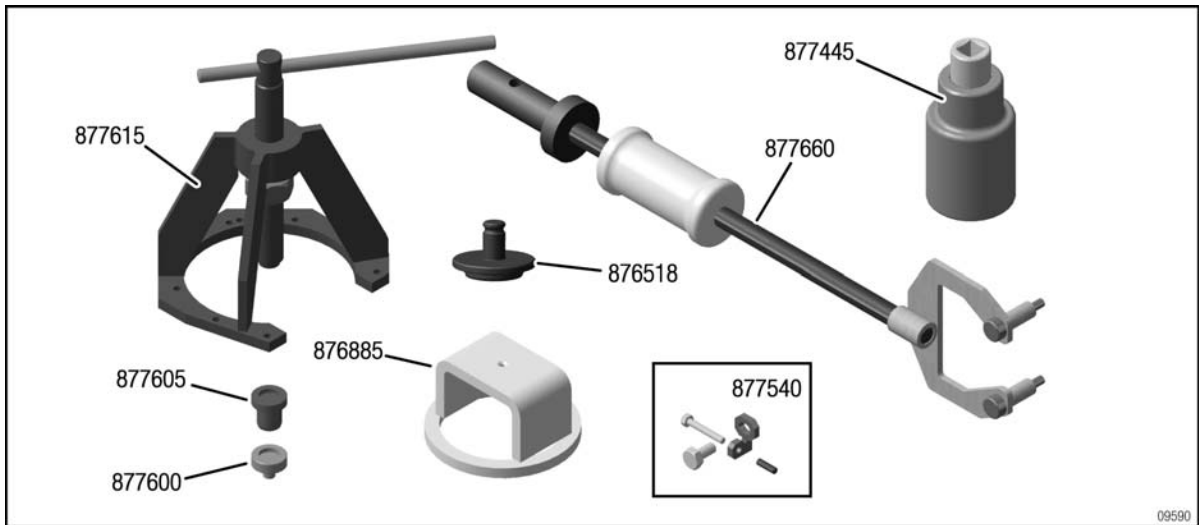
Chapter: 72-10-00
PROPELLER GEARBOX

SPECIAL TOOLS

Description	Part no.
Hot air gun	n.a.
Insert SW 41	877445
Puller	877660
Pushing jig assy.	877540
Mounting yoke	876885
Fixture	n.a.
Circlip pliers	n.a.
Extractor	877615
Press-out mushroom (version 3)	877600
Press-out mushroom (version 2)	877605
Insertion jig	876518

SERVICE PRODUCTS

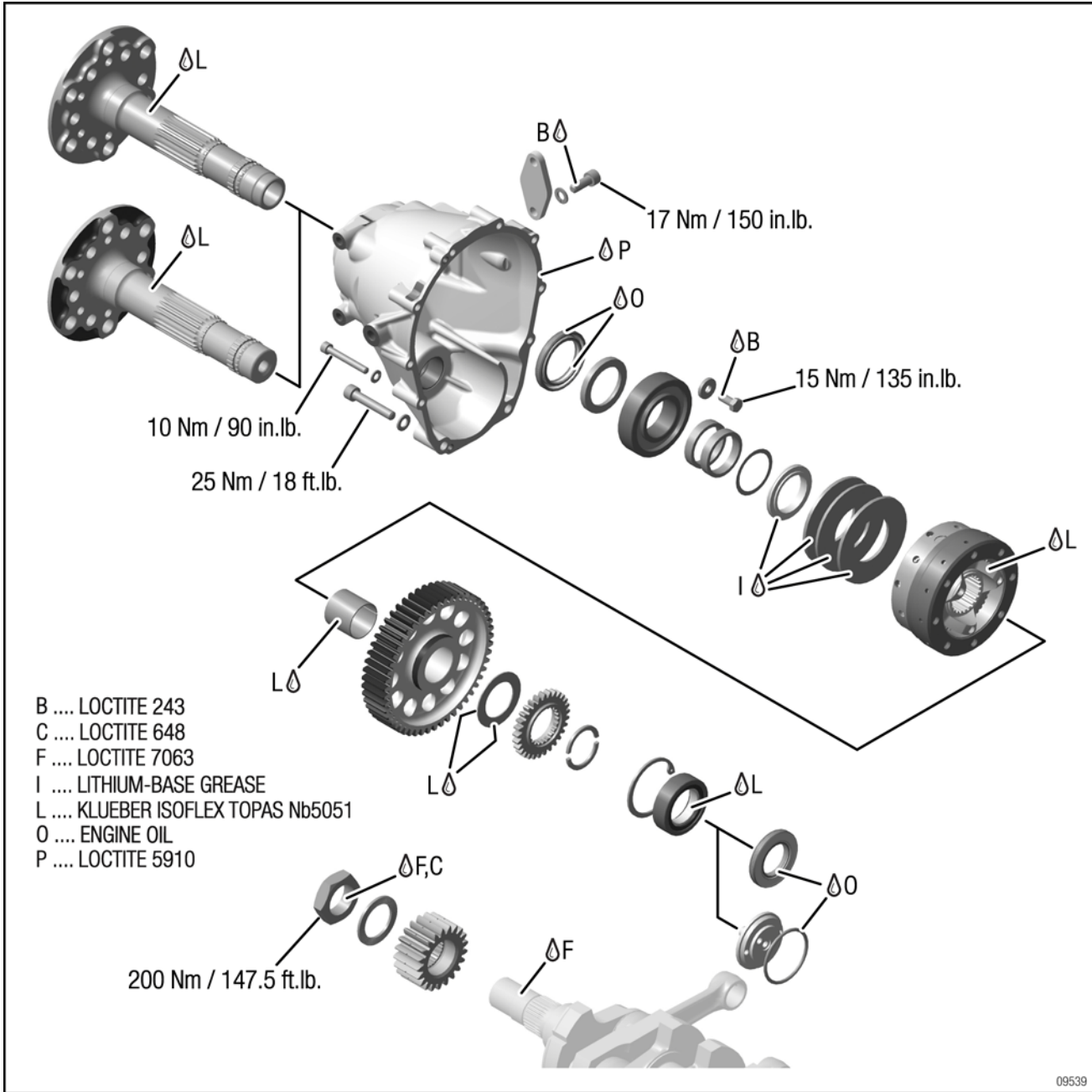
Description	Part no.
Engine oil	n.a.
LOCTITE 243	897651
LOCTITE 648	899788
LOCTITE 5910	899791
LOCTITE 7063	n.a.
KLUEBER ISOFLEX TOPAS Nb 5051	898351



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MAINTENANCE MANUAL

Components



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SYSTEM DESCRIPTION

The propeller shaft is driven by the crankshaft by means of a linear helical gear unit. Gear ratio Crankshaft : propeller shaft 2.43 : 1.

The propeller gearbox has a damping means to counteract torsional vibrations. This consists of torsional shock absorption by means of contoured dogs with axial spring loading by disc springs.

NOTE: This overload clutch also protects the crankshaft from overloading if the propeller comes into contact with the ground.

SAFETY INSTRUCTIONS

WARNING

Danger of severe burns and scalds! Always allow the engine to cool down to ambient temperature before starting any work.

WARNING

During work on the engine there is a risk of life-threatening injuries from the propeller and rotating parts in the engine!

- Ensure that the ignition is switched off!
- Disconnect the battery
- Prevent the engine from being unintentionally switched on!

CONNECTIONS FOR DISPLAY SYSTEMS

NOTICE

Follow the instructions in the installation manual regarding connections for instrumentation.

MAINTENANCE

As well as the maintenance and special checks, see the relevant Maintenance Manual Line for the respective 912 i Series engine type.

REMOVAL

REMOVAL OF THE PROPELLER GEARBOX

Preparation

Before the propeller gearbox is removed, the work described below must be carried out to identify any further malfunctions in the propeller gearbox and rectify them as part of repair work.

NOTICE

If these checks are omitted, it may be necessary to dismantle the propeller gearbox again to rectify any faults after it has been repaired.

- General visual inspection. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Engine cleaning. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Carry out an engine test run. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Remove surrounding assemblies and detach oil lines.

NOTE: The assemblies and lines are only to be removed if necessary and only as far as is necessary!

Step	Procedure
1	Fix the crankshaft into place. See relevant Maintenance Manual Line for the respective 912 i Series engine type.
2	Loosen eight M6 Allen screws and two M8 Allen screws together with the washers from the gear cover diagonally from each other. The gear cover is held in place with two dowel pins.

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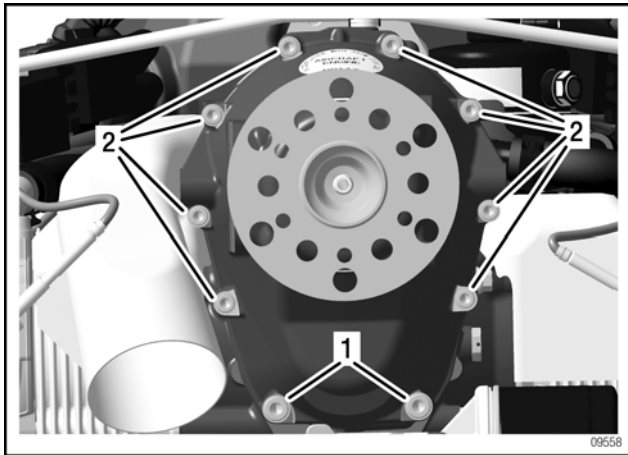
MAINTENANCE MANUAL

Step	Procedure
3	Install puller part no. 877660 onto the two M8 threaded bolts of the gear cover.
4	The entire propeller gearbox can now be tapped off with the handle without damaging the ball bearing or propeller shaft.

NOTICE

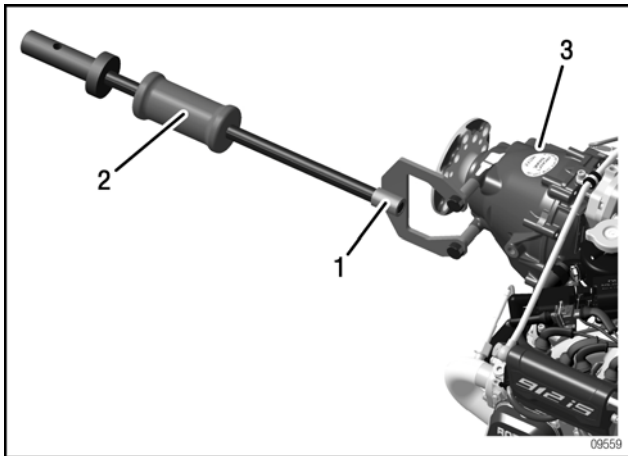
When removing the propeller gearbox, take care not to damage the bearing point and the oil seal running surface (on the roller bearing side) of the propeller shaft.

Fig. 1



1. M8 Allen screw 2. M6 Allen screw

Fig. 2



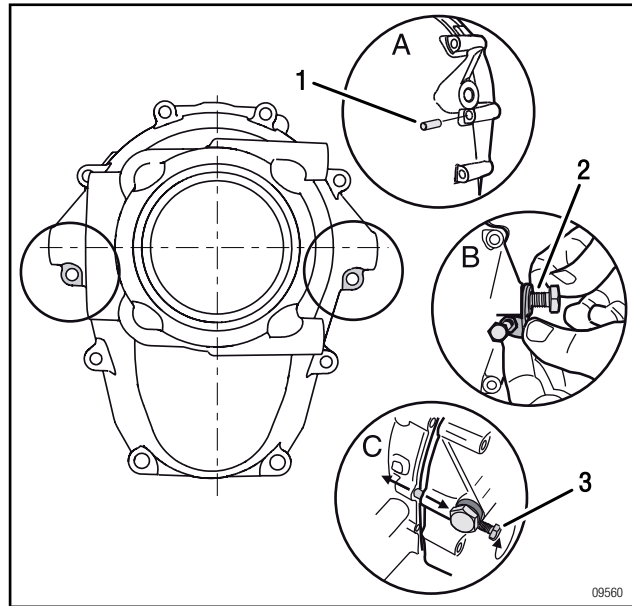
1. Puller part no. 877660
2. Handle 3. Gear cover

NOTE: If desired, the optimised special tool part no. 877540 can be used to remove the propeller gearbox.

See Fig. 3.

Step	Procedure
1	Insert the 8x20 dowel pin into the bore on the right and left of the gearbox housing.
2	Install M6x40 hex. screw into the pushing jig assy..
3	Put the pushing jig assy. in the center and fix it with a M10x20 hex. screw.
4	Using the hex. screw, press the gearbox housing off from the crankcase simultaneously on the right and left.

Fig. 3



1. 8x20 dowel pin 2. M10x20 hex. screw
3. M6x40 hex. screw

DRIVE GEAR - REMOVAL

NOTICE

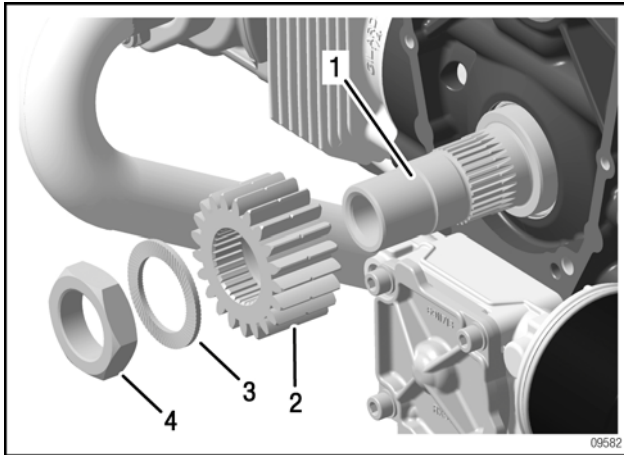
The gear set has a continuous 6-digit serial number which is marked on the drive gear and on the end of the dog gear. The gears are in pairs and must not be mixed up!

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Step	Procedure
1	Heat the M30x1.5 hex. nut with the hot air gun (100-120 °C).
2	Loosen M30x1.5 hex. nut with wrench socket SW 41 part no. 877445. NOTE: The hex. nut has a left handed thread!
3	Remove the drive gear and the friction washer from the crankshaft. NOTE: If necessary, carefully press off the drive gear with 2 screwdrivers.

Fig. 4



1. Crankshaft 2. Drive gear
 3. Friction washer 4. M30x1.5 hex. nut

DISASSEMBLY

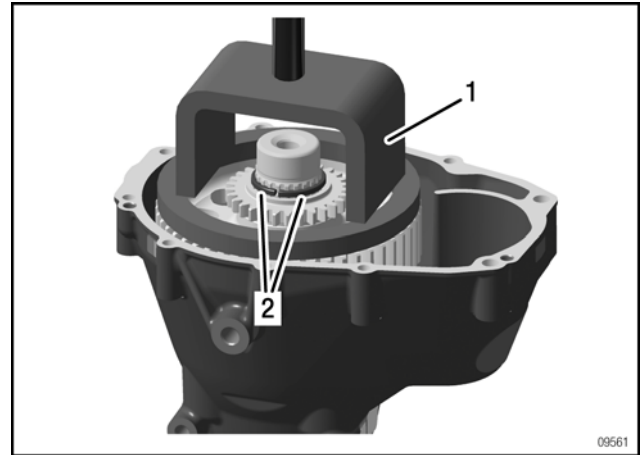
DISASSEMBLY OF THE PROPELLER GE-ARBOX

See Fig. 5.

NOTICE	
Push the dog gear down only until the ring halves can be taken out, otherwise the gearbox housing can be damaged. The gear cover must be freely rotatable!	

Step	Procedure
1	Place the entire gearbox into a suitable fixture and press down the gear with the mounting yoke part no. 876885 until the ring halves can be taken out.

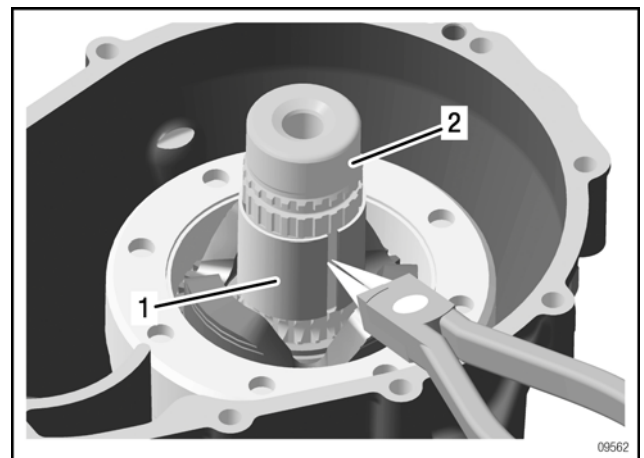
Fig. 5



1. Mounting yoke 2. Ring halves
 Part no. 876885

NOTICE	
Do not over-stretch the bearing bushing, otherwise it will become unusable.	

Fig. 6



1. Bearing bushing 2. Propeller shaft

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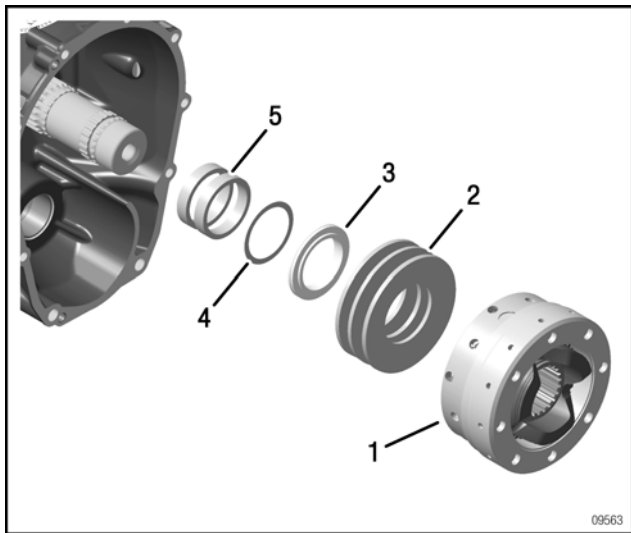
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Step	Procedure
2	Remove the clutch assy., 80x35x3 disc spring, step collar, 35.4/43/1 compensating shim and 35.2/42/8 distance sleeve.

NOTICE

The overload clutch is built in as standard in all certified and non-certified aircraft engines.

Fig. 7



- 1. Clutch assy.
- 2. Disc springs
- 3. Step collar
- 4. Compensating shim
- 5. Distance sleeves

REMOVAL OF THE PROPELLER SHAFT

NOTICE

If the propeller shaft is removed, the oil seal and the deep groove ball bearing must be replaced (see Fig. 9)!

Step	Procedure
1	Place the gearbox housing on a suitable support.
2	Press out the propeller shaft with an extractor part no. 877615.

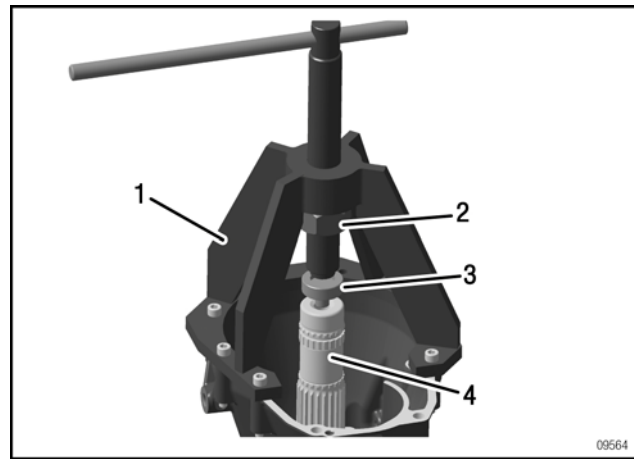
NOTICE

The protection piece (press-out mushroom part no. 877605 or 877600) must be used, otherwise the machined inner diameter of the propeller shaft will be damaged.

NOTE: Alternatively, the hand press can also be used to press out the propeller shaft.

Step	Procedure
3	Screw the extractor onto the gearbox housing with six M6 Allen screws and place press-out mushroom part no. 877605 (for version 2) or press-out mushroom part no. 877600 (for version 3) onto the end of the propeller shaft as protection.
4	Place the pull-in spindle into the extractor support and screw the M24x1.5 hex. nuts onto the spindle from the inside.
5	Held with the spanner, the propeller shaft is pushed out of the gearbox housing by turning the spindle clockwise.

Fig. 8



- 1. Extractor
- 2. M24x1.5 hex. nut
- 3. Press-out mushroom
- 4. Propeller shaft

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REMOVAL OF THE DEEP GROOVE BALL BEARING

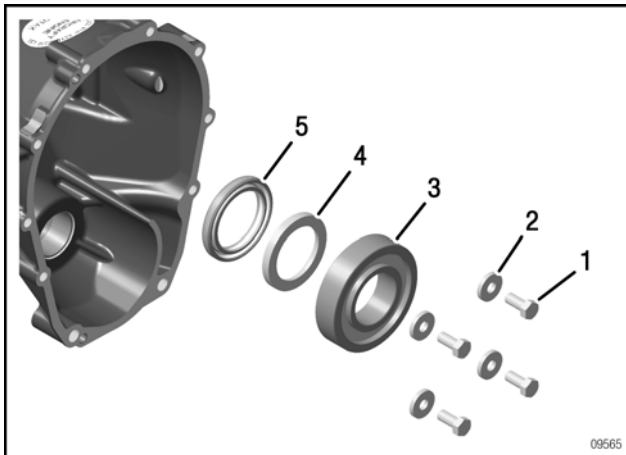
After the propeller gearbox has been removed, the propeller shaft bearing on the crankcase side and the oil seal must be replaced.

NOTICE

The shaft seal is damaged in the process and must therefore be replaced.

Step	Procedure
1	Loosen 4 M7x16 hex. screws with washers from the gearbox housing.
2	Heat the gearbox housing about 100 to 120 °C and press the deep groove ball bearing together with the oil seal and radius ring inwards with a suitable insertion jig.

Fig. 9



- | | |
|------------------------------|--------------------------|
| 1. M7x16 hex. screw | 2. 7.2/18.8/3 washer |
| 3. Ball bearing 6207 E THNC3 | 4. 36/50/5.5 radius ring |
| 5. Oil seal AS 40x55x7 FPM | |

REMOVAL OF THE ROLLER BEARING, VERSION 3

See also section 61-20-00 Governor.

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INSPECTION

**PROPELLER GEARBOX
SINGLE PARTS CHECK**

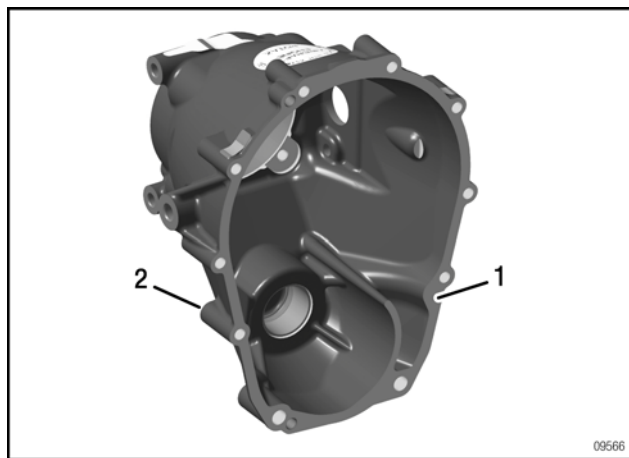
Preparation

- Clean all parts carefully.

GEAR COVER ASSY. CHECK

Step	Procedure
1	Inspect the gear cover for cracks using a dye penetrant method or magnetic particle method. NOTE: Only carry out in the case of ground contact!
2	Inspect gear cover for damage. <ul style="list-style-type: none"> - Depressions and scratches outside flat and sealing surfaces up to a maximum of 0.5 mm in depth and 2 mm in diameter are permissible. - Traces of corrosion and pitting outside sealing surfaces up to a maximum of 0.3 mm in depth and 2 mm in diameter are permissible.
3	Inspect contact surfaces for Allen screws. <ul style="list-style-type: none"> - Indentations up to a maximum of 0.2 mm are permissible. - Bumps up to a maximum of 0.2 mm are permissible.

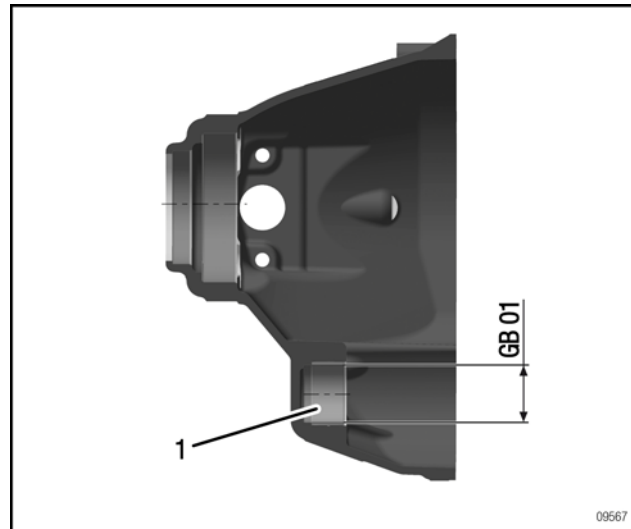
Fig. 10



1. Flat sealing surfaces 2. Contact surfaces

Step	Procedure
4	Inspect that the bearing bushing for supporting the crankshaft in the gear cover is secure and measure dimension (GB01). See also section 72-10-00 Wear limits.

Fig. 11



1. Bearing bushing

PROPELLER SHAFT - INSPECTION

NOTICE

The entire propeller shaft including fastening bores must be free from corrosion; there must be no fretting corrosion at the bearing points either.

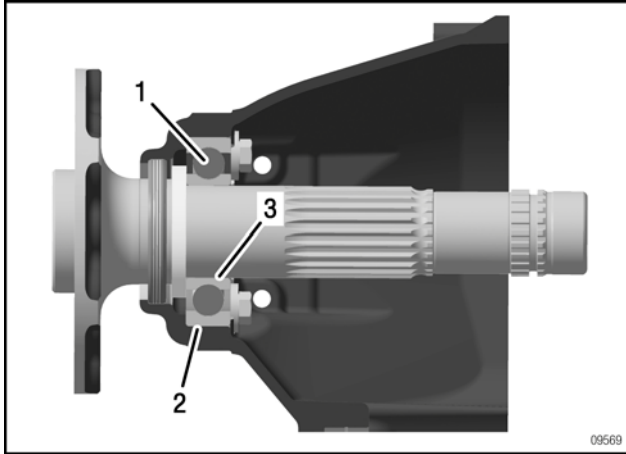
Step	Procedure
1	Measure both bearing points. See also section 72-10-00 Wear limits.
2	Roll the propeller shaft and check for run-out. Check the axial runout of the propeller flange. See section 72-10-00 Wear limits.
3	Check the oil seal running surface.

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NOTE: The ball bearing must have an interference fit between the outer ring and the gearbox housing, and between the inner ring and the propeller shaft. See also section 72-10-00 Wear limits.

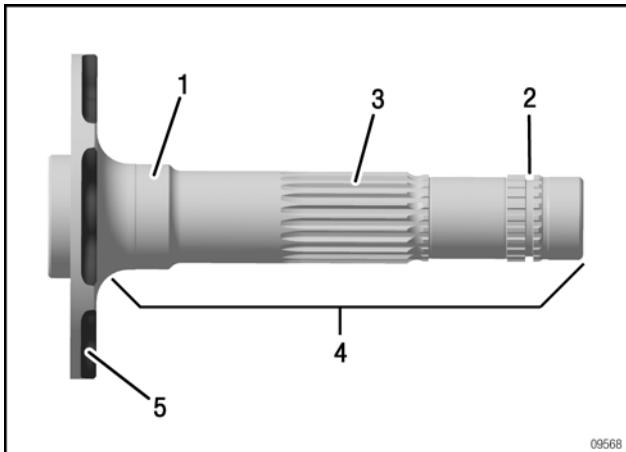
Fig. 12



- 1. Ball bearing
- 2. Outer ring
- 3. Inner ring

Step	Procedure
4	Check the groove for the retaining rings and gear-tooth system for wear and damage.

Fig. 13



- 1. Oil seal running surface
- 2. Groove for retaining rings
- 3. Gear-tooth system
- 4. Propeller shaft
- 5. Propeller flange

Version 3.

Step	Procedure
1	Measure the inner diameter of the propeller shaft in the vicinity of the oil inlet flange. Dimension. See also section 72-10-00 Wear limits. NOTE: It is not the dimensions GB05 or GB06 which are important, but the backlash GB05/GB06.
2	Check the propeller shaft for cracks. See section 00-00-00. The results of the magnetic particle crack check must be entered in the form provided.

Treatment of corrosion damage and surface damage on the propeller flange.

See Fig. 13.

The flange of the propeller shaft is susceptible to flash rust. After the propeller shaft has been covered with an adhesive plastic tape or a plastic tube, the propeller flange can be treated with a blasting medium.

NOTICE

To apply the protective paint, carefully cover the flange surface, fastening bores and the propeller shaft.

To prevent corrosion damage, the rear of the propeller flange should be coated with a layer of anti-corrosion paint.

In the event of more severe corrosion damage which has affected the material, the propeller shaft must be replaced.

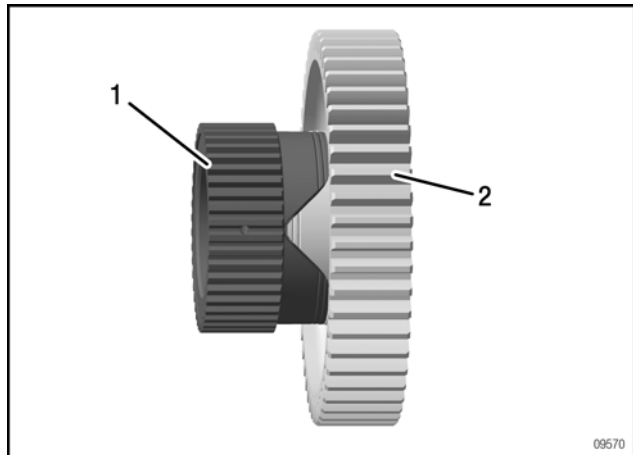
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DOG HUB CHECK

Step	Procedure
1	Visually check the dog hub for visible pitting on the gear-tooth system and/or in the engagement faces of the dogs; see section 72-10-00 Wear limits. (GB08) NOTE: The cam peaks of the gear must never rest in the trough of the dog hub.
2	Measure the gap between the cam peak and the cam trough; see section 72-10-00 Wear limits. (GB07) NOTE: Slight to moderate traces of wear and pitting on the dogs are permissible.

Fig. 14

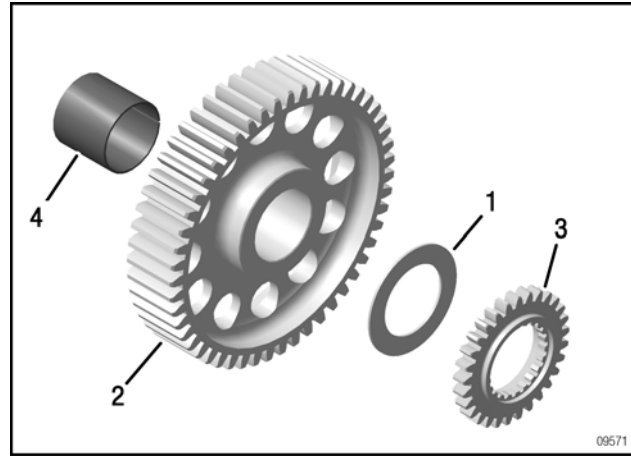


1. Dog hub 2. Gear (propeller shaft)

THRUST WASHER CHECK, BEARING BUSHING CHECK

Step	Procedure
1	Measure the thickness of the plastic thrust washer between the gear set and the drive gear; see section 72-10-00 Wear limits. (GB11)
2	Check the heat-treated steel bearing bushing for wear.

Fig. 15

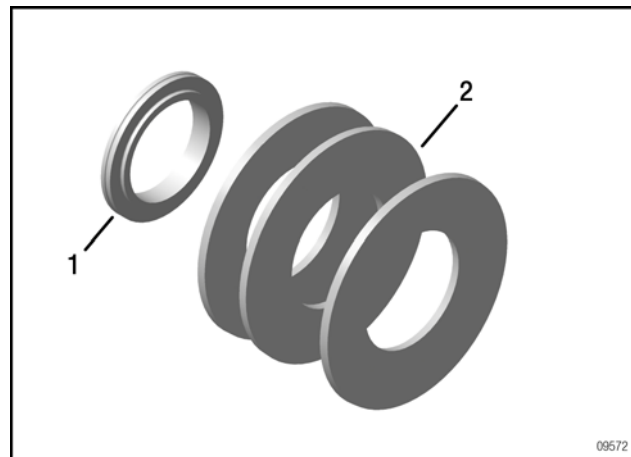


1. Thrust washer 2. Gear (propeller shaft)
 3. 29T drive gear 4. Bearing bushing

STEP COLLAR CHECK, DISC SPRING CHECK

Step	Procedure
1	Check the step collar in the vicinity of the disc spring support for wear.
2	If wear of the disc springs is visible in the contact area, replace the disc springs. Inspect the dimension (GB13) of the non-tensioned disc spring; see section 72-10-00 Wear limits.

Fig. 16



1. Step collar 2. Disc springs

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CHECKING THE SPLINES

There are two essential splined shaft connections in the gearbox.

- Crankshaft to drive gear
- Propeller shaft to the clutch hub of the over-load clutch

NOTE: To check the splines, determine the tooth widths at the tip circle of the respective inner or outer gear-tooth system. The smallest value in each case is significant.

Step	Procedure
1	Inspect all the splines visually for damage and wear. See section 72-10-00 Wear limits. (CS07,GB15, GB14, GB16)

GEAR SET CHECK (GEARS)

The gear set is checked to identify any damage to the gear-tooth system.

NOTICE
Check all the tooth flanks for any damage or pitting.

NOTE: If the gearbox is installed, it is also possible to check the gear set using an endoscope. This must be done in such a manner that an **exact assessment** of the tooth flanks is possible and requires experience.

Pitting

Pitting is damage which is attributable to fatigue of the material. As far as is known today, this is caused when the Hertzian stress permissible for the material in question is exceeded, the tangential stress on the surface (friction stress) and temperature stress. As well as the material and the heat treatment of it, the surface quality and structure, surface treatment and lubricant (viscosity at operating temperature and additives) are also important.

NOTE: The likely location of pitting formation is the dedendum flank of the driving gear. Therefore, begin by checking the drive gear.

Pitting in the gearbox

Pitting in the gearbox can cause high-frequency vibrations. This vibration can cause several problems as it is transferred via the engine to the connected parts:

- Wear on the gearbox (gear profile and contact faces)
- External alternative accessories
- Wear on the exhaust system
- Leaking of the sealing surface of the crankcase

NOTE: This vibration can be detected with a dynamic engine analysis; these are units which are used to adjust propellers. The normal vibration level for the engine is approximately between 1.27 cm and 2.45 cm per second, or the values specified by the aircraft manufacturer for the respective installation apply.

PITTING, GENERAL INFORMATION

NOTE: When pitting occurs it is necessary to distinguish between **tolerable initial pitting** and **flake pitting**. To make the assessment easier for you, see the following assessment tips

Pitting is the breaking off of more or less small, flat material particles from the active tooth flank. Whereas tooth breakage results in failure of the gearbox, this is not the case for pitting damage. There are in this case different stages of damage.

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Rate of development

The rate of development depends on the lubricant and amount of stress. The pitting surface can become so large that the remaining undamaged flank can no longer transfer the load. During further operation the gear-tooth system is then completely destroyed.

NOTE: Fine pitting or pitted areas hardly affect the running behaviour of the gear-tooth system at all.

The rule is however pitting damage which increases over time.

A distinction can be made according to the size, type and number of pitting, as follows.

- Slight pitting (initial pitting)
- Destructive pitting
- Flake pitting (large-area flank fractures)

SLIGHT PITTING

Features:

Individual small pits (up to approx. 0.5% of the flank area) or pore-like areas of pitting, generally only present in the dedendum area of the flank. This pit formation can cease during the operating phase of the gearbox.

Causes:

Locally high stresses in gears which have not yet run in can result in isolated pits. The adjustable running-in wear which results in these areas being relieved of stress, as a result of which the formation of pits can cease. Similarly, changed operating conditions can prevent pits which have already formed from developing.

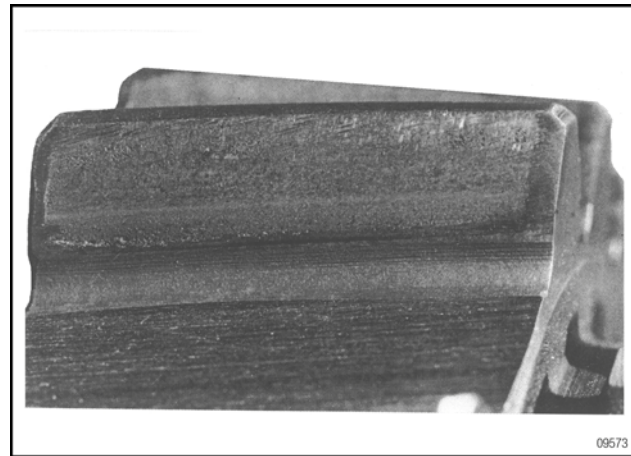
Conclusion:

These pits are not important for safe operation. The gear set can still be used.

NOTE: The illustrations are sometimes not very informative due to fine pitting or the reproduction process. If in doubt, consult technical literature or contact the authorised ROTAX distributor or its service centre.

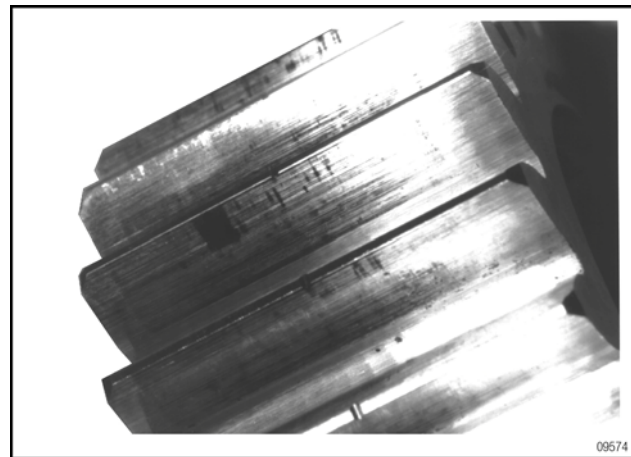
See Fig. 17 to Fig. 19.

Fig. 17



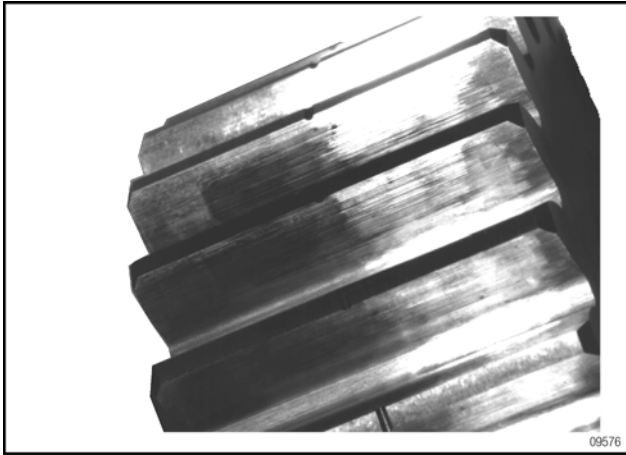
Magnification: approx. 2x

Fig. 18



Magnification: approx. 1.5x

Fig. 19



Magnification: approx. 1.5x

DESTRUCTIVE PITTING

See [Fig. 20](#) and [Fig. 21](#).

Features:

Extensive flank fractures, generally occurring as zones of pitting. The bottom of the fracture generally has a mussel-shaped structure. The total pitting area can be so great that the running smoothness is noticeably affected and/or the remaining flank area which still bears the load is rapidly destroyed by wear etc.

Causes:

Pitting is attributable to the fatigue of the material due to combined stresses from compression and sliding. They are triggered when the material strength is exceeded locally. Essential influences on pit strength are: oil viscosity and oil temperature.

Conclusion:

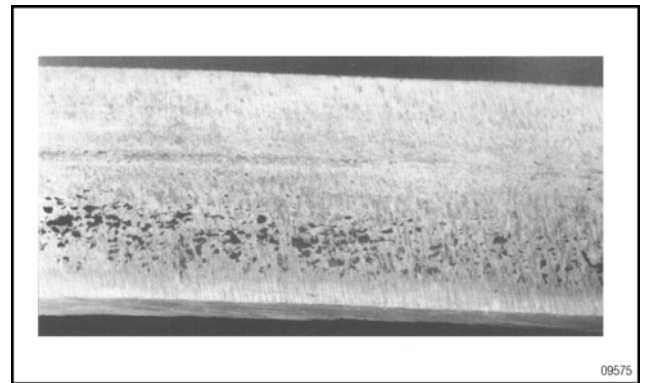
Pitting of up to 5% of the flank area is permissible if the individual flank fractures do not exceed a size (greatest longitudinal extent) of 0.5 mm. Otherwise the gear set must be replaced

!

NOTICE

The whole gear set must always be replaced. Dog hubs or drive gears must not be replaced individually.

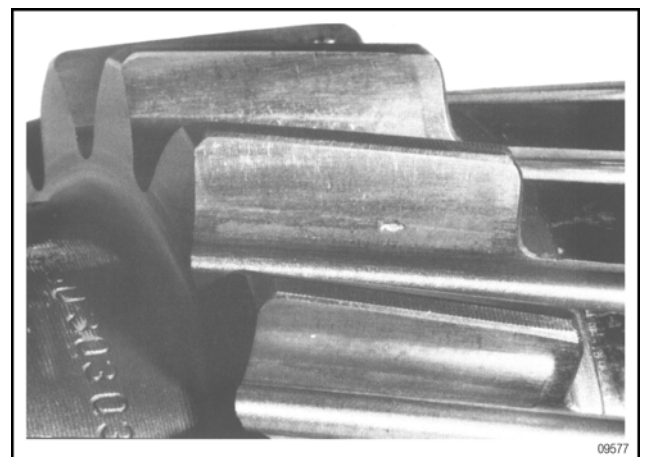
Fig. 20



Pitted area in the dedendum flank region of a spur gear.

Magnification approx. 5x.

Fig. 21



Pit formation in the dedendum region of a spur gear tooth system

Magnification approx. 1.5x.

FLAKE PITTING (LARGE-AREA FLANK FRACTURES)

See Fig. 22 and Fig. 23.

Features:

A large-area, triangular flank fracture emanating from a micropitting zone or a fine line of pits in the tooth dedendum. The fracture area has a relatively constant depth. Further cracks can run obliquely over the flank from the fracture. The damage sometimes extends into the addendum region, which results in breakage of the tooth tip.

NOTICE

If flake pitting is found, the gear set must be replaced.

Max. permissible pitting or flake pitting. See Destructive pitting.

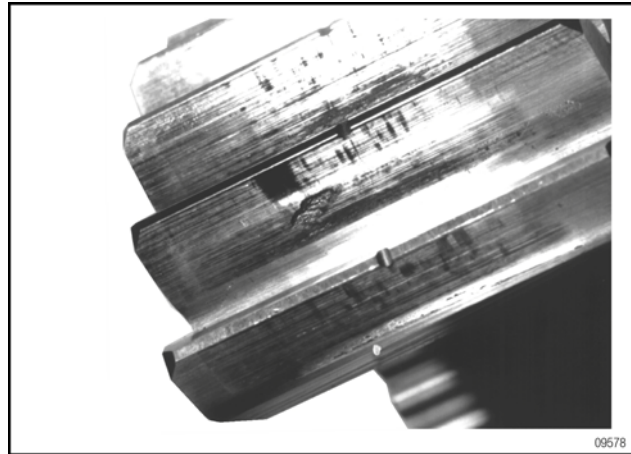
NOTICE

The whole gear set must always be replaced. Gears must not be replaced individually.

Causes:

This pattern of damage generally occurs at low operating oil viscosities and/or high oil temperatures. Apart from these, the same causes apply as for pitting.

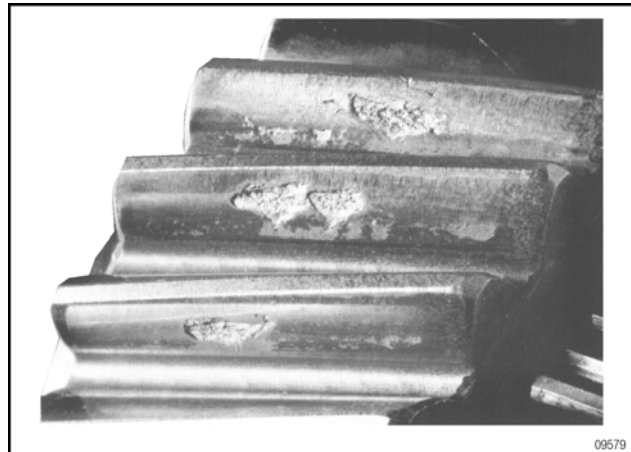
Fig. 22



Triangular flake pitting

Magnification approx. 2x.

Fig. 23



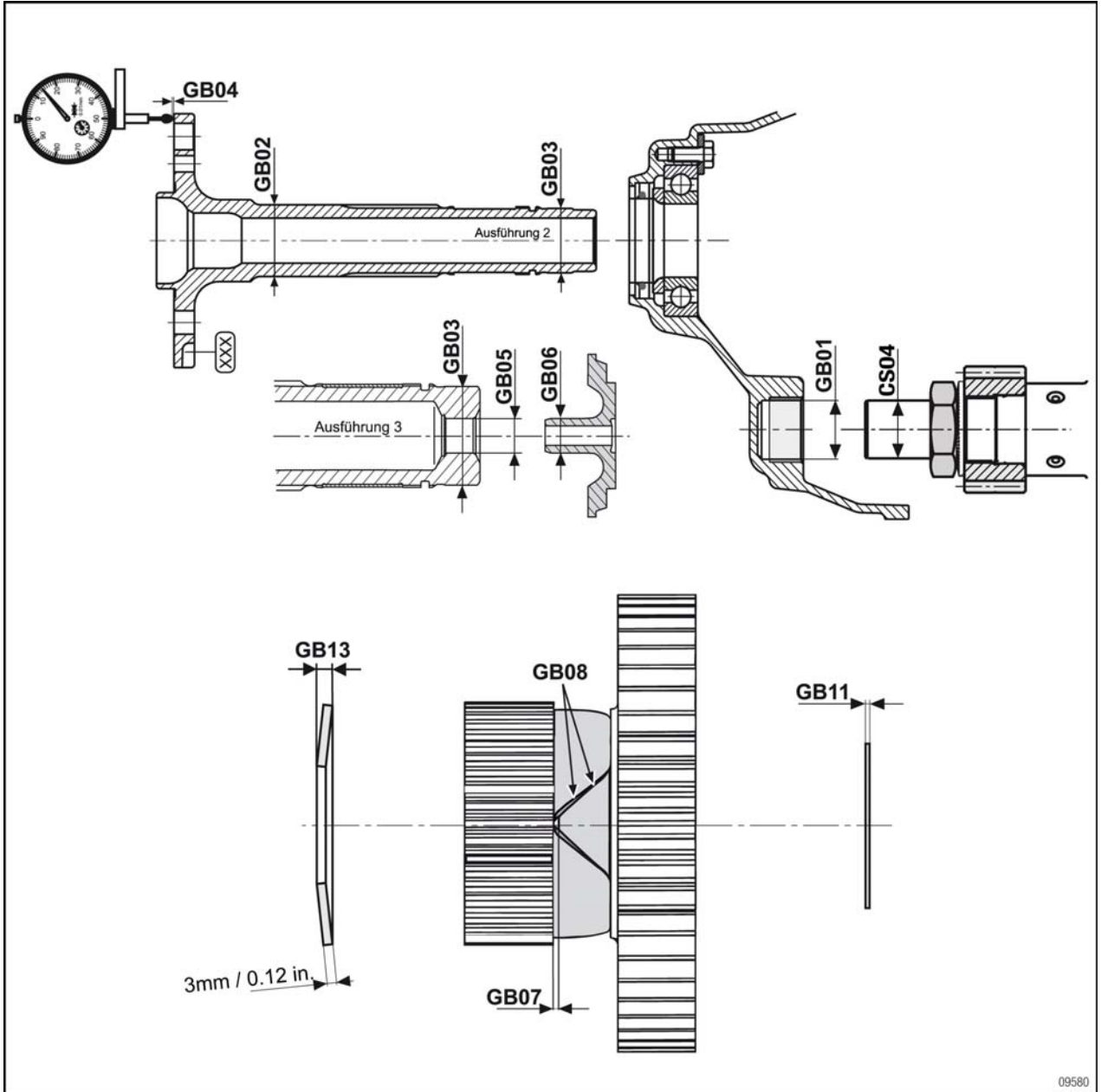
Triangular flake pitting

Magnification approx. 2x.

BRP-Powertrain
MAINTENANCE MANUAL

WEAR LIMITS

Fig. 24



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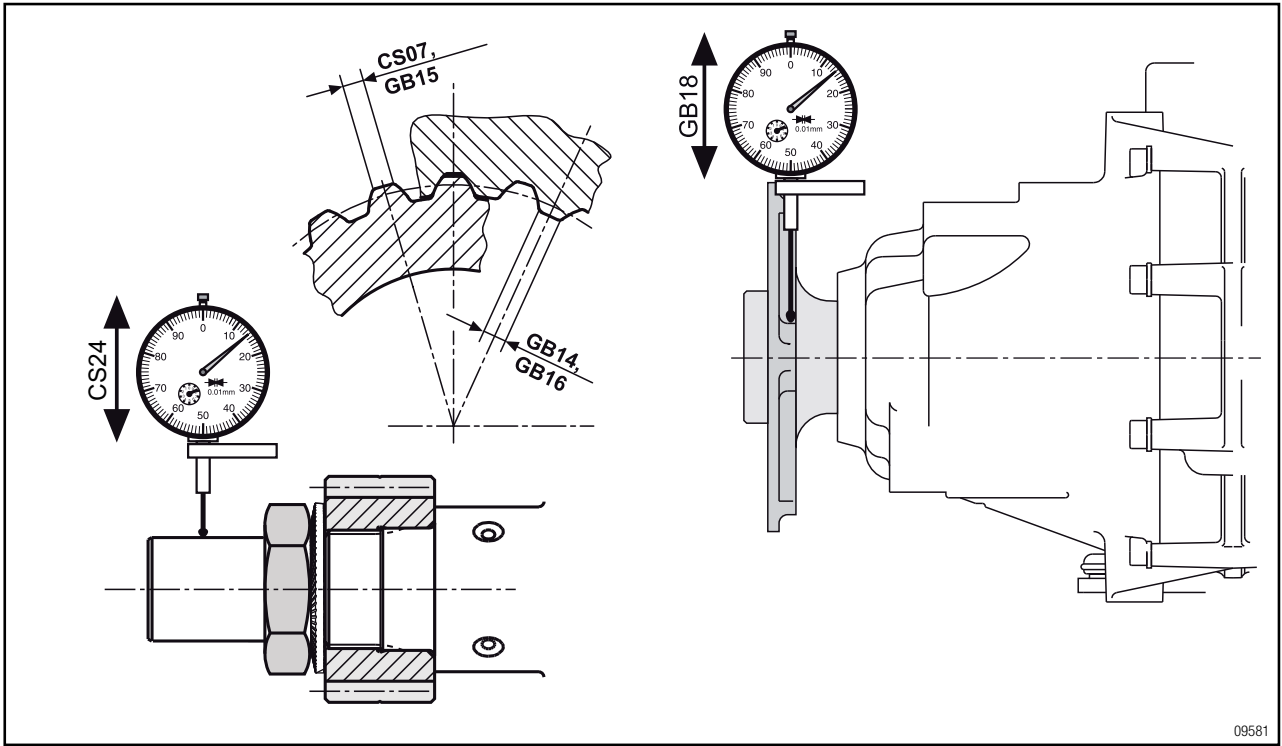
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Description	Code	Current measurement value		Tolerance limit	Tolerance limit		Measurements
		min	max	100 %	50 %		
Propeller gearbox							
1) Bearing bushing in gear cover							
Bore	GB01	28.03 mm 1.1035 in.	28.04 mm 1.1039 in.	28.10 mm 1.1063 in.	28.07 mm 1.1051 in.	current replaced	
Radial clearance	GB01	0.03 mm 0.0012 in.	0.05 mm 0.0020 in.	0.12 mm 0.0047 in.	0.09 mm 0.0035 in.	current replaced	
2) Propeller shaft							
Shaft diameter 35 mm	GB02	35.009 mm 1.3783 in.	35.020 mm 1.3787 in.	35.003 mm 1.3780 in.	35.006 mm 1.37815 in.	current replaced	
Shaft diameter 31.5 mm	GB03	31.470 mm 1.2390 in.	31.481 mm 1.2394 in.	31.460 mm 1.2386 in.	31.465 mm 1.2388 in.	current replaced	
Radial run-out, pro- peller flange at ø 122 mm	GB04	0.00 mm 0.000 in.	0.05 mm 0.0020 in.	0.06 mm 0.0024 in.	0.06 mm 0.0022 in.	current replaced	
Bore at rear end of propeller shaft (only in vers. 3)	GB05	11.00 mm 0.4331 in.	11.02 mm 0.4339 in.			current replaced	
Journal diameter at oil inlet flange (only in vers. 3)	GB06	10.935 mm 0.4305 in.	10.960 mm 0.4315 in.			current replaced	
Radial clearance, bore/journal	GB05/ GB06	0.040 mm 0.0016 in.	0.085 mm 0.0033 in.	0.160 mm 0.0063 in.	0.123 mm 0.0048 in.	current replaced	
3) Dog gear, thrust washer							
Thickness of thrust washer	GB11	1.075 mm 0.0423 in.	1.325 mm 0.0522 in.	1.000 mm 0.0394 in.	1.038 mm 0.0408 in.	current replaced	
Total height of disc spring	GB13	5.20 mm 0.2047 in.	5.40 mm 0.2126 in.	4.80 mm 0.1889 in.	5.00 mm 0.1968 in.	current replaced	

BRP-Powertrain
MAINTENANCE MANUAL

PROPELLER GEARBOX

Fig. 25



Description	Code	Current measurement value		Tolerance limit	Tolerance limit	Measur-ments
		min	max	100 %	50 %	
4) Gear profile						
Crankshaft	CS07	0.95 mm 0.0374 in.	1.00 mm 0.0374 in.	0.80 mm 0.0315 in.	0.88 mm 0.0344 in.	current replaced
Drive gear	GB14	0.95 mm 0.0374 in.	1.00 mm 0.0374 in.	0.80 mm 0.0315 in.	0.88 mm 0.0344 in.	current replaced
Propeller shaft	GB15	1.50 mm 0.0591 in.	1.60 mm 0.0630 in.	1.10 mm 0.0433 in.	1.30 mm 0.0512 in.	current replaced
Clutch/dog hub	GB16	1.50 mm 0.0591 in.	1.60 mm 0.0630 in.	1.10 mm 0.0433 in.	1.30 mm 0.0512 in.	current replaced
5) Gear set, backlash						
Pitting on drive gear up to 5%		0	0	5%	2.5%	current replaced
Pitting on dog gear up to 5%		0	0	5%	2.5%	current replaced
Gear backlash	GB18	0.07 mm 0.0028 in.	0.15 mm 0.0059 in.	0.20 mm 0.0079 in.	0.18 mm 0.0069 in.	current replaced

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Description	Code	Current measurement value		Tolerance limit	Tolerance limit		Measurements
		min	max	100 %	50 %		
6) Overload clutch							
Axial gap	GB07	1.0 mm 0.039 in.	1.2 mm 0.047 in.	0.5 mm 0.020 in.	0.8 mm 0.030 in.	current replaced	
Clutch/dog hub	GB08	0.0 mm 0.000 in.	0.0 mm 0.000 in.	0.2 mm 0.0079 in.	0.1 mm 0.0039 in.	current replaced	
Crankshaft							
Measure crankshaft run-out (installed in housing with drive gear)	CS24	0.000 mm 0.0000 in.	0.060 mm 0.0024 in.	0.080 mm 0.0031 in.		current replaced	

ASSEMBLY

Preparation

⚠ WARNING

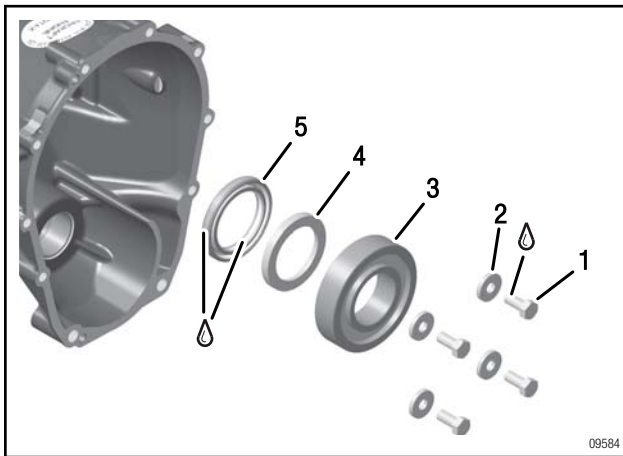
Danger of severe burns and scalds! Wear heat-resistant gloves!

- Heat the gearbox housing with hot air (or in an oven) to approx. 100 to 120°C.

INSTALLATION OF BALL BEARING

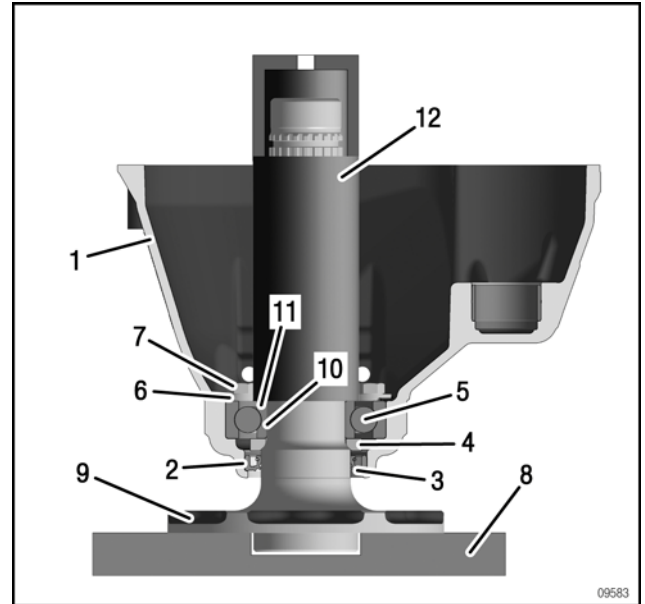
Step	Procedure
1	Press the oil seal into the gearbox housing from the inside using insertion jig part no. 876518. NOTE: Lubricate sealing lips with engine oil.
2	Insert the 36/50/5.5 radius ring with the radius facing the oil seal.
3	Insert the ball bearing. (The cage must be visible.) NOTE: The ball bearing must drop into the bearing position under its own weight!
4	Screw in 4 M7x16 hex. screws with hardened 7.2/18.8/3 washers. Tightening torque 15 Nm (132.72 in. lb.). NOTE: Secure screws with LOCTITE 243!

Fig. 26



1. M7x16 hex. screw 2. 7.2/18.8/3 washer
3. Ball bearing 6207 E THNC3 4. 36/50/5.5 radius ring
5. Oil seal AS 40x55x7 FPM

Fig. 27



- | | |
|---------------------|--------------------------|
| 1. Gearbox housing | 2. Oil seal |
| 3. Sealing lips | 4. 36/50/5.5 radius ring |
| 5. Ball bearing | 6. 7.2/18.8/3 washer |
| 7. M7x16 hex. screw | 8. Support |
| 9. Propeller shaft | 10. Bearing seat |
| 11. Inner ring | 12. Sleeve |

PROPELLER SHAFT - INSTALLATION

Preparation

- Place the propeller shaft with the gearbox housing placed on it onto a suitable flat support.
- Lubricate the propeller shaft with KLUEBER ISOFLEX TOPAS Nb5051 on the bearing seat.

NOTICE

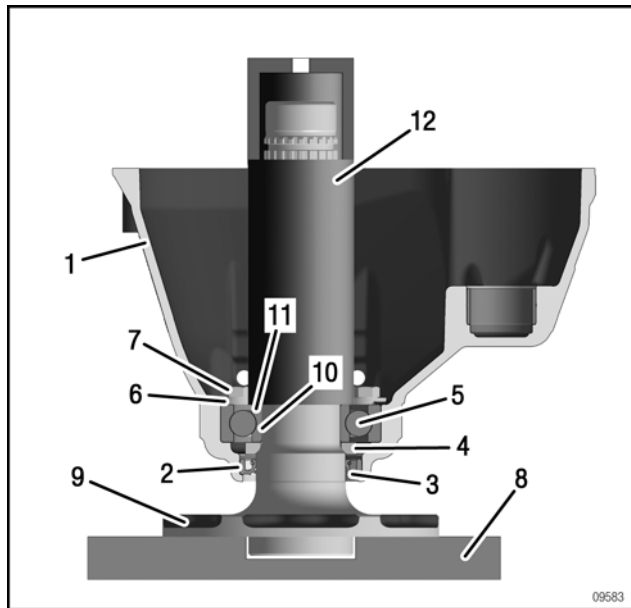
Push or press on, do not tap on.

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MAINTENANCE MANUAL

Step	Procedure
1	Pull on the sleeve, which is approx. 30 mm longer than the propeller shaft. NOTE: The inner diameter of the sleeve should be selected such that it presses on the inner ring of the bearing.
2	Press on the gearbox housing with a slight turning movement. NOTE: It is advantageous when the gearbox housing is still warm.

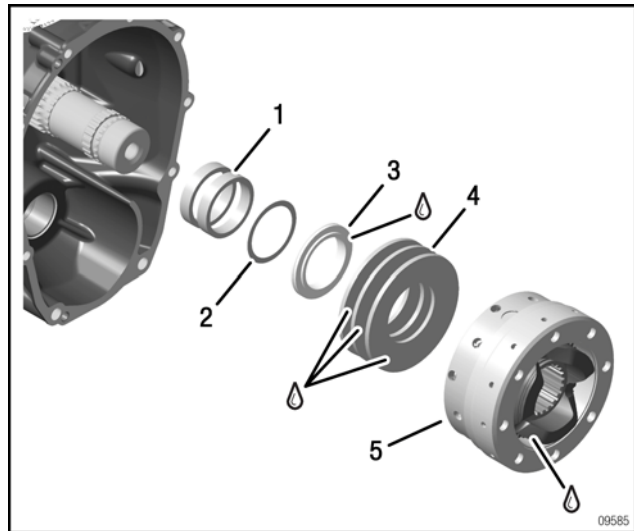
Fig. 28



- | | |
|---------------------|--------------------------|
| 1. Gearbox housing | 2. Oil seal |
| 3. Sealing lips | 4. 36/50/5.5 radius ring |
| 5. Ball bearing | 6. 7.2/18.8/3 washer |
| 7. M7x16 hex. screw | 8. Support |
| 9. Propeller shaft | 10. Bearing seat |
| 11. Inner ring | 12. Sleeve |

Step	Procedure
3	Push 2 x 35.2/42/8 distance sleeves onto the propeller shaft.
4	Lubricate 2 disc springs (lying against each other) along with the step collar (with a diameter of 40.8 mm facing the disc spring) with KLUEBER ISOFLEX TOPAS Nb5051 and push them on. NOTE: The disc springs must lie on the centring collar of the clutch hub!
5	Lubricate the third disc spring (with its rear facing the others) with KLUEBER ISO-FLEX TOPAS Nb5051 and push it on.
6	Lubricate the clutch on the gear profile with KLUEBER ISOFLEX TOPAS Nb5051 and push it onto the propeller shaft.

Fig. 29

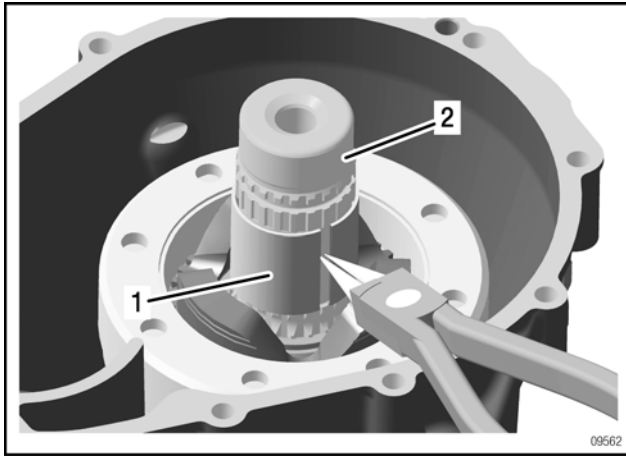


- | | |
|---------------------|----------------------|
| 1. Distance sleeves | 2. Compensating shim |
| 3. Step collar | 4. Disc springs |
| 5. Clutch assy. | |

Step	Procedure
7	Install the lubricated bearing bushing carefully on the propeller shaft with circlip pliers.

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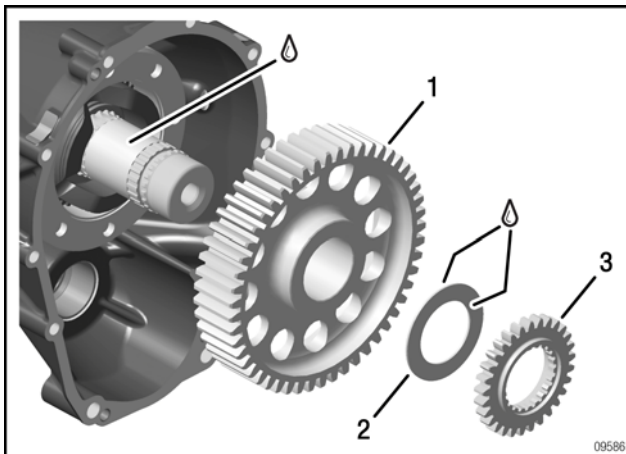
Fig. 30



1. Bearing bushing 2. Propeller shaft

Step	Procedure
8	Push on the gear (propeller shaft).
9	Lubricate the plastic 33.2/51/1.2 thrust washer on both sides with KLUEBER ISOFLEX TOPAS Nb5051 and push it on along with the drive gear.

Fig. 31



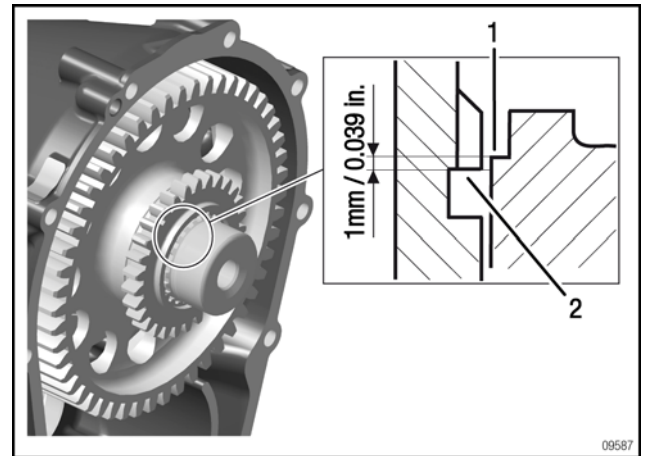
1. Gear (propeller shaft) 2. Thrust washer
 3. Drive gear

ADJUSTMENT OF THE DISC SPRING PRETENSION

NOTE: To make adjustment easier, it can be spaced out until the contact face for the ring halves aligns with the upper edge in the groove of the propeller shaft.

Step	Procedure
1	Place compensating shims between the distance sleeve and the step collar. NOTE: When the propeller shaft assembly is not tensioned, the contact face for the ring halves must lie 1 mm above the upper edge in the groove of the propeller shaft.

Fig. 32



1. Contact face 2. Upper edge

ASSEMBLY OF THE PROPELLER GEAR-BOX ASSY.

NOTICE

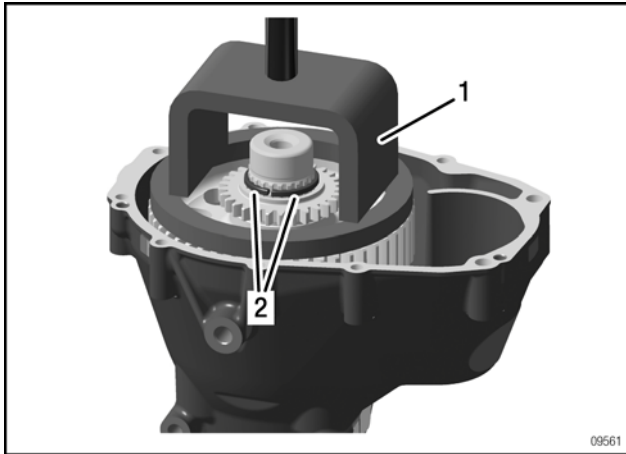
If the disc springs do not sit centrally, the gear (propeller shaft) cannot be pressed down enough to insert the ring halves. Do not increase the force, but remove the clutch again and center the disc springs correctly.

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Step	Procedure
1	Place the whole gearbox in a suitable fixture.
2	Press down the gear (propeller shaft) with a mounting yoke part no. 876885 and assemble with new ring halves.

Fig. 33



1. Mounting yoke
Part no. 876885

2. Ring halves

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MAINTENANCE MANUAL

INSTALLATION

Preparation

NOTICE

No hammering or pressing!
 The drive gear must only be pushed on manually.

NOTICE

Ensure that the friction washer is in the correct installation position.

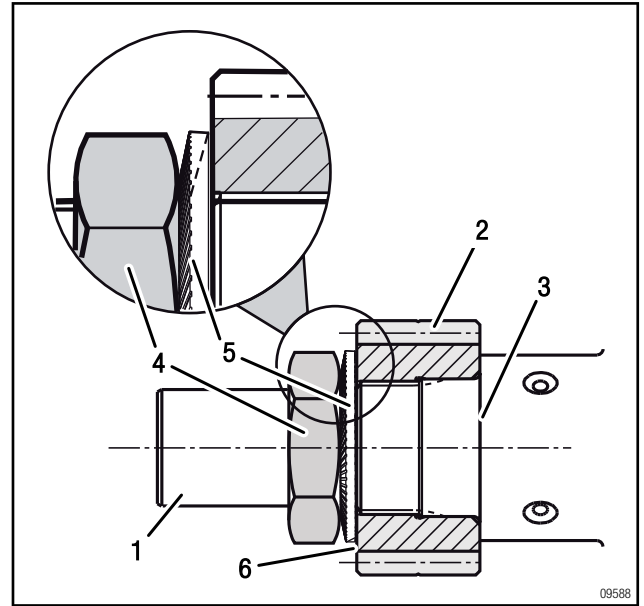
NOTICE

The dog and drive gears are in pairs.
 Only use parts with the same serial number.

- Clean and degrease all parts carefully.
- Remove LOCTITE adhesive residue with LOCTITE 7063.
- Visual inspection of the crankshaft on the power take off side.

Step	Procedure
1	Push the drive gear onto the crankshaft. NOTE: Due to limited tolerances, it may be difficult to push the drive gear onto the end of the crankshaft. If necessary, push it on in another position.
2	Secure the M30x1.5 hex. nut with LOCTITE 648 and screw it onto the crankshaft along with the VS-30 friction washer. Tightening torque 200 Nm (147.5 ft.lb.).

Fig. 34



- | | |
|-------------------------------------|------------------|
| 1. Crankshaft (power take off side) | 2. Drive gear |
| 3. Crankshaft | 4. Hex. nut |
| 5. VS-30 friction washer | 6. Serial number |

NOTICE

The sealing surface must be free from dirt and oil.

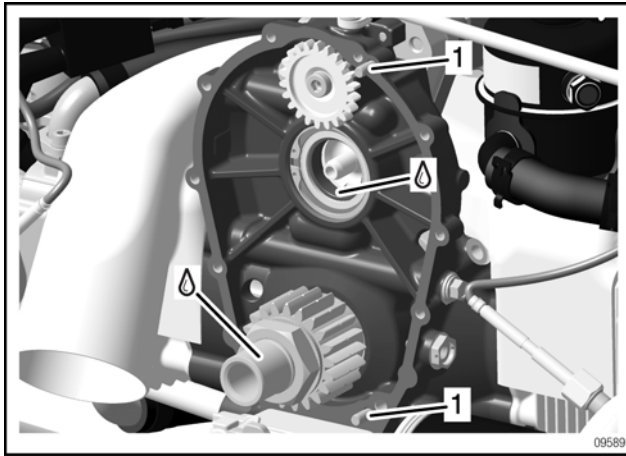
See Fig. 35

Step	Procedure
3	Inspect the run-out. See also section 72-10-00 Wear limits. (CS24) NOTE: If there is slight vertical run-out, replace the nut and repeat the measurement.
4	Insert 2 6x20 dowel pins into the crankcase.
5	Hold the roller bearing rollers in position with KLUEBER ISOFLEX TOPAS Nb5051 and lubricate the bearing position of the propeller shaft and crankshaft.

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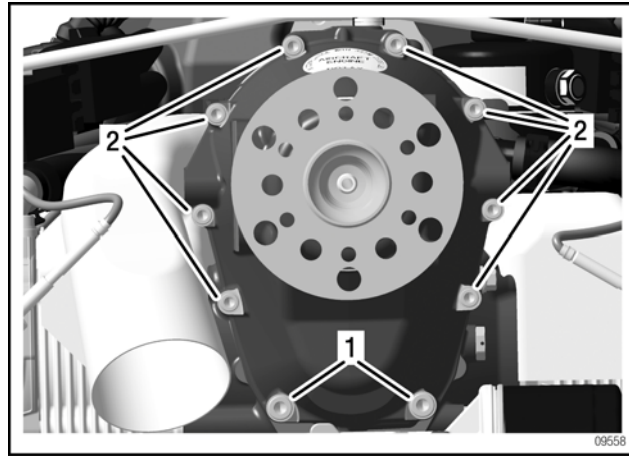
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MAINTENANCE MANUAL

Fig. 35



1. 6x20 dowel pins

Fig. 36



1. M8 Allen screw

2. M6 Allen screw

NOTICE

If excessive installation force is used, the bearing or vacuum pump gear can be damaged.

Step	Procedure
6	Apply LOCTITE 5910 surface sealing compound to the sealing surface of the gearbox housing and place on the gear cover assy. with the pre-assembled gearbox. NOTE: Move the propeller shaft a little to allow the dog gear to engage.
7	Tap gently on the gearbox housing with a soft-faced hammer to position the gearbox on the crankcase. NOTE: If there is a large amount of resistance at a gap of approximately 10 mm, the bearing rollers of the roller bearing may not be in position.

Step	Procedure
8	Tighten 2 M8x45 Allen screws and 8 M6x45 Allen screws with washers 6.4 diagonally from each other. Tightening torque M6: 10 Nm (88.5 in.lb.) Tightening torque M8: 25 Nm (18.4 ft.lb.)
9	Inspect the run-out. See also section 72-10-00 Wear limits. (GB18)

Finishing work

- Fill with operating fluids or check filling levels. To do this, see section 12-10-00 Adding operating fluids.
- Carry out an engine test run. See relevant Maintenance Manual Line for the 912 i Series engine type.
- After the engine test run, check the engine and gearbox for leaks.

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BRP-Powertrain
MAINTENANCE MANUAL

Chapter: 72-20-00
ENGINE BLOCK

Introduction

This section describes the maintenance of the ROTAX 912 i Series engine block. The description is divided into sub-section and explanations of system functions.

Subject	Page
1. Introduction	Page 1
2. Special tools	Page 3
3. Service products	Page 3
4. General note	Page 5
5. Safety information	Page 5
6. Removal	Page 5
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B. Removal of the sprag clutch housing	Page 5
7. Disassembly	Page 6
C. Disassembling the sprag clutch housing	Page 6
8. Inspection	Page 7
D. Sprag clutch housing parts check	Page 7
(1) Sprag clutch housing check	Page 7
(2) Sprag clutch check	Page 8
(3) Free wheel gear check	Page 8
(4) Starter intermediate gear check	Page 8
9. Assembly	Page 9
E. Assembly of the sprag clutch housing	Page 9
10. Installation	Page 11
F. Preparation	Page 11
G. Installation of the sprag clutch housing	Page 11
H. Measuring the axial clearance of the free wheel gear	Page 12
11. Wear limits	Page 13
12. Finishing work	Page 13

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NOTES

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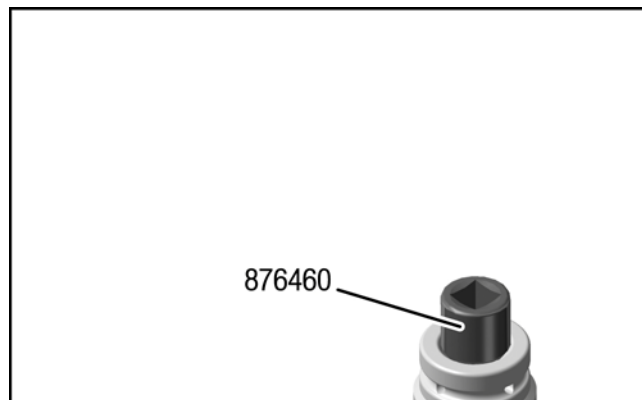
Chapter: 72-20-00
ENGINE BLOCK

SPECIAL TOOLS

Description	Part no.
Hot air gun	n.a.
Puller	877375
Seeger ring pliers	n.a.
Free wheel gear axial clearance measuring fixture	n.a.
38x20 insert for SW32 hex. nut, magneto side crankshaft	876070
A 20x12.5 reducing socket	877460
Protection mushroom	876557

SERVICE PRODUCTS

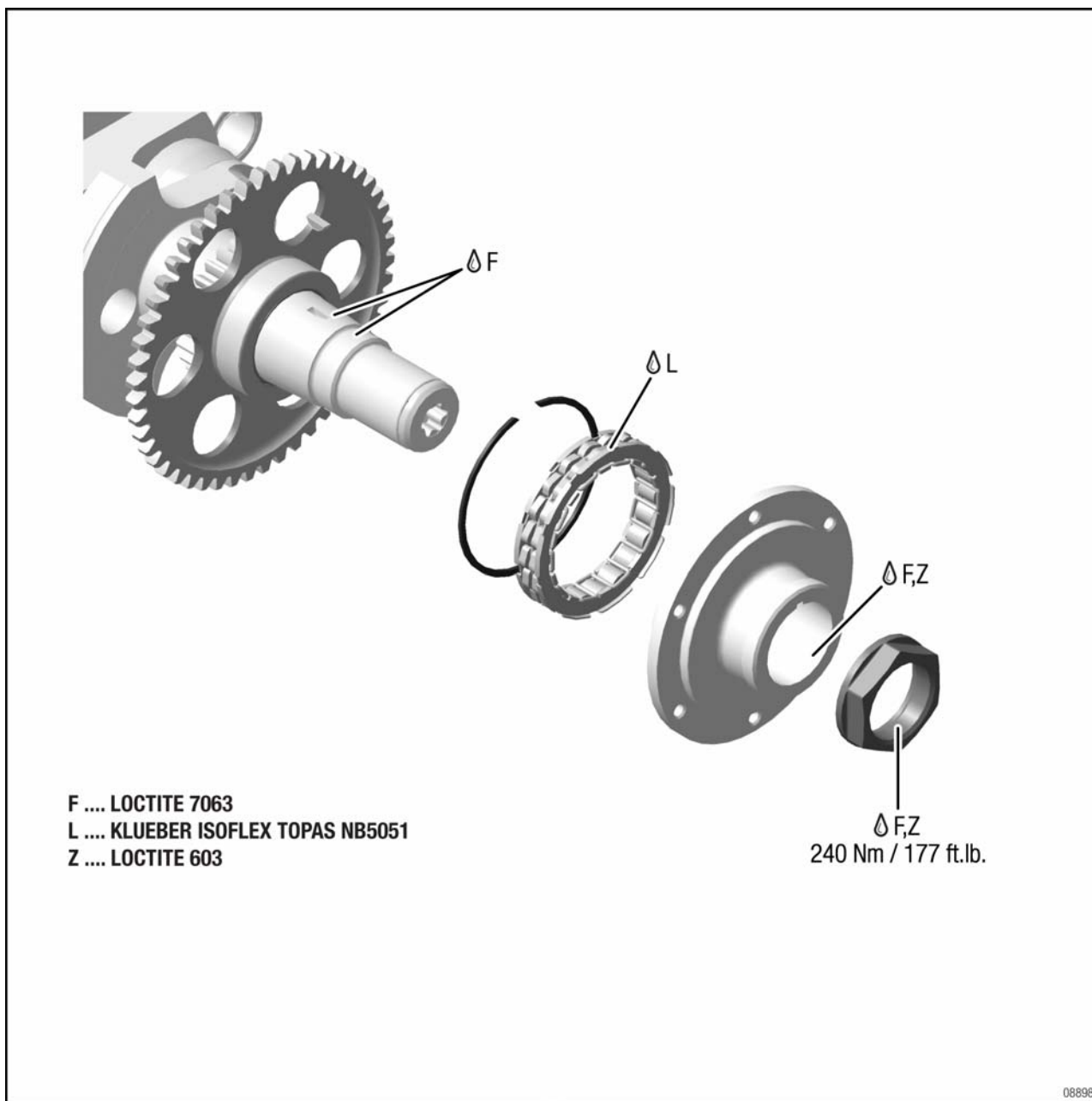
Description	Part no.
Klueber ISOFLEX TOPAS NB5051	898351
LOCTITE 7063	898450
LOCTITE 603	899789



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MAINTENANCE MANUAL

Engine block



GENERAL NOTE

This section only describes work relating directly to repairing the engine block and its assemblies. Note the cross-references to maintenance work and work on other assemblies which is necessary when working on the engine block.

SAFETY INSTRUCTIONS

⚠ WARNING

Danger of severe burns and scalds! Allow the engine to cool to ambient temperature before starting work.

MAINTENANCE

As well as the maintenance and special checks, see the relevant Maintenance Manual Line for the respective 912 i Series engine type.

REMOVAL

Before the sprag clutch is removed, the work described below must be carried out to identify any further faults in the engine block and rectify them as part of repair work.

NOTICE

If these checks are omitted, it may be necessary to dismantle the cylinder head again to rectify any faults after it has been repaired.

- General visual inspection. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Engine cleaning. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Carry out an engine test run. See relevant Maintenance Manual Line for the 912 i Series engine type.

SPRAG CLUTCH - REMOVAL

Preparation

NOTICE

Use appropriate protective coverings to prevent the ingress of debris particles into all disconnected lines and connections.

- Remove the electric starter. See also section 80-00-00 Electric starter.
- Remove the ignition housing and fly wheel. See section 24-20-00 Internal generator.
- Fix the crankshaft into place. See relevant Maintenance Manual Line for the 912 i Series engine type.

NOTE: The assemblies and lines are only to be removed if necessary and only as far as is necessary!

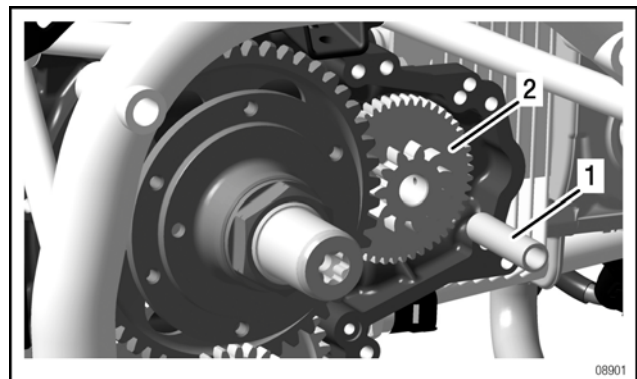
REMOVAL OF THE SPRAG CLUTCH HOUSING

Step	Procedure
1	Pull out the intermediate gear shaft.
2	Remove the starter intermediate gear.

NOTICE

The M32x1.5 hex. collar nut (secured with LOC-TITE 603) must be heated correspondingly. The nut has a left handed thread!

Fig. 1



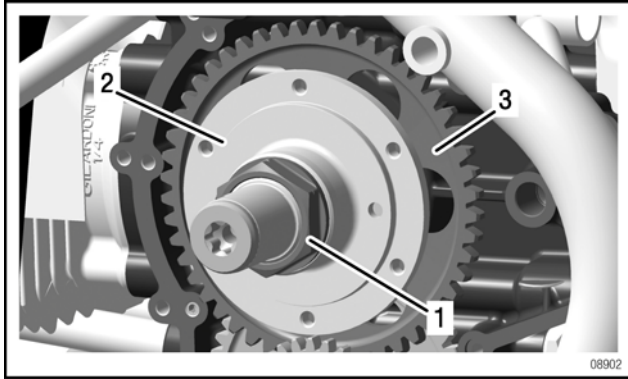
1. Intermediate gear shaft 2. Intermediate gear

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MAINTENANCE MANUAL

Step	Procedure
3	Heat the hex. collar nut about 100 °C to 120 °C using a hot air gun.
4	Loosen the M32x1.5 hex. collar nut from the crankshaft with a SW 38 socket part no. 876075.

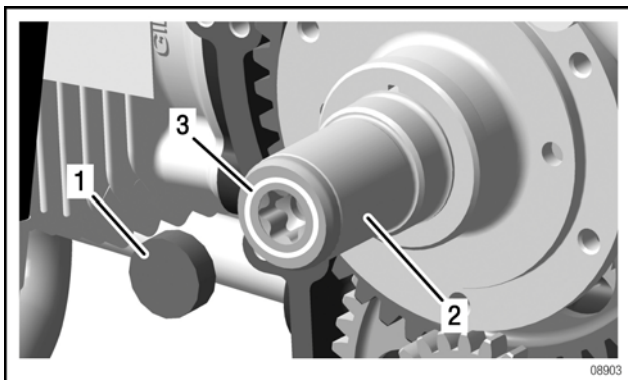
Fig. 2



1. M32x1.5 hex. collar nut 2. Sprag clutch housing
 3. Free wheel gear

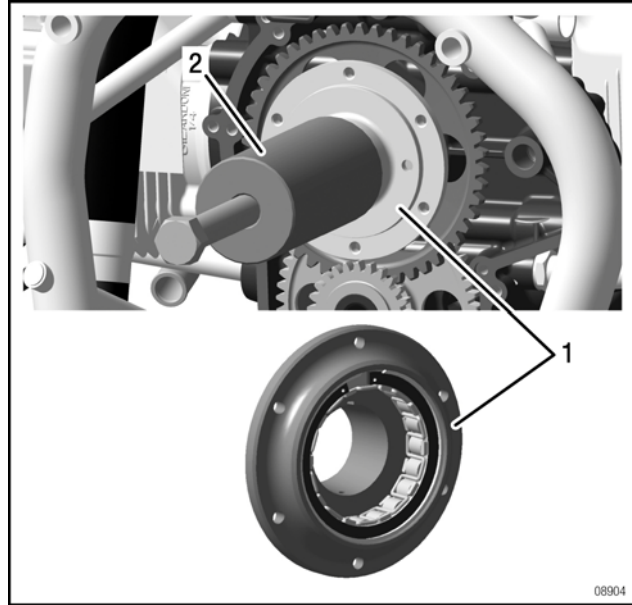
Step	Procedure
5	Lubricate the end of the crankshaft with KLUEBER ISOFLEX TOPAS Nb5051 and press the protection piece onto the crankshaft.
6	Pull off the sprag clutch housing using the puller part no. 877375.

Fig. 3



1. Protection piece 2. Crankshaft
 3. End of crankshaft

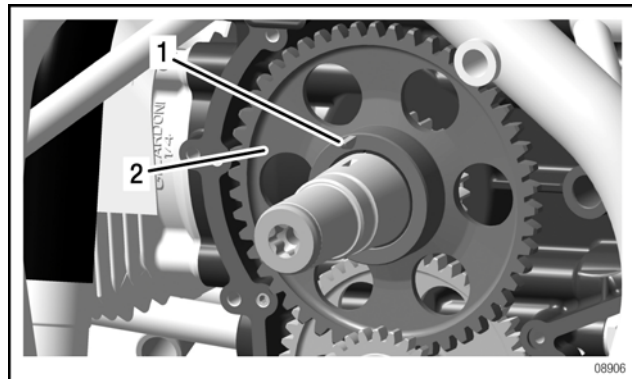
Fig. 4



1. Sprag clutch housing 2. Puller part no. 877375

Step	Procedure
7	Remove the woodruff key from the crankshaft.

Fig. 5



1. Woodruff key 2. Free wheel gear

DISASSEMBLY

DISASSEMBLING THE SPRAG CLUTCH HOUSING

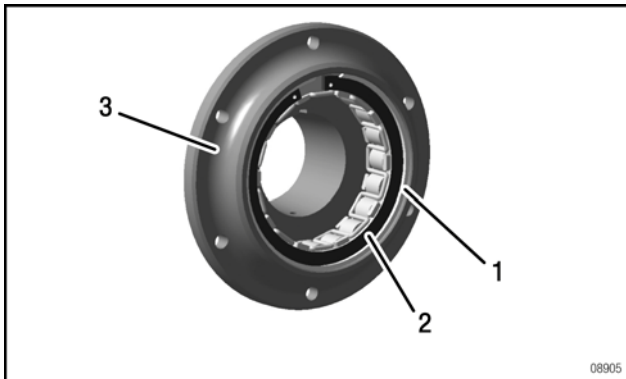
The sprag clutch housing should be disassembled on a clean surface. There must be enough space to lay out the removed parts to ensure

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that all the parts can be laid out and allocated according to their installation position.

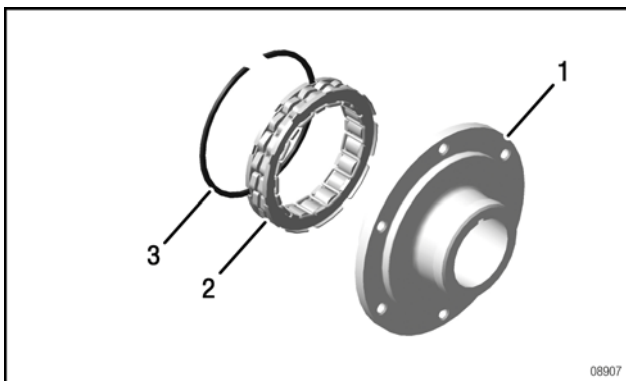
Step	Procedure
1	Remove the circlip from the sprag clutch housing.
2	Compress the Seeger ring slightly using Seeger ring pliers and take the sprag clutch out of the sprag clutch housing while turning it.

Fig. 6



1. Circlip 2. Seeger ring
 3. Sprag clutch housing

Fig. 7



1. Sprag clutch housing 2. Sprag clutch
 3. Circlip

INSPECTION

**SPRAG CLUTCH HOUSING
 SINGLE PARTS CHECK**

Preparation

- Clean all parts carefully. See also section 05-00-00 "Procedures"

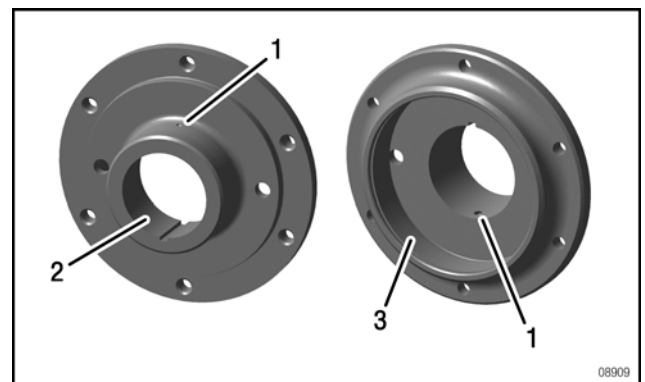
SPRAG CLUTCH HOUSING CHECK

Step	Procedure
1	Check whether oil sludge has accumulated in the sprag clutch housing.
2	Check that the oil nozzle for the generator is clear. NOTE: The nozzle is 0.8 mm in diameter. Check using a 0.5 mm wire.
3	Check crankshaft bore.
4	Check the cone surface.
5	Check the sprag clutch engagement faces in the sprag clutch housing.

NOTICE

If the oil nozzle is clogged, the generator coils are no longer cooled sufficiently.

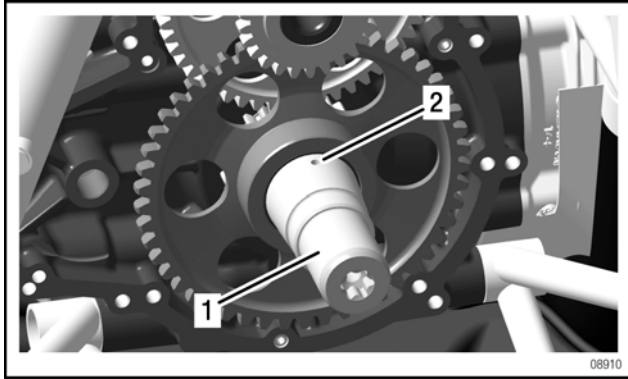
Fig. 8



1. Oil nozzle 2. Cone surface
 3. Sprag clutch engagement face

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Fig. 9

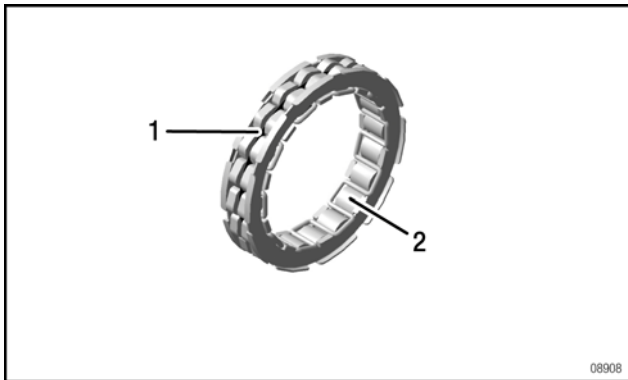


1. Crankshaft 2. Crankshaft bore (oil duct)

SPRAG CLUTCH CHECK

Step	Procedure
1	Check whether oil sludge has accumulated in the sprag clutch and in the spear body.
2	The spear body of the sprag clutch must be freely movable and may not be damaged.
3	The surrounding helical spring must not be loose or bent in a serpentine manner; replace the sprag clutch if necessary.

Fig. 10



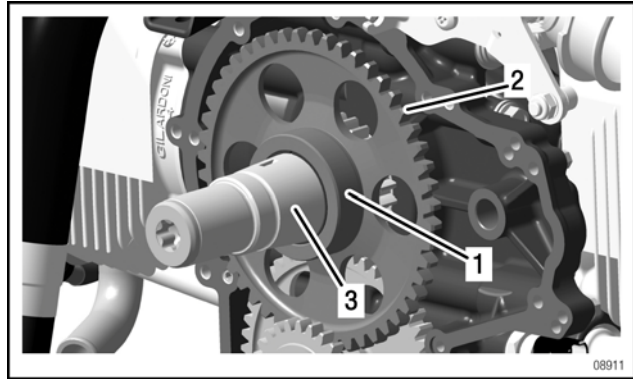
1. Helical spring 2. Spear body

FREE WHEEL GEAR CHECK

Step	Procedure
1	Check the gear-tooth system of the free wheel gear.

Step	Procedure
2	Check the sprag clutch engagement face on the free wheel gear.
3	Check the cone surface.

Fig. 11



1. Sprag clutch engagement face 2. Gear-tooth system
 3. Cone surface

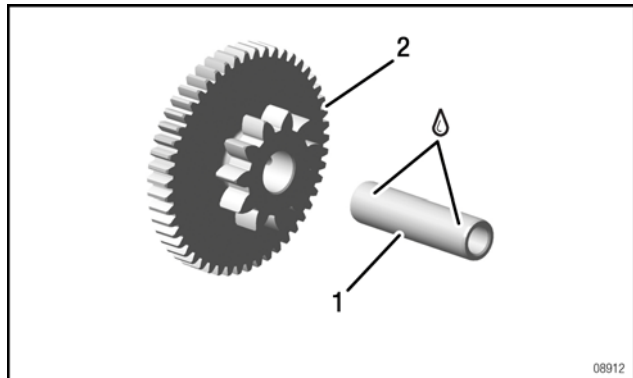
STARTER INTERMEDIATE GEAR CHECK

Step	Procedure
1	Check the gear-tooth system of the starter intermediate gear.
2	Check the intermediate gear shaft for damage.

NOTICE

If the gear-tooth system is deformed, the starter intermediate gear must be replaced.

Fig. 12



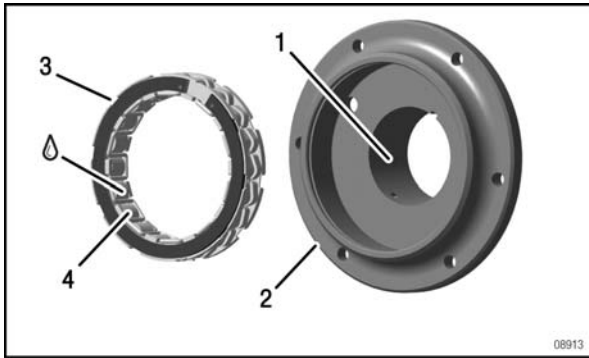
1. Intermediate gear shaft 2. Starter intermediate gear

ASSEMBLY

ASSEMBLY OF THE SPRAG CLUTCH HOUSING

Step	Procedure
1	Clean the cone of the sprag clutch housing with a cloth.
2	Apply KLUEBER ISOFLEX TOPAS to the spear body.

Fig. 13

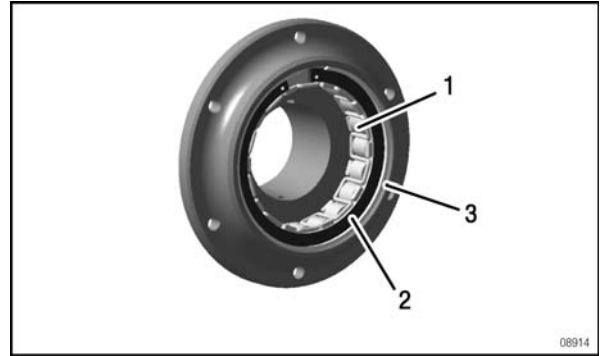


- 1. Cone
- 2. Sprag clutch housing
- 3. Sprag clutch
- 4. Spear body

Step	Procedure
3	Place the sprag clutch in the sprag clutch housing; the Seeger ring must be visible.
4	Install the circlip so that its chamfer faces the sprag clutch.

NOTE: To assemble it, compress it slightly with Seeger ring pliers and ensure that the Seeger ring remains in position and latches completely with the noses in the sprag clutch body.

Fig. 14



- 1. Sprag clutch
- 2. Seeger ring
- 3. Circlip

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INSTALLATION

Preparation

- Fix the crankshaft into place. See relevant Maintenance Manual Line for the 912 i Series engine type.

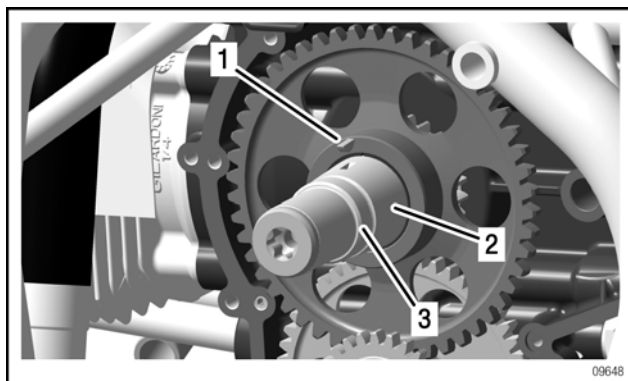
INSTALLATION OF THE SPRAG CLUTCH HOUSING

NOTICE

Approx. 2 to 3 mm on the underside of the sprag clutch housing must not be lubricated with LOCTITE 603. Otherwise the bearing bushing and the free wheel gear may stick to the crankshaft and the sprag clutch may be abraded as a result.

Step	Procedure
1	Degrease the thread and cone of the crankshaft with LOCTITE 7063 and place the woodruff key in the crankshaft.

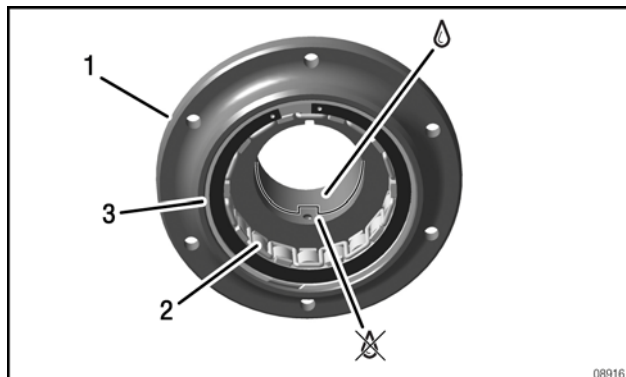
Fig. 15



1. Woodruff key 2. Cone
 3. Thread

Step	Procedure
2	Degrease the cone in the sprag clutch housing with LOCTITE 7063 and lubricate thinly with LOCTITE 603.

Fig. 16



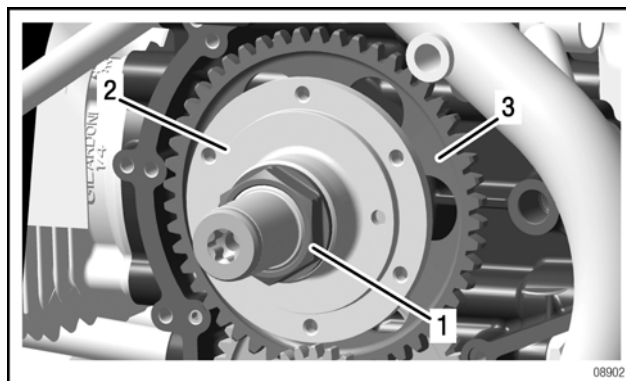
1. Sprag clutch housing 2. Spear body
 3. Circlip

See Fig. 17 to Fig. 18.

Step	Procedure
3	Place the sprag clutch housing on the crankshaft. Turn the free wheel gear in the process to align the spear body.
4	Degrease M32x1.5 hex. collar nut with LOCTITE 7063, then secure it with LOCTITE 603 and tighten it. Tightening torque 240 Nm (177 ft.lb.).

NOTE: The free wheel gear must drive the crankshaft when turned anticlockwise and must be freely rotatable when turned clockwise, viewed towards the magneto side of the engine.

Fig. 17

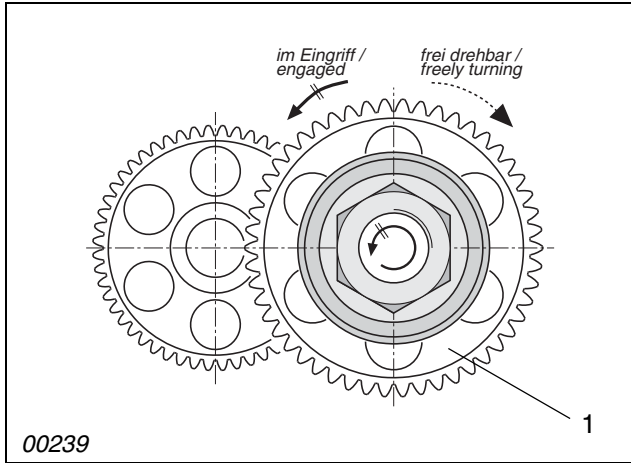


1. M32x1.5 hex. collar nut 2. Sprag clutch housing
 3. Free wheel gear

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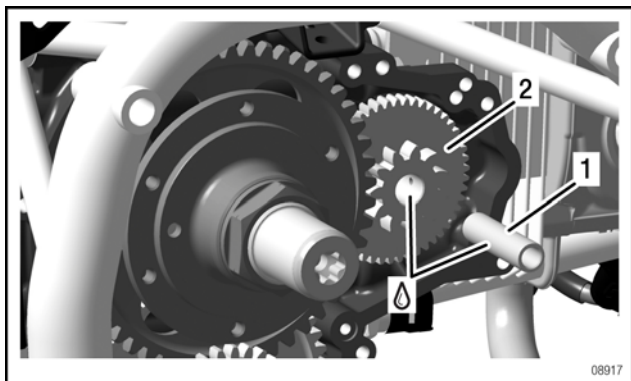
Fig. 18



1. Free wheel gear

Step	Procedure
5	Lubricate the intermediate gear shaft and bore of the starter intermediate gear with KLUEBER ISOFLEX TOPAS.
6	Install the starter intermediate gear.
7	Install the intermediate gear shaft.

Fig. 19



1. Intermediate gear shaft 2. Starter intermediate gear

MEASURING THE AXIAL CLEARANCE OF THE FREE WHEEL GEAR

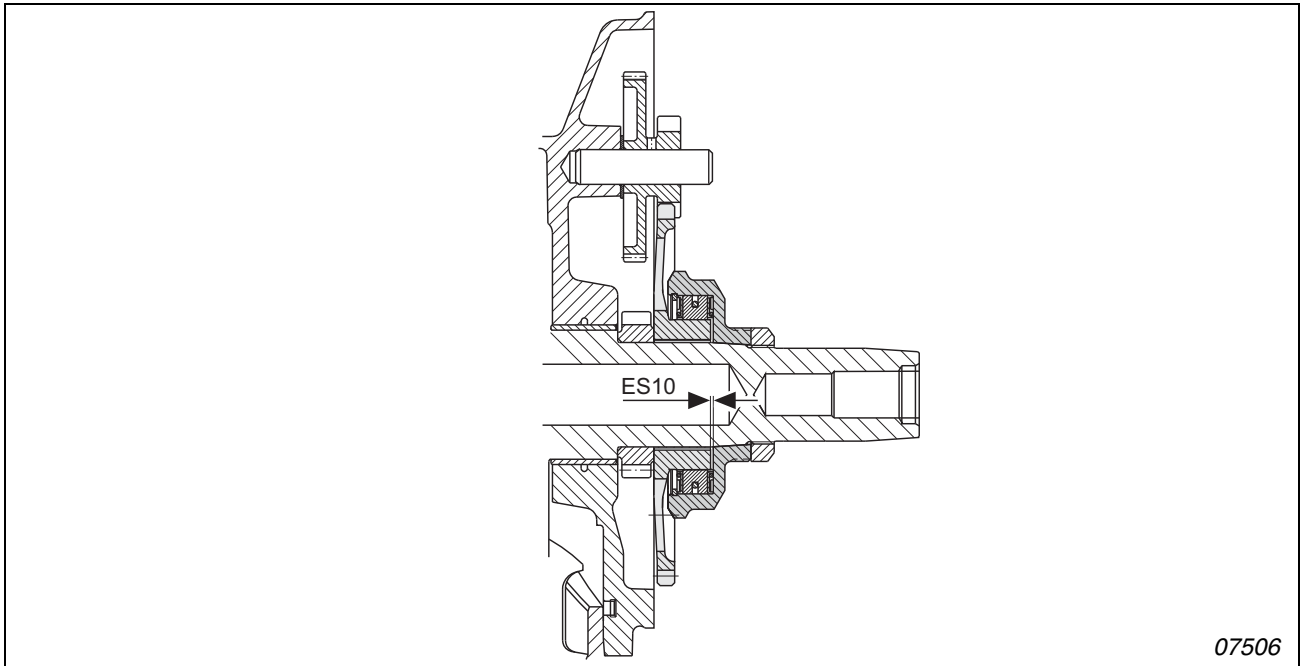
See Fig. 20.

NOTICE

If there is no or too little axial clearance, the sprag clutch may not be release and the electric starter may be damaged.

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Fig. 20



WEAR LIMITS

Free wheel gear

Description	Code	Current measurement value		Tolerance limit	Tolerance limit	Measurements
		min	max	100 %	50 %	
Axial clearance	ES10	0.5 mm 0.020 in.	1.1 mm 0.043 in.	0.2 mm 0.008 in.	0.4 mm 0.014 in.	current replaced

FINISHING WORK

- Install the ignition housing and fly wheel. See also section 24-20-00 Internal generator.
- Install the surrounding assemblies.
- Fill with operating fluids or check filling levels. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Carry out an engine test run. See relevant Maintenance Manual Line for the 912 i Series engine type.

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Chapter: 72-30-00
CYLINDER HEAD

Introduction

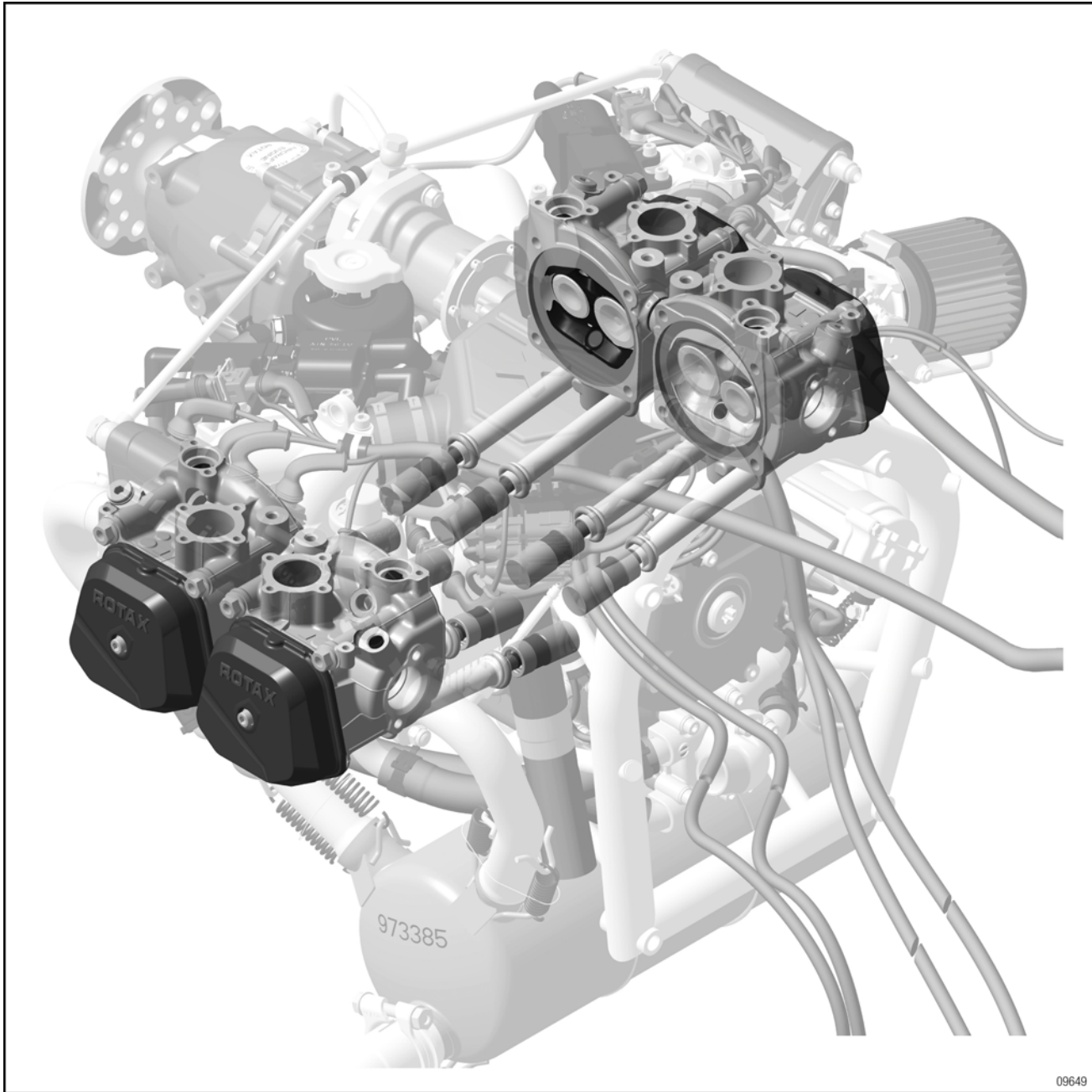
This section describes the maintenance of the ROTAX 912 i Series cylinder head. The description is divided into sub-sections and explanations of system functions.

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2. Special tools	Page 3
3. Service products	Page 3
4. System description	Page 5
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D. Disassembling the cylinder head	Page 9
(1) Removal the rocker arms	Page 9
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(5) Removal of the coolant elbow outlet	Page 10
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J. Valve cover - installation	Page 28
12. Finishing work	Page 29

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Location on the engine



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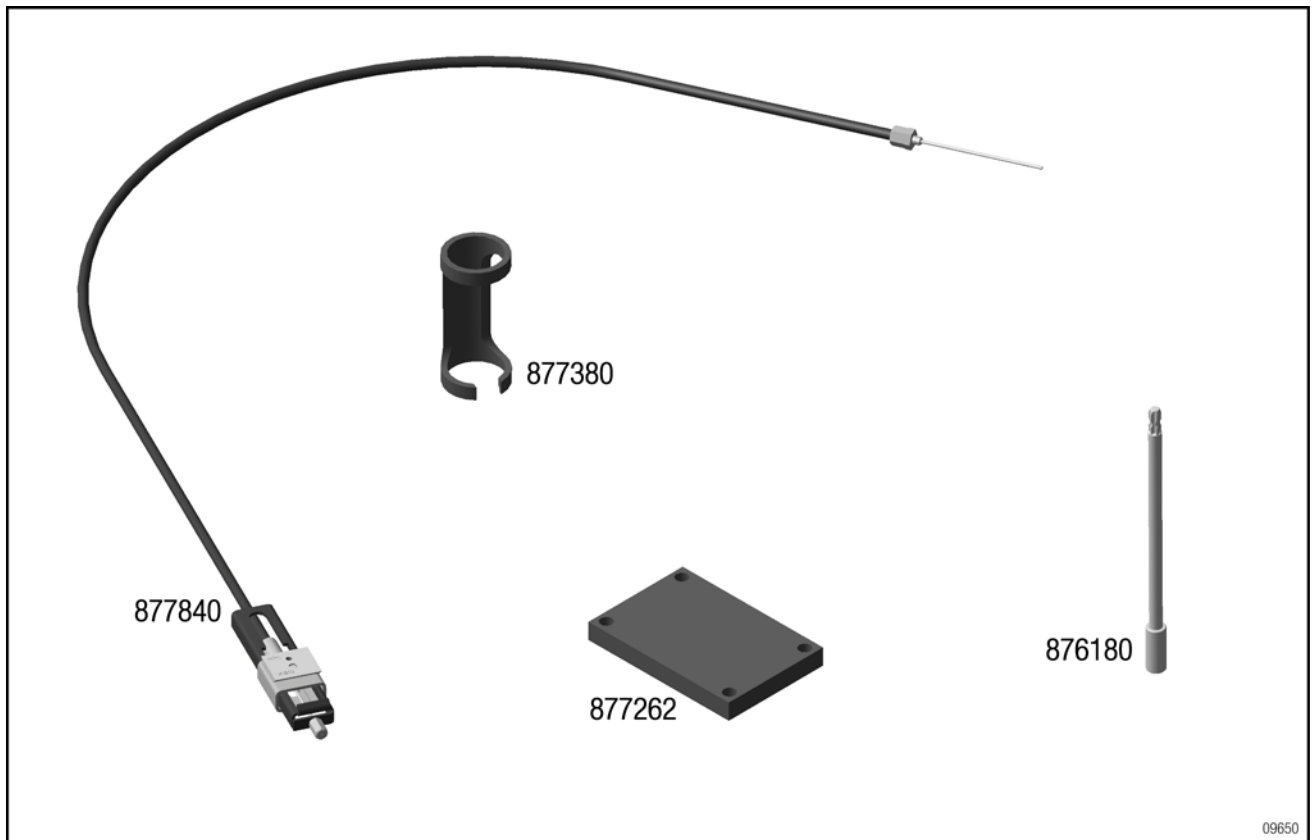
Chapter: 72-30-00
CYLINDER HEAD

SPECIAL TOOLS

Description	Part no.
Cylinder aligning tool	877262
Measuring fixture (valve spring inspection)	n.a.
Spring clamp pliers	877840
Valve spring mounting device	877380
Torx T30 ball-head insert	876180
Collet	n.a.

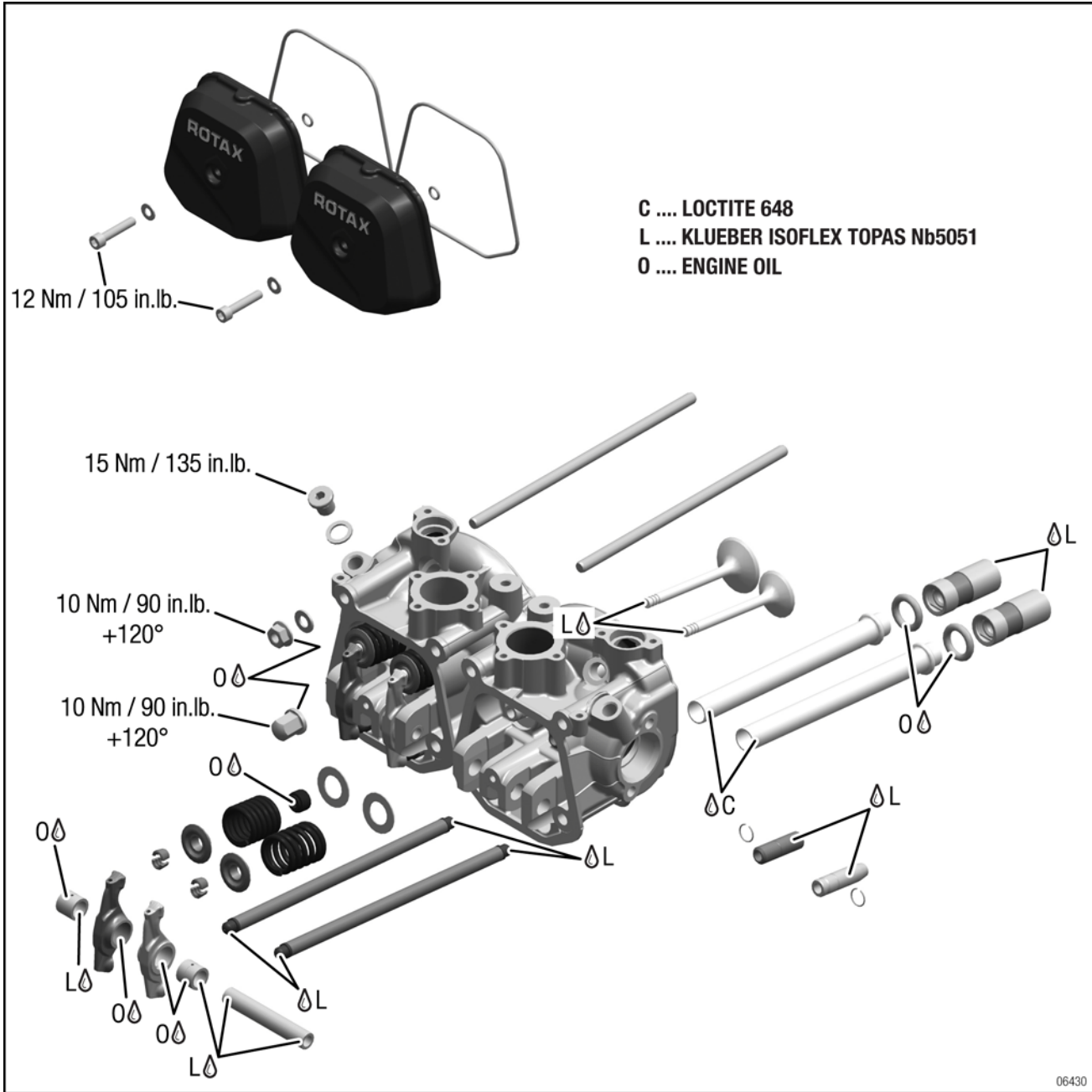
SERVICE PRODUCTS

Description	Part no.
KLUEBER ISOFLEX TOPAS NB5051	898351
LOCTITE 648	899788
Engine oil	n.a.



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Cylinder head



SYSTEM DESCRIPTION

The 912 i Series engine has 4 liquid-cooled cylinder heads.

SAFETY INFORMATION

⚠ WARNING

Danger of severe burns and scalds! Always allow the engine to cool down to ambient temperature before starting any work.

MAINTENANCE

As well as the maintenance and special checks, see the relevant Maintenance Manual Line for the respective 912 i Series engine type.

REMOVAL

CYLINDER HEAD - REMOVAL

Preparation

Before the cylinder head is removed, the work described below must be carried out to identify any further faults in the cylinder head and rectify them as part of repair work.

NOTICE

If these checks are omitted, it may be necessary to dismantle the cylinder head again to rectify any faults after it has been repaired.

- General visual inspection. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Carry out an engine test run. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Engine cleaning. See relevant Maintenance Manual Line for the 912 i Series engine type.

INSTALLATION OF SURROUNDING ASSEMBLIES

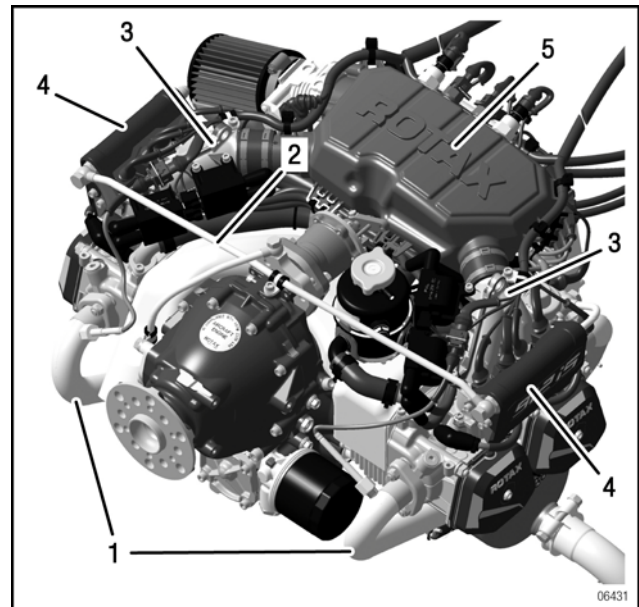
NOTICE

Use appropriate protective coverings to prevent the ingress of foreign bodies into all disconnected lines and connections.

NOTE: The assemblies and lines are only to be removed if necessary and only as far as is necessary!

Step	Procedure
1	If parts of more than one cylinder are removed, they must be numbered accordingly.
2	Remove the exhaust system. See also section 78-10-00 Exhaust.
3	Remove the fuel hose assy. and outlet if necessary. To do this, see section 73-10-00 Fuel pump and distribution.

Fig. 1



- | | |
|--------------------|--------------------|
| 1. Exhaust system | 2. Fuel hose assy. |
| 3. Intake manifold | 4. Fuel rail |
| 5. Airbox | |

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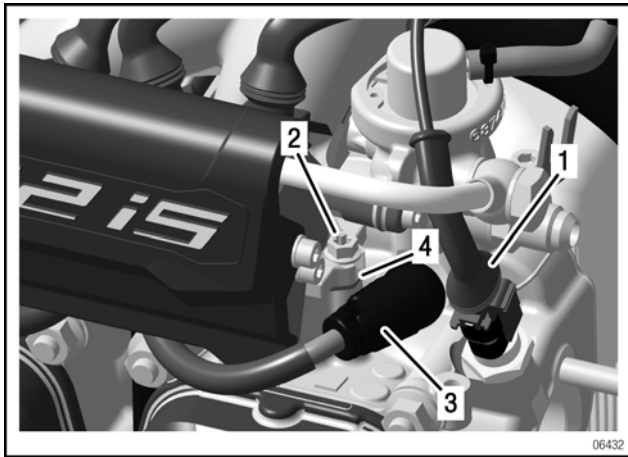
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Step	Procedure
4	Disconnect the wiring harness from the temperature sensor and remove the temperature sensor. To do this, see section 76-70-00 Sensors and actuators.
5	Loosen 4 M6x20 hex./torx collar screws from the intake manifold.

NOTE: Remove the 2 insulating flanges between the intake manifold and the cylinder head.

6	Disconnect the resistance spark plug connector and remove the spark plugs. See also section 74-20-00 Distribution.
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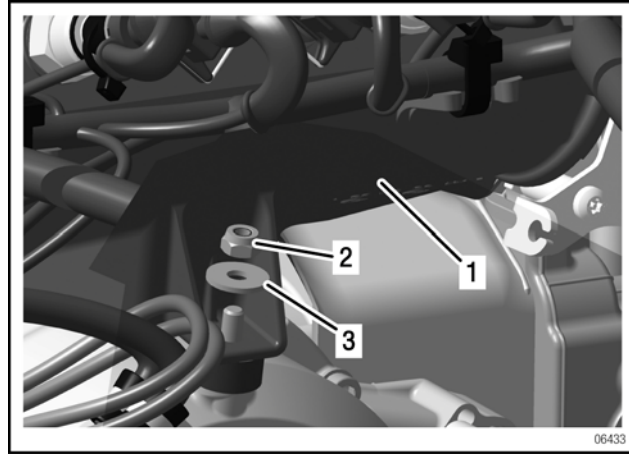
Fig. 2



1. Temperature sensor 2. M6x20 hex./torx collar screw
3. Resistance spark plug connector 4. Insulating flange connector

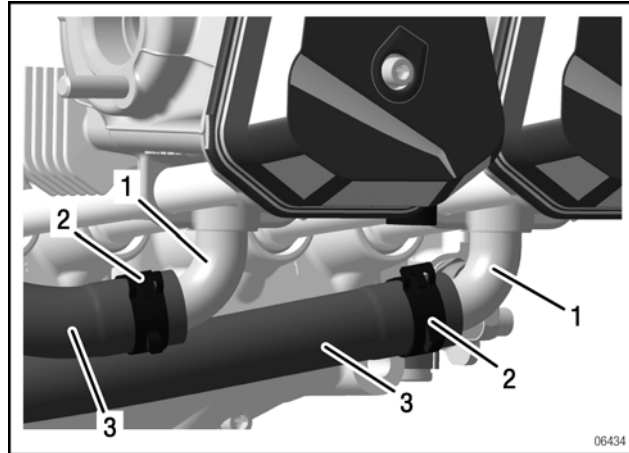
Step	Procedure
7	Release the attachment of the airbox to the ignition housing.
8	Take off the spring type hose clip 25 using spring clamp pliers part no. 877840.
9	Mark the coolant hoses and pull them out of the coolant elbows (inlet). See also section 75-00-00 Cooling system.

Fig. 3



1. Airbox 2. M6 hex. nut
3. 6.4 washer

Fig. 4



1. Coolant elbow 2. Spring type hose clip 25
3. Coolant hose

See Fig. 5.

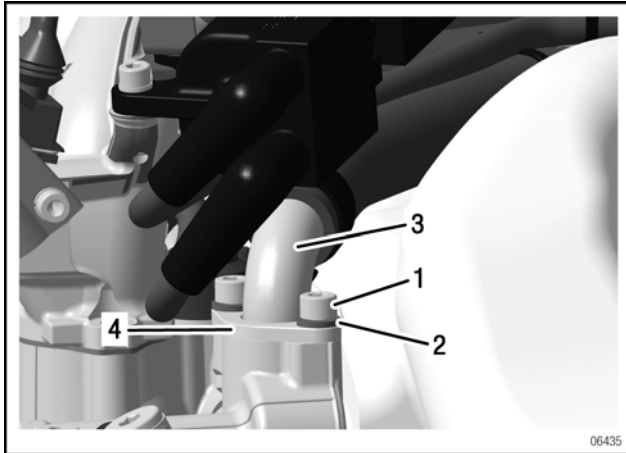
Step	Procedure
10	Loosen 2 M6x20 Allen screws along with the washers and remove the elbow flange.

NOTE: There is an O-ring under the elbow flange. Remove the connector brackets on cylinder 3/4.

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Fig. 5



- 1. M6x20 Allen screw
- 2. 6.4 washer
- 3. Coolant elbow
- 4. Elbow flange

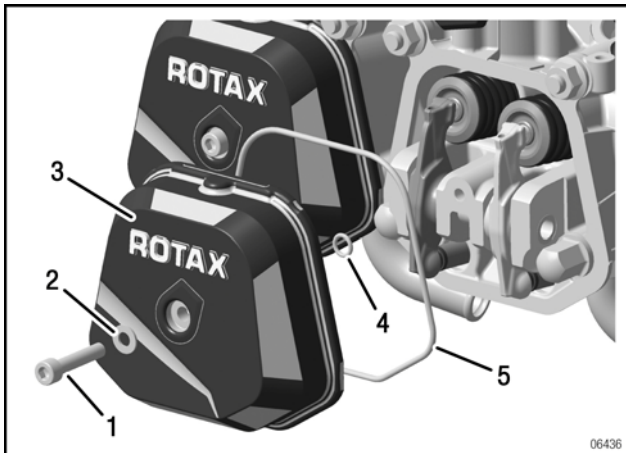
Step	Procedure
11	Remove the knock sensor from cylinder 1. To do this, see section 76-70-00 Sensors and actuators.

CYLINDER HEAD - REMOVAL

See Fig. 6 to Fig. 8.

Step	Procedure
1	Loosen the M6x30 screw and washer.
2	Remove the valve cover with the large and small O-rings.

Fig. 6



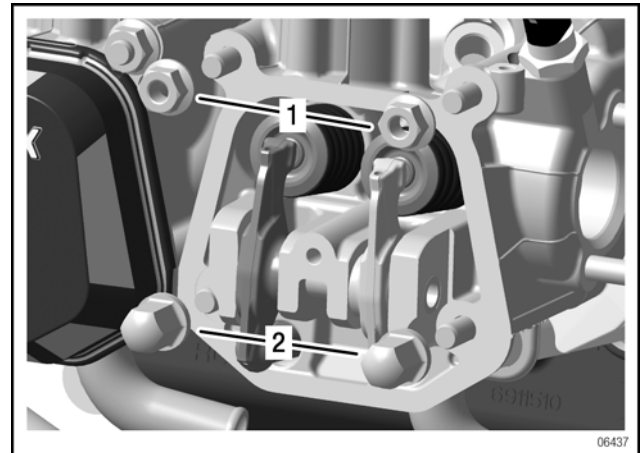
- 1. M6x30 screw
- 2. 6.0 washer
- 3. Valve cover
- 4. O-rings

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NOTICE	
Do not lose the O-rings!	

Step	Procedure
3	Loosen 2 hex. nuts.
4	Loosen 2 M8 collar cap nuts inside the valve cover (diagonally).

Fig. 7



- 1. Hex nuts
- 2. Collar cap nuts

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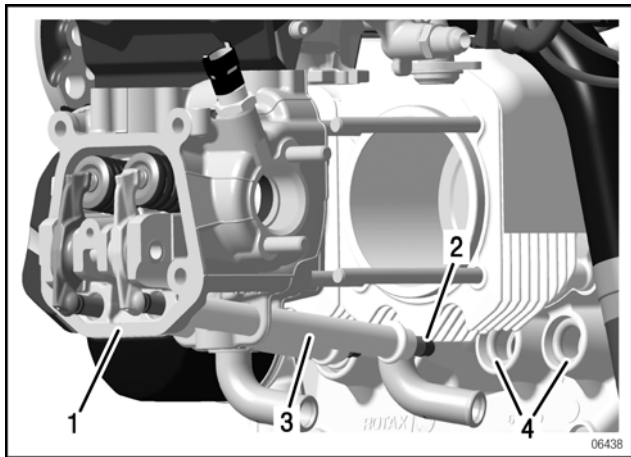
NOTE: If the parts are installed again with the same position and allocation as before they were removed, the push-rods can be reused. The reason for this is the break-in which takes place on the parts prior to removal.

Step	Procedure
5	Lift the intake manifold with the fuel rail slightly and carefully pull the entire cylinder head off the cylinder with both hands.
6	Hold both push-rods in position in the oil return bores. Hold the oil bore closed with a finger and remove the cylinder head.
7	Remove 16x5 O-rings from the oil return tubes and the crankcase.

NOTICE

Put down the cylinder head in such a manner that the sealing surfaces and the oil return bores are not damaged.

Fig. 8



- 1. Cylinder head assy.
- 2. Push-rod assy.
- 3. Oil return bore
- 4. 16x5 O-ring

Step	Procedure
8	Hold the oil-filled push-rods closed with a finger, remove them and put them down with the corresponding cylinder heads to prevent confusion.

NOTE: Mark the installation position of the push-rod with an appropriate marker (e.g. a touch-up pen) (e.g. "IV1" for intake valve cylinder 1).

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DISASSEMBLY

DISASSEMBLING THE CYLINDER HEAD

The cylinder head should be disassembled on a clean surface. There must be enough space to lay out the removed parts to ensure that all the parts can be laid out and allocated according to their installation position.

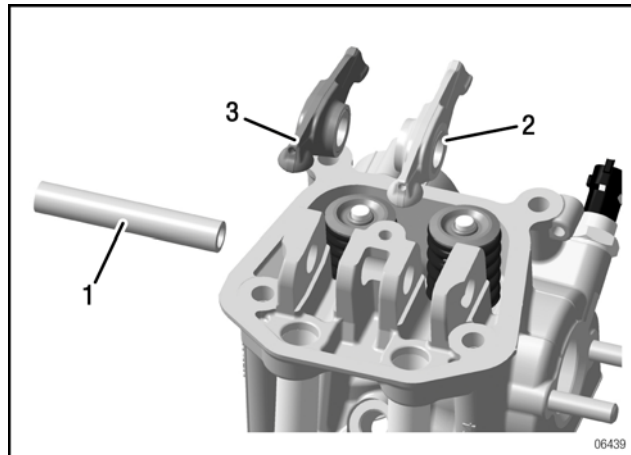
NOTICE	
Danger of consequent damage to engine! During assembly, the valves and all the associated components must be re-installed in their original position. Mark the valves and the associated components correspondingly before removing them.	

ROCKER ARM - REMOVAL

NOTICE	
The rocker arm shaft should never be forced out.	

Step	Procedure
1	Pull out the rocker arm shaft and take out the two rocker arms.

Fig. 9



- 1. Rocker arm shaft
- 2. Right rocker arm
- 3. Left rocker arm

VALVE - REMOVAL

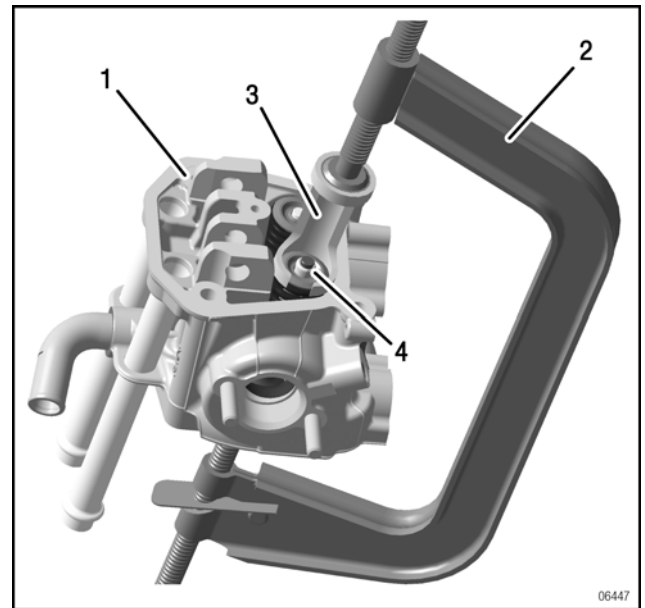
See Fig. 10.

NOTICE	
Before taking out the valves, remove any burrs on the valve stem to avoid damage to the stem seal or guide. Mark the valves accordingly.	

Step	Procedure
1	Compress the valve springs using the valve spring mounting device part no. 877380 and valve spring collet.
2	Removal of the valve cotters.
3	Release the valve spring tension.
4	Remove the valve spring retainer and valve springs with the washer and pull out the valve.
5	Repeat this process for the second valve and clean the cylinder head.

NOTE: There is a valve stem seal only on the intake valve.

Fig. 10



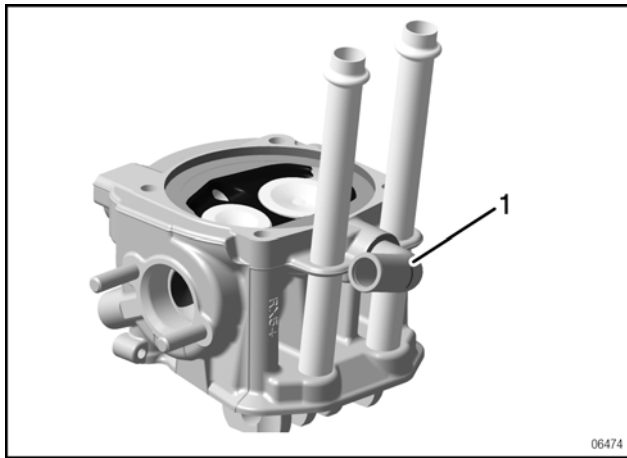
- 1. Cylinder head assy.
- 2. Valve spring collet
- 3. Valve spring mounting device part no. 877380
- 4. Valve cotter

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**COOLANT ELBOW INLET -
REMOVAL**

Step	Procedure
1	Heat the coolant elbow with a hot air gun to max. 120 °C.
2	Remove the coolant elbow.
3	Remove adhesive residues in the bore and check the thread.

Fig. 11



1. Coolant elbow

REMOVAL OF THE OIL RETURN TUBE

Preparation

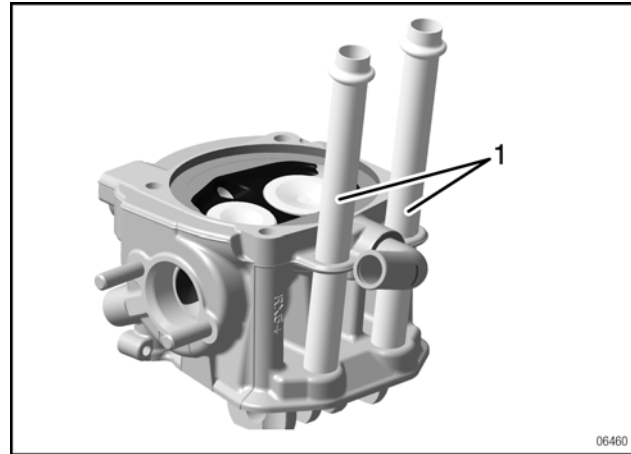
- General visual inspection. See relevant Maintenance Manual Line for the 912 i Series engine type.

NOTICE

If there are leaks, the corresponding oil return tubes must be replaced.

Step	Procedure
1	Pull out the oil return tube.
2	Remove adhesive residues in the bore.

Fig. 12



1. Oil return tube

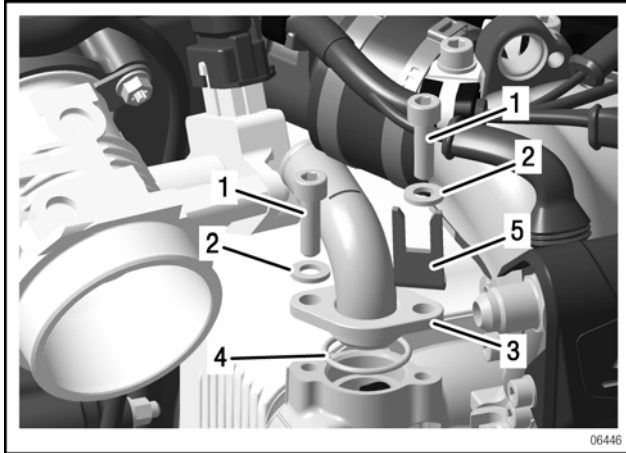
**COOLANT ELBOW OUTLET -
REMOVAL**

See Fig. 13.

Step	Procedure
1	Take off the spring type hose clip 25 using spring clamp pliers part no. 877840.
2	Mark the coolant hoses and pull them out of the coolant elbows (outlet). See also section 75-00-00 Cooling system.
3	Loosen 2 M6x20 Allen screws with 6.4 washer.
4	Remove the elbow flange and O-ring.

NOTE: Remove the connector brackets on cylinder 3/4.

Fig. 13



- 1. M6x20 Allen screw
- 2. 6.4 washer
- 3. Elbow flange
- 4. 19x2 O-ring
- 5. Plug holder

Step	Procedure
5	Heat the coolant elbow and elbow flange with a hot air gun to max. 120 °C.
6	Remove the coolant elbow.
7	Remove adhesive residues in the bore and check the thread.

INSPECTION

**CYLINDER HEAD
 SINGLE PARTS CHECK**

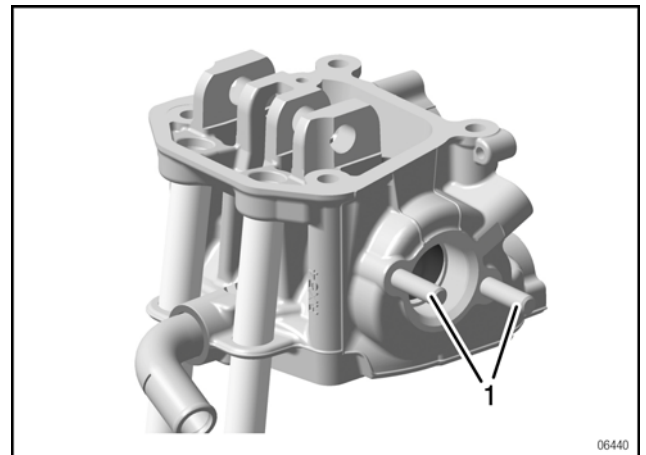
Preparation

- Clean all parts carefully. See also section 05-00-00 Procedures

CYLINDER HEAD STUDS CHECK

Step	Procedure
1	M8x20/23 studs are used to attach the exhaust manifold.
2	Check that they are securely fitted and undamaged.
3	If replacement is necessary, the stud is installed in such a manner that the longer thread (23 mm) is screwed into the cylinder head.
4	Secure studs with LOCTITE 648. Tightening torque 8 Nm (70.78 in. lb.).

Fig. 14



- 1. Stud

CYLINDER HEAD ASSY. - INSPECTION

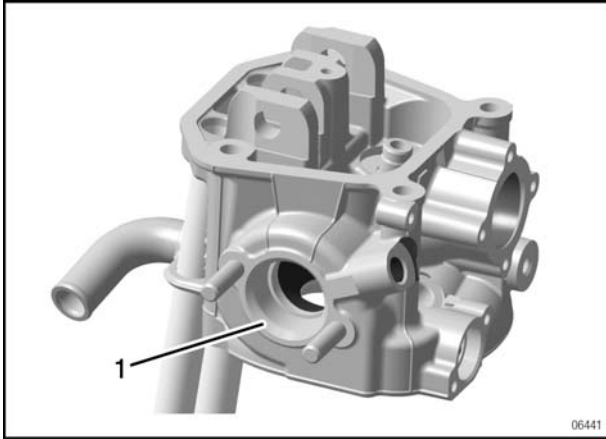
Step	Procedure
1	Inspect the cone of the exhaust manifold. Indentations and scratches no greater than 0.2 mm are permissible. Bumps no greater than 0.1 mm are permissible.

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NOTE: If the sealing cone of the exhaust manifold leaks, post-machining is permissible. If post-machining is necessary, the cylinder head must be sent to an authorised ROTAX overhauling company.

Fig. 15



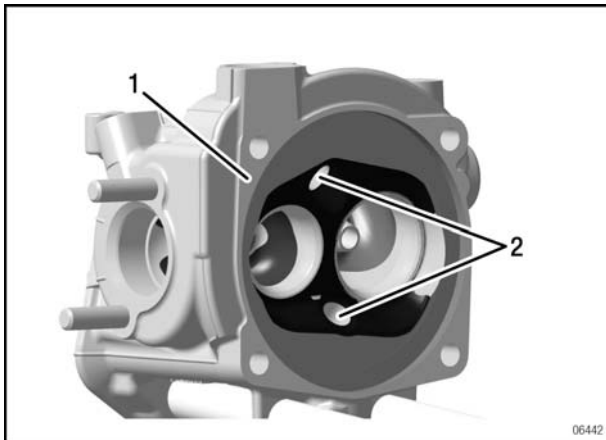
1. Cone (exhaust manifold)

NOTICE

Cracks in the cylinder head are not permissible! If in doubt, inspect the affected parts for cracks using then dye penetrant method.

Step	Procedure
2	Check the spark plug bore. Check the thread for damage.
3	Check the sealing surface of the cylinder block.

Fig. 16



1. Sealing surface 2. Spark plug bore

HARDNESS TEST METHOD:

NOTICE

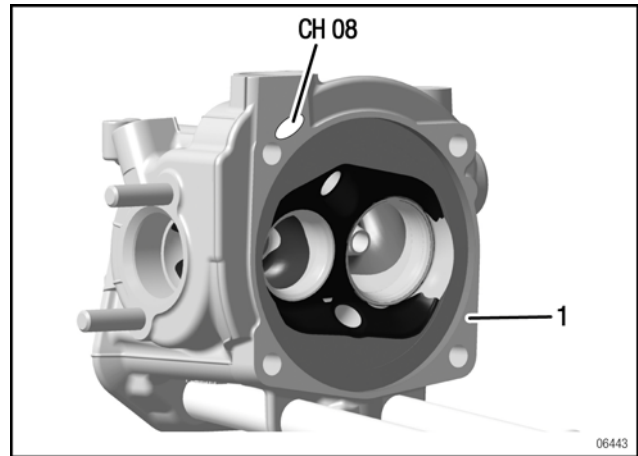
If the engine has been overheated, a hardness test of the cylinder head is necessary. See the current Maintenance Manual Line for the 912 i Series engine type. The hardness test takes place at measurement point CH08 according to Fig. 17.

CH08: HB2,5/62,5 DIN EN ISO 6506-2

NOTICE

The results of the hardness test must be noted in section 72-30-00, subsection: Wear limits.

Fig. 17

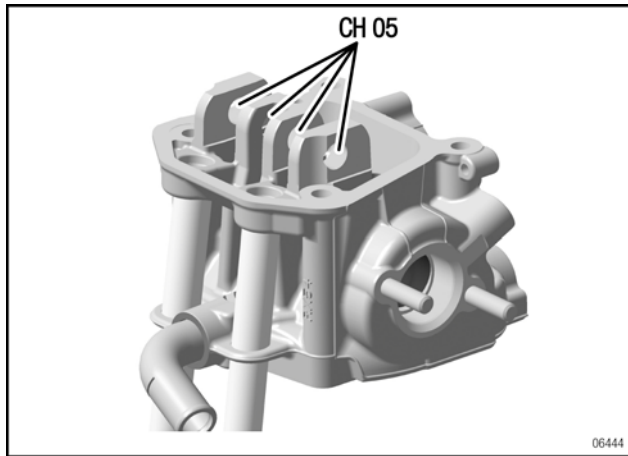


1. Cylinder head

NOTE: If the rocker arm shaft bearing (CH05) is worn, it can be post-machined to a certain extent. The cylinder head must be sent to an authorised ROTAX overhauling company.

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Fig. 18



VALVE GUIDE CHECK

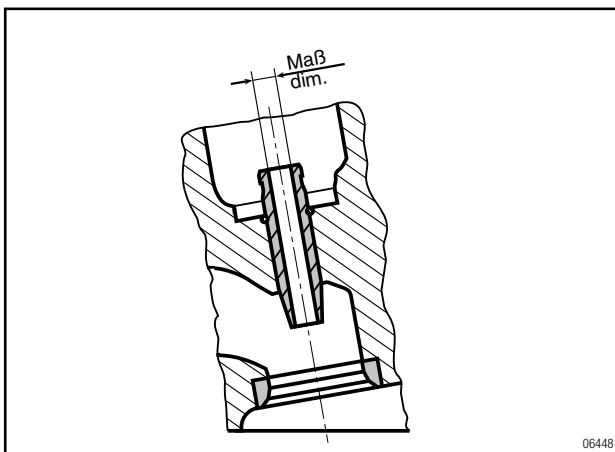
See Fig. 19

NOTICE

If the wear limit has been reached, the valve guide must be replaced.

Step	Procedure
1	Check the valve guide visually for damage and wear.
2	Inspect the inner diameter of the valve guide.

Fig. 19



VALVE CHECK

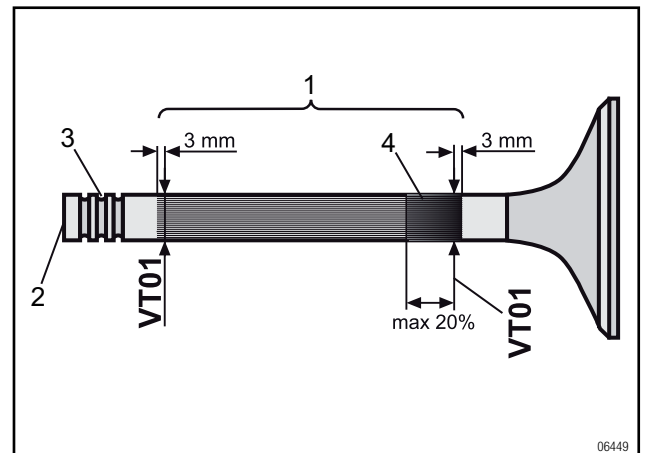
NOTICE

Replace the valve if the valve stem is out of specification, is damaged or shows traces of wear.

Step	Procedure
1	Check the valve visually for damage and wear.
2	Determine the valve stem diameter and check the valve disc for wear.
3	Check the valve end face for pitting.
4	Check the valve stem for any deposits.

NOTE: The valve stem diameter VTO is measured in the edge region of the running surface of the valve stem.

Fig. 20



- 1. Valve stem
- 2. Valve end face
- 3. Retaining grooves
- 4. Max. oil residues

NOTICE

Oil residues up to **max. 20 %** of the running surface are permissible. At greater values, the valve may have already been overheated and must be replaced. Risk of valve fracture at the weld point.

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Step	Procedure
5	The 3 retaining grooves on the valve stem must be visually inspected for damage and wear.

NOTE: A new valve cotter must be inserted for the wear check. This must have no perceptible backlash.

VALVE SEATS CHECK

See Fig. 21.

Step	Procedure
1	Check the valve seat faces visually for damage and wear.
2	Lubricate the valve seat faces evenly with touch up paste and install the valves in the corresponding valve guides.
3	Turn the valves with moderate pressure so that a clear print of the sealing surface is produced on the valve seat ring.
4	Check that the seal fits properly, if necessary lubricate with valve lapping paste.

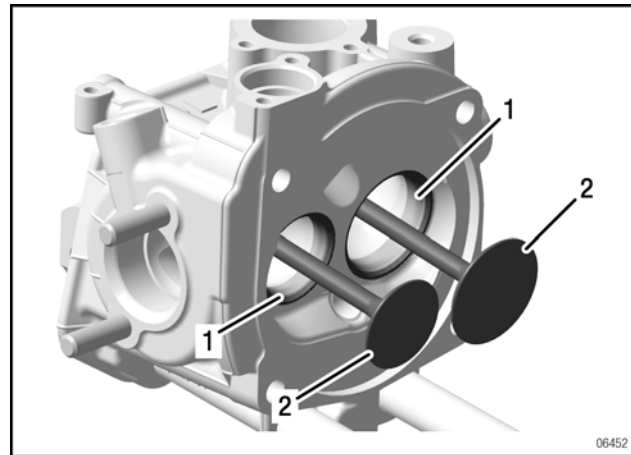
NOTICE

The ring-shaped print on the valve seat faces of the valve seat rings must be continuous and have no breaks.
 The width of the print corresponds to the valve seat width CH02.

NOTICE

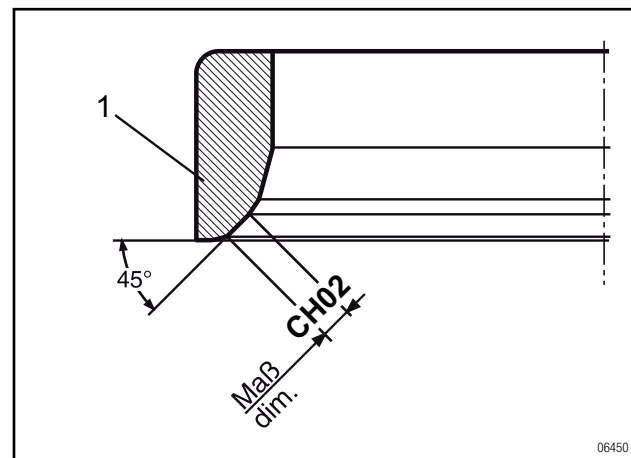
If there are burn marks or distortion, the cylinder head must be sent to an authorised overhauling company for overhauling or repair.

Fig. 21



1. Valve seat ring 2. Valve

Fig. 22



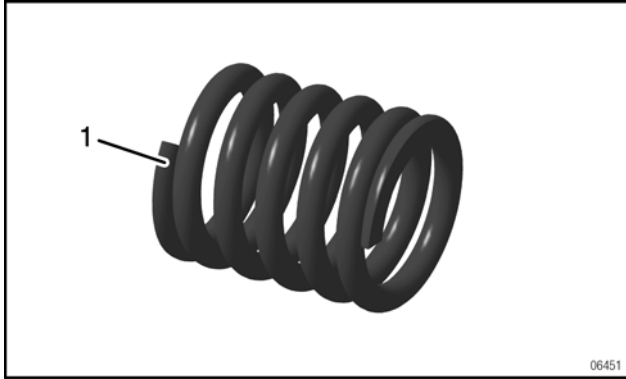
1. Valve seat ring

VALVE SPRING CHECK

Step	Procedure
1	Check the valve springs visually for damage such as fracture, deformation.

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Fig. 23



1. Valve spring

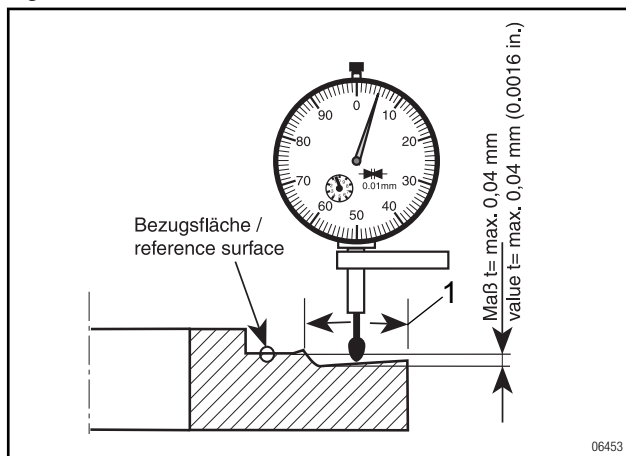
WASHER CHECK

Step	Procedure
1	Check the washers visually for damage and wear.

The wear must be measured starting from the reference face (on the inner part of the valve spring support) radially outwards in the measurement region, using a dial gauge. **Dimension t = max. 0.04 mm.**

Break-in (wear) of more than 0.04 mm is not permissible. If this value is exceeded, the valve, the valve spring support, the valve spring retainer, the valve cotter and the hydraulic valve tappet or other damaged components in the affected valve drive must always be replaced.

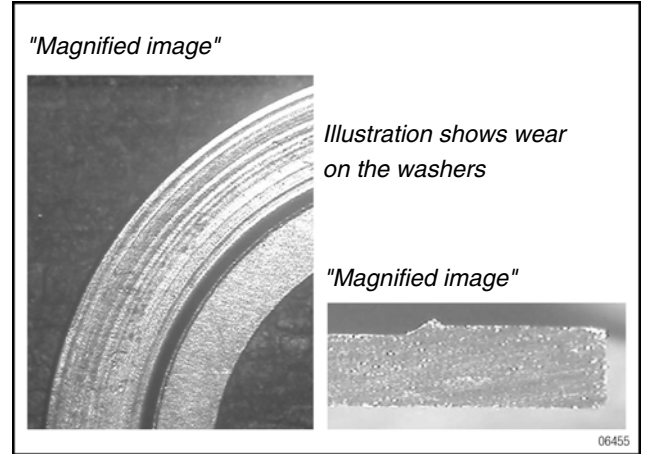
Fig. 24



1. Measurement region

NOTE: The valve spring support can be used as an indicator of a malfunction of the valve drive relating to poorly or insufficiently ventilated hydraulic valve tappets. In normal conditions, no measurable wear can be seen even after a relatively long operating time. See also SI-912-018, "Ventilation of the lubrication system".

Fig. 25



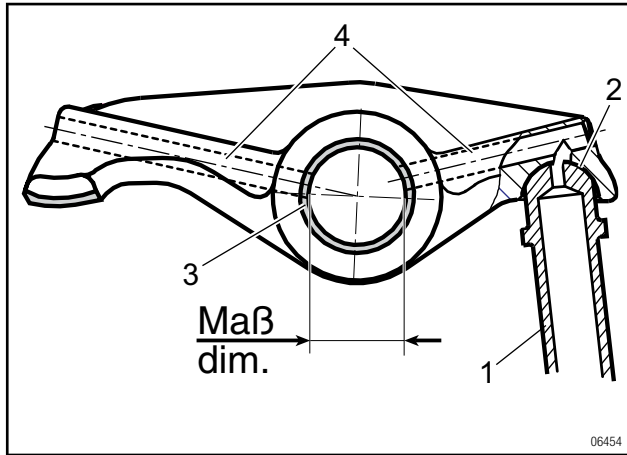
ROCKER ARM CHECK AND ROCKER ARM SHAFT CHECK

System description

The rocker arm bearing is lubricated by the hollow drilled push-rod of the ball joint socket. The rocker arm bearing is supplied with oil via the oil ducts in the rocker arm. The oil exits and thus lubricates the rest of the valve mechanism via the bore. The rocker arms for the inlet and outlet are different.

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Fig. 26



- 1. Push-rod
- 2. Ball joint
- 3. Rocker arm bushing
- 4. Oil ducts

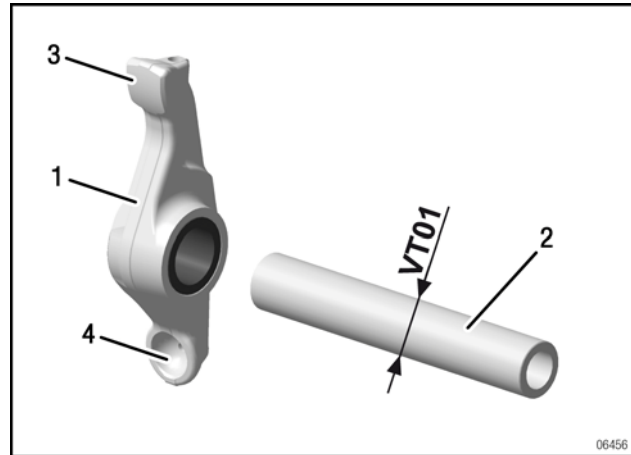
Step	Procedure
1	Check the surface of the rocker arm shaft and the inner diameter of the rocker arm bushing for traces of wear.
2	Check the valve support surface and ball joint of the rocker arm.

NOTICE

If excessive wear is visible in the rocker arm bearing, this indicates a lack of oil. The support surface for the valve stem can be post-machined a little.

NOTE: Oversized rocker arm shafts and rocker arm bushings are available to provide the option of repairing the rocker arm bearing in the cylinder head.

Fig. 27



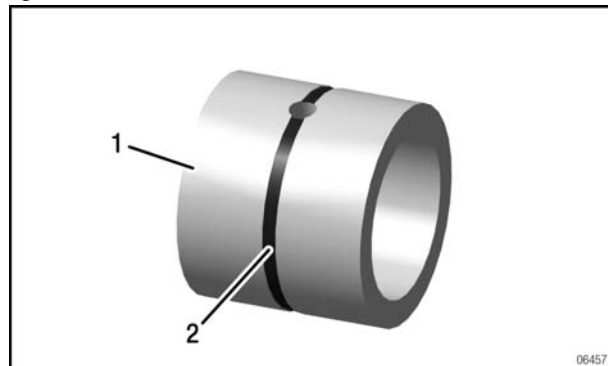
- 1. Rocker arm
- 2. Rocker arm shaft
- 3. Valve guide
- 4. Ball joint

ROCKER ARM BUSHING

With the rocker arm bushings (plastic bushing), ensure that the plastic bushing is a sliding seat. This can rotate relative to the rocker arm bore after installation too. The rocker arm bushing is therefore provided with an outer circular groove to allow oil supply. The rocker arm bushing can be installed independently of position.

NOTE: Oversized rocker arm shafts and rocker arm bushings are available to provide the option of repairing the rocker arm bearing in the cylinder head. In this case ensure that the correct rocker arm bushing is installed. The oversized rocker arm bushing part no. 933397 has two mutually opposite bores for identification and differentiation.

Fig. 28

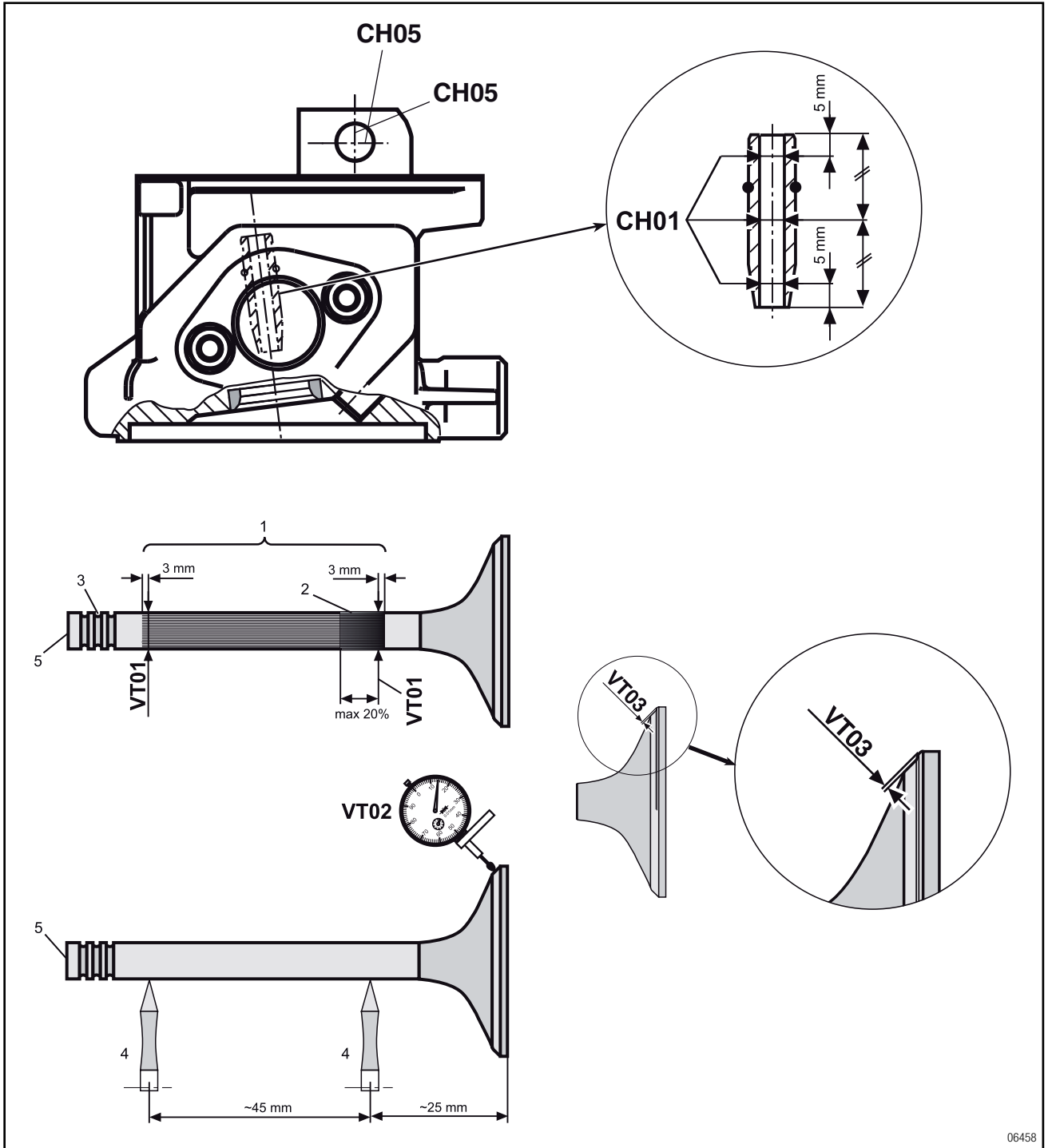


- 1. Rocker arm bushing
- 2. Groove

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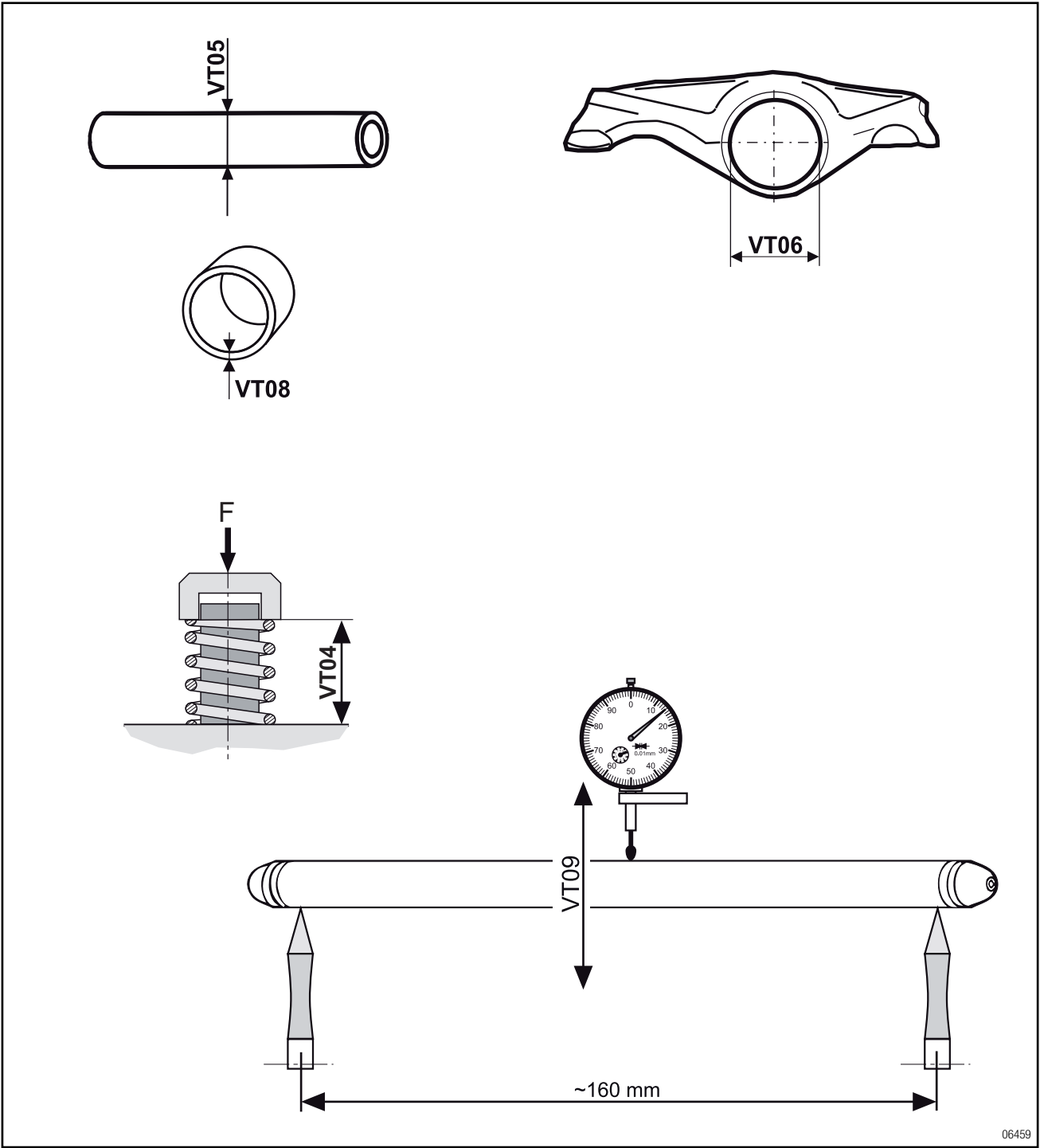
WEAR LIMITS



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Description	Code	Current measurement value		Tolerance limit	Tolerance limit		Measurements				
		min	max	100 %	50 %		Cyl . 1	Cyl . 2	Cyl . 3	Cyl . 4	
1) Cylinder head											
Diameter of Valve guide	Intake Valve	CH01	7.006 mm 0.2758 in.	7.018 mm 0.2763 in.	7.150 mm 0.2815 in.	7.084 mm 0.2789 in.	current replaced				
	Exhaust Valve	CH01	7.006 mm 0.2758 in.	7.018 mm 0.2763 in.	7.150 mm 0.2815 in.	7.084 mm 0.2789 in.	current replaced				
Width of Valve seat	Intake Valve	CH02	1.40 mm 0.0551 in.	1.90 mm 0.0748 in.	2.40 mm 0.0945 in.	2.15 mm 0.0846 in.	current replaced				
	Exhaust Valve	CH02	1.50 mm 0.0591 in.	2.00 mm 0.0787 in.	2.50 mm 0.0984 in.	2.25 mm 0.0886 in.	current replaced				
Hardness test		CH08	85 HB				current replaced				
2) Valves											
Diameter of Valve stem	Intake Valve	VT01	6.965 mm 0.2742 in.	6.980 mm 0.2748 in.	6.940 mm 0.2732 in.	6.953 mm 0.2737 in.	current replaced				
	Exhaust Valve	VT01	6.965 mm 0.2742 in.	6.980 mm 0.2748 in.	6.940 mm 0.2732 in.	6.953 mm 0.2737 in.	current replaced				
Backlash Valve guide/ valve stem	Intake Valve	CH01 /VT01	0.026 mm 0.0010 in.	0.053 mm 0.0021 in.	0.150 mm 0.0059 in.	0.102 mm 0.0040 in.	current replaced				
	Exhaust Valve	CH01 /VT01	0.026 mm 0.0010 in.	0.053 mm 0.0021 in.	0.150 mm 0.0059 in.	0.102 mm 0.0040 in.	current replaced				
Circularity of Valve disc	Intake Valve	VT02	0.00 mm 0.0000 in.	0.03 mm 0.0012 in.	0.04 mm 0.0016 in.	0.035 mm 0.0014 in.	current replaced				
	Exhaust Valve	VT02	0.00 mm 0.0000 in.	0.03 mm 0.0012 in.	0.04 mm 0.0016 in.	0.035 mm 0.0014 in.	current replaced				
Wear on Valve disc	Intake Valve	VT03	0.00 mm 0.0000 in.	0.00 mm 0.0000 in.	0.2 mm 0.0080 in.	0.1 mm 0.0040 in.	current replaced				
	Exhaust Valve	VT03	0.00 mm 0.0000 in.	0.00 mm 0.0000 in.	0.02 mm 0.0008 in.	0.01 mm 0.0004 in.	current replaced				
Length of valve spring at test force, each	Intake Valve	VT04	32.40 mm 1.2760 in.	33.60 mm 1.3230 in.	32.00 mm 1.2600 in.	32.20 mm 1.2680 in.	current replaced				
	Exhaust Valve	VT04	32.40 mm 1.2760 in.	33.60 mm 1.3230 in.	32.00 mm 1.2600 in.	32.20 mm 1.2680 in.	current replaced				
3.1) Rocker arm											
Bore for rocker arm shaft	Intake Valve	CH05	12.000 mm 0.4724 in.	12.018 mm 0.4731 in.	12.090 mm 0.4760 in.	12.054 mm 0.4746 in.	current replaced				
	Exhaust Valve	CH05	12.000 mm 0.4724 in.	12.018 mm 0.4731 in.	12.090 mm 0.4760 in.	12.054 mm 0.4746 in.	current replaced				

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Description	Code	Current measurement value		Tolerance limit	Tolerance limit		Measurements				
		min	max	100 %	50 %		Cyl . 1	Cyl . 2	Cyl . 3	Cyl . 4	
3.2) Rocker arm											
Bore for rocker arm shaft "over-sized"	Intake Valve	CH05	12.200 mm 0.4803 in.	12.218 mm 0.4810 in.	12.290 mm 0.4839 in.	12.254 mm 0.4824 in.	current replaced				
	Exhaust Valve	CH05	12.200 mm 0.4803 in.	12.218 mm 0.4810 in.	12.290 mm 0.4839 in.	12.254 mm 0.4824 in.	current replaced				
Diameter of Rocker arm shaft	Intake Valve	VT05	11.983 mm 0.4718 in.	11.994 mm 0.4722 in.	11.950 mm 0.4705 in.	11.967 mm 0.4711 in.	current replaced				
	Exhaust Valve	VT05	11.983 mm 0.4718 in.	11.994 mm 0.4722 in.	11.950 mm 0.4705 in.	11.967 mm 0.4711 in.	current replaced				
Diameter of rocker arm shaft "over-sized"	Intake Valve	VT05	12.183 mm 0.4796 in.	12.194 mm 0.4801 in.	12.150 mm 0.4783 in.	12.167 mm 0.4790 in.	current replaced				
	Exhaust Valve	VT05	12.183 mm 0.4796 in.	12.194 mm 0.4801 in.	12.150 mm 0.4783 in.	12.167 mm 0.4790 in.	current replaced				
Radial clearance Bore/rocker arm shaft	Intake Valve	CH05 /VT05	0.006 mm 0.0002 in.	0.035 mm 0.0014 in.	0.150 mm 0.0059 in.	0.093 mm 0.0036 in.	current replaced				
	Exhaust Valve	CH05 /VT05	0.006 mm 0.0002 in.	0.035 mm 0.0014 in.	0.150 mm 0.0059 in.	0.093 mm 0.0036 in.	current replaced				
Rocker arm bushing (plastic)	Intake Valve	VT06	16.000 mm 0.6299 in.	16.018 mm 0.6306 in.	16.038 mm 0.6314 in.	16.028 mm 0.6310 in.	current replaced				
	Exhaust Valve	VT06	16.000 mm 0.6299 in.	16.018 mm 0.6306 in.	16.038 mm 0.6314 in.	16.028 mm 0.6310 in.	current replaced				
Wall thickness of rocker arm shaft (plastic)	Intake Valve	VT08	1.95 mm 0.0768 in.	1.98 mm 0.0780 in.	1.90 mm 0.0748 in.	1.93 mm 0.0758 in.	current replaced				
	Exhaust Valve	VT08	1.95 mm 0.0768 in.	1.98 mm 0.0780 in.	1.90 mm 0.0748 in.	1.93 mm 0.0758 in.	current replaced				
4) Push-rod assy.											
Deflection of Push-rod	Intake Valve	VT09	0.000 mm 0.0000 in.	0.100 mm 0.0039 in.	0.200 mm 0.0079 in.	0.150 mm 0.0059 in.	current replaced				
	Exhaust Valve	VT09	0.000 mm 0.0000 in.	0.100 mm 0.0039 in.	0.200 mm 0.0079 in.	0.150 mm 0.0059 in.	current replaced				

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ASSEMBLY

CYLINDER HEAD - ASSEMBLY

Preparation

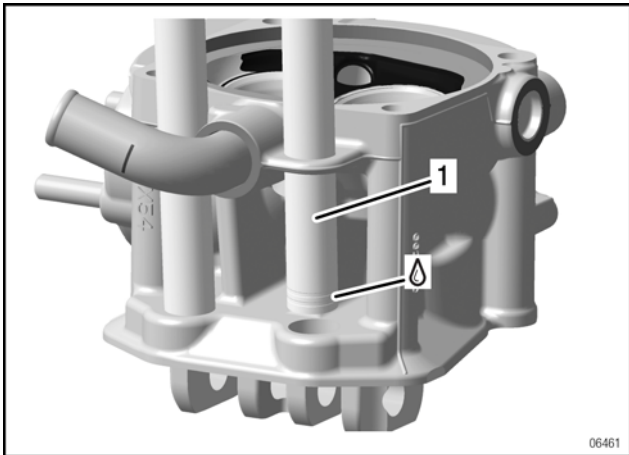
- Clean all parts carefully.

NOTICE	
Check sealing surface for bumps! Remove carbon residues!	

OIL RETURN TUBE INSTALLATION

Step	Procedure
1	Secure the oil return tube with LOCTITE 648 and install it in the cylinder head.
2	Allow the cylinder head to harden for at least 10 minutes at 100 °C.

Fig. 29



1. Oil return tube

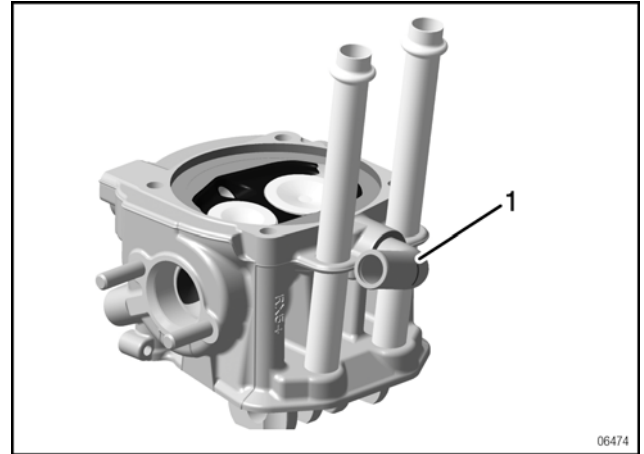
INSTALLATION OF THE COOLANT ELBOW INLET

Step	Procedure
1	Secure the coolant elbow with LOCTITE 243 and install the elbow in the cold cylinder head. NOTE: Also lubricate the thread in the cylinder head with LOCTITE 243.

Step	Procedure
2	Allow the cylinder head to harden for 10 minutes at 100 °C. NOTE: If the sealing surface of the cylinder has carbon residues, it must be removed carefully.

NOTE: Remove excess LOCTITE!

Fig. 30



1. Coolant elbow inlet

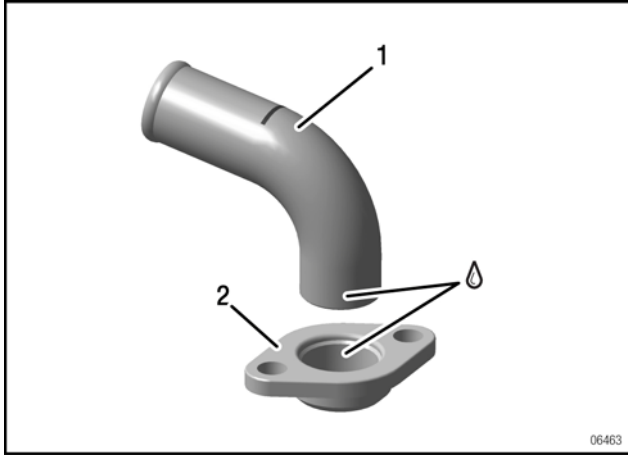
COOLANT ELBOW OUTLET - ASSEMBLY

Step	Procedure
1	Secure the coolant elbow with LOCTITE 243 and install the elbow in the cold elbow flange. NOTE: Also coat the thread in the elbow flange with LOCTITE 243.
2	Allow the elbow flange to harden for 10 minutes at 100 °C. NOTE: Remove excess LOCTITE.

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Fig. 31

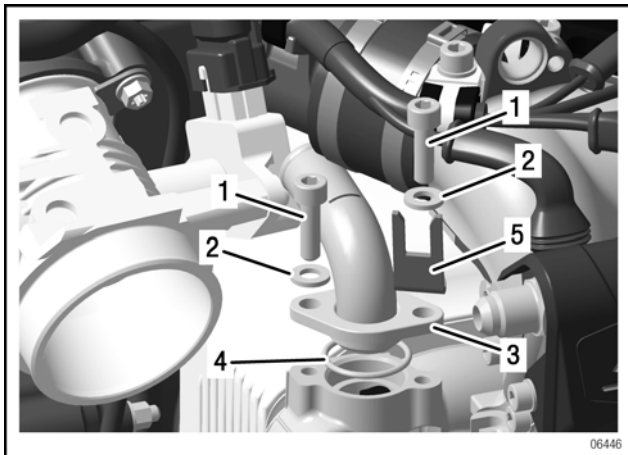


1. Coolant elbow 2. Elbow flange

COOLANT ELBOW - INSTALLATION

Step	Procedure
1	Install a new 19x2 O-ring in the cylinder head.
2	Fasten the coolant elbow with 2 M6x20 Allen screws and 6.4 lock washers. Tightening torque 10 Nm (88.48 in. lb.). NOTE: Install the cable brackets on cylinder 2/4.

Fig. 32



1. M6x20 Allen screws 2. 6.4 washers
3. Elbow flange 4. 19x2 O-ring
5. Cable brackets

VALVE INSTALLATION

NOTICE

Risk of engine damage if damaged parts are installed!
All parts must be measured and assessed before installation.
All moving parts must be lubricated with engine oil before installation!

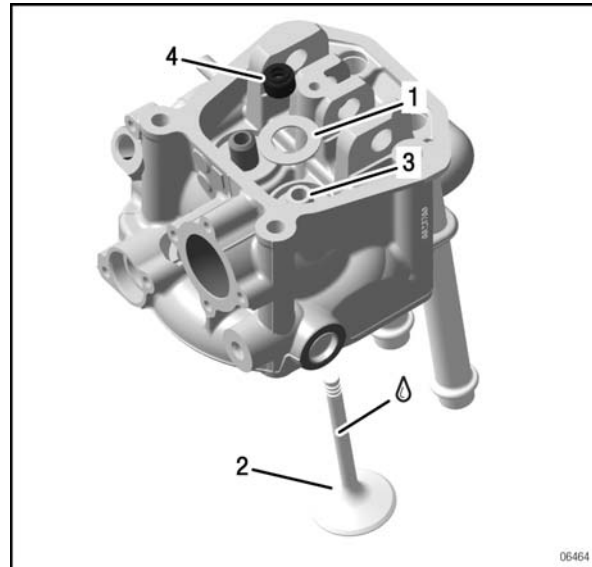
NOTICE

Oil residues up to max. 20% of the running surface are permissible.

See Fig. 33.

Step	Procedure
1	Push 16/27.9/1 onto the valve guide and install a new valve stem seal on the intake side.
2	Lubricate the valve stem and push the intake valve from outside into the valve guide.

Fig. 33

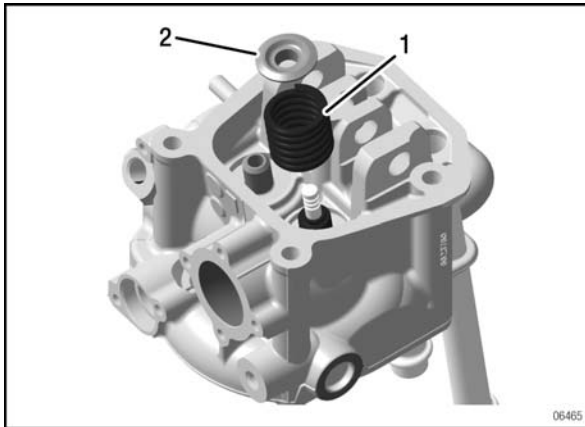


1. 16/27.9/1 washer 2. Intake valve
3. Valve spring retainer 4. Valve stem seal

Step	Procedure
3	Install the valve springs and the valve spring retainer

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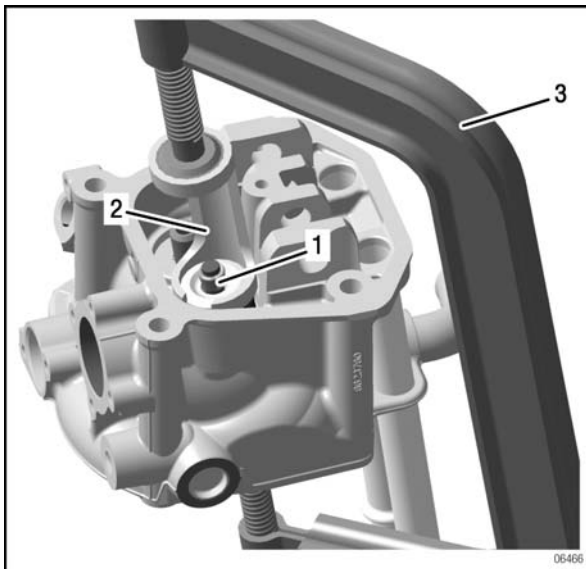
Fig. 34



1. Valve spring 2. Valve spring retainer

Step	Procedure
4	Compress valve springs with the mounting device part no. 877380 and collet.
5	Insert the valve cotters and de-tension the valve springs. NOTE: Ensure they are positioned correctly and that there is a uniform gap between the valve cotters.
6	Carry out the same procedure for the exhaust valve.

Fig. 35



1. Valve cottoer 2. Mounting device
 3. Collet

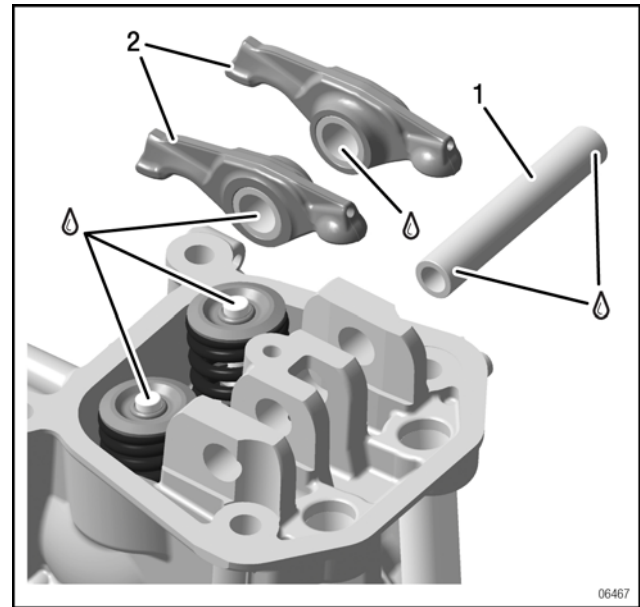
ROCKER ARM - INSTALLATION

NOTICE

Do not use force!
 The rocker arm bearing is a sliding seat.

Step	Procedure
1	Lubricate the rocker arm shaft (on both sides), rocker arm bore and valve spring support with KLUEBER ISOFLEX TO-PAS.
2	Bring the intake rocker arm and the exhaust rocker arm with the rocker arm bushing into position depending on the state of construction.
3	Position the rocker arm shaft.

Fig. 36



1. Rocker arm shaft 2. Rocker arm

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NOTES

INSTALLATION

CYLINDER HEAD INSTALLATION

Preparation

- Clean all parts carefully.
- Lightly grease or lubricate O-rings and gas-kets.

NOTICE

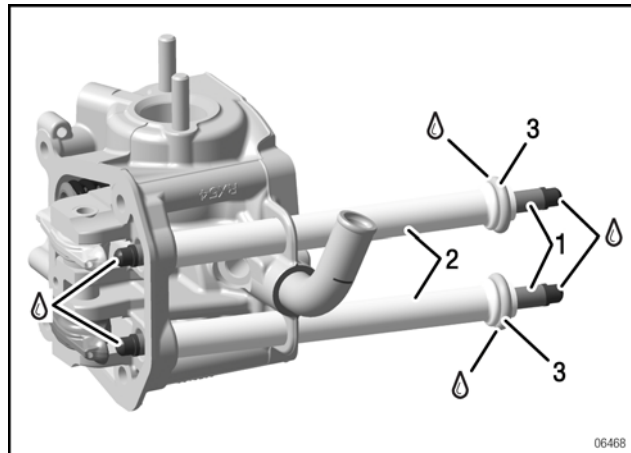
To ensure constant tightening torque, lightly lubricate the flat surfaces of the collar cap nuts.

NOTICE

Place the cylinder at TDC. The valves then overlap. This prevents a situation in which a valve is open and the cylinder head lifts off again from the cylinder head gasket face. Otherwise the oil return tube O-rings can be damaged.

Step	Procedure
1	Install the corresponding push-rods in the oil return tubes.
2	Lubricate the push-rod heads with KLUEBER ISOFLEX TOPAS.
3	Install the lubricated 16x5 O-ring on the oil return tube.

Fig. 37

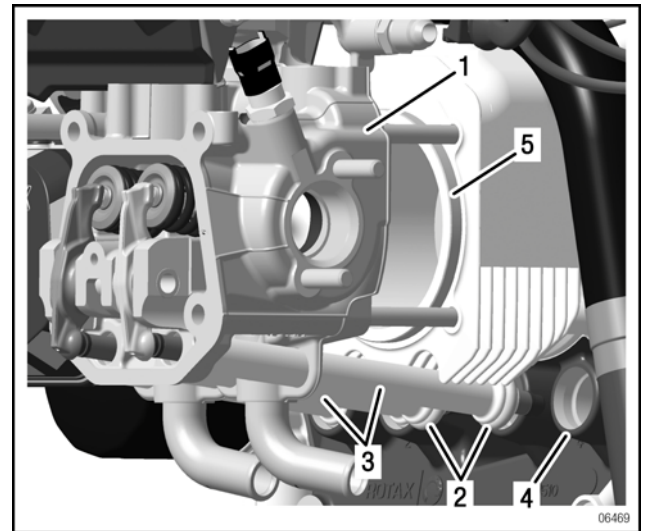


1. Push-rods 2. Oil return tubes
 3. 16x5 O-ring

NOTE: The intake manifold with the fuel rail must be raised slightly for part repairs.

Step	Procedure
4	Place on the cylinder head until the O-rings of the two oil return tubes rest in the crankcase.
5	Raise the cylinder until the centring collar of the cylinder engages in the cylinder head release.

Fig. 38



1. Cylinder head assy. 2. O-ring
 3. Oil return tube 4. Crankcase
 5. Centring collar of cylinder

NOTICE

O-rings must be pressed into the crankcase at the same time.

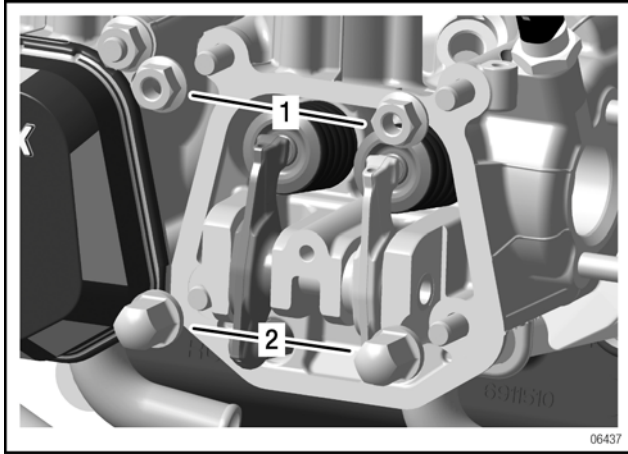
Step	Procedure
6	Install the cylinder head and the cylinder together.
7	Fasten the cylinders finger-tight and diagonally at first with 2 M8 collar cap nuts and 2 M8 hex. nuts.

NOTE: If necessary, repeat the process for the other cylinder heads.

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Fig. 39

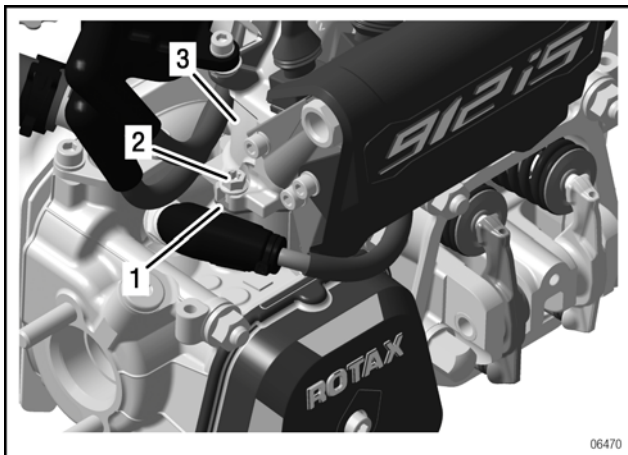


1. M8f hex. nut 2. 8.4 washer
3. M8 collar cap nut

IF ONLY ONE CYLINDER HEAD PER ENGINE SIDE HAS BEEN REPAIRED

Step	Procedure
1	Position the insulating flange between the intake manifold and the cylinder head.
2	Install the intake manifold on the cylinder head which has not been removed with 2 M6x20 hex./torx collar screws. Tightening torque 10 Nm (88.48 in. lb.).

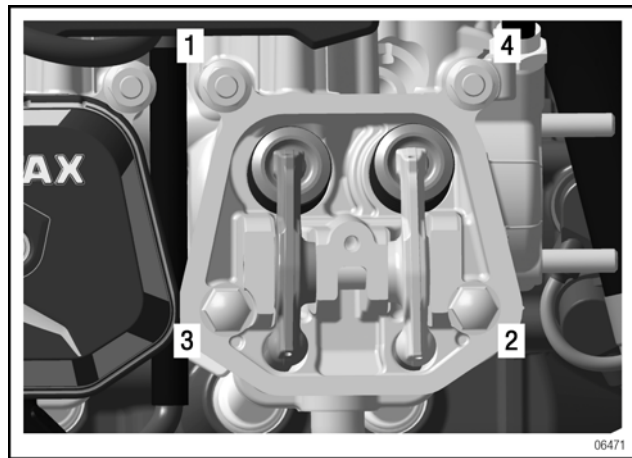
Fig. 40



1. Insulating flange 2. M6x20 hex./torx collar screw
3. Intake manifold

Step	Procedure
3	Align the second cylinder head on the intake manifold and fasten it with 2 M6x20 hex./torx collar screws. Tightening torque 10 Nm (88.48 in. lb.). NOTE: This aligns the cylinder heads to ensure a flat support for the intake manifold.
4	Fasten the cylinder head according to the screw diagram with 10 Nm (88.48 in. lb.) +180°.

Fig. 41



Screw diagram

Finishing work

- If necessary, install the knock sensor for cylinder 1. To do this, see section 76-70-00 Sensors and actuators.
- Install the elbow flange.

NOTE: There is an O-ring under the elbow flange.
Install the connector brackets on cylinder 3/4.

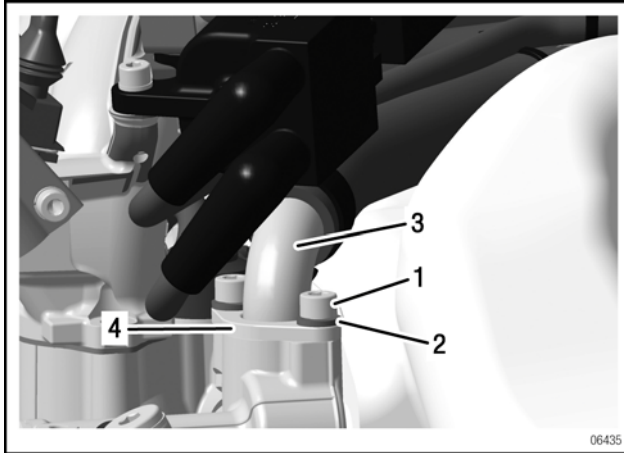
See Fig. 42

Step	Procedure
1	Fasten the elbow flange with 2 M6x20 Allen screws and 6.4 lock washers. Tightening torque 10 Nm (88.48 in. lb.).

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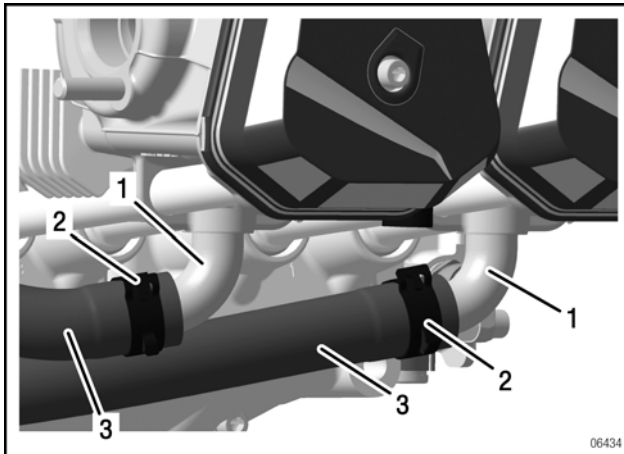
Fig. 42



- 1. M6x20 Allen screw
- 2. 6.4 washer
- 3. Coolant elbow
- 4. Elbow flange

- Install the coolant hose as far as the mark on the coolant elbow. See also section 75-00-00 Cooling system.
- Install the spring type hose clip 25 using spring clamp pliers part no. 877840.

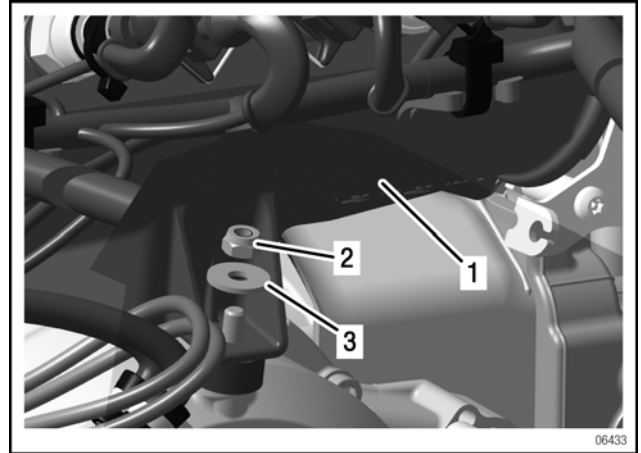
Fig. 43



- 1. Coolant elbow
- 2. Spring type hose clip 25
- 3. Coolant hose

- Install the airbox on the ignition housing using an M6 hex. nut and 6.4 washer.

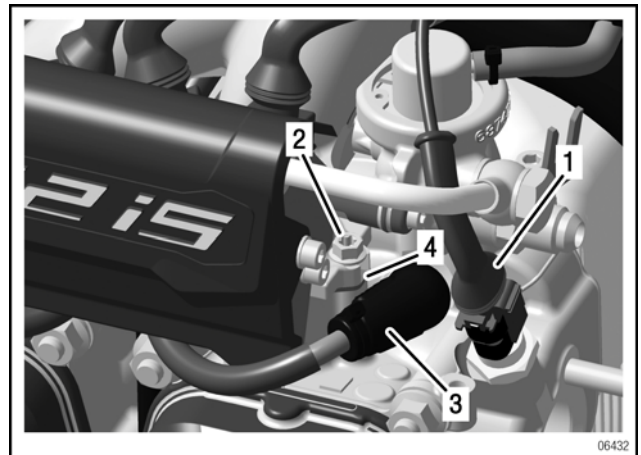
Fig. 44



- 1. Airbox
- 2. M6 hex. nut
- 3. 6.4 washer

- Install the spark plugs and connect the resistance spark plug connectors. See also section 74-20-00 Distribution.
- Install the temperature sensor and connect the wiring harness. To do this, see section 76-70-00 Sensors and actuators.

Fig. 45



- 1. Temperature sensor
- 2. M6x20 hex./torx collar screw
- 3. Resistance spark
- 4. Insulating flange plug connector

- Install the fuel line assy. To do this, see section 73-10-00 Fuel pump and distribution.
- Install the exhaust system. See also section 78-00-00 Exhaust.

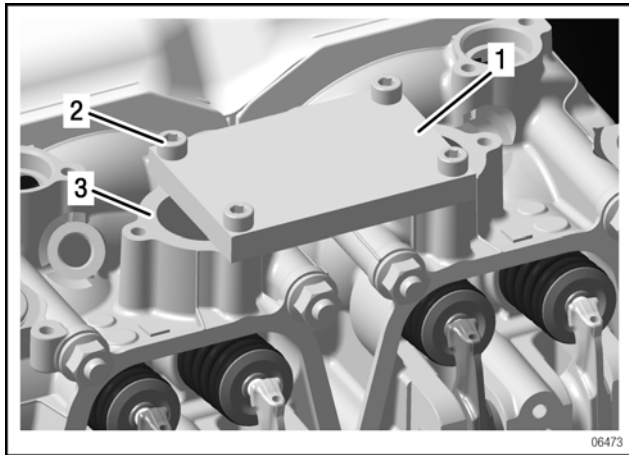
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IF BOTH CYLINDER HEADS PER ENGINE SIDE HAVE BEEN REPAIRED

Step	Procedure
1	Fasten the cylinder aligning tool part no. 877262 to the intake flange of the cylinder heads with 4 M6x25 Allen screws. NOTE: This aligns the cylinder heads to ensure a flat support for the intake manifold.

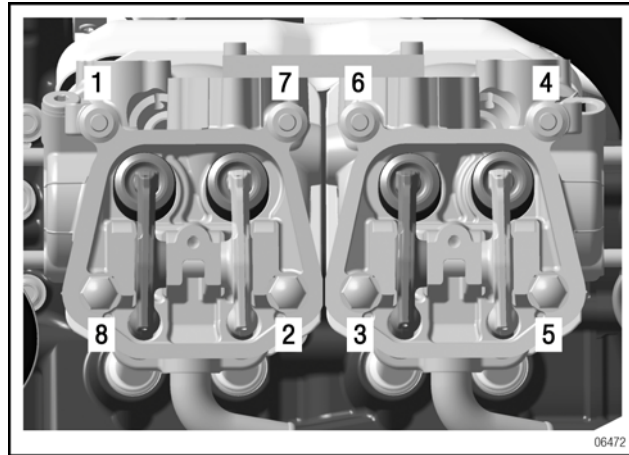
Fig. 46



1. Cylinder aligning tool 2. M6x25 Allen screw 877262
3. Intake flange

Step	Procedure
2	Tighten the collar cap nut and the M8 hex. nut (diagonally) until they are finger-tight.
3	Fasten the cylinder heads according to the screw diagram. See Figure 47. Tightening torque 10 Nm (88.48 in. lb.) +180°.

Fig. 47



1. Screw diagram

Step	Procedure
4	Loosen 4 Allen screws and remove the cylinder aligning tool.

VALVE COVER INSTALLATION

NOTICE

There must be a minimum gap of 0.2 mm between the valve covers on the outer contour. The valve covers must not touch each other!

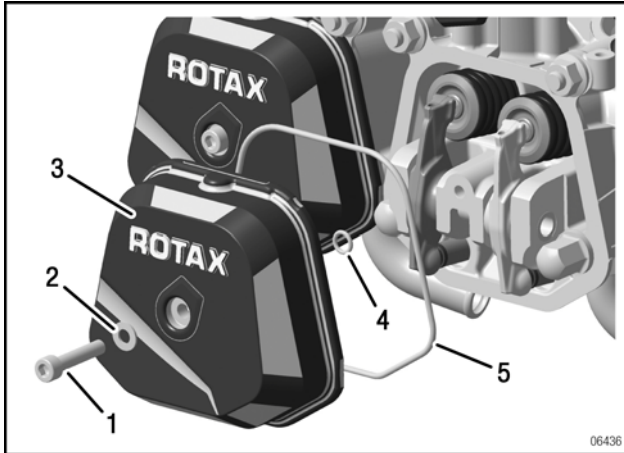
NOTICE

Ensure the valve cover screw is the correct length!
Look out for damaged threads. If the screw is loose or the valve cover leaks, the oil return to the oil tank works by "blow by gas" i.e. insufficiently.

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Step	Procedure
1	Install the 105x2.5 O-ring and the 6.4x1.8 O-ring in the valve cover.
2	Place on the valve cover and fasten it with an M6x30 Allen screw and washer. Tightening torque 12 Nm (106.18 in. lb.).

Fig. 48



- | | |
|------------------------|-------------------|
| 1. M6x30 Allen screw | 2. 6/12/1 washer |
| 3. Cylinder head cover | 4. 6.4x1.8 O-ring |
| 5. 105x2.5 O-ring | |

FINISHING WORK

- Install the coolant hoses to the inlet and outlet elbow. See also section 75-00-00 Cooling system.
- Install the intake manifold. See also section 73-00-00 Fuel system.
- Form the connection to the airbox. To do this, see section 73-10-00 Fuel pump and distribution.
- If necessary, install the knock sensor of cylinder 1.
- Install the fuel rail assy. To do this, see section 73-10-00 Fuel pump and distribution.
- Install the spark plugs and connect the resistance spark plug connectors. See also section 74-20-00 Distribution.
- Install the temperature sensor and connect the wiring harness. To do this, see section 76-70-00 Sensors and actuators.
- Install the fuel line inlet and outlet. To do this, see section 73-10-00 Fuel pump and distribution.
- Install the exhaust system. See also section 78-00-00 Exhaust.
- Connect the wiring harness. See also section 76-00-00 Wiring harness.

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Chapter: 72-30-10
DISPLACEMENT PARTS

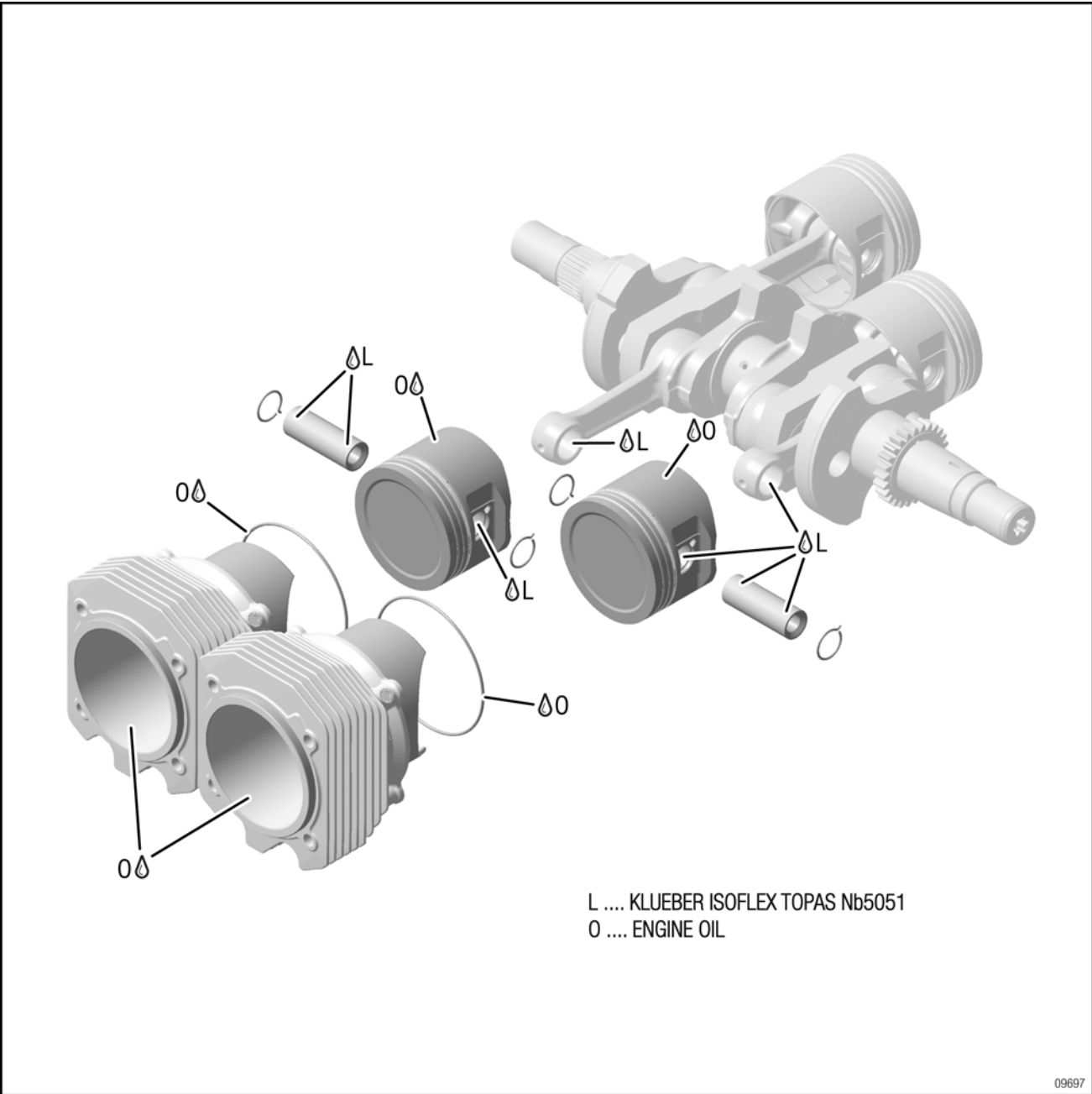
Introduction

This section describes the maintenance of the ROTAX 912 i Series displacement parts. The description is divided into sub-sections and explanations of system functions.

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2. Special tools	Page 3
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8. Wear limits	Page 10
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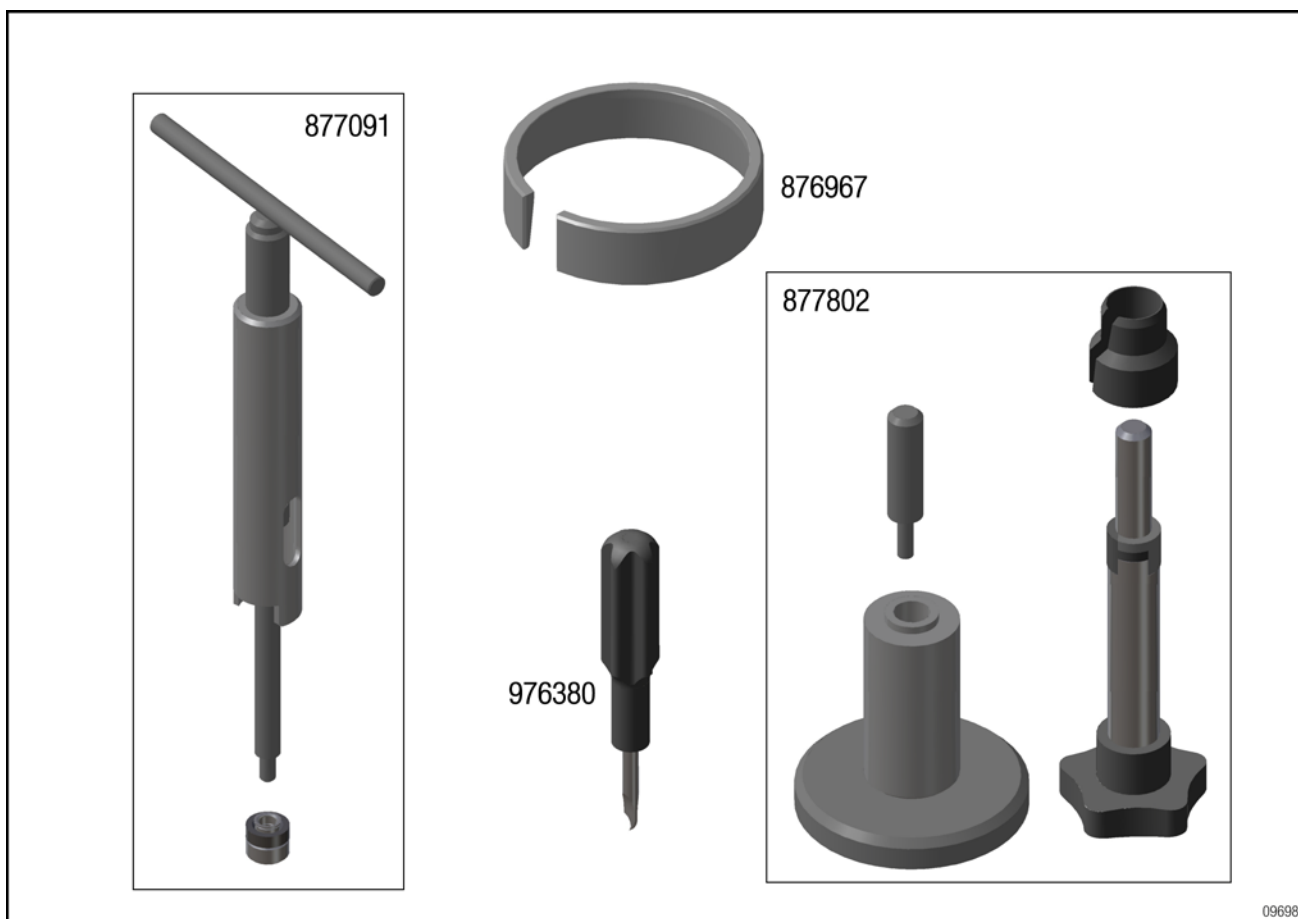
Chapter: 72-30-10
CYLINDER HEAD

SPECIAL TOOLS

Description	Part no.
Piston pin extractor assy.	877091
Piston ring spanner, 84 mm	876967
Monohook circlip remover	976380
Installation tool assy.	877802

SERVICE PRODUCTS

Description	Part no.
KLUEBER ISOFLEX TOPAS NB5051	898351
Engine oil	n.a.



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SYSTEM DESCRIPTION

In the 912 i Series engine, 4 cylinders with "GIL-NISIL"-coated running surfaces are used. The pistons are light alloy full skirt pistons. The piston axle is axially offset by 1 mm (0.03937 in.) with respect to the piston skirt.

SAFETY INFORMATION

 WARNING
Danger of severe burns and scalds! Always allow the engine to cool down to ambient temperature before starting any work.

MAINTENANCE

As well as the maintenance and special checks, see the relevant Maintenance Manual Line for the respective 912 i Series engine type.

REMOVAL

Preparation

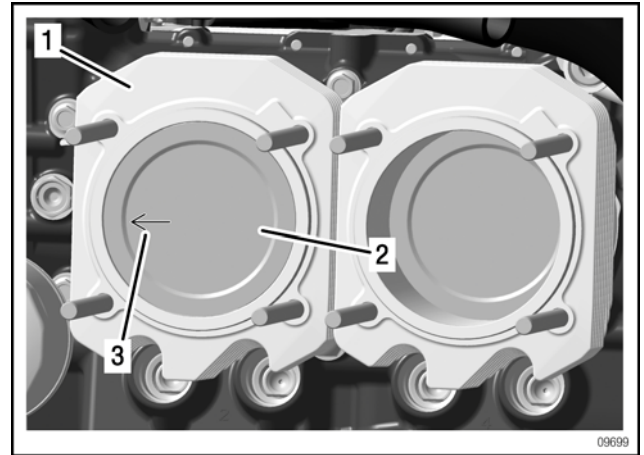
- Remove the cylinder head. See section 72-30-00.

CYLINDER AND PISTON - REMOVAL

NOTE: Before the cylinders and pistons are removed, they must be marked in pairs to prevent confusion. The cylinders are all identical. The pistons are axially offset!

Step	Procedure
1	Put the piston in the TDC position and apply the marking arrow in the direction of the gearbox. NOTE: When the piston is cleaned the marking arrow becomes visible. It points in the direction of the gearbox for all four cylinders and aids correct assembly of the axially offset piston.

Fig. 1




- 1. Cylinders
- 2. Pistons
- 3. Marking arrow

 NOTICE
Pistons and piston rings can be damaged. Support pistons by hand!

Step	Procedure
2	Support the piston by hand and carefully remove the cylinder along with the O-ring.

 WARNING
The mono hook circlip is under stress!

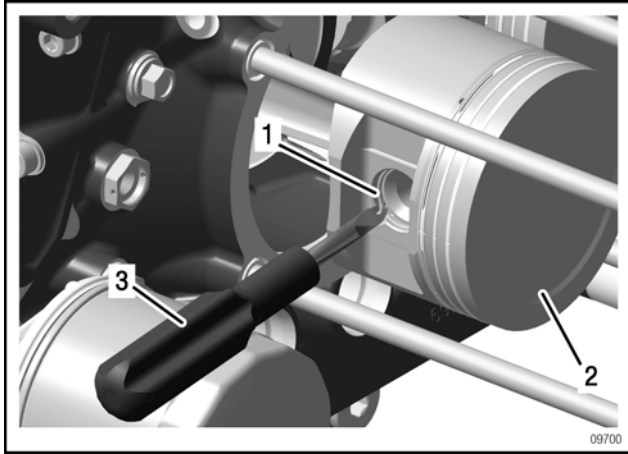
 NOTICE
Cover the crankcase! The mono hook circlip must not fall in.

Step	Procedure
3	Remove the piston pin circlip with mono hook circlip remover part no. 976380.

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Fig. 2

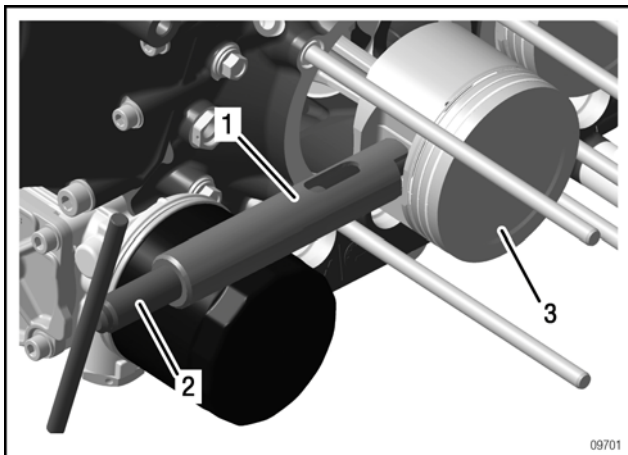


1. Piston pin circlip 2. Pistons
3. monohook circlip remover

NOTE: Piston pin puller assy. part no. 877091 is used to pull out the piston pin.

Step	Procedure
4	Install the puller spindle in the piston pin and mount M6 extracting nut (part no. 877455).
5	Turn the puller spindle clockwise to pull the piston pin out of the conrod into the puller sleeve until the piston can be taken off.

Fig. 3



1. Piston pin puller 2. Puller spindle
3. Pistons

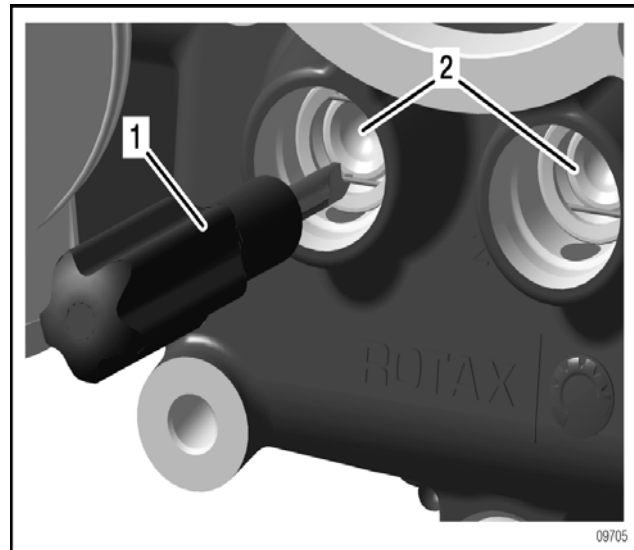
Step	Procedure
6	Loosen the nut and remove the puller. Remove the piston and put it down with the corresponding cylinder.

REMOVAL OF THE HYDRAULIC VALVE TAPPET

NOTE: Put the hydraulic valve tappet down so that it can be installed in the same place when it is reused.

Step	Procedure
1	Remove the hydraulic valve tappet from the housing with the mono hook circlip remover part no. 976380.

Fig. 4



1. mono hook circlip remover 2. Hydraulic valve tappet

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INSPECTION

DISPLACEMENT PARTS - INSPECTION

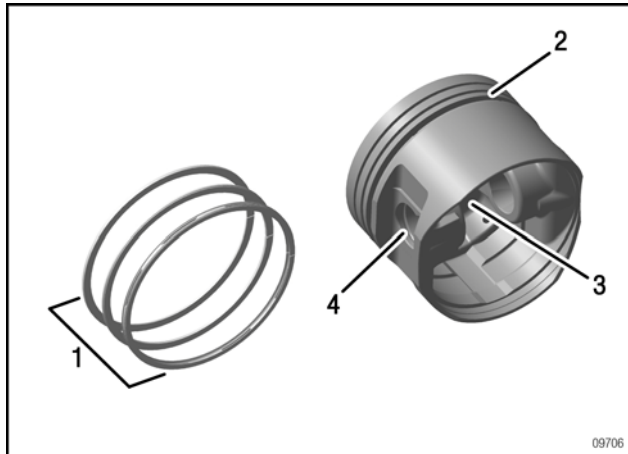
Preparation

- Clean all parts carefully. See also section 05-00-00 Procedures

PISTON - INSPECTION

Step	Procedure
1	Remove the piston rings with the piston ring pliers. NOTE: Removed rings must be re-installed in the same position and location.
2	Remove carbon residues from piston rings and ring grooves and from the piston crown. NOTE: The best way to clean the groove root is with an old, broken piston ring. Multiple deposits are likely if AV-GAS 100LL is used.
3	Check the groove for the piston pin circlip. Carefully remove any burrs. NOTE: If the groove is excessively worn (>0.3 mm (0.0118 in.) than the retaining ring), the piston must be replaced.

Fig. 5



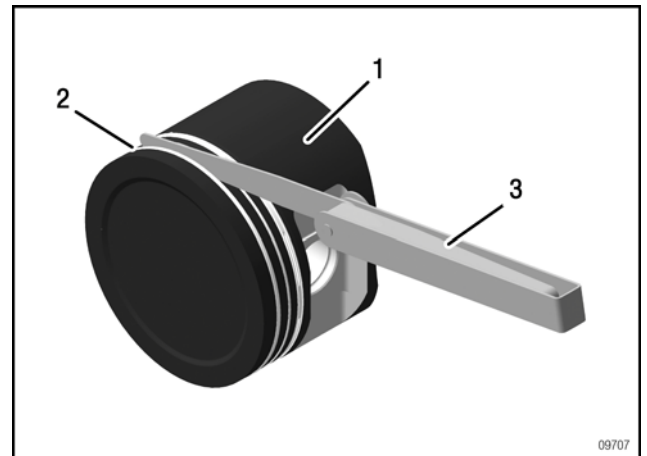
- 1. Piston rings
- 2. Ring grooves
- 3. Piston crown
- 4. Piston pin circlip groove

NOTE: Two sizes of pistons are available, red and green. The difference is 0.01 mm (0.00039 in.). The "red" piston is the smaller one. The nominal size of the piston is stamped on the piston crown. Oversized pistons are not available. The piston is only delivered with 3 rings.

Step	Procedure
4	Visually inspect and measure the piston. Measure the cylinder and determine the permissible installation clearance. See also section 72-30-10 Wear limits. NOTE: If the determined installation clearance is greater than the permissible installation clearance, the piston and/or cylinder must be replaced.
5	Determine the diameter of the piston pin bore. See also section 72-30-10 Wear limits.

NOTE: The flank clearance can be measured on the installed rings using a feeler gauge. Multiple deposits in the spiral expander of the oil scraper ring suggests that AV-GAS 100LL has been used.

Fig. 6



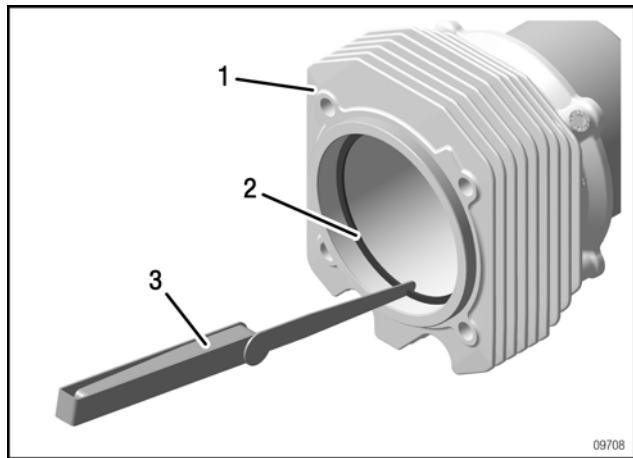
- 1. Pistons
- 2. Ring grooves
- 3. Feeler gauge

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PISTON RINGS - INSPECTION

Step	Procedure
1	<p>Check the cleaned piston rings for piston ring joint clearance.</p> <p>NOTE: To determine the piston ring joint clearance, remove the piston rings with piston ring pliers, clean them and place them in the cylinder. Aligned with a piston in the cylinder and pushed approx. 10 mm (0.3937 in.) from the upper edge into the cylinder.</p>
2	<p>Measure the piston ring joint clearance using a feeler gauge. See also section 72-30-10 Wear limits (PI07).</p> <p>NOTE: Examine the ring surface closely to identify the supporting part and thus also the wear which has already taken place.</p>

Fig. 7



- 1. Cylinders
- 2. Piston ring
- 3. Feeler gauge

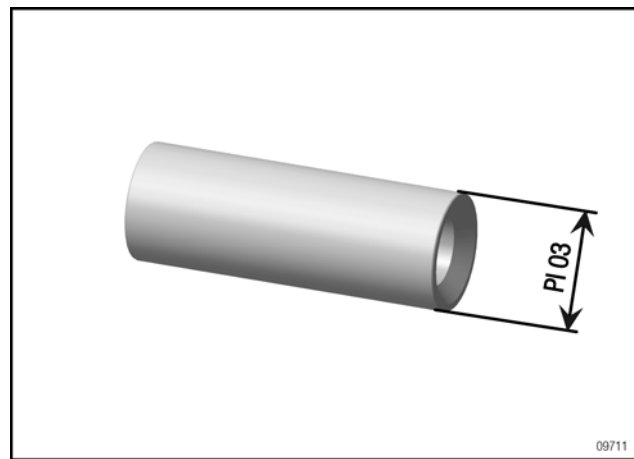
PISTON PIN - INSPECTION

NOTICE

The mono hook circlips for the axial piston pin circlip must only be used once and must therefore be replaced.

Step	Procedure
1	<p>Check the piston pin for traces of wear in the region of the conrod bearing and in the region of the piston bearing and measure it.</p> <p>NOTE: If perceptible traces of wear are found, even if the pistons are within tolerable dimensions, the piston pin must be replaced.</p>
2	<p>Measure dimension PI03. See also section 72-30-10 Wear limits.</p>

Fig. 8



CYLINDER - INSPECTION

NOTICE

If the engine has been overheated, a hardness test of the cylinder is necessary. The hardness test takes place at measurement point CY04. See also section 72-30-10 Wear limits.

NOTE: If the sealing surface of the cylinder has slight carbon residues. This is a sign of leaking. The cylinder must be touched up with the cylinder head until uniform contact is achieved.

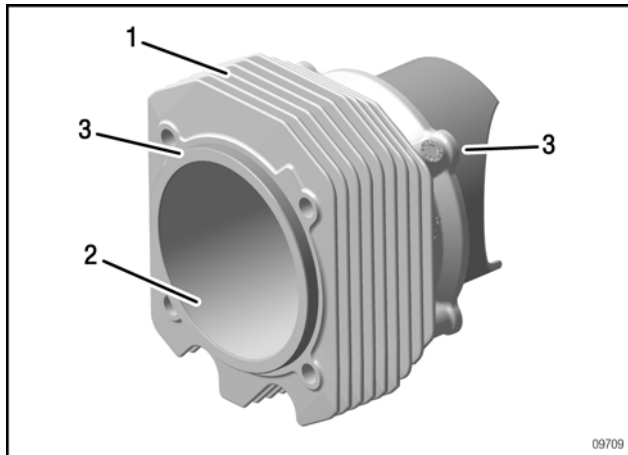
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NOTE: If porosity is found, pores must not exceed a size of 0.4 mm (0.0157 in.) and the pores must have a minimum spacing of 8 mm (0.3150 in.).

Step	Procedure
1	Clean the cooling fins of the cylinder and remove carbon residues in the upper region of the cylinder bore.
2	Clean and check the sealing surfaces on the upper side and rear side.

Fig. 9



1. Cooling fins 2. Cylinder bore
3. Sealing surface

Step	Procedure
3	Measure the cylinder and enter the measurement data (CY01/CY02/CY03). See also section 72-30-10 Wear limits.
4	Determine the installation clearance. See also section 72-30-10 Piston inspection.

HYDRAULIC VALVE TAPPET - INSPECTION

Step	Procedure
1	Check visually for damage and wear. NOTE: The hydraulic valve tappet rotates during operation, so there is a uniform, rotationally symmetrical support pattern on the cam contact face.

NOTE: If the tappet does not rotate, uneven wear occurs on the contact face. If there are uneven smooth areas, corroded areas/pitting, the tappet must be replaced.

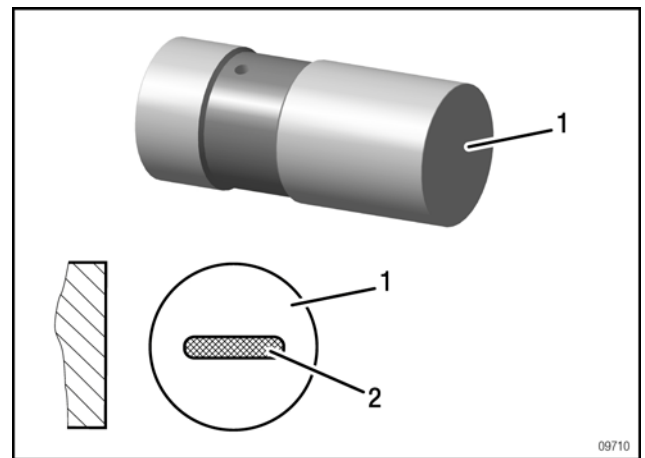
NOTICE

The hydraulic valve tappet must not be reground on the end!

NOTICE

Disassembly of the hydraulic valve tappet is neither permissible nor necessary.

Fig. 10

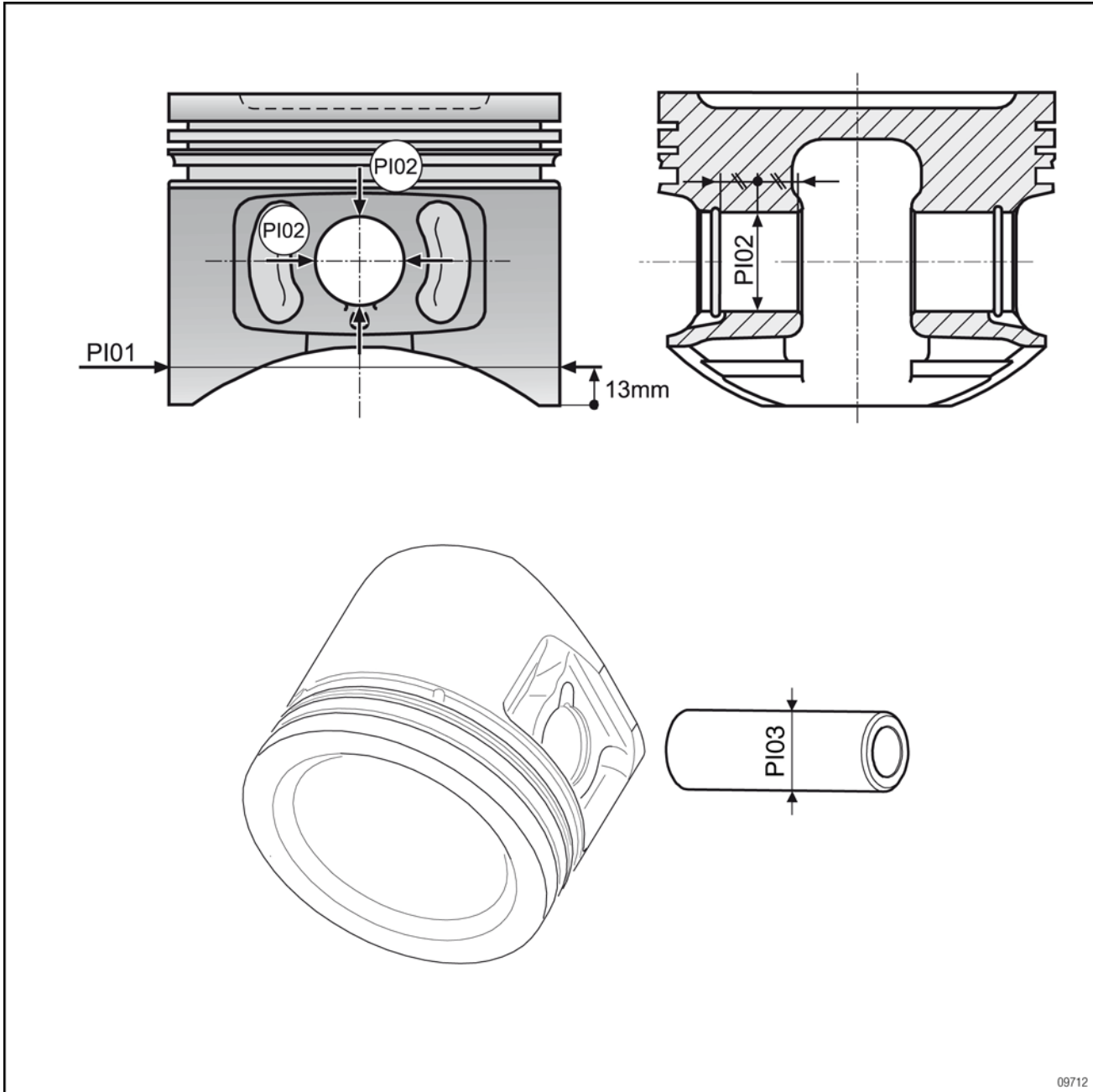


1. Cam contact face 2. Uneven wear

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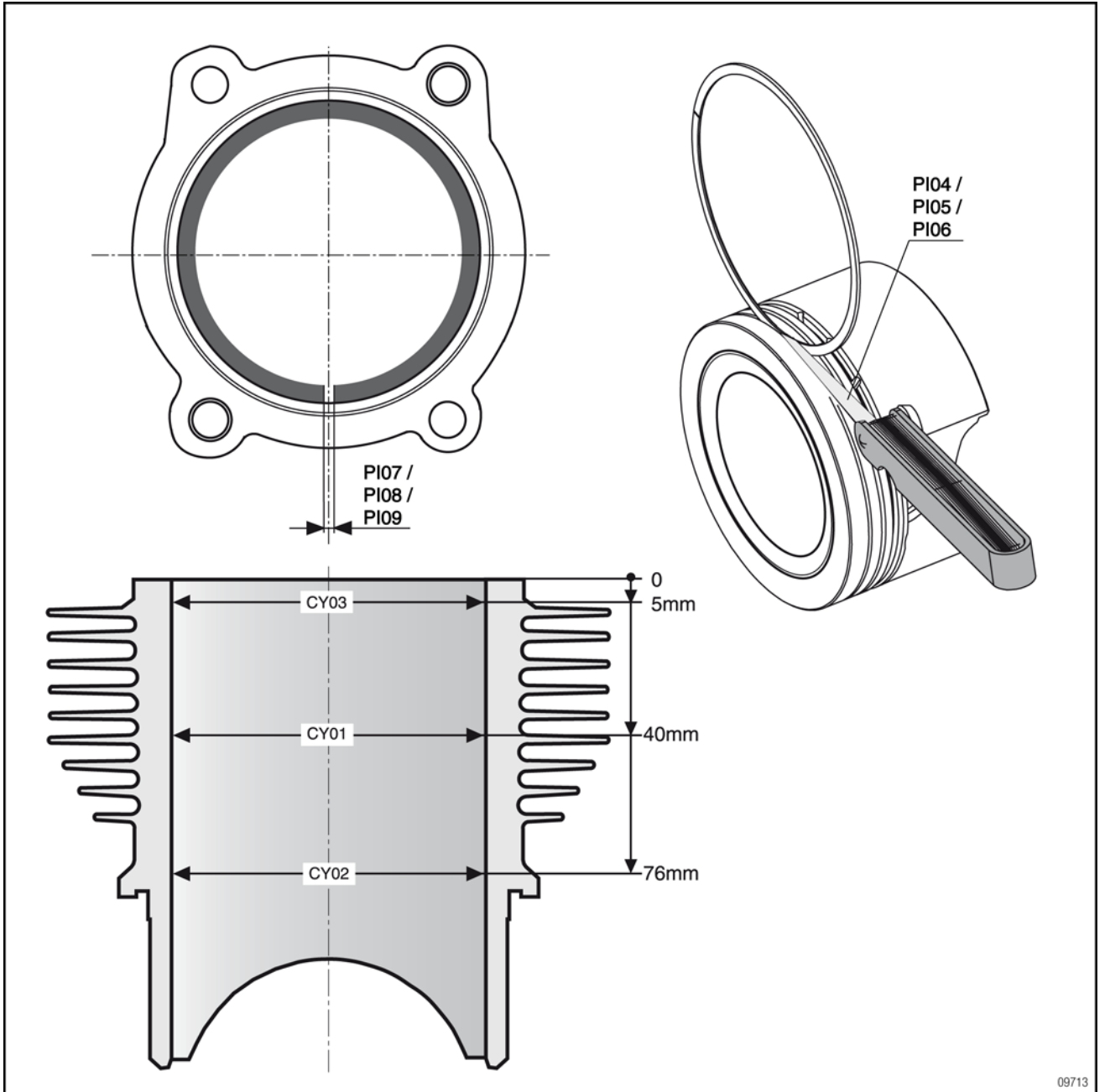
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WEAR LIMITS



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Description	Code	Current measurement value		Tolerance limit	Tolerance limit		Measurements			
		min	max	100 %	50 %		Cyl. 1	Cyl. 2	Cyl. 3	Cyl. 4
1) Piston							Cyl. 1	Cyl. 2	Cyl. 3	Cyl. 4
Piston, red 84 mm / 3.3 in.	PI01	83.988 mm 3.3066 in.	84.002 mm 3.3072 in.	83.890 mm 3.3027 in.	83.939 mm 3.3047 in.	current replaced				
Piston, green 84 mm / 3.3 in.	PI01	83.998 mm 3.3070 in.	84.012 mm 3.3075 in.	83.890 mm 3.3027 in.	83.944 mm 3.3049 in.	current replaced				
Installation clearance, cyl. "A" with "red" piston	CY01 /PI01	0.000 mm 0.0000 in.	0.024 mm 0.0009 in.	0.130 mm 0.0051 in.	0.077 mm 0.0030 in.	current replaced				
Installation clearance, cyl. "B" with "green" piston	CY01 /PI01	0.000 mm 0.0000 in.	0.026 mm 0.0010 in.	0.130 mm 0.0051 in.	0.078 mm 0.0031 in.	current replaced				
Piston pin bore	PI02	20.001 mm 0.7874 in.	20.005 mm 0.7876 in.	20.040 mm 0.7890 in.	20.023 mm 0.7883 in.	current replaced				
Piston pin	PI03	19.992 mm 0.7871 in.	19.995 mm 0.7872 in.	19.970 mm 0.7862 in.	19.981 mm 0.7867 in.	current replaced				
Piston pin clearance in piston pin bore	PI01/PI02	0.006 mm 0.0002 in.	0.013 mm 0.0005 in.	0.050 mm 0.0020 in.	0.032 mm 0.0012 in.	current replaced				
Piston pin clearance in conrod	CS06 /PI03	0.015 mm 0.0006 in.	0.035 mm 0.0014 in.	0.050 mm 0.0020 in.	0.043 mm 0.0017 in.	current replaced				
Backlash between piston ring groove and rectangular piston ring 1	PI04	0.030 mm 0.0012 in.	0.062 mm 0.0024 in.	0.100 mm 0.0039 in.	0.081 mm 0.0032 in.	current replaced				
Backlash between piston ring groove and conical compression ring 2	PI05	0.030 mm 0.0012 in.	0.062 mm 0.0024 in.	0.100 mm 0.0039 in.	0.081 mm 0.0032 in.	current replaced				

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Description	Code	Current measurement value		Tolerance limit	Tolerance limit		Measurements				
		min	max	100 %	50 %						
Backlash between piston ring groove and oil scraper ring 3	PI06	0.020 mm 0.0008 in.	0.055 mm 0.0022 in.	0.100 mm 0.0039 in.	0.078 mm 0.0032 in.	current replaced					
Piston ring end, rectangular piston ring 1	PI07	0.15 mm 0.0059 in.	0.35 mm 0.0138 in.	1.00 mm 0.0394 in.	0.68 mm 0.0266 in.	current replaced					
Piston ring end, conical compression ring 2	PI08	0.15 mm 0.0059 in.	0.35 mm 0.0138 in.	1.00 mm 0.0394 in.	0.68 mm 0.0266 in.	current replaced					
Piston ring end, oil scraper ring 3	PI09	0.15 mm 0.0059 in.	0.40 mm 0.0157 in.	1.00 mm 0.0394 in.	0.70 mm 0.0276 in.	current replaced					
2) Cylinder							Cyl. 1	Cyl. 2	Cyl. 3	Cyl. 4	
Cylinder bore A 84 mm / 3.3 in.	D1	CY01	84.000 mm 3.3071 in.	84.012 mm 3.3075 in.	84.080 mm 3.3102 in.	84.046 mm 3.3089 in.	current replaced				
	D2	CY02	CY01 +0.015 mm CY01 +0.0006 in.		CY01 +0.015/-0.008 mm CY01 +0.0006/ -0.0003 in.		current replaced				
	D3	CY03	CY01 +/- 0.008 mm CY01 +/- 0.0003 mm		CY01 +0.020/-0.008 mm CY01 +0.0008/ -0.0003 in.		current replaced				
Cylinder bore B 84 mm / 3.3 in.	D1	CY01	84.012 mm 3.3075 in.	84.024 mm 3.3080 in.	84.090 mm 3.3106 in.	84.057 mm 3.3093 in.	current replaced				
	D2	CY02	CY01 +0.015 mm CY01 +0.0006 in.		CY01 +0.015/-0.008 mm CY01 +0.0006/ -0.0003 in.		current replaced				
	D3	CY03	CY01 +/- 0.008 mm CY01 +/- 0.0003 mm		CY01 +0.020/-0.008 mm CY01 +0.0008/ -0.0003 in.		current replaced				
Cylinder ovality			0.0000 mm 0.0000 in.	0.007 mm 0.0003 in.	0.050 mm 0.0020 in.	0.029 mm 0.0011 in.	current replaced				
Cylinder cone			0.0000 mm 0.0000 in.	0.030 mm 0.0012 in.	0.060 mm 0.0024 in.	0.045 mm 0.0018 in.	current replaced				
Post-machining of sealing surface/cylinder head			0.0000 mm 0.0000 in.	0.0000 mm 0.0000 in.	0.03 mm 0,0012 in.		current replaced				

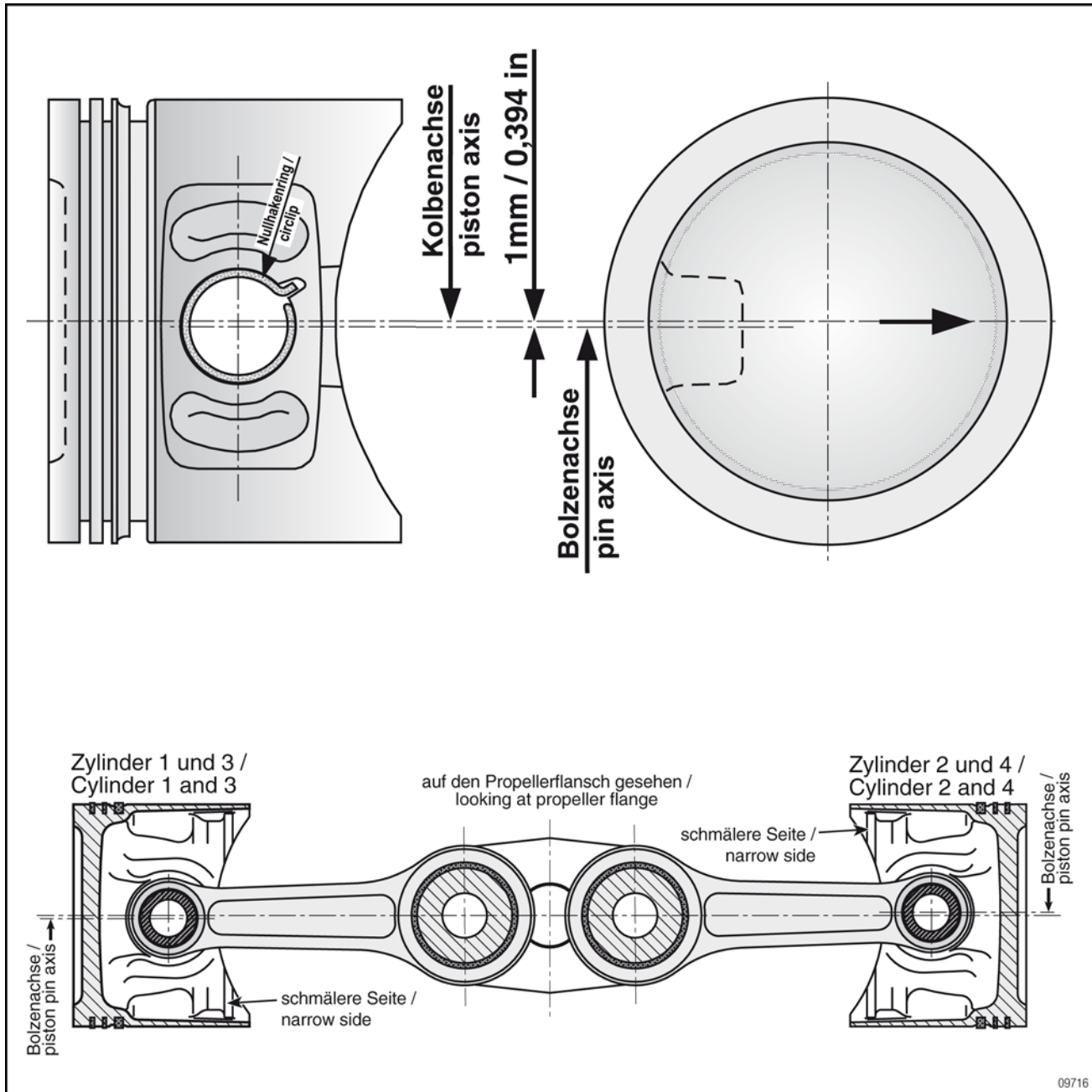
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Fig. 13



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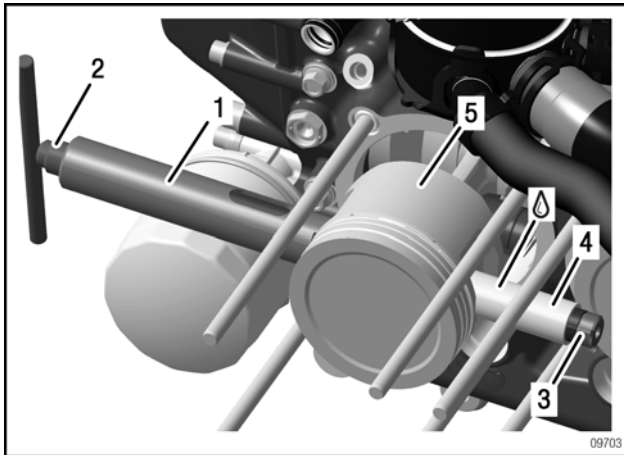
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Step	Procedure
2	Lubricate the piston pin along with the conrod eye and the piston pin bore with KLUEBER ISOFLEX TOPAS Nb5051.

NOTE: Pull in the piston pin with the piston pin puller part no. 877091. The following steps must be followed.

Step	Procedure
3	Push the piston pin to one side in the piston, insert the puller spindle and mount the extracting nut.
4	Turn the spindle clockwise to pull in the piston pin entirely as far as the retaining ring.

Fig. 14



- | | |
|----------------------|-------------------|
| 1. Piston pin puller | 2. Puller spindle |
| 3. Extracting nut | 4. Piston pin |
| 5. Pistons | |

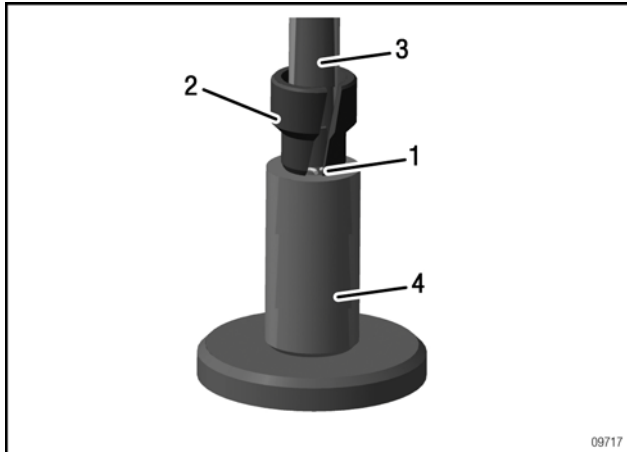
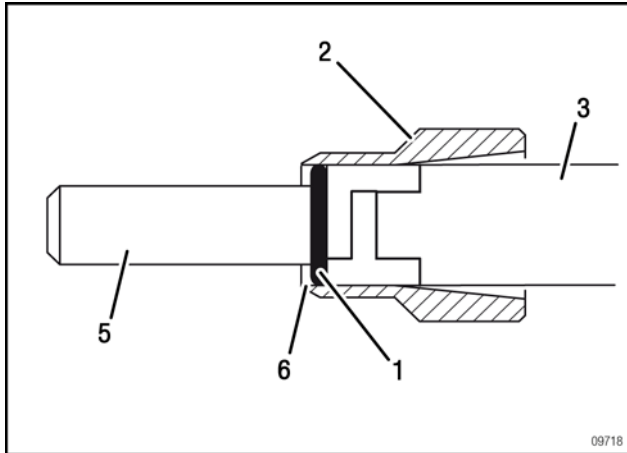
NOTICE
Always use new mono hook circlips. Retaining rings which are used or have already been installed have insufficient tangential tension, can twist and consequently abrade the groove in the piston.

NOTICE
The position of the mono hook circlip is defined by the recess in the piston. The open side of the mono hook circlip must be opposite the piston crown when installed.

Step	Procedure
5	Install the piston pin circlip with installation tool part no. 877802. To do this, press the mono hook circlip into the groove of the installation sleeve and push the guide tool into the installation sleeve.
6	Push the installation sleeve onto the installation tool.
7	Push the installation tool into the position gauge and press the ring forwards as far as it will go.

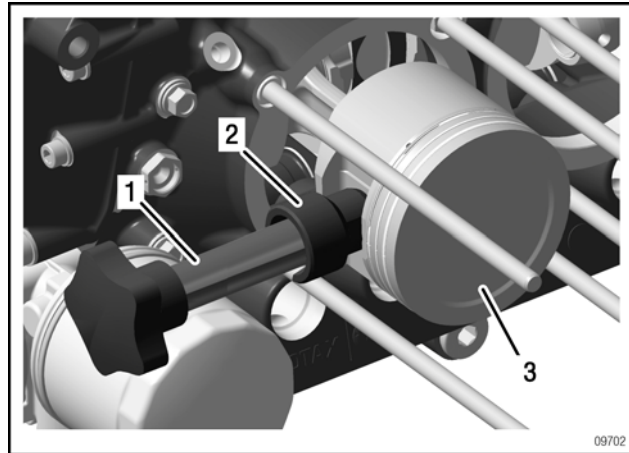
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Fig. 15



- 1. Mono hook circlip
- 2. Installation sleeve
- 3. Installation tool
- 4. Punch tool assy.
- 5. Guide tool
- 6. Groove

Fig. 16



- 1. Installation tool
- 2. Installation sleeve
- 3. Pistons

Step	Procedure
8	Place the whole installation tool on the piston. Support the piston with your hand and push the mono hook circlip into the retaining groove of the piston with a strong pressure on the installation tool.

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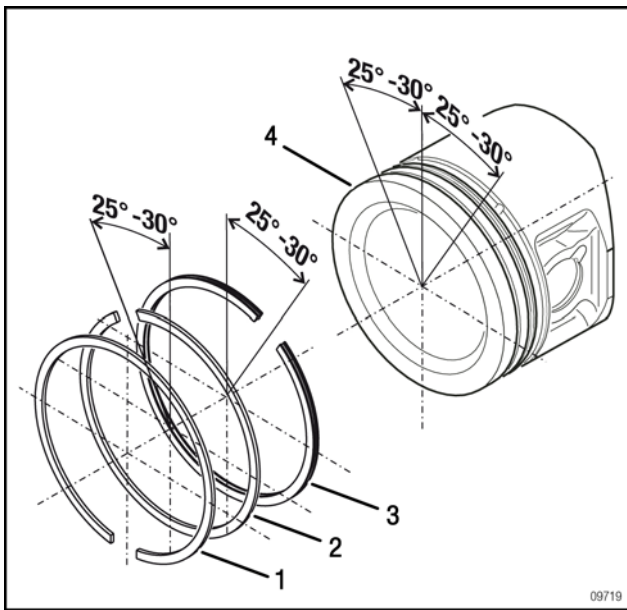
CYLINDER INSTALLATION

NOTICE

The suitable piston ring spanner part no. 876967 must be used to avoid ring breakages. Ensure that the piston ring joints are in the specified angle range. See Figure 17.

Step	Procedure
1	Install the piston ring in the centre of the lower piston skirt.
2	Install the compression and oil scraper rings on the upper piston skirt, inclined away between 25° and max. 30°.

Fig. 17



- 1. Piston ring
- 2. Compression ring
- 3. Oil scraper ring
- 4. Pistons

NOTICE

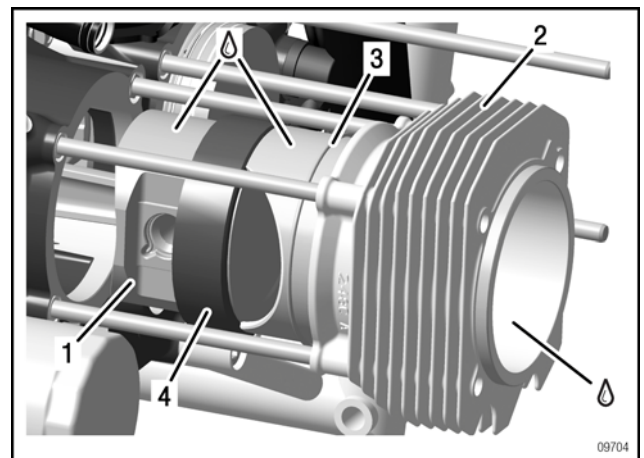
The ring gap should never come to lie in the region of the piston pin eye.

NOTICE

Double-check that piston pin circlips are installed properly.

Step	Procedure
3	Install the 87x2 O-ring on the cylinder neck and lubricate the cylinder running surface.
4	Lubricate the piston, compress the piston rings with piston ring spanner part no. 876967 and carefully install the corresponding cylinders. NOTE: Repeat this process for the other cylinders.

Fig. 18



- 1. Pistons
- 2. Cylinders
- 3. 87x2 O-ring
- 4. Piston ring spanner part no. 876967

FINISHING WORK

- Install the cylinder head. See section 72-30-00.
- Purge the lubrication system.

NOTE: Before commissioning, take note of SI-912-018 Purging of lubrication system.

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Chapter: 73-00-00
FUEL SYSTEM

Introduction

This section describes the maintenance of the fuel system assembly of the ROTAX 912 i Series engine. The description is divided into sub-sections and explanations of system functions.

Subject	Section
1. Introduction A. System description B. Safety information C. Connections for display systems	Chapter 73-00-00 Page 4 Page 4 Page 4
2. Fuel pump and distribution	Chapter 73-10-00

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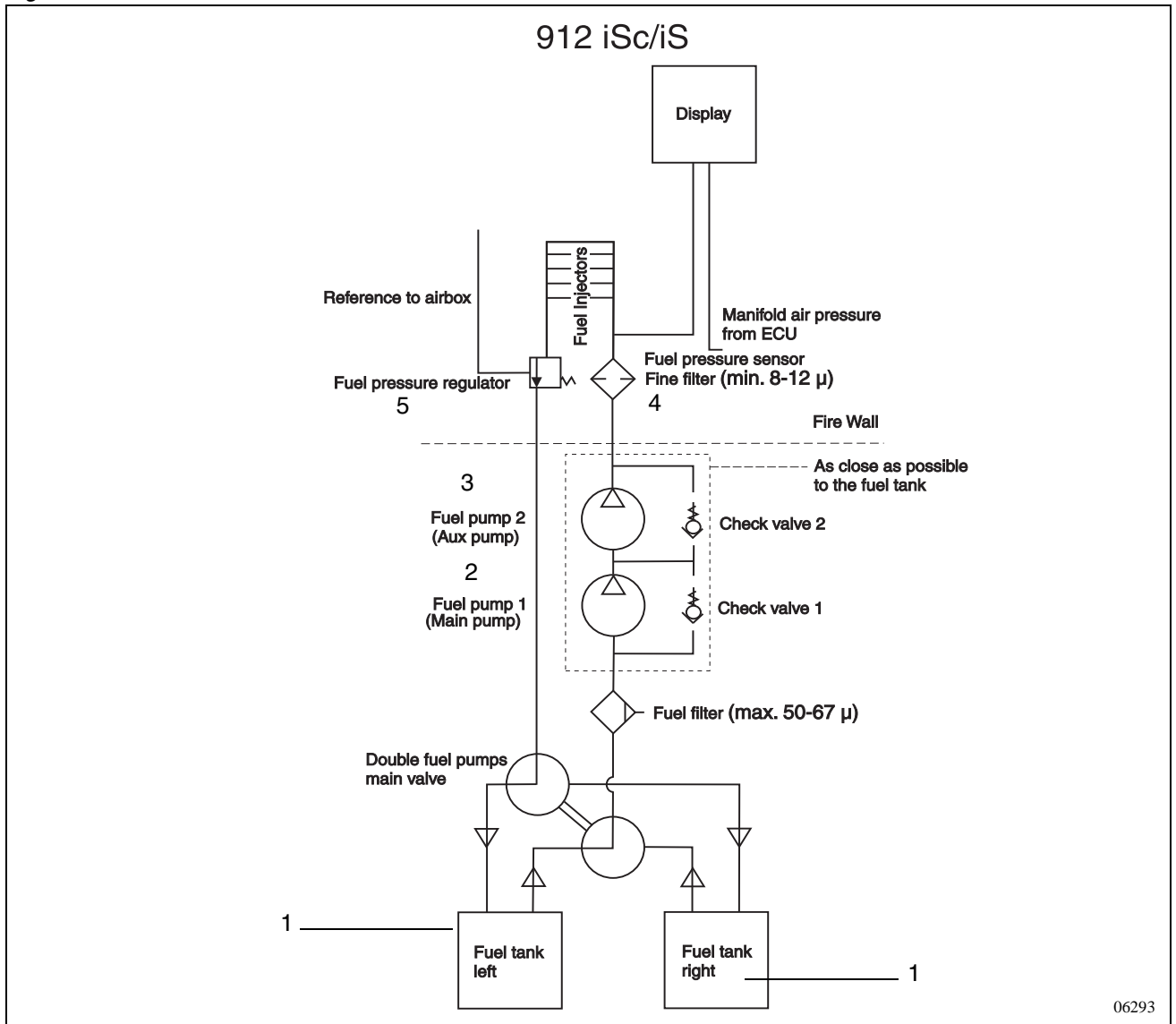
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System description

Fig. 1



- | | |
|---------------------------|----------------------------|
| 1. Fuel tank | 2,3. Fuel pump |
| 4. Water trap/fine filter | 5. Fuel pressure regulator |

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SYSTEM DESCRIPTION

The fuel passes from the tanks via the water trap/ fine filter to the series-connected electric fuel pumps, from there to the fuel rails, the injection valves and the fuel pressure regulator.

The fuel pressure must be measured with an absolute pressure sensor.

ECU

The ECU controls one of the two fuel pumps through one of the two LANEs. The pilot can switch on the second fuel pump with an additional switch if required, if no automatic detection is present.

FUEL FILTER

Coarse filter

The coarse filter is installed by the aircraft manufacturer and is not included in the ROTAX delivery.

Fine filter

The fine filter is installed before the fuel pumps and is not included in the ROTAX delivery.

SAFETY INFORMATION

WARNING

During work on the fuel system there is a risk of injury due to pressure and fuel!

- Always wear safety goggles and gloves when working on the fuel system!
 - Before starting repair work on the fuel system, ensure that it is no longer pressurised!
 - Ensure that pressure cannot build up again by disconnecting the electric supply.
 - At the workplace, ensure that drained fuel is handled according to the safety information.
-

CONNECTIONS FOR DISPLAY SYSTEMS

NOTICE

Follow the instructions in the installation manual regarding connections for instrumentation.

PRESSURE SENSOR

The 2 pressure sensors are situated directly on the airbox and measure the intake air pressure.

TEMPERATURE SENSOR

The 2 temperature sensors are situated directly on the airbox and measure the intake air temperature.

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Chapter: 73-10-00
FUEL PUMP AND DISTRIBUTION

Introduction

This section describes the maintenance of the fuel pump and distribution assembly of the ROTAX 912 i Series engine. The description is divided into sub-sections and explanations of system functions.

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Chapter: 73-10-00
FUEL PUMP AND DISTRIBUTION

SPECIAL TOOLS

Description	Part no.
Seeger ring pliers	n.a.

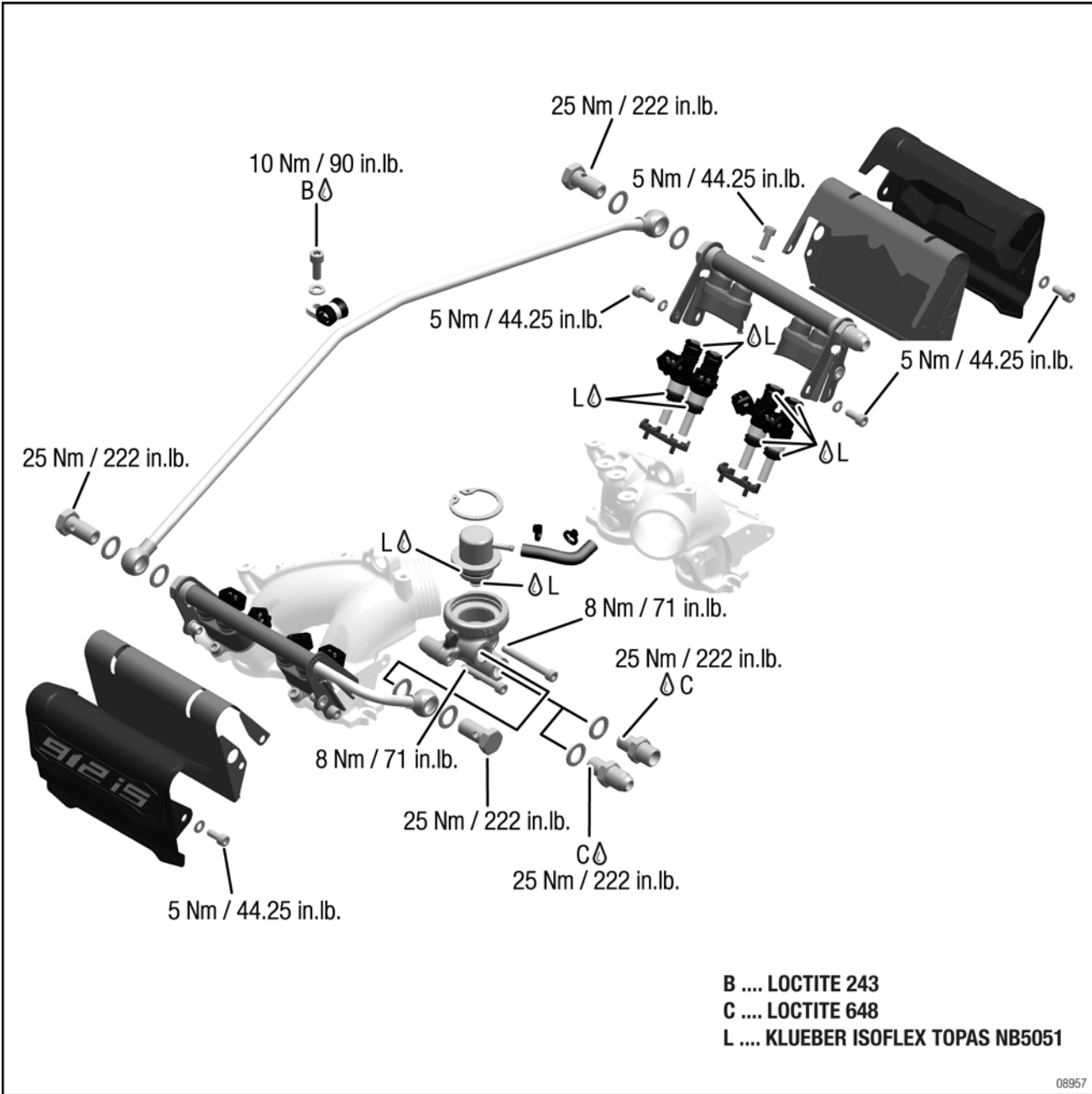
SERVICE PRODUCTS

Description	Part no.
KLUEBER ISOFLEX TOPAS Nb5051	898351
LOCTITE 243	897651
LOCTITE 648	899788

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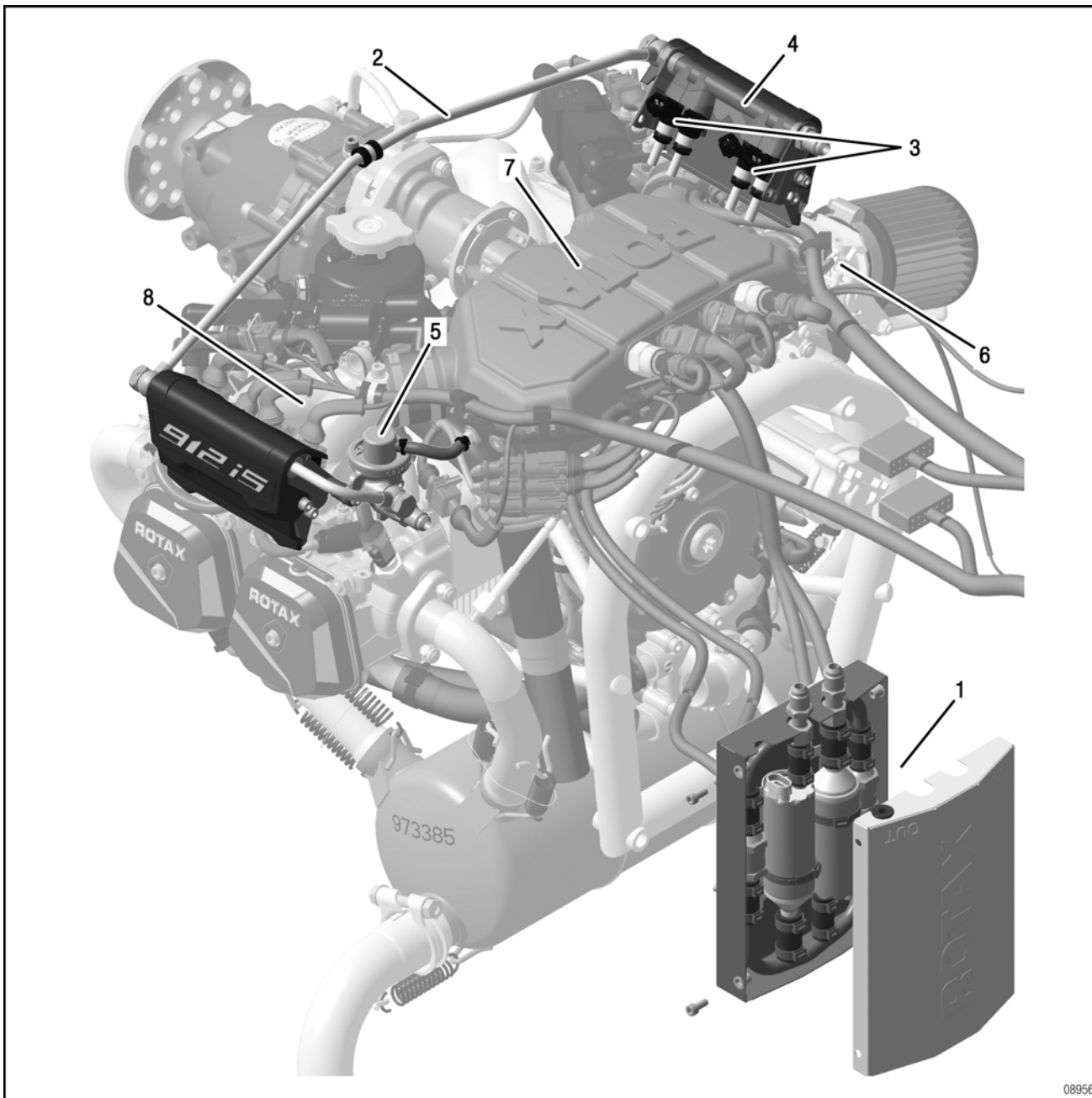
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Fuel distribution



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Fuel distribution



- | | |
|----------------------------------|-------------------------|
| 1. Fuel pump assy. | 2. Fuel hose assy. |
| 3. Injection valves | 4. Right-hand fuel rail |
| 5. Fuel pressure regulator assy. | 6. Throttle body |
| 7. Airbox | 8. Intake manifold |

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SYSTEM DESCRIPTION

FUEL PUMP MODULE

The fuel pump module is available from ROTAX on request.

The fuel pump module consists of:
Main and additional pump
2 check valves
connecting lines, connecting hoses
sheet metal housing

The main fuel pump is always switched on during operation of the aircraft engine. The additional fuel pump is switched on in the event of a failure of the main pump or for certain flight situations (e.g. take-off and landing). If a pump is blocked by dirt, the fuel is sucked in via the check valves and carried to the engine.

FUEL DISTRIBUTION

The main elements of the fuel distribution assembly are:

- Air filter
- Throttle body
- Airbox
- Injection system with fuel pressure regulator assy.

Throttle body

The throttle valve is actuated by using the throttle lever. The position of the throttle valve is detected by the throttle potentiometer and the signal is sent to the ECU. The ECU uses the sensors to determine the amount of fuel and the fuel is injected directly into the intake manifold through the injection valves.

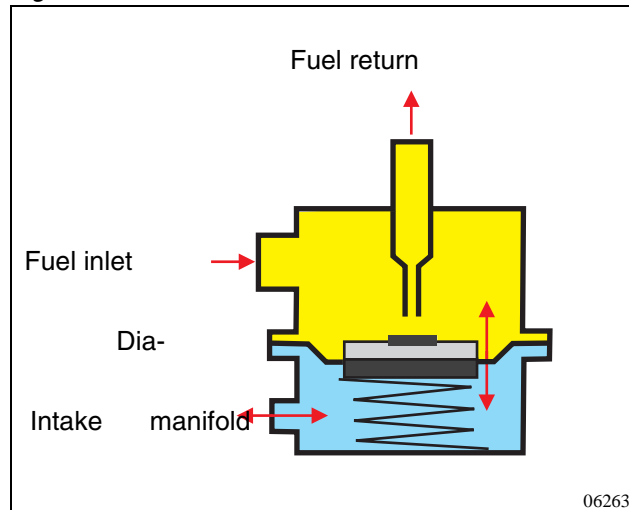
NOTICE

The throttle valve is set to WOT if no throttle valve is attached. Never start the engine without connecting a throttle cable.

Fuel pressure regulator

The fuel pressure regulator keeps the fuel system pressure upstream of the injection valves constant relative to the intake manifold pressure (differential fuel pressure). The injection quantity is therefore only dependent on the activation time of the injection valves and can be reproduced using the activation time in all operating conditions. Therefore, the same amount of fuel is injected per unit time at all pressure ratios. It is essentially a bypass valve, which opens a return duct to the tank for the fuel by means of a spring-loaded diaphragm when the set pressure is exceeded. The regulator has a vacuum line to the airbox (reference line) so that the absolute fuel pressure can be changed proportionally to the airbox pressure.

Fig. 1



Function principle

NOTE: The fuel pressure is 3 bar +/-0.1 bar.

Injection valve

The injection valves are laid out in a redundant manner and are activated by the control unit so that they inject alternately.

1-4-2-3 and in the next combustion cycle
5-8-6-7.

Fuel line assy. and fuel rails

The fuel line assy. from the tank to the fuel pump, to the fuel rail of cylinders 1 and 3 and also the fuel return line from the fuel rail for cylinders 2 and 4 are made by the aircraft manufacturer.

The fuel line assy. on the engine consists of steel.

Bubble trap – see aircraft manufacturer

Water trap – see aircraft manufacturer

Fuel cock – see aircraft manufacturer

SAFETY INFORMATION

 **WARNING**

Danger of severe burns and scalds! Always allow the engine to cool down to ambient temperature before starting any work.

 **WARNING**

During work on the fuel distribution system/fuel pump there is a risk of injury due to pressure and fuel!
Before starting repair work on the fuel system, ensure that it is no longer pressurised!

MAINTENANCE

As well as the maintenance and special checks, see the relevant Maintenance Manual Line for the respective 912 i Series engine type.

REMOVAL

Preparation

Before the fuel distribution system/fuel pump is removed, the work described below must be carried out to identify any further faults in the fuel distribution system and rectify them as part of the repair work.

NOTICE

If these checks are omitted, it may be necessary to dismantle the fuel distribution system again to rectify any faults after it has been repaired.

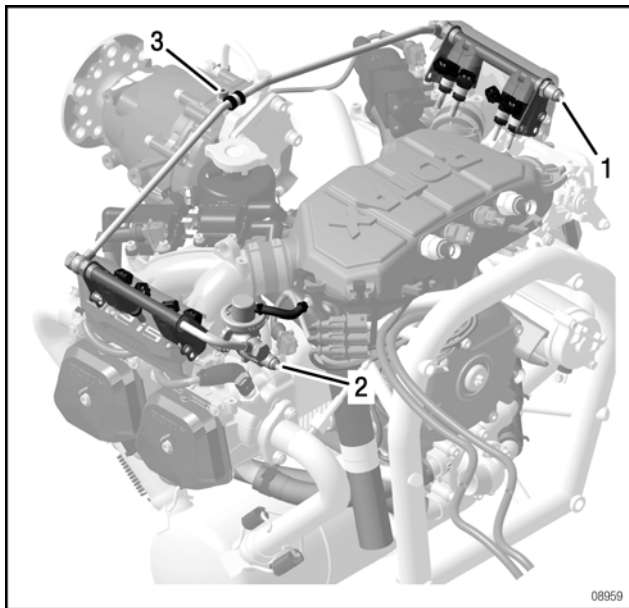
- General visual inspection. See relevant Maintenance Manual Line for the 912 i Series engine type.
 - Carry out an engine test run. See relevant Maintenance Manual Line for the 912 i Series engine type.
 - Functional check of the fuel distribution system assy.
 - Check that the system is leakproof.
 - Check the injection valves. Check the "spray pattern" using the map.
 - Measure the resistance of the injection valves. To do this, see section 76-70-00 Sensors and actuators.
 - Check the fuel pressure regulator with a pressure gauge in the static operating state.
 - Check that the fuel filter in the feed line is clear.
-

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FUEL LINE ASSY. - REMOVAL

Step	Procedure
1	Drain the fuel. See also section 12-20-00 Planned maintenance.
2	Remove the feed line to fuel rail 1/3 and the return line to fuel rail 2/4 and fuel pressure regulator and close them with the appropriate caps.
3	Loosen the M6x16 Allen screw of the fuel line assy.

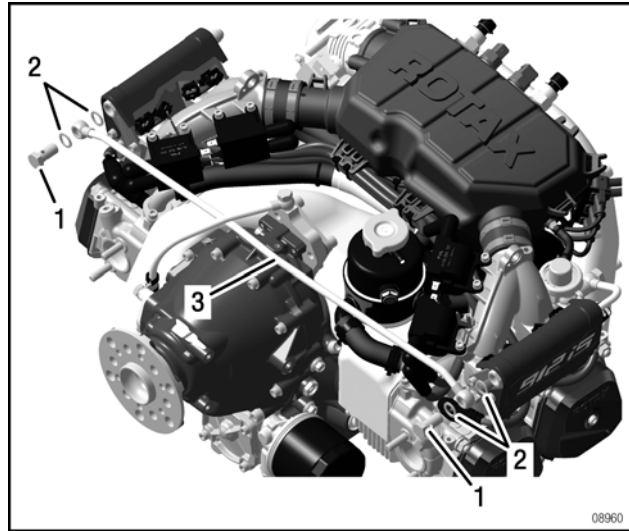
Fig. 2



1. Fuel rail 1/3 feed line 2. Fuel rail 2/4 outlet line
3. M6x16 Allen screw

Step	Procedure
4	Loosen 2 M12x1.5 banjo bolts with gasket ring.
5	Remove the fuel line assy.

Fig. 3



1. M12x1.5 banjo bolt 2. Gasket ring
3. Fuel hose assy.

FUEL PRESSURE REGULATOR ASSY. - REMOVAL

Preparation

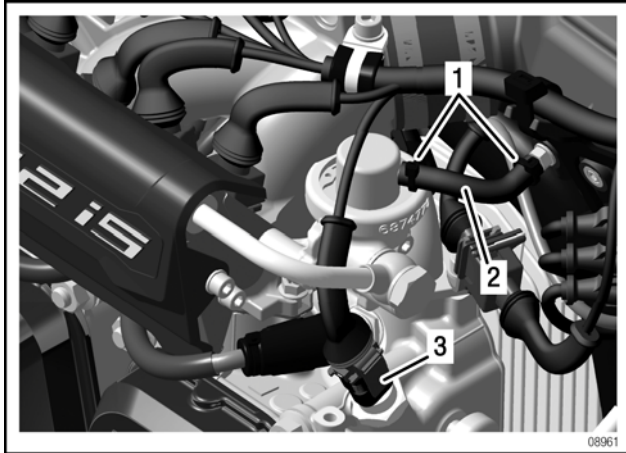
- Carry out functional check.
Fuel pressure: 3.00 bar +/- 0.1 bar (differential pressure to the intake manifold pressure or intake air pressure)

Step	Procedure
1	Drain the fuel. See also section 12-20-00 Planned maintenance.
2	Remove the return line to fuel rail 2/4 and fuel pressure regulator and close them with the appropriate caps.
3	Remove the cable ties and pull out the hose.
4	Disconnect the plug connection to the temperature sensor.

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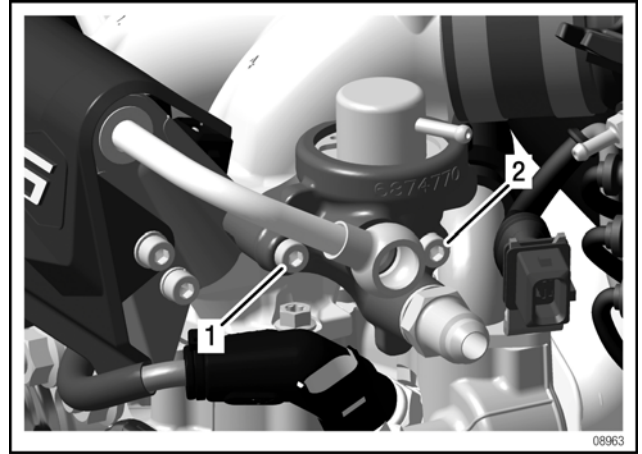
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Fig. 4



- 1. Cable ties
- 2. Hose
- 3. Temperature sensor

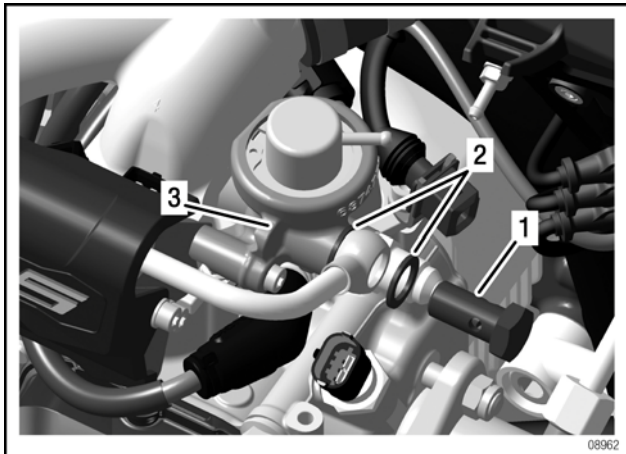
Fig. 6



- 1. M5x35 Allen screw
- 2. M5x45 Allen screw

Step	Procedure
5	Loosen the banjo bolt with gasket ring in the pressure regulator housing.

Fig. 5



- 1. Banjo bolt
- 2. Gasket ring
- 3. Pressure regulator housing

Step	Procedure
6	Loosen the M5 Allen screws. NOTE: 1 M5x35 Allen screw. 1 M5x45 Allen screw.
7	Remove the fuel pressure regulator and housing.

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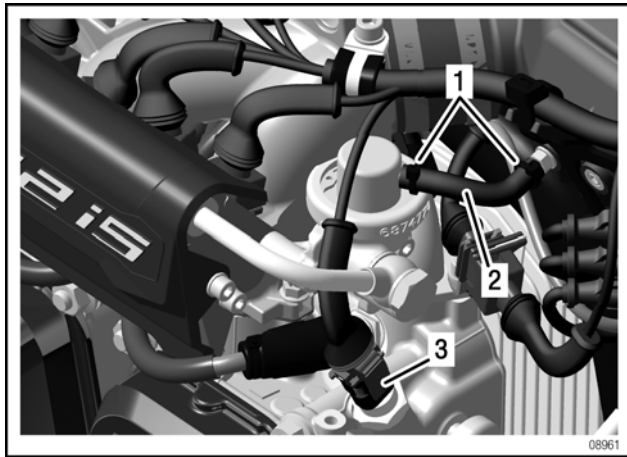
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DISASSEMBLY

**FUEL PRESSURE REGULATOR ASSY. -
DISASSEMBLY**

Step	Procedure
1	Drain the fuel. See also section 12-20-00 Planned maintenance.
2	Remove the cable ties and pull out the hose.
3	Disconnect the plug connection to the temperature sensor.

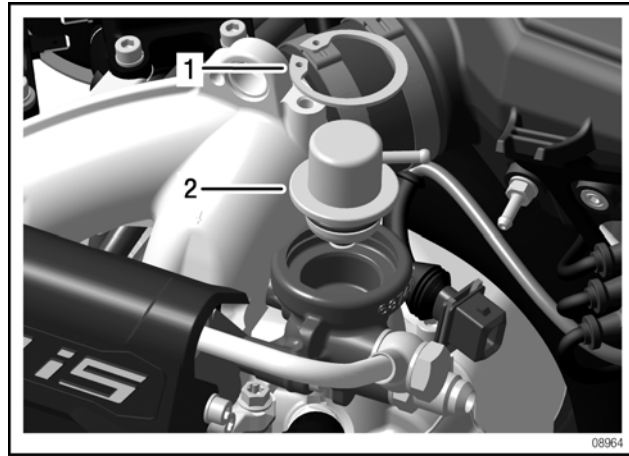
Fig. 7



1. Cable ties 2. Hose
3. Temperature sensor

Step	Procedure
4	Remove the retaining ring using Seeger ring pliers.
5	Remove the fuel pressure regulator.

Fig. 8



1. Retaining ring 2. Fuel pressure regulator

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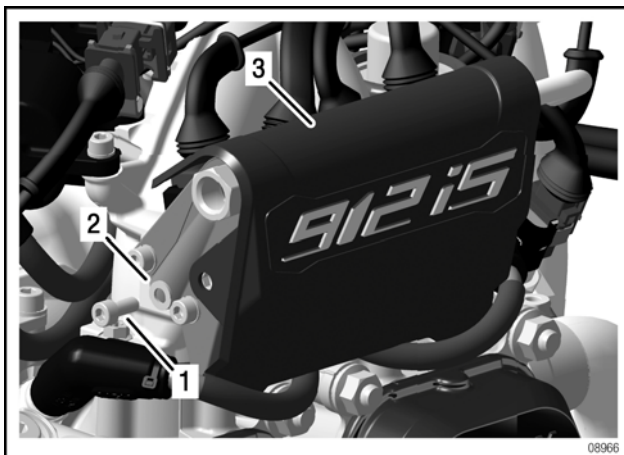
FUEL RAIL - REMOVAL

Preparation

- Drain the fuel. See also section 12-20-00 Planned maintenance.
- Unscrew the feed line to fuel rail 1/3 and the return line to fuel rail 2/4 and fuel pressure regulator and close them with the appropriate caps.
- Loosen the M6x16 Allen screw of the fuel line assy.
- Remove the fuel line assy.

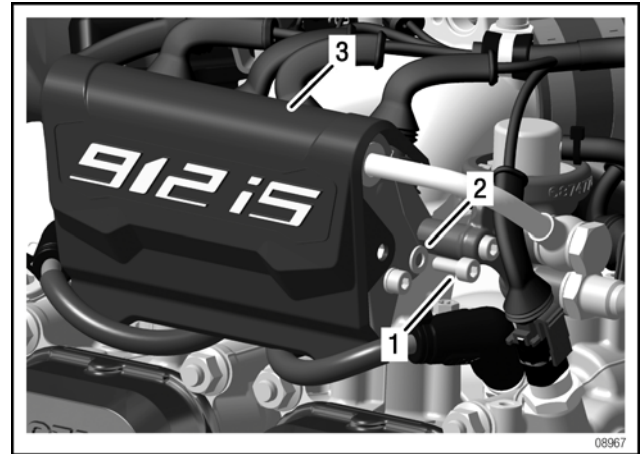
Step	Procedure
1	Loosen 2 M5 x12 Allen screws from the cover of the fuel rail.
2	Lift off the cover.

Fig. 9



1. M5x12 Allen screw 2. 5.3 washer
 3. Fuel rail cover

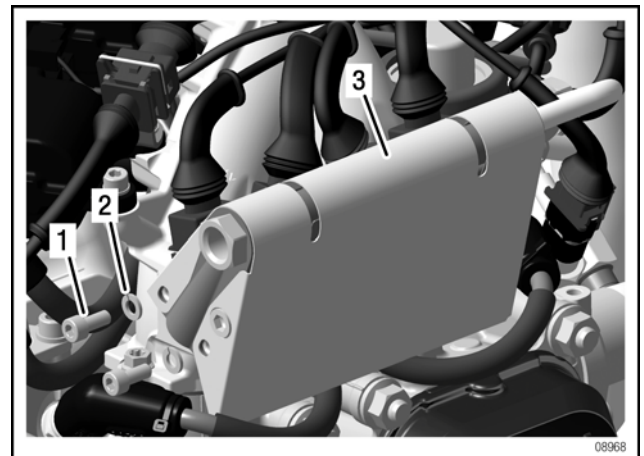
Fig. 10



1. M5x12 Allen screw 2. 5.3 washer
 3. Fuel rail cover

Step	Procedure
3	Loosen 4 M5x12 Allen screws.

Fig. 11



1. M5x12 Allen screw 2. 5.3 washer
 3. Heat shield

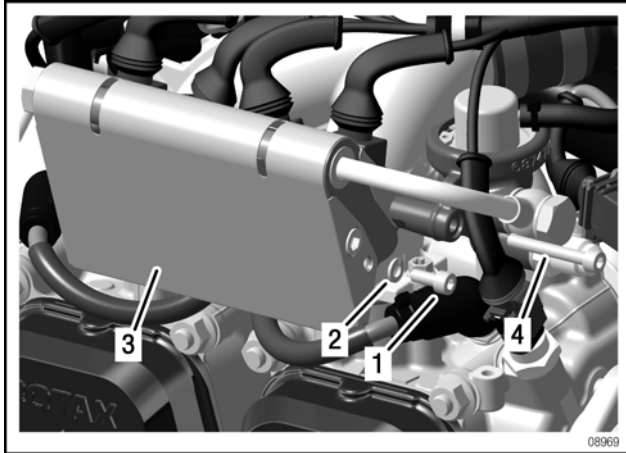
Step	Procedure
4	For cylinder 2 and cylinder 4, loosen the fuel pressure regulator and the M5x35 Allen screw.
5	Lift off the heat shield on both sides in the region of the rivet nut.

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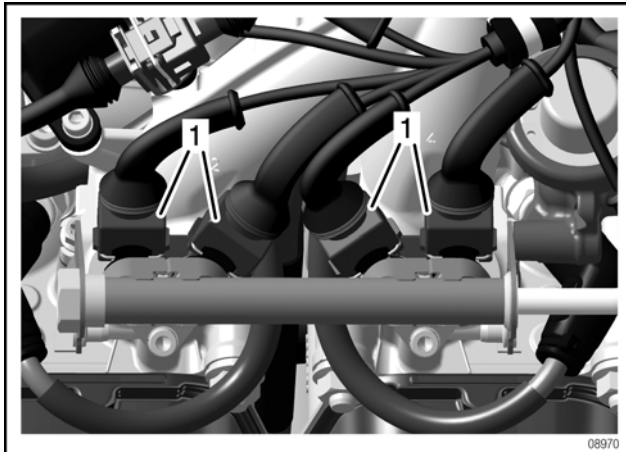
Fig. 12



- 1. M5x12 Allen screw
- 2. 5.3 washer
- 3. Heat shield
- 4. M5x35 Allen screw

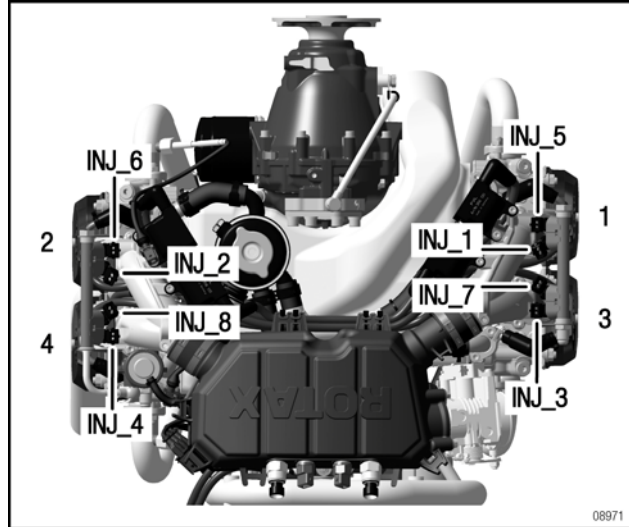
Step	Procedure
6	Disconnect the injectors. NOTE: The cables are labelled INJ_1 to INJ_8.

Fig. 13



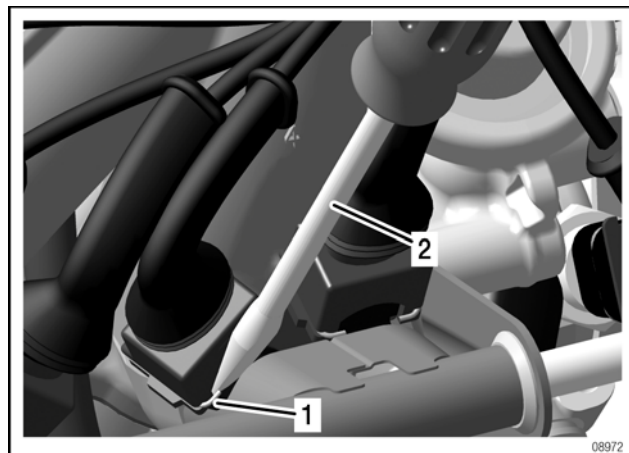
- 1. Injector connectors

Labelling diagram



Step	Procedure
7	Use a screwdriver to lever out the spring clip and then unplug the connector. NOTE: Let the wire clip snap back in after the connector has been disconnected so that it does not get lost.

Fig. 14



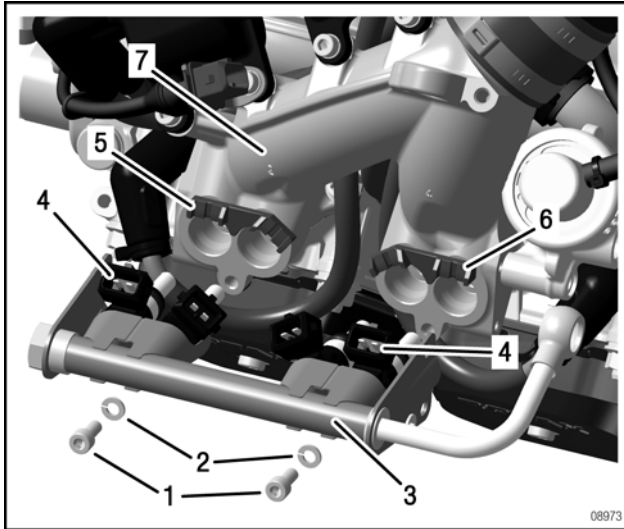
- 1. Injector connectors
- 2. Screwdriver

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Step	Procedure
8	Loosen the two M5x12 Allen screws of the left-hand fuel rail (2/4) attachment and the two M5x12 Allen screws of the right-hand fuel rail (1/3) with the lock washers.
9	Remove the fuel rail on the left and right of the intake manifold.

Fig. 15



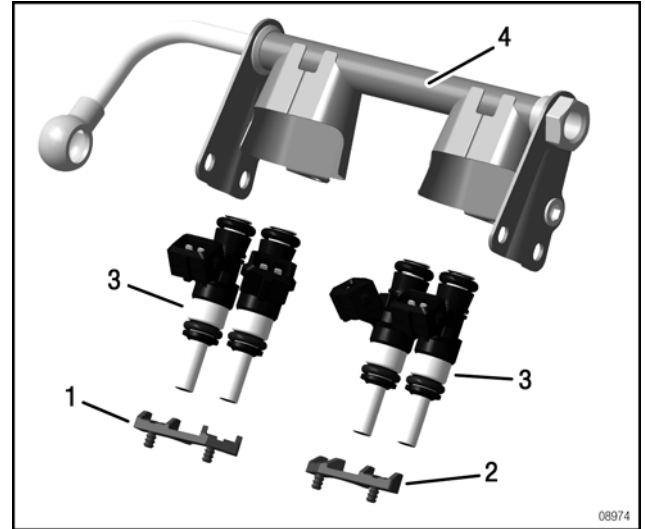
- | | |
|----------------------|-------------------------------|
| 1. M5x12 Allen screw | 2. DIN 128-A5-FST lock washer |
| 3. Fuel rail (2/4) | 4. Injection valve |
| 5. Left muffler | 6. Right muffler |
| 7. Intake manifold | |

DISASSEMBLY

LEFT-HAND (2/4) AND RIGHT-HAND (1/3) FUEL RAIL - DISASSEMBLY

Step	Procedure
1	Remove the injection valves individually from the fuel rail.

Fig. 16



- | | |
|---------------------|------------------|
| 1. Left muffler | 2. Right muffler |
| 3. Injection valves | 4. Fuel rail |

INTAKE MANIFOLD - REMOVAL

Preparation

- Drain the fuel. See also section 12-20-00 Planned maintenance.
- Unscrew the feed line to fuel rail 1/3 and the return line to fuel rail 2/4 and fuel pressure regulator and close them with the appropriate caps.
- Remove the (left and right) fuel rails
- Remove the injection valves from the fuel rails
- Remove the fuel pressure regulator assy.

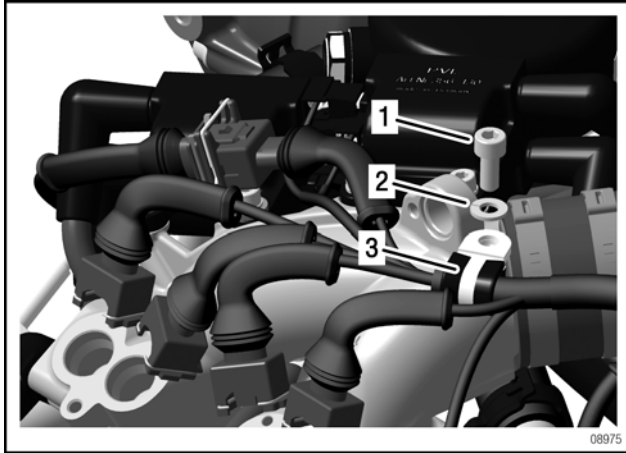
IGNITION COIL - REMOVAL

Step	Procedure
1	Remove the cable clamps of the wiring harness.

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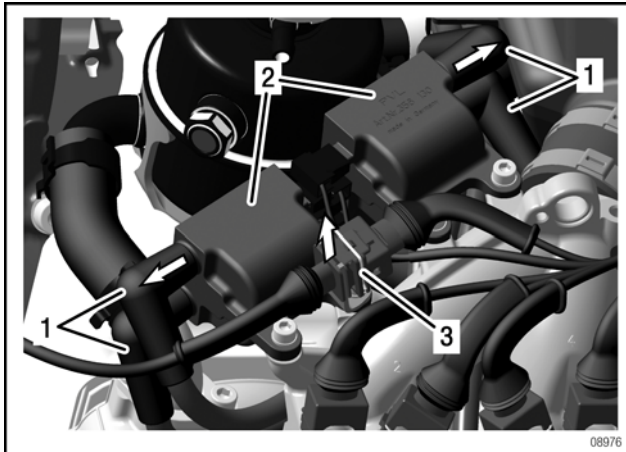
Fig. 17



1. M6x14 Allen screw 2. 6.4 washer
3. 12/M6 cable clamp

Step	Procedure
2	Disconnect the 4 ignition coil connectors on both sides. NOTE: Use a suitable tool to pull out the ignition coil plugs.

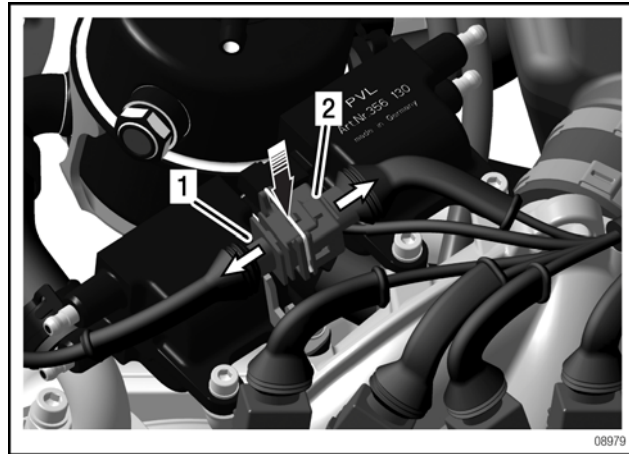
Fig. 18.



1. Ignition coil connector 2. Double ignition coils
3. EGT connector

Step	Procedure
3	Carefully pull EGT 1 and EGT 2 (cylinders 1 and 2) out of the locking plate.
4	Press the metal bracket and unplug the connectors.

Fig. 19



1. EGT connector 2. Spring clip

Step	Procedure
5	Loosen the M5x16 Allen screws of the double ignition coils with washers.

Fig. 20



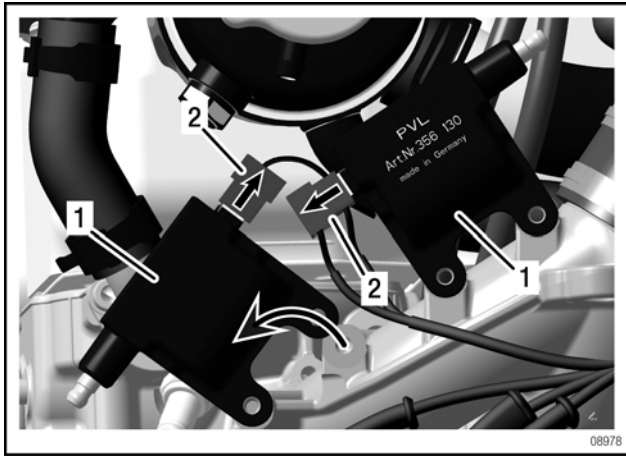
1. M5x16 Allen screw 2. 5.3 washer
3. Plug holder

Step	Procedure
6	Unplug the connectors to the double ignition coils.
7	Remove the double ignition coils

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Fig. 21



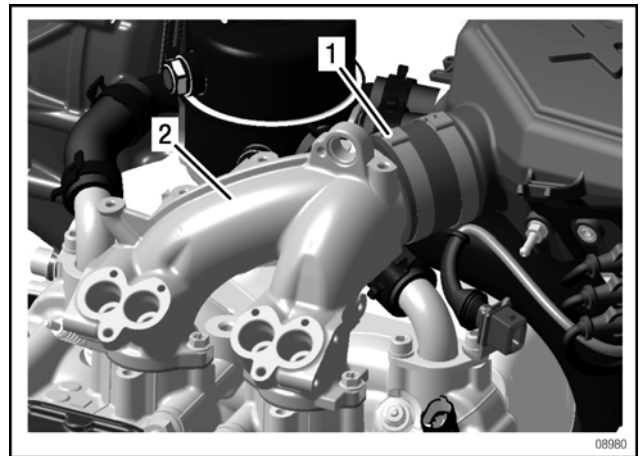
1. Double ignition coils 2. Ignition coil connector
 (coil 1, coil 2, coil 3, coil 4)

NOTE: The red cable is positive (+), the red cable with the black dash is negative (-). Double ignition coils are labelled + and -!

LEFT-HAND 2/4 INTAKE MANIFOLD - REMOVAL

Step	Procedure
1	Remove the 1-ear clamps.

Fig. 22



1. 1-ear clamps 2. Intake manifolds

Step	Procedure
2	Loosen 4 M6 hex./torx collar screws inwards for attachment to the cylinder head 2/4.
3	Loosen the two inner hex./torx collar screws.

NOTICE

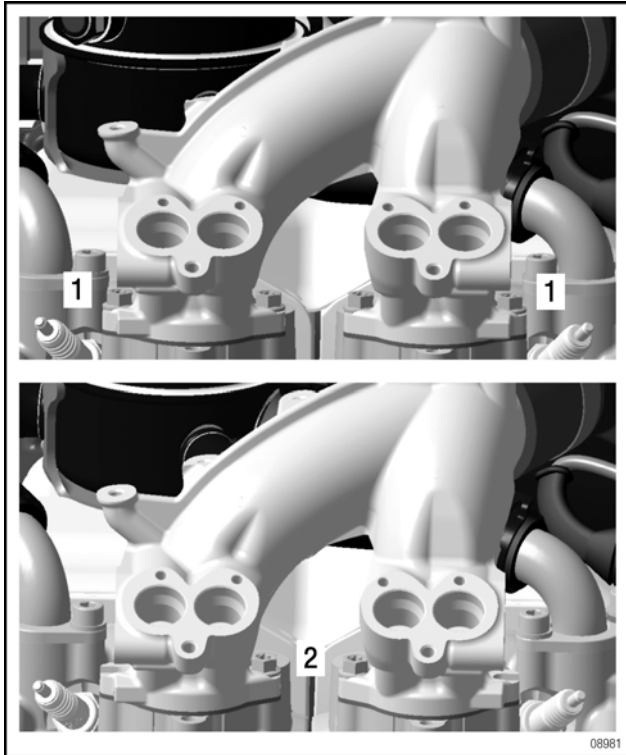
Screws cannot be completely unscrewed. To remove the screws, the intake manifold must be lifted after loosening all 4 hex./torx collar screws.

NOTE: The intake manifolds have ports rather than bores for the M6 hex./torx collar screws.

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Fig. 23



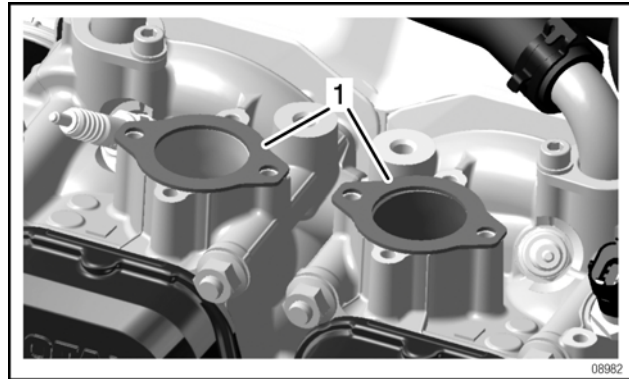
1. Outer screw-fastening 2. Inner screw-fastening

Step	Procedure
4	Remove the insulating flange of the cylinder heads.
5	Close the intake duct using a plug (part no. 860397).

NOTICE

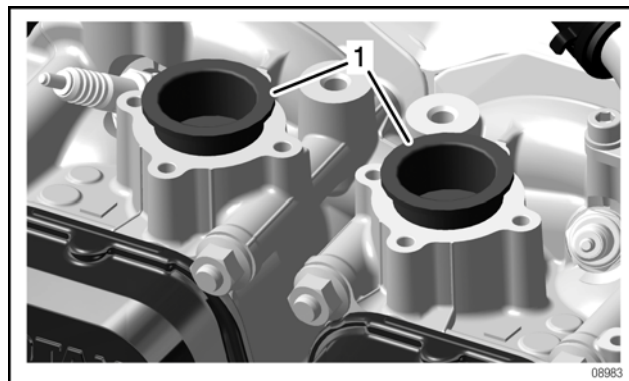
Close the intake duct immediately so that no debris particles can get into the combustion chamber!

Fig. 24



1. Insulating flange

Fig. 25



1. Plug part no. 860397

RIGHT-HAND 1/3 INTAKE MANIFOLD - REMOVAL

- It is removed in the same way as the left-hand 2/4 intake manifold.

PRESSURE AND TEMPERATURE SENSOR - REMOVAL

Preparation

See [Fig. 26](#)

- Unplug the connectors of the 2 pressure sensors and 2 temperature sensors. See also section 76-50-00 Wiring harness.
- Loosen and detach the wiring harness (main strand) from all fastenings (cable ties, retaining fixtures) on the engine. See also section 76-50-00 Wiring harness.

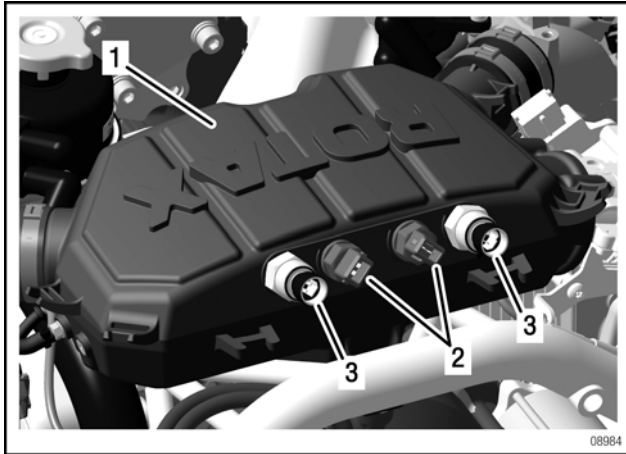
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- For removal and installation of pressure and temperature sensors, see section 76-70-00 Sensors and actuators.

NOTE: The pressure and temperature sensors must only be removed if absolutely necessary!

Fig. 26

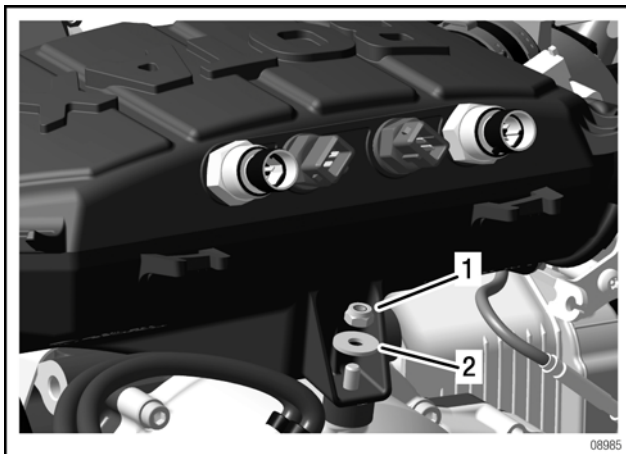


- 1. Airbox
- 2. Temperature sensor
- 3. Pressure sensors

AIRBOX - REMOVAL

Step	Procedure
1	Loosen the M6 hex. nut attaching the airbox to the ignition housing along with the washer.

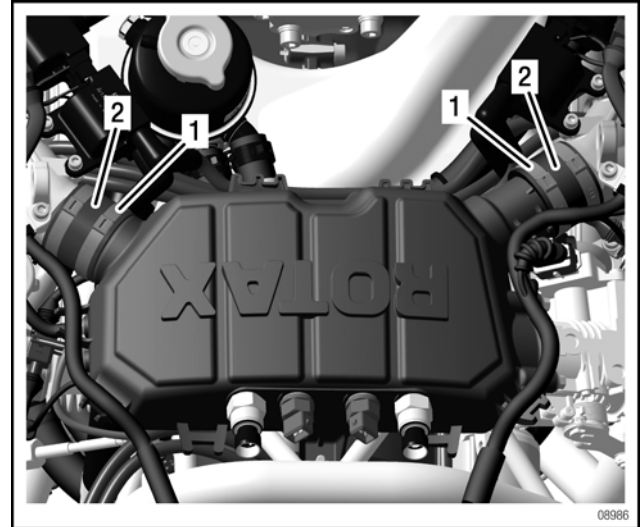
Fig. 27



- 1. M6 hex. nut
- 2. 6.4 washer

Step	Procedure
2	Remove the two 1-ear clamps.
3	Remove the airbox.

Fig. 28



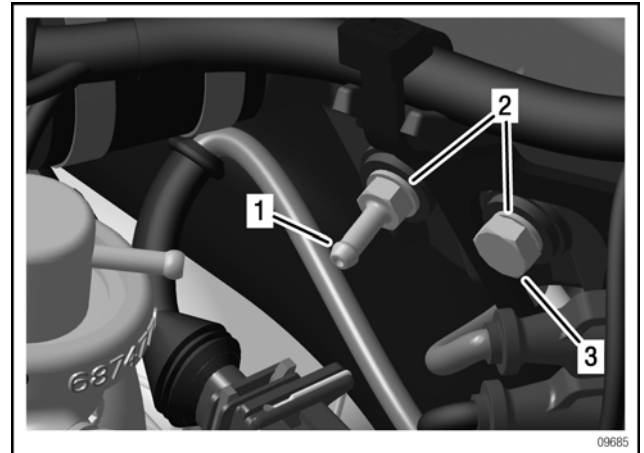
- 1. 1-ear clamps
- 2. Connecting piece

NOTE: Remove the nipple and M6x12 hex. screw only if absolutely necessary!

See Fig. 29

Step	Procedure
4	Loosen the nipple and M6x12 hex. screw along with the gasket ring.

Fig. 29



- 1. Nipple
- 2. Gasket ring
- 3. M6x12 hex. screw

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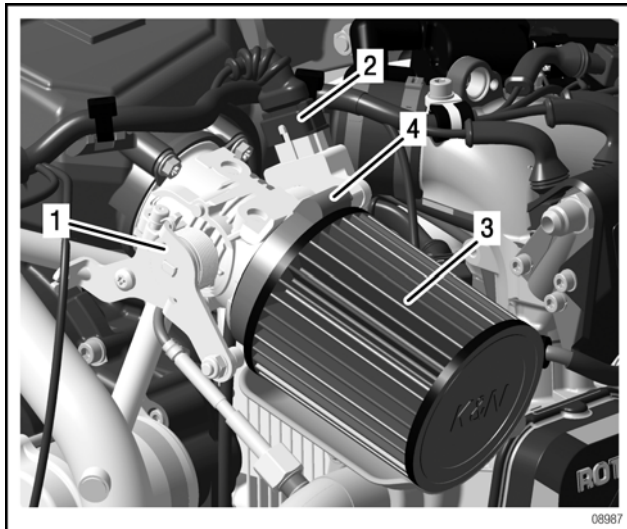
THROTTLE BODY ASSY.
- REMOVAL

Preparation

- General visual inspection. See relevant Maintenance Manual Line for the 912 i Series engine type.

Step	Procedure
1	Remove the throttle body assy.
2	Remove the air filter and air intake hose (delivered by manufacturer) from the throttle body assy.

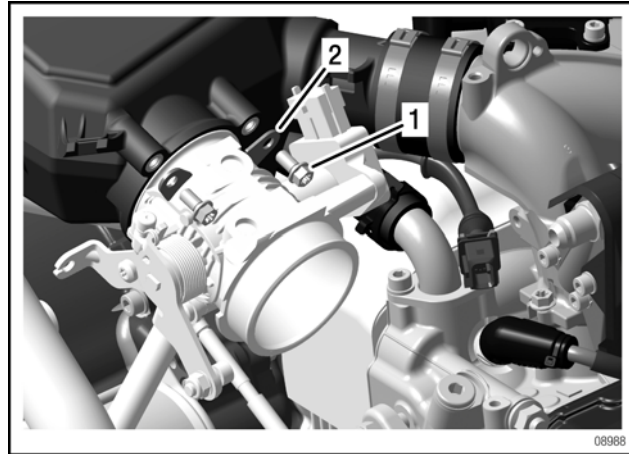
Fig. 30



1. Throttle body assy. 2. Connector
 3. Air filter 4. Screw hose clamp

Step	Procedure
3	Remove the throttle cable from the throttle body.
4	Loosen 3 M6x12 hex./torx collar screws with the fixation latch. NOTE: They are adhered with LOCTITE 243!

Fig. 31



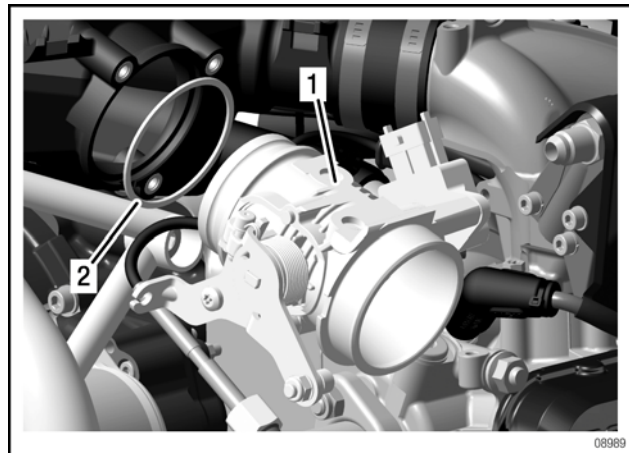
1. M6x12 hex./torx collar screws 2. Fixation latch

NOTICE

Do not lose the rubber gasket ring and ensure that it does not remain in the airbox.

Step	Procedure
5	Remove the throttle body and the rubber gasket ring.

Fig. 32



1. Throttle body 2. Rubber gasket ring

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FUEL PUMP ASSY. - REMOVAL

Preparation

- Drain the fuel and coolant. See also section 12-20-00 Planned maintenance.
- Remove the feed line to fuel rail 1/3 and the return line to fuel rail 2/4 and fuel pressure regulator and close them with the appropriate caps.
- Drain the fuel from the fuel pump and close it with appropriate plug caps.

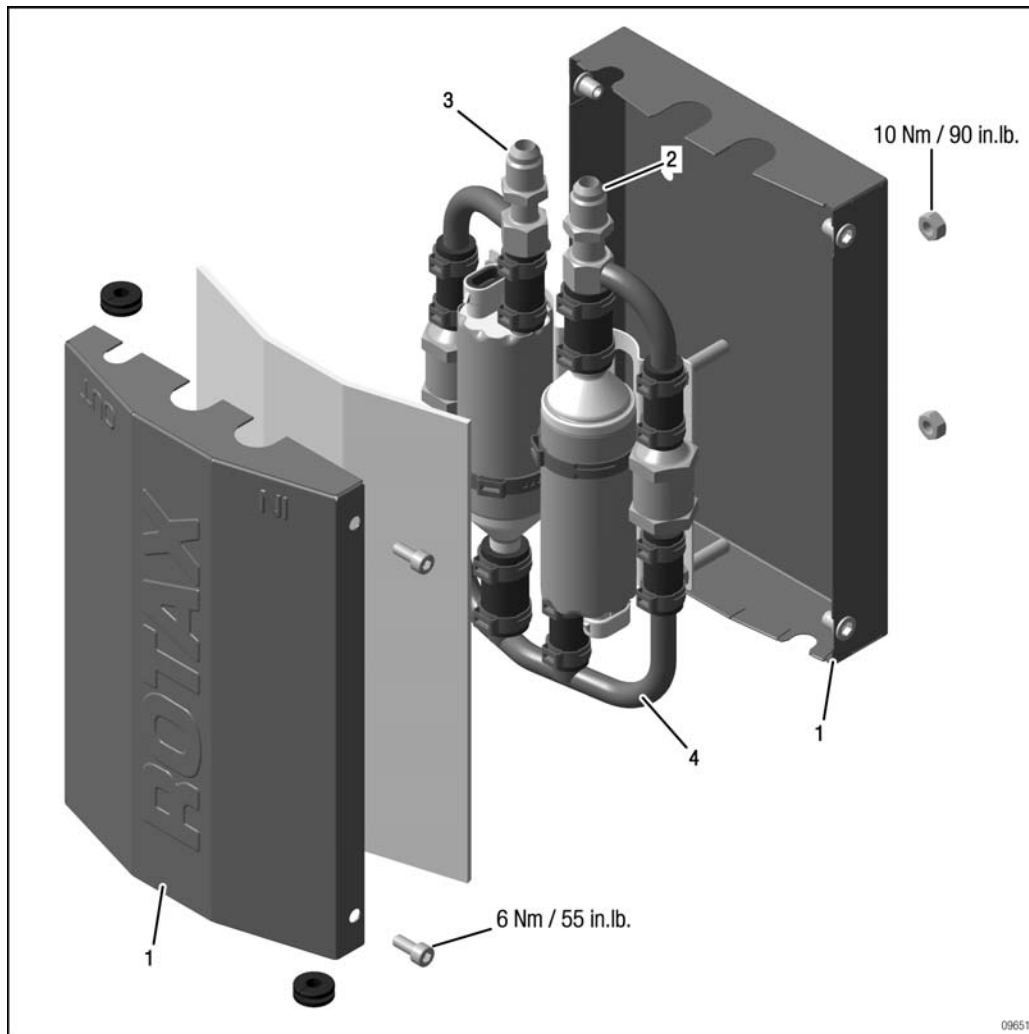
NOTE: The position and type of positioning and attachment of the fuel pump depends on the aircraft type. See aircraft manufacturer documentation.

See overview and [Fig. 33](#) to [Fig. 36](#).

ENVIRONMENT NOTE

All the operating fluids and cleaning agents can damage the environment if not disposed of properly.
Dispose of operating fluids in an eco-friendly manner!

Overview:



- 1. Housing
- 2. Intake system
- 3. Pressure line
- 4. Fuel pump assy.

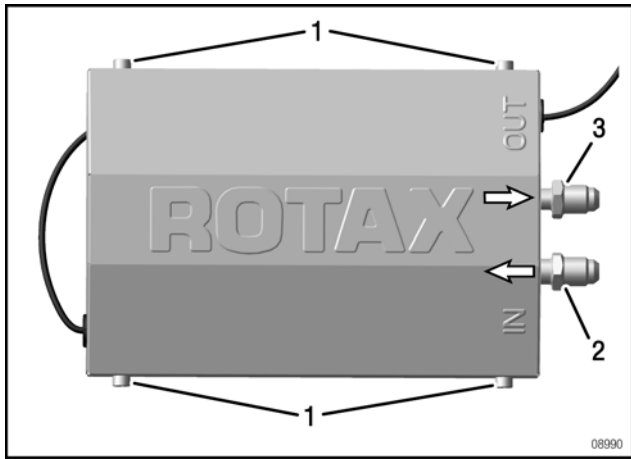
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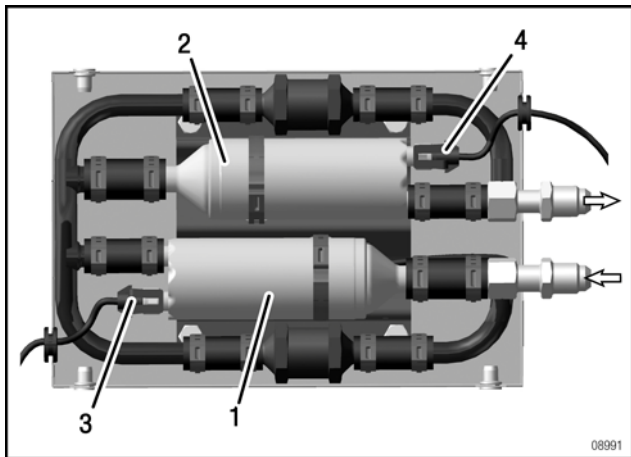
Step	Procedure
1	Loosen 4 M5 Allen screws from the cover.
2	Disconnect the fuel inlet and outlet.
3	Disconnect the fuel pumps (main, aux): <ul style="list-style-type: none"> - Lift the latches - Unplug the connectors.

Fig. 33



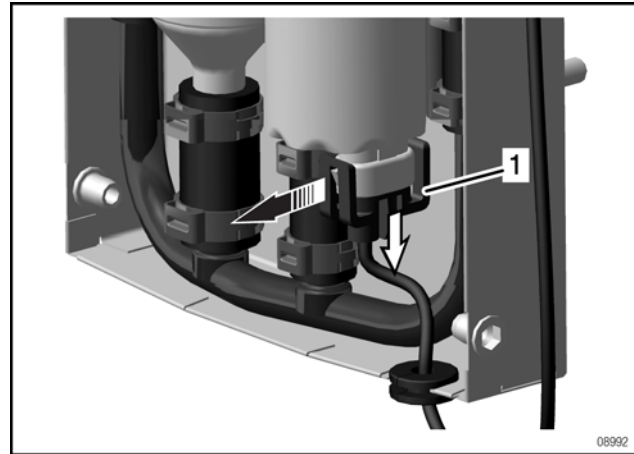
1. M5x12 Allen screws 2. Fuel inlet
3. Fuel outlet

Fig. 34



1. Main pump (main) 2. Additional pump (aux)
3. Connector (Fuel pump 1) 4. Connector (Fuel pump 2)

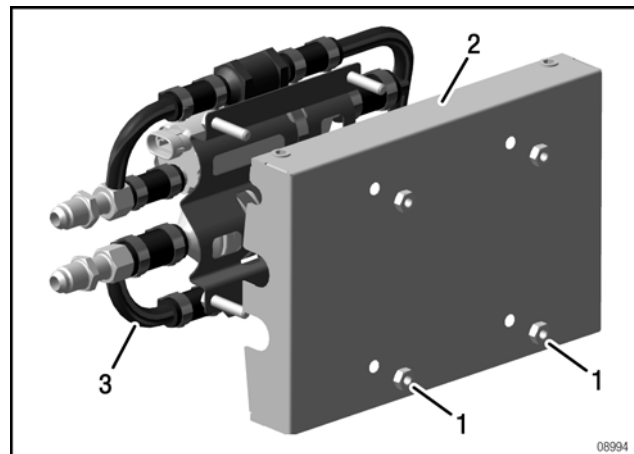
Fig. 35



1. Connector

Step	Procedure
4	Remove the fuel pump module from the aircraft according to the aircraft manufacturer's manual.
5	Loosen the 4 M6 hex. nut and take the fuel pump unit out of the housing.

Fig. 36



1. M6 hex. nut 2. Housing
3. Fuel pump unit

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INSPECTION

**FUEL DISTRIBUTION
 SINGLE PARTS - CHECK**

Preparation

- Clean all parts carefully. See also section 05-00-00 Procedures

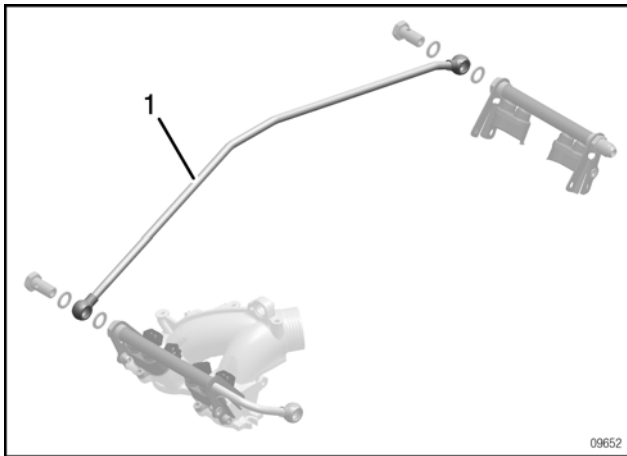
FUEL LINE ASSY. - INSPECTION

Step	Procedure
1	Check the fuel line assy. for cracks, scuffing marks and kinks.

NOTICE

Cracks in the fuel distribution system, its components and hoses are not permissible! If in doubt, check the affected parts for cracks with a dye penetrant method.

Fig. 37



1. Fuel hose assy.

FUEL PRESSURE REGULATOR ASSY. - INSPECTION

Step	Procedure
1	Check all the O-rings. NOTE: If an o-ring is damaged, the entire fuel pressure regulator must be replaced. O-rings are not available as spare parts.
2	Check the screen for dirt.

NOTE: If the screen is dirty, all the prefilters must be checked for function and dirt.

Fig. 38

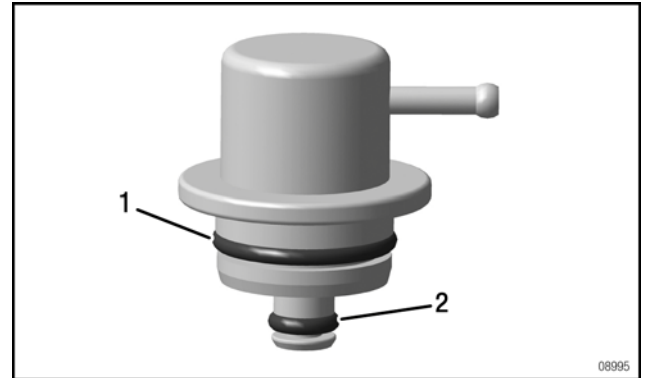
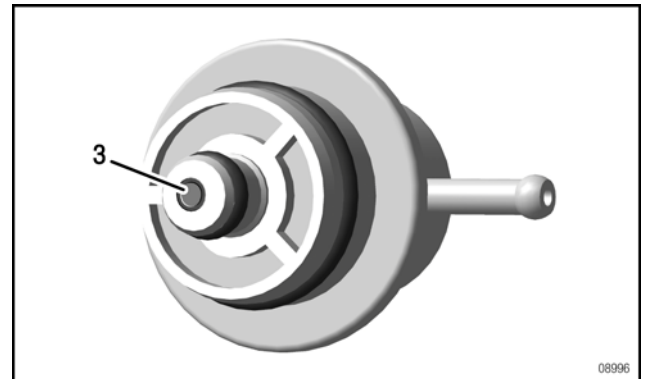


Fig. 39



- 1. 20x2.5 o-ring
- 2. 5x2.5 o-ring
- 3. Screen

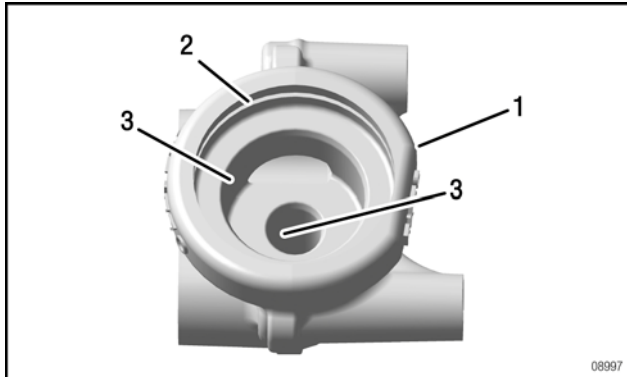
PRESSURE REGULATOR HOUSING - INSPECTION

Step	Procedure
1	Check the sealing surfaces of the O-rings for striations.
2	Check the recess of the retaining ring for sharp edges and burrs.

NOTE: The depressions must not have sharp edges! Sharp edges can be carefully reworked with a sharpening stone. The roughness depth of the flat surfaces must not be changed!

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Fig. 40



- 1. Pressure regulator
- 2. Recess for retaining ring housing
- 3. Sealing surface for O-rings

FUEL RAIL - INSPECTION

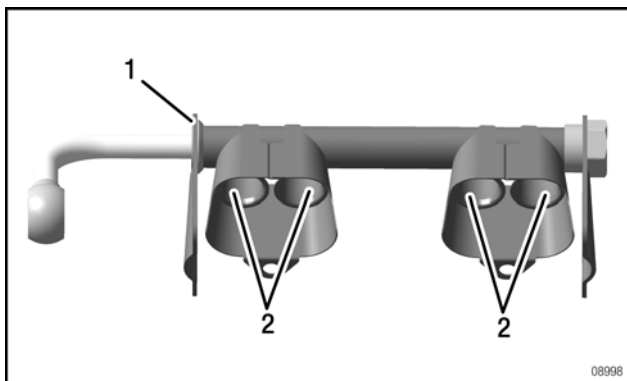
See Fig. 41.

Step	Procedure
1	Check the sealing surfaces for the O-rings of the injection valves for scratches and burrs.
2	Visual inspection for dents, kinks and cracks.

NOTICE

The fuel rail must be replaced if damaged!

Fig. 41

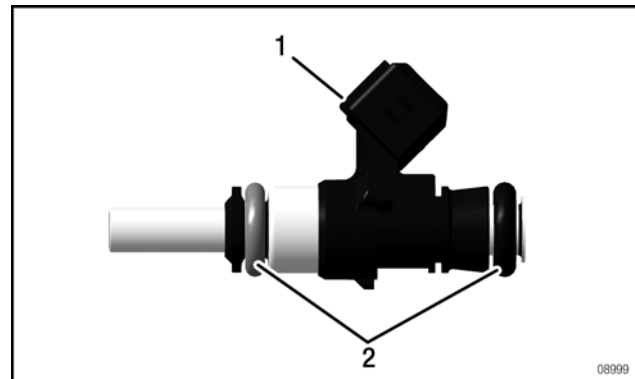


- 1. Fuel rail
- 2. Sealing surface for O-rings

INJECTION VALVE - INSPECTION

Step	Procedure
1	Check the injection valves for damage. - Scuffing marks (including scratches) on the valves are permissible up to a maximum depth of 0.2 mm (0.0079 in.).
2	All O-rings must be replaced when the injection valves are repaired.

Fig. 42



- 1. Injection valve
- 2. O-rings

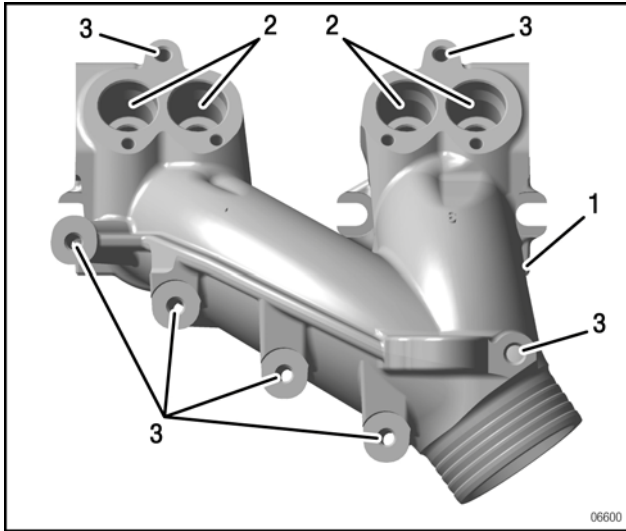
INTAKE MANIFOLD - INSPECTION

Step	Procedure
1	Check the intake manifold for cracks and scuffing marks.
2	Check threaded bores for damage.
3	Check bores for injection valves for scuffing marks. Scuffing marks (including scratches) on the valves are permissible up to a maximum depth of 0.2 mm (0.0079 in.).

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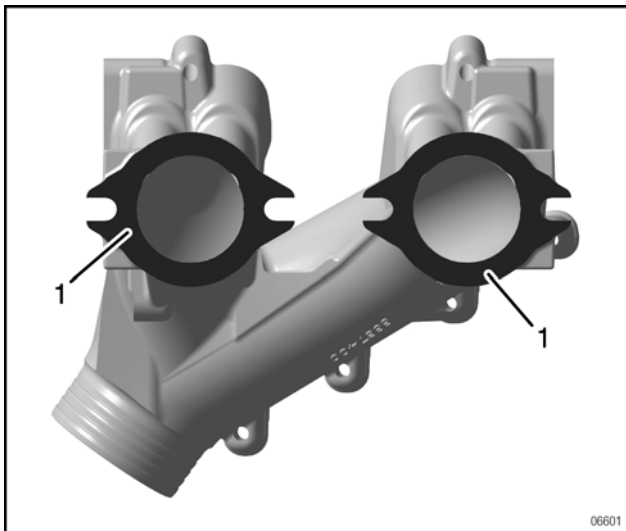
Fig. 43



1. Intake manifold 2. Injection valve bore
 3. Threaded bores

Step	Procedure
4	Check contact and flat surfaces for Allen/hex. screws, nuts and sensors. - Indentations up to a maximum of 0.1 mm (0.0039 in.) are permissible. - Bumps up to a maximum of 0.1 mm (0.0039 in.) are permissible.

Fig. 44

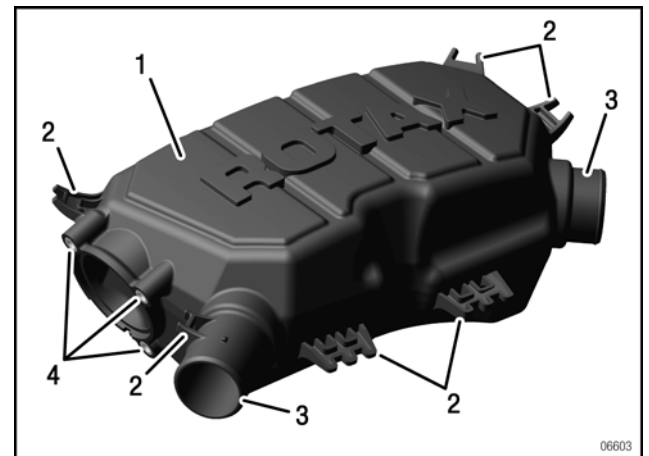
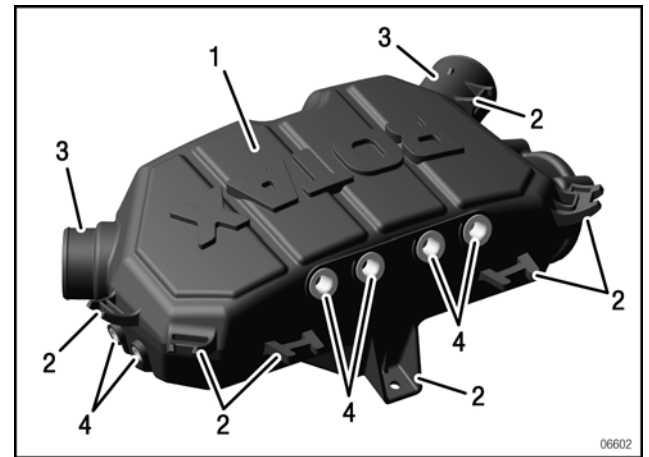


1. Contact face

AIRBOX - INSPECTION

Step	Procedure
1	Check the airbox for damage and wear.
2	Check the support plates for damage.
3	Check the connecting pieces for brittleness.
4	Check threaded bores for damage.

Fig. 45



1. Airbox 2. Support plate
 3. Connecting piece 4. Threaded bores

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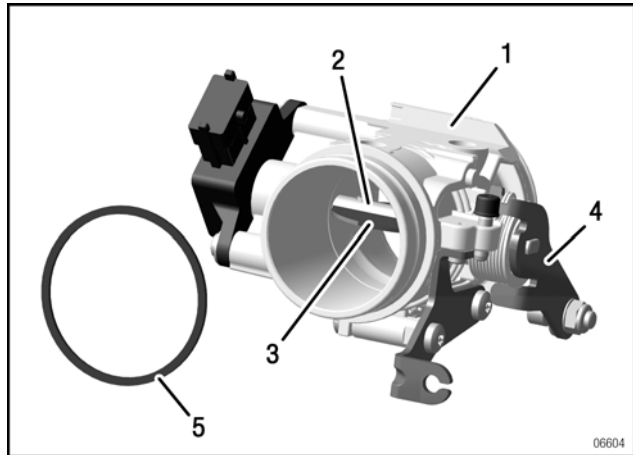
THROTTLE BODY - INSPECTION

NOTICE

Danger of consequent damage to engine!
The throttle body must not be post-machined! If the throttle body is damaged or worn, it must be replaced with a new part.

Step	Procedure
1	Check the throttle body for damage and wear.
2	Check the bearing of the throttle shaft for damage. NOTE: Wear of more than 0.1 mm (0.0039 in.) is not permissible.
3	Check the throttle valve for damage. NOTE: Traces of wear up to a maximum of 0.05 mm (0.0020 in.) in depth are permissible.
4	Check the evenness of the flat and contact surfaces of the throttle body and bent socket with respect to each other.

Fig. 46



- 1. Throttle valve assy.
- 2. Throttle shaft
- 3. Throttle valve
- 4. Throttle cable
- 5. Rubber gasket ring

Step	Procedure
5	Ensure that the throttle valve and the bowden cable can move freely.
6	Check that the fastening and securing elements are secure.

**FUEL PUMP ASSY.
SINGLE PARTS - CHECK**

Preparation

- Clean all parts carefully. See also section 05-00-00 Procedures
- Carry out a visual inspection. See also section 05-20-00 Maintenance.

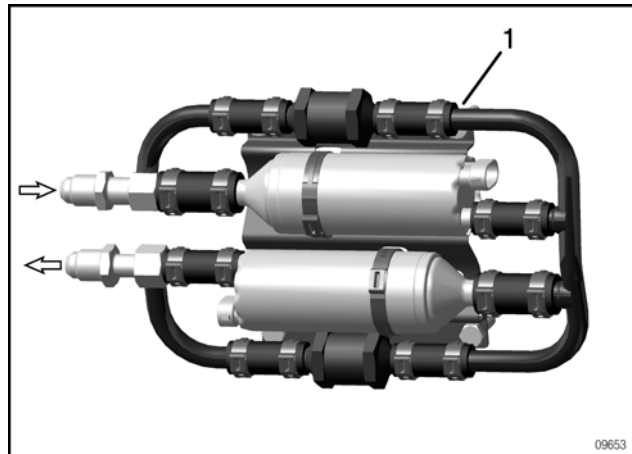
FUEL PUMP - INSPECTION

Step	Procedure
1	Check the fuel pumps for damage and wear.

NOTICE

No longitudinal scratches are allowed on the connections!

Fig. 47



- 1. Fuel pump assy.

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CHECK VALVE - INSPECTION

See Fig. 47.

Step	Procedure
1	Check the check valves for damage and wear.

LINE AND HOSE - INSPECTION

See Fig. 47

Step	Procedure
1	Check the lines and hoses for damage and wear.

AIR FILTER - INSPECTION

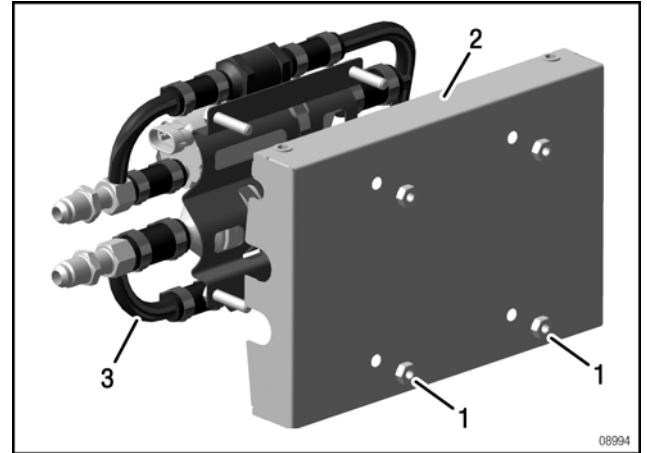
Step	Procedure
1	Check the air filter according to the aircraft manufacturer's instructions. See the most recent Line Maintenance Manual, section 12-20-00.

ASSEMBLY

FUEL PUMP ASSY. - ASSEMBLY

Step	Procedure
1	Fix the fuel pump unit in the housing with 4 M6 hex. nuts. Tightening torque 10 Nm (88.48 in. lb.)

Fig. 48



- 1. M6 hex. nut
- 2. Housing
- 3. Fuel pump unit

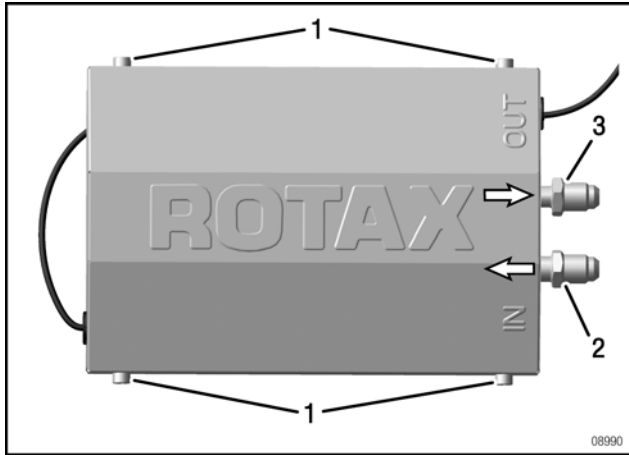
Step	Procedure
2	Connect the wiring harness connector appropriately. See also section 76-50-00 Wiring harness.
3	Fix the cover with 4 Allen screws. Tightening torque 6 Nm (53.09 in. lb.)
4	Install the fuel line assy.

NOTE: The position and type of positioning and attachment of the fuel pump depends on the aircraft type. See aircraft manufacturer documentation.

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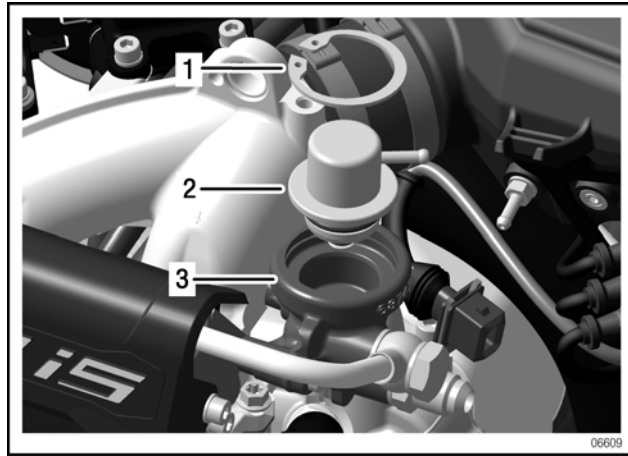
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Fig. 49



- 1. Allen screws
- 2. Intake system
- 3. Pressure line

Fig. 51



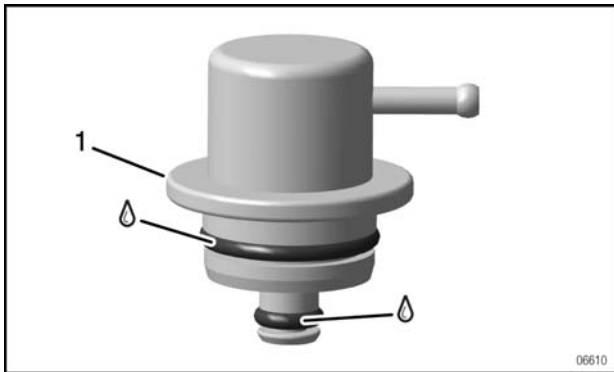
- 1. 36x1.5 retaining ring
- 2. Fuel pressure regulator
- 3. Pressure regulator housing

FUEL PRESSURE REGULATOR - ASSEMBLY

The fuel pressure regulator is assembled and disassembled in the same way. The following should be noted.

Step	Procedure
1	Lubricate the O-rings lightly with KLUEBER ISOFLEX TOPAS Nb5051.
2	Install the fuel pressure regulator in the pressure regulator housing until it stops.
3	Install the retaining ring. NOTE: When the retaining ring is mounted, it must be possible to rotate the fuel pressure regulator manually.

Fig. 50

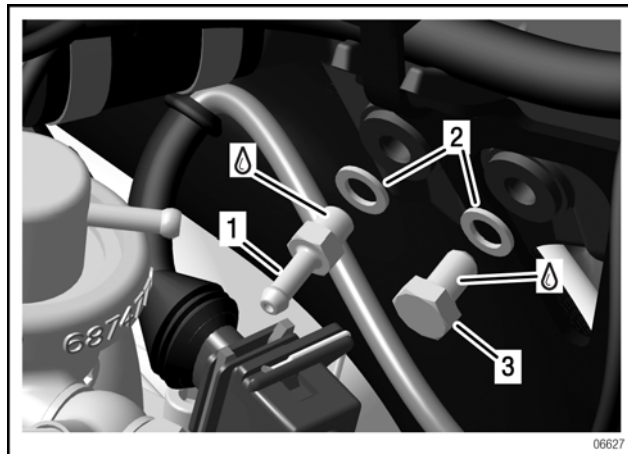


- 1. Fuel pressure regulator

AIRBOX - ASSEMBLY

Step	Procedure
1	Secure the nipple and the gasket ring with LOCTITE 243. Tightening torque 6 Nm (53 in. lb.)
2	Secure the M6x12 hex. screw and the gasket ring with LOCTITE 243. Tightening torque 6 Nm (53 in. lb.)

Fig. 52

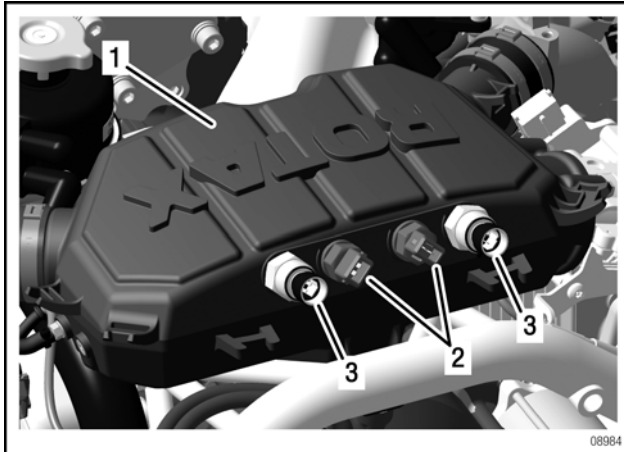


- 1. Nipple
- 2. Gasket rings
- 3. Hex. screw

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Step	Procedure
3	For pressure sensor and temperature sensor installation, see section 76-70-00.

Fig. 53



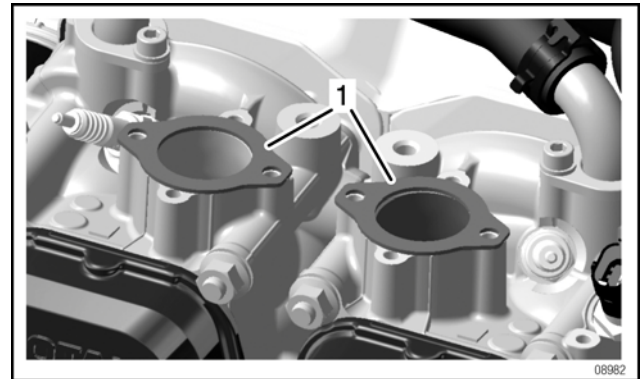
- 1. Airbox
- 2. Temperature sensor
- 3. Pressure sensors

INSTALLATION

INTAKE MANIFOLD - INSTALLATION

Step	Procedure
1	Place the insulating flange on the cylinder heads.
2	Place on the left-hand 2/4 and right-hand 1/3 intake manifolds.

Fig. 54



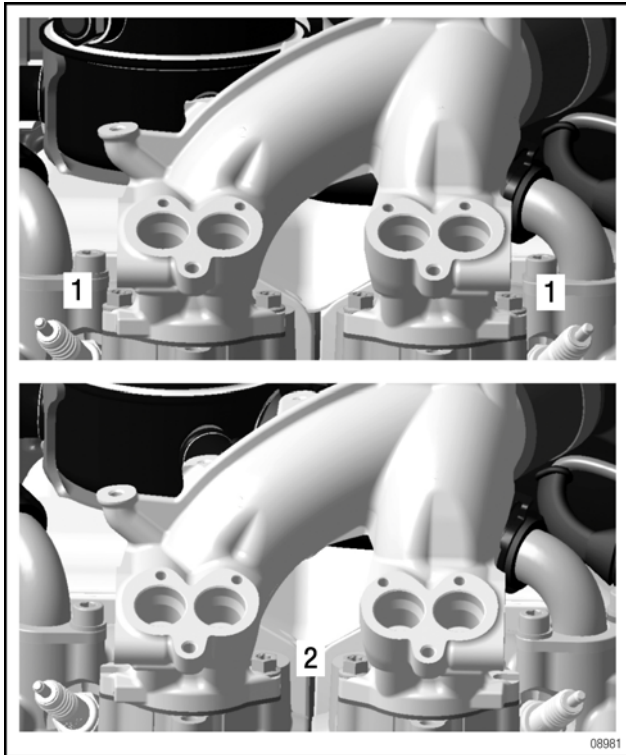
- 1. Insulating flange

NOTICE	
1-ear clamps may only be used once!	

Step	Procedure
3	Fix the 2/4, 1/3 intake manifolds with 8 M6x20 hex./torx collar screws from the inside outwards. Tightening torque 10 Nm (88.48 in. lb.).
4	Install new 1-ear clamps.

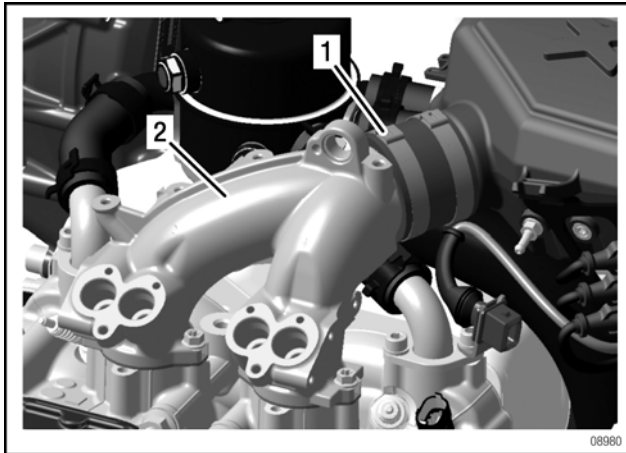
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Fig. 55



1. Outer screw-fastening 2. Inner screw-fastening

Fig. 56

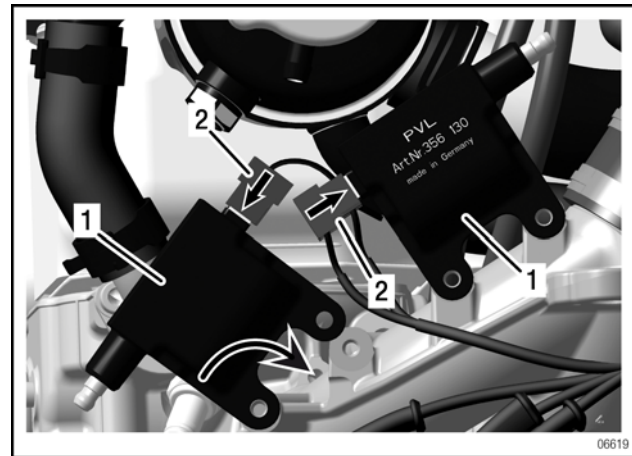


1. 1-ear clamp 2. Intake manifold

NOTE: The red cable is positive (+), the red cable with the black dash is negative (-). Double ignition coils are labelled + and -!

Step	Procedure
5	Plug the connectors into the double ignition coils.

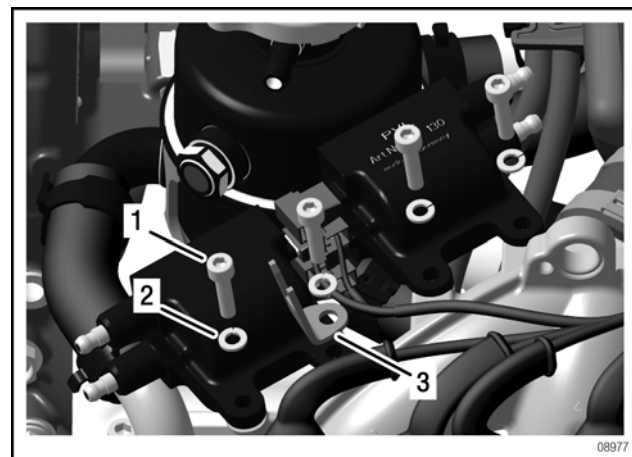
Fig. 57



1. Double ignition coil 2. Ignition coil connector

Step	Procedure
6	Fix the double ignition coils with M5x15 Allen screws with plug holders and A5 lock washers. Tightening torque 6 Nm (53 in. lb.).

Fig. 58



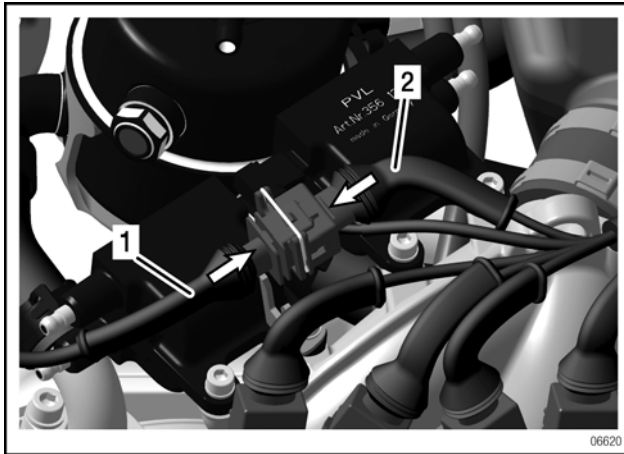
1. M5x16 Allen screw 2. 5.3 washer
 3. Plug holder

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Step	Procedure
7	Connect the connector with the EGT connector. NOTE: Compress the connector with the EGT connector so that the spring clip latches in.

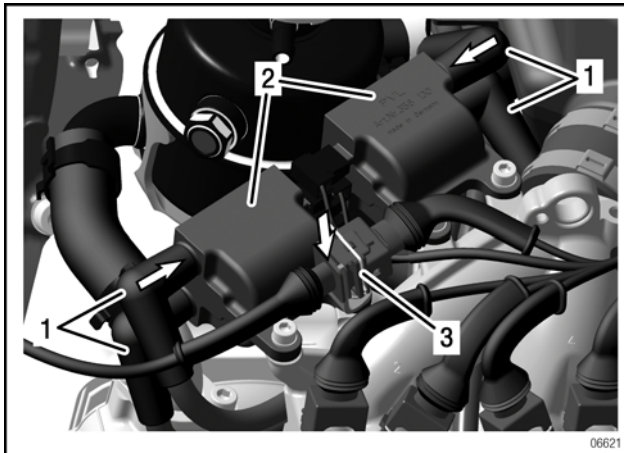
Fig. 59



1. EGT connector 2. Connector

Step	Procedure
8	Attach the ignition coil connector to the double ignition coils and press the EGT connector into the plug holder. NOTE: Check for secure connection.

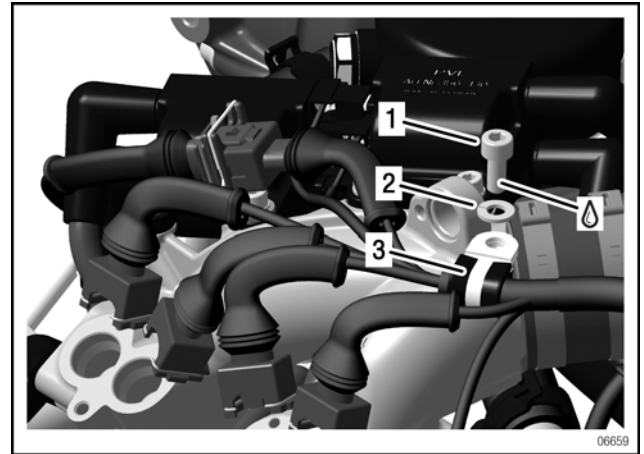
Fig. 60



1. Ignition coil connector 2. Double ignition coils
 3. EGT connector

Step	Procedure
9	Secure the 12/M6 cable clamp with an M6x14 Allen screw and washer with LOCTITE 243. Tightening torque 10 Nm (88.48 in. lb.).

Fig. 61



1. M5x16 Allen screw 2. 5.3 washer
 3. 12/M6 cable clamp

NOTICE

Continuous thread, the Allen screws go into the intake duct. The Allen screws are therefore secured with LOCTITE 243.
 Leaking Allen screws can cause an excessively lean mixture!

INSTALLATION OF LEFT-HAND (2/4) AND RIGHT-HAND (1/3) FUEL RAILS

The fuel rails (2/4) and (1/3) are installed and removed in the same way. The following should be noted.

Step	Procedure
1	Lubricate the O-rings of the injection valves lightly with KLUEBER ISOFLEX TOPAS Nb5051. NOTE: When a used injection jet is re-installed, new O-rings must be installed, and the injection jet must be inserted by hand.

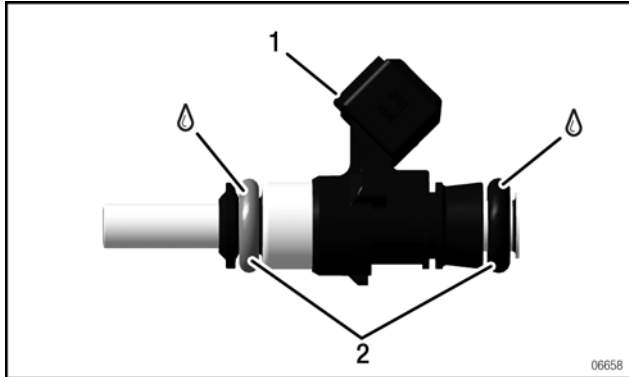
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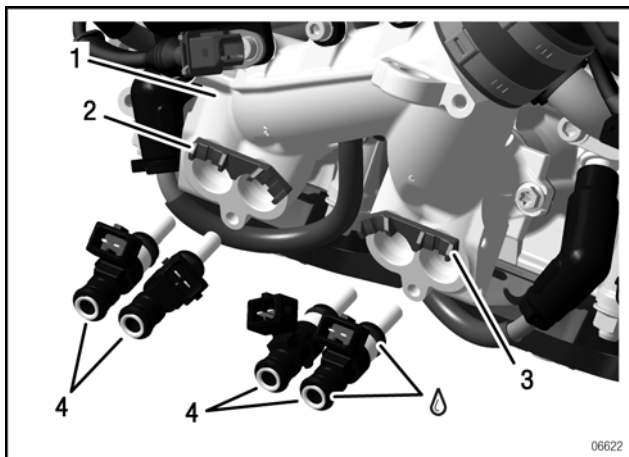
Step	Procedure
2	Install the injection valves and mufflers.

Fig. 62



1. Injection valve 2. O-rings

Fig. 63

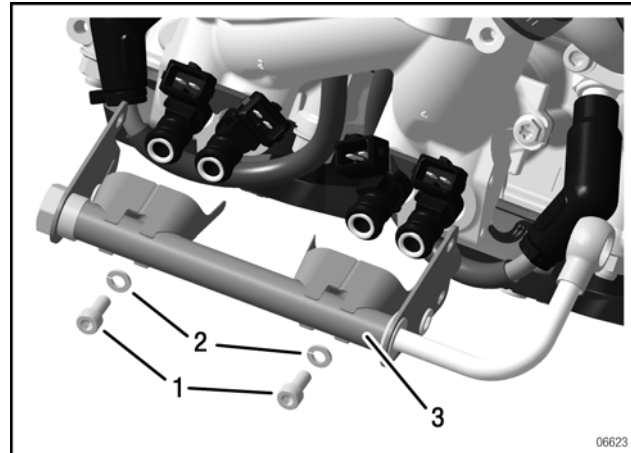


1. Intake manifold 2. Left muffler
3. Right muffler 4. Injection valves

NOTE: The left-hand and right-hand mufflers are different and are used to position and fix the injection valves.

Step	Procedure
3	Fix the fuel rail on the left and right of the intake manifold with M5x12 Allen screws and 5.3 washers. Tightening torque 6 Nm (53 in. lb.)

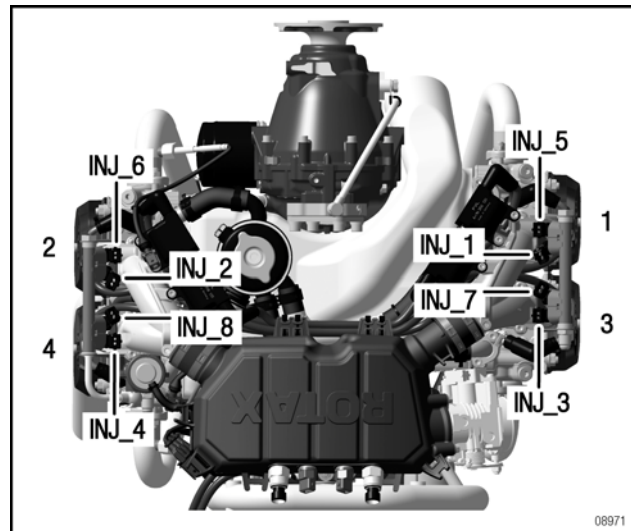
Fig. 64



1. M5x12 Allen screws 2. DIN 128-A5-FST lock washers
3. Fuel rail

Step	Procedure
4	Plug in the injectors. NOTE: The cables are labelled INJ_1 to INJ_8.

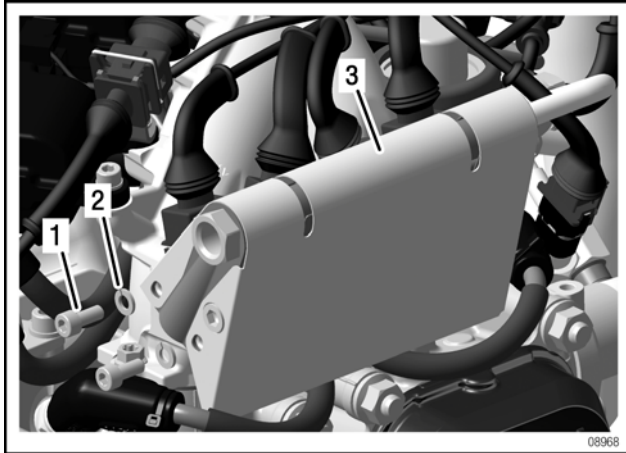
Fig. 65



Step	Procedure
5	Fasten the heat shield with 4 M5x12 Allen screws and 5.3 lock washers. Tightening torque 6 Nm (53 in. lb.)

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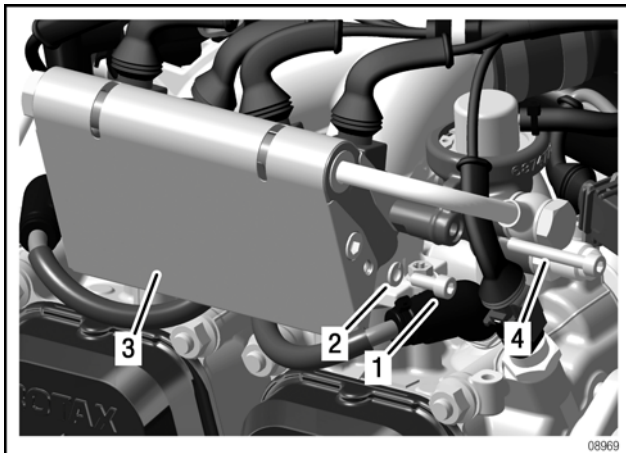
Fig. 66



- 1. M5x12 Allen screw
- 2. 5.3 washer
- 3. Heat shield

Step	Procedure
6	Fix the fuel pressure regulator for cylinders 2 and 4 with an M5x35 Allen screw. Tightening torque 6 Nm (53 in. lb.).

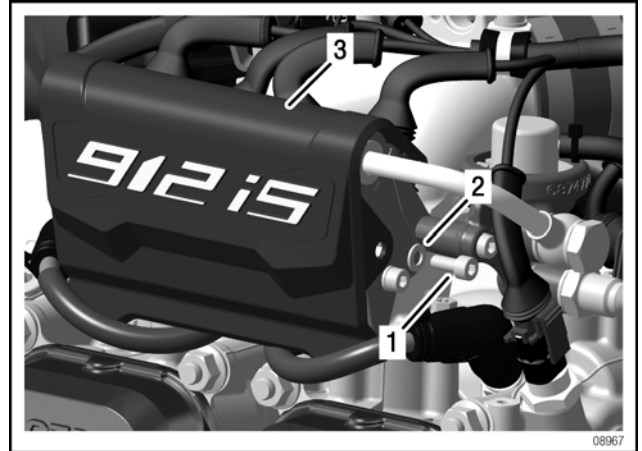
Fig. 67



- 1. M5x12 Allen screw
- 2. 5.3 washer
- 3. Heat shield
- 4. M5x35 Allen screw

Step	Procedure
7	Install the cover with an M5x12 Allen screw and 5.3 lock washer. Tightening torque 5 Nm (44.25 in. lb.)

Fig. 68



- 1. M5x12 Allen screw
- 2. 5.3 washer
- 3. Cover

FUEL PRESSURE REGULATOR ASSY. - INSTALLATION

The fuel pressure regulator assy. is installed and removed in the same way. The following should be noted.

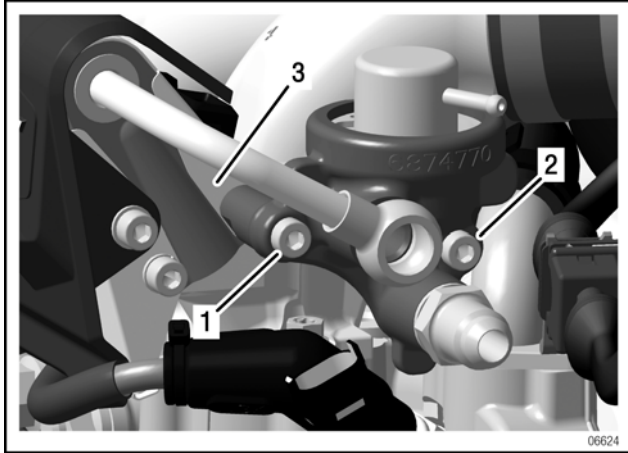
Step	Procedure
1	Fix the fuel pressure regulator assy. with an M5x35 Allen screw and an M5x45 Allen screw. Tightening torque 6 Nm (53 in. lb.).

NOTE: Tighten the M5x45 Allen screw first. The heat shield is screwed on along with the front M5x35 Allen screw.

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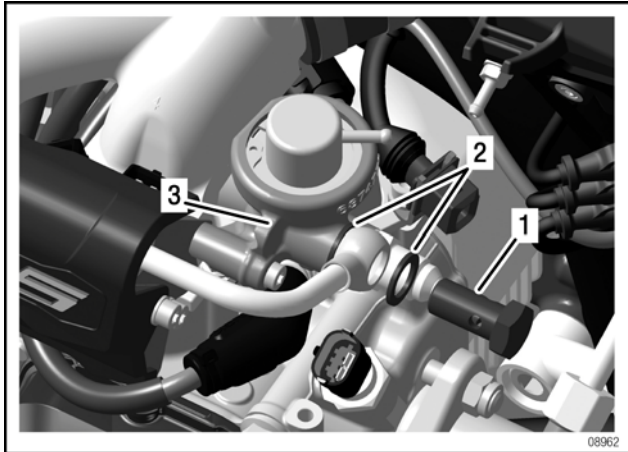
Fig. 69



1. M5x35 Allen screw 2. M5x45 Allen screw
3. Heat shield

Step	Procedure
2	Install the M12x1.5x24 banjo bolt with two A12x18 gasket rings. Tightening torque 25 Nm (221.2 in. lb.).

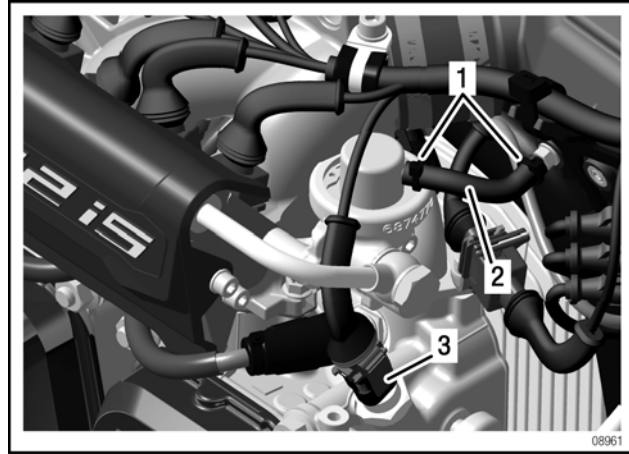
Fig. 70



1. M12x1.5x24 banjo bolt 2. A12x18 gasket rings
3. Fuel pressure regulator
assy.

Step	Procedure
3	Fix hose 60 (regulator/airbox) with 2 cable ties.
4	Plug in temperature sensor CTS.

Fig. 71



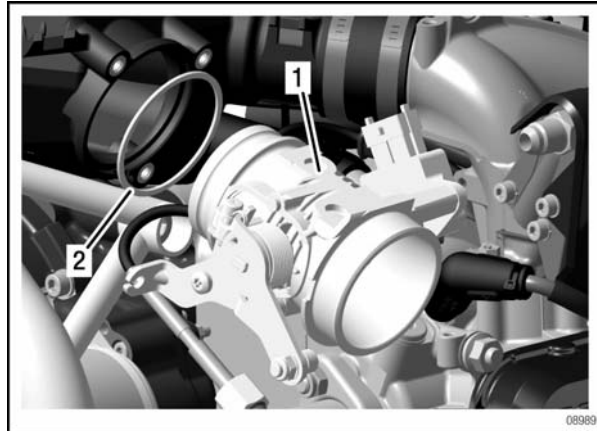
1. 94x2.5mm cable ties 2. 60 +/-3mm hose
3. Temperature sensor CTS

**THROTTLE BODY ASSY. -
INSTALLATION**

NOTE: When the throttle body is installed, a new rubber gasket ring must be used!

Step	Procedure
1	Install the rubber gasket ring. NOTE: The rubber gasket ring is installed dry!

Fig. 72



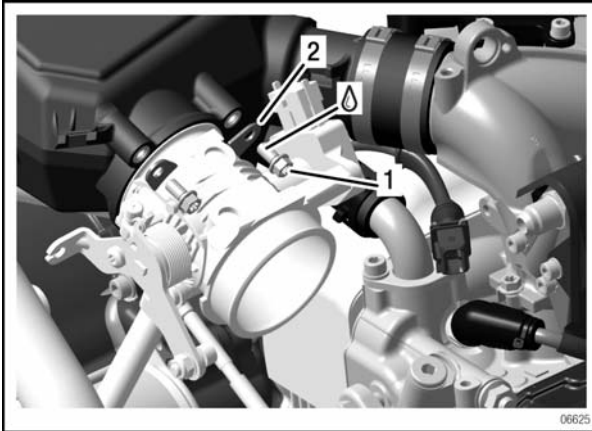
1. Throttle body assy. 2. Rubber gasket ring

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Step	Procedure
2	Push the throttle body into the airbox. Secure 3 hex./torx collar screws and fixation latch with LOCTITE 243. Tightening torque 8 Nm (70.78 in. lb.).

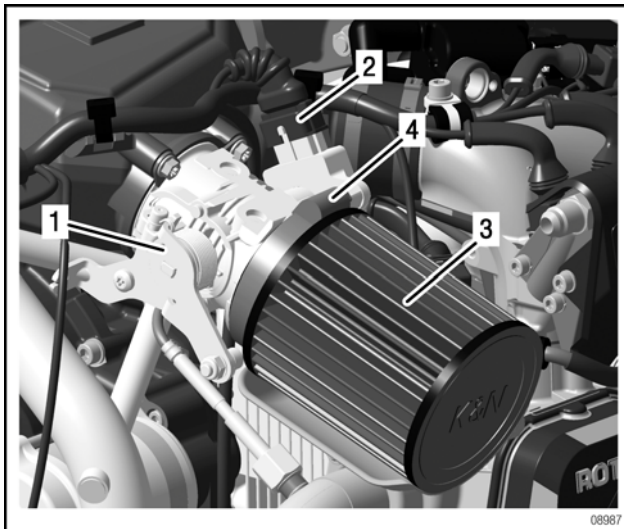
Fig. 73



1. M6x12 hex./torx collar screws 2. Fixation latch

Step	Procedure
3	Install the air filter and air intake hose (supplied by manufacturer) on the throttle body assy. and plug in the EGT connector.

Fig. 74

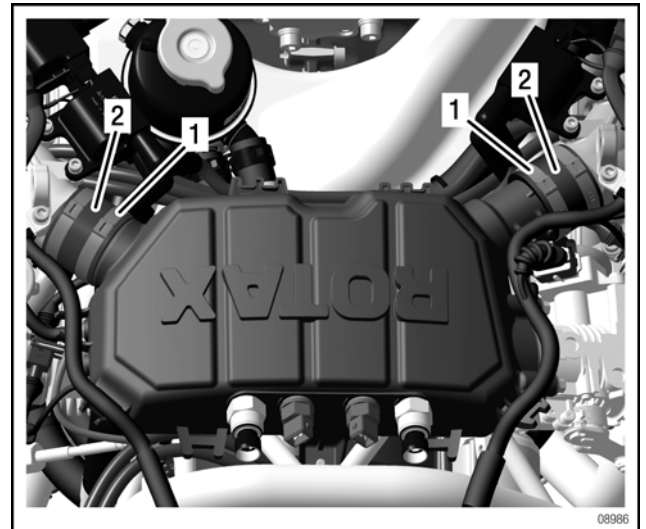


1. Throttle body assy. 2. EGT connector
3. Air filter 4. Screw hose clamp

AIRBOX - INSTALLATION

Step	Procedure
1	Install a new 1-ear clamp on the connecting piece.
2	Insert the airbox in the connecting piece.

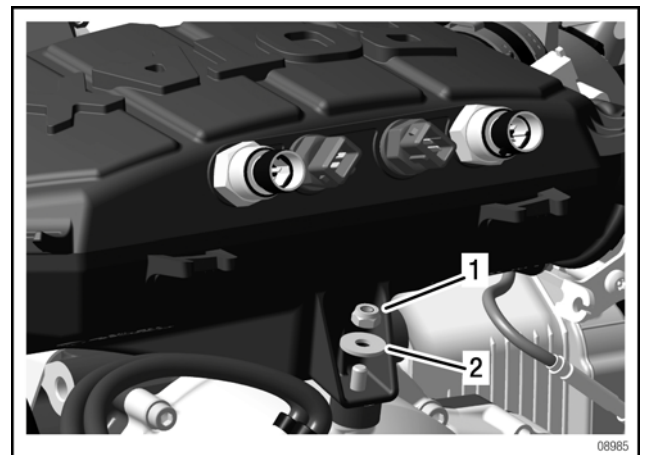
Fig. 75



1. 1-ear clamps 2. Connecting piece

Step	Procedure
3	Fix the airbox with a new M6 DIN 934 hex. nut on the ignition housing. Tightening torque 10 Nm (88.48 in. lb.).
4	Fix the 1-ear clamps.

Fig. 76



1. M6 DIN 924 hex. nut 2. 6.4 washer

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Step	Procedure
5	Plug in the wiring harness connector appropriately. See also section 76-50-00 Wiring harness.
6	Fix the plug holder with cable ties.
7	Fix the ignition cable with cable ties.

Fig. 77

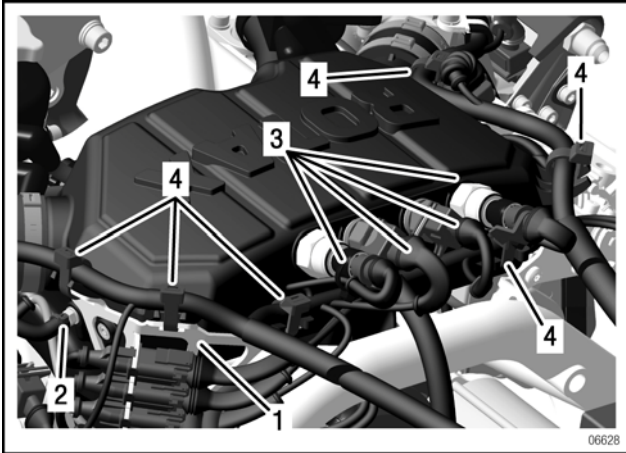
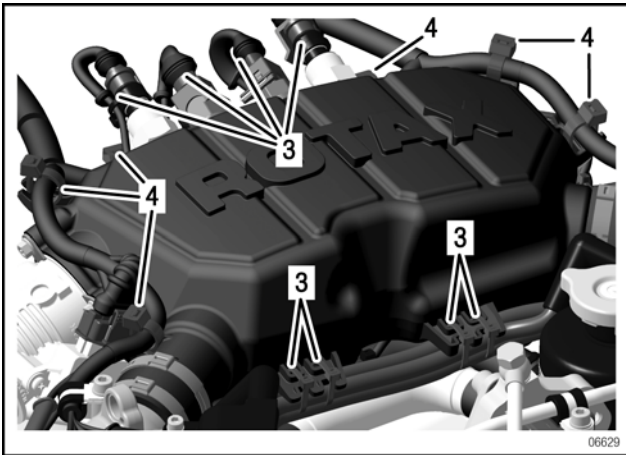


Fig. 78



- | | |
|-------------------------|-------------------------|
| 1. Plug holder | 2. 94x2.5mm cable ties |
| 3. 203x7.6mm cable ties | 4. 142x3.2mm cable ties |

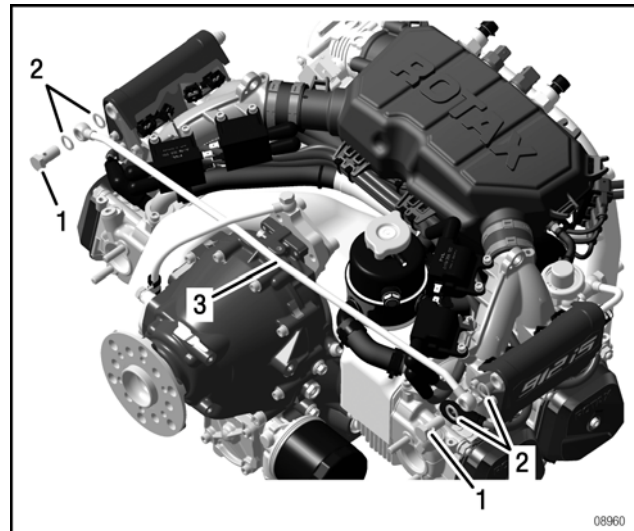
FUEL LINE ASSY. - INSTALLATION

The fuel line is installed and removed in the same way. The following should be noted.

NOTICE	
Install the fuel line assy. in a tension-free manner. If the line is too far away from the fuel rail, the fuel line must be adjusted. The sealing surfaces must be parallel.	

Step	Procedure
1	Fix the fuel line assy. on the left and right of the fuel rails with banjo bolts. Tightening torque 25 Nm (18 ft. lb.).

Fig. 79

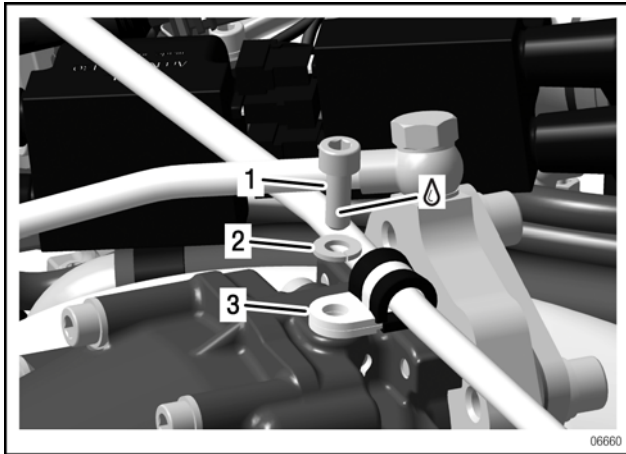


- | | |
|-----------------------|-----------------------|
| 1. M12x1.5 banjo bolt | 2. A12x18 gasket ring |
| 3. Fuel hose assy. | |

Step	Procedure
2	Secure the 8/M6 cable clamp with an M6x16 Allen screw and 6.4 washer to the propeller gearbox with LOCTITE 243. Tightening torque 10 Nm (88.48 in. lb.).

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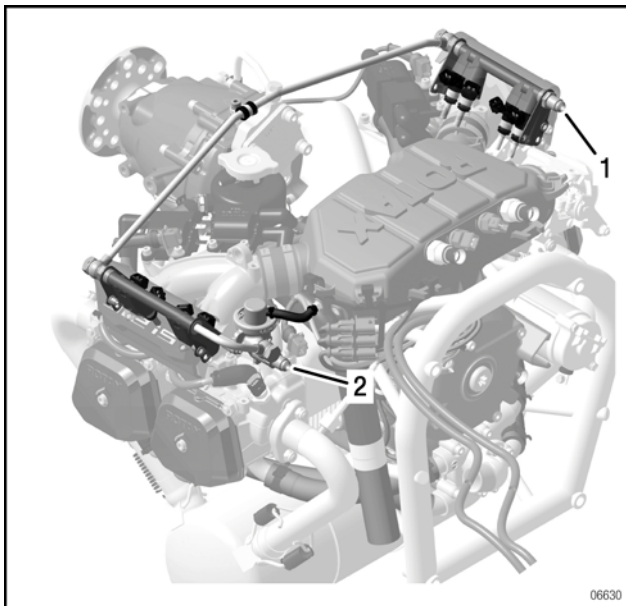
Fig. 80



1. M6x16 Allen screw 2. 6.4 washer
 3. 8/M6 cable clamp

Step	Procedure
3	Install the inlet and outlet lines on the 1/3 and 2/4 fuel rails.

Fig. 81



1. Inlet line 2. Outlet line

FINISHING WORK

- Fill the fuel and coolant systems. See also section 12-20-00 Planned maintenance.
- Install the bowden cable on the throttle body. See section 70-00-00 Standard work on the engine.
- Adjustment of the throttle position, sensor position and idle speed. See section 70-00-00 Standard work on the engine.

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MAINTENANCE MANUAL

Chapter: 74-00-00
IGNITION UNIT

Introduction

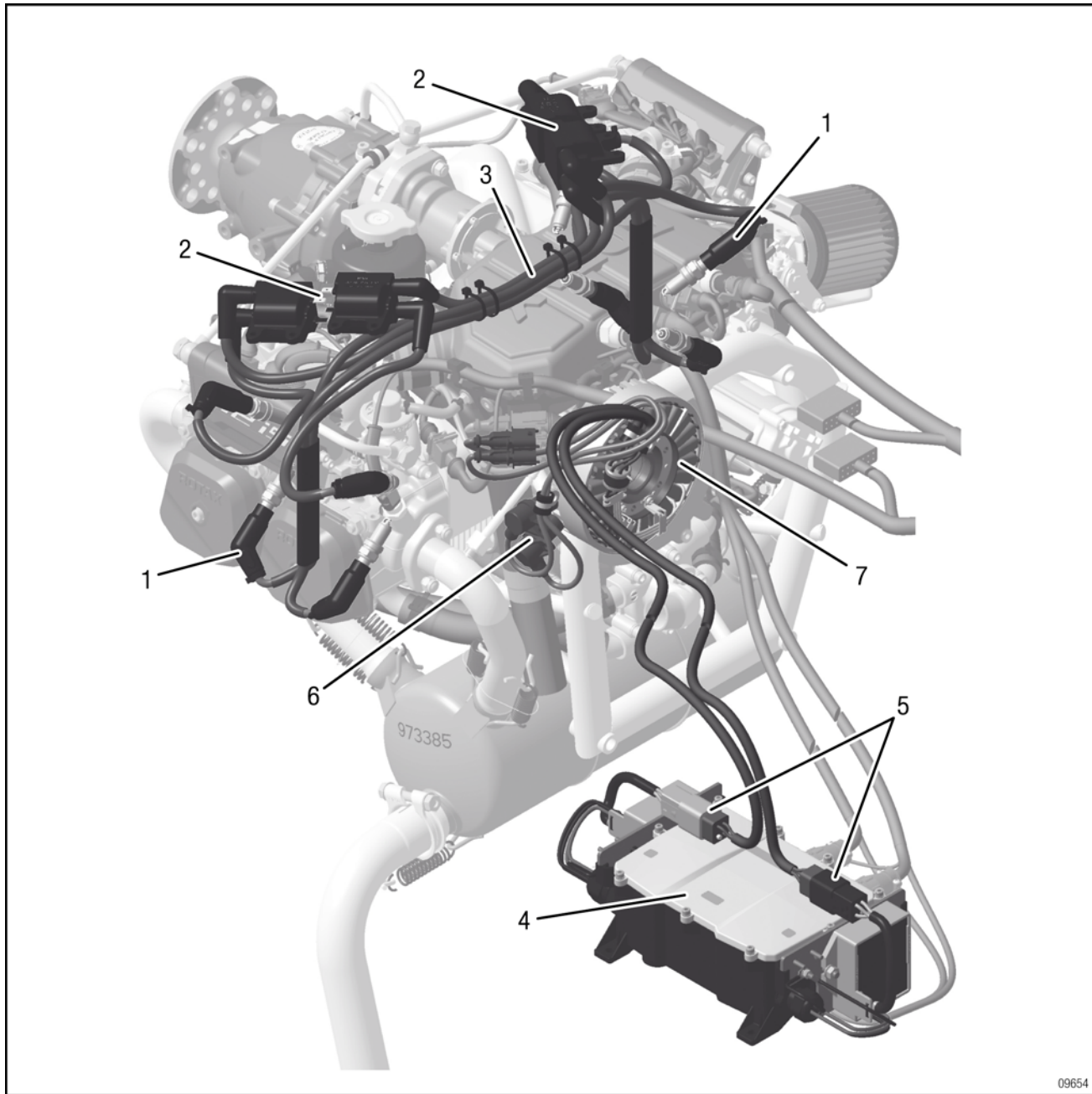
This section describes the maintenance of the ignition unit assembly of the ROTAX 912 i Series engine. The description is divided into sub-sections and explanations of system functions.

Subject	Section
1. Introduction A. System description B. Safety information C. Connections for display systems	Chapter 74-00-00 Page 3 Page 3 Page 3
2. Distribution	Chapter 74-20-00

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BRP-Powertrain
MAINTENANCE MANUAL

Ignition unit



- | | | |
|------------------------------------|-------------------------|-------------------------------------|
| 1. Resistance spark plug connector | 2. Double ignition coil | 3. Ignition cable assy. |
| 4. Fuse box assy. | 5. Connector | 6. Crankshaft position sensor assy. |
| 7. Stator assy. | | |

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SYSTEM DESCRIPTION

The ignition unit operates with four double ignition coils with double ignition. If the LANE selector switch is in the "AUTO" position, the active LANE controls all four double ignition coils which are connected to the eight spark plugs. In normal Dual LANE Mode (Auto Mode), both spark plugs ignite each cylinder at the same time. In LANE A or LANE B Mode, only one spark plug ignites per cylinder.

The ignition unit does not require an external power supply.

FIRING ORDER

1-4-2-3

CHARGING COILS

The two independent charging coils arranged on the stator each supply one of the two ignition circuits. The energy is stored in capacitors in the fuse box. The time of discharge of the capacitors is defined by the control unit. The capacitors are discharged via the primary circuit of the double ignition coils.

INTERNAL GENERATOR B

The internal generator B also supplies non-engine-related consumers of the aircraft. If electricity consumption is high, an external generator (12 V/30 A) can be used. This is driven by the propeller shaft by means of v-belts and already has the regulator integrated.

SAFETY INFORMATION

 **WARNING**

Follow the general safety instructions during all work on the engine and the assemblies around it. See section Introduction.
See also section 70-00-00 Standard work on the engine.

CONNECTIONS FOR DISPLAY SYSTEMS

NOTICE

Follow the instructions in the Installation Manual regarding connections for instrumentation.

KNOCK SENSOR

The knock sensor is situated directly on the cylinder head and helps to prevent any uncontrolled combustion (engine knocking).

See section 76-70-00 Sensors and actuators and section 76-50-00 Wiring harness.

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Chapter: 74-20-00
DISTRIBUTION

Introduction

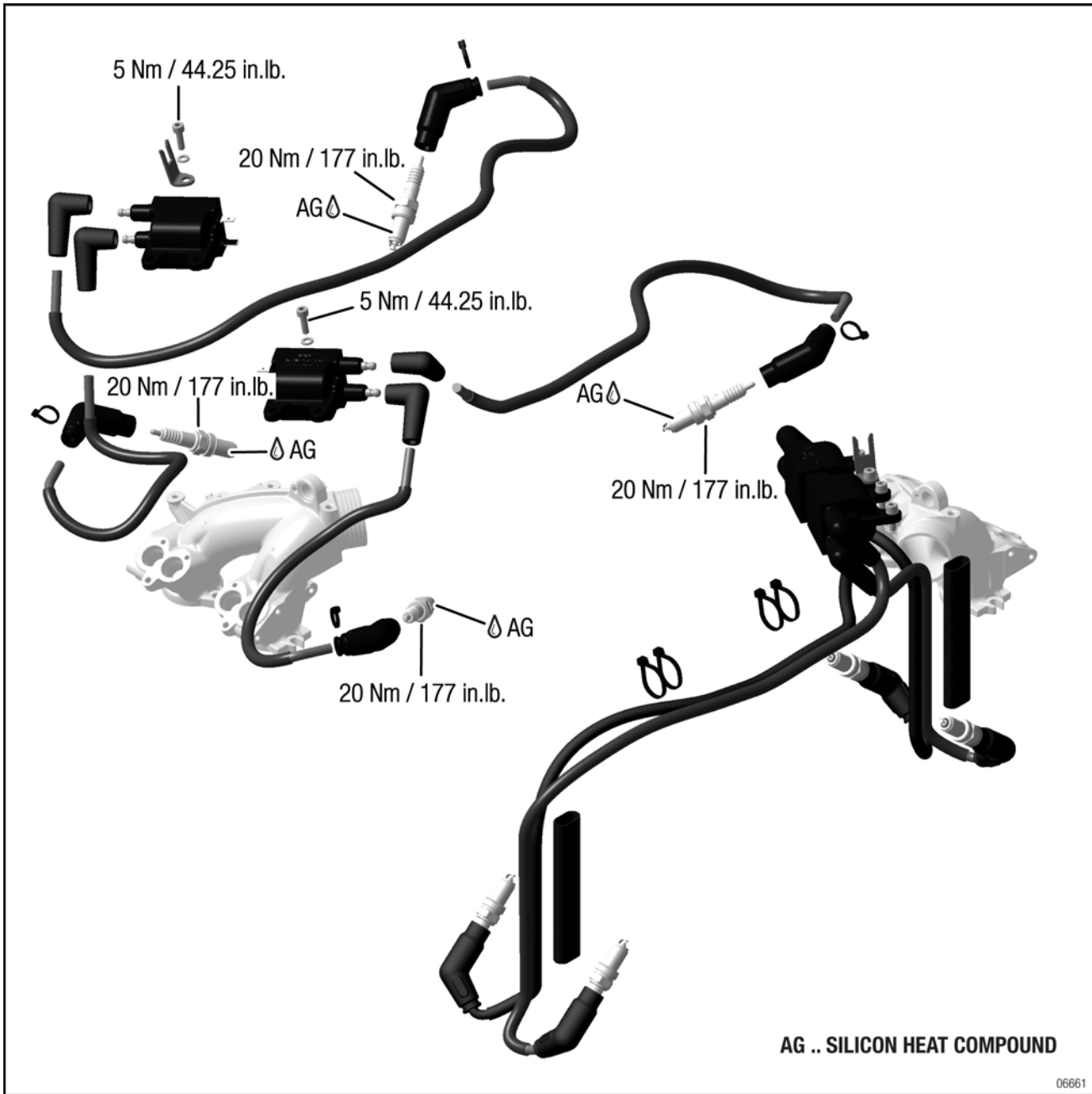
This section describes the maintenance of the ignition unit (distribution) assembly of the ROTAX 912 i Series engine. The description is divided into sub-sections and explanations of system functions.

Subject	Section
1. Introduction	Page 1
2. Service products	Page 3
3. System description	Page 7
4. Safety information	Page 7
5. Removal	Page 8
A. Preparation	Page 8
B. Internal generator - removal	Page 8
C. Double ignition coil assy. - removal	Page 8
D. Resistance spark plug connector and ignition cable assy. - removal	Page 9
E. Spark plug - removal	Page 10
F. Knock sensor - removal	Page 10
6. Inspection	Page 11
G. Double ignition coil assy. - inspection	Page 11
H. Resistance spark plug connector and ignition cable assy. - inspection	Page 11
I. Spark plug - inspection	Page 12
J. Knock sensor - inspection	Page 12
7. Wear limits	Page 13
8. Installation	Page 14
K. Knock sensor - installation	Page 14
L. Spark plug - installation	Page 14
M. Resistance spark plug connector and ignition cable assy. - installation	Page 14
N. Double ignition coil assy. - installation	Page 15
O. Internal generator - installation	Page 16
9. Finishing work	Page 16

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WARTUNGSHANDBUCH

Distribution



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Chapter: 74-20-00
DISTRIBUTION

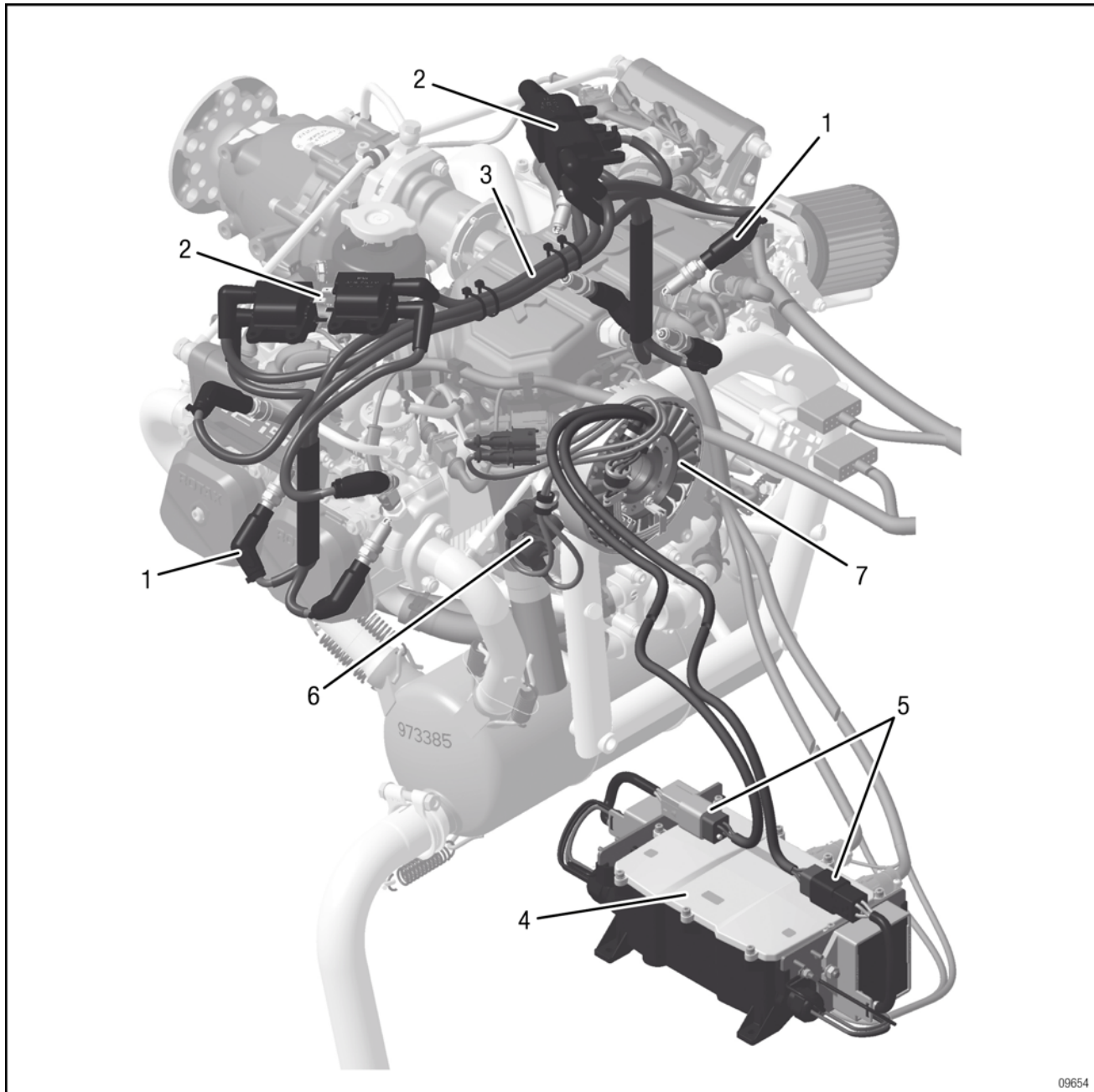
SERVICE PRODUCTS

Description	Part no.
SILIKON heat conduction compound	897186

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Ignition unit (distribution)



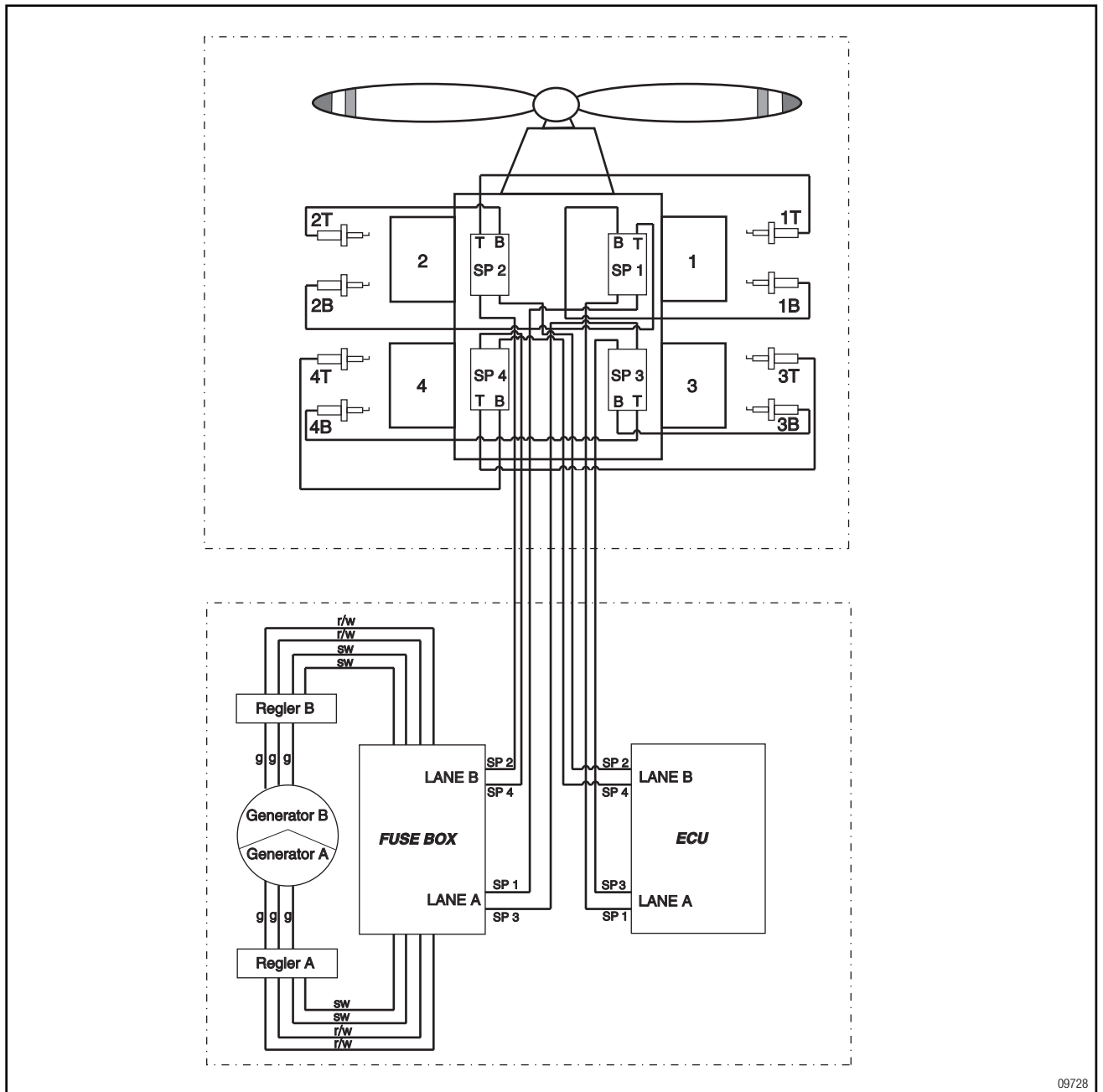
1. Resistance spark plug connector 2. Double ignition coil 3. Ignition cable assy.
4. Fuse box assy. 5. Connector 6. Crankshaft position sensor assy.
7. Stator assy.

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MAINTENANCE MANUAL

Layout plan allocation (cylinder/LANE)

Fig. 1



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MAINTENANCE MANUAL

NOTES

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SYSTEM DESCRIPTION

The ignition voltage is distributed directly to the cylinders by stationary, electronically controlled components.

The ignition voltage is generated by four double ignition coils which are situated above the spark plugs. The ignition unit is synchronised by the signals of the position sensors (see section 76-70-00 Sensors and actuators) of the crankshaft, which are sent to the control unit (ECU) (see 76-10-00 Control unit (ECU)). To determine the optimal ignition point, the ECU uses its saved ignition map to adapt to the different operating states, taking into account the signals of the knock sensor.

INTERNAL GENERATORS

See also section 24-20-00 Internal generator.

DOUBLE IGNITION COILS

The four double ignition coils are fastened to the intake manifolds.

NOTE: The connections are labelled according to the closest cylinder designation.

IGNITION CABLE ASSY.

The high voltage ignition cable consist of copper alloys for applications at high ignition temperatures.

Protection hose identification

The protection hoses of the ignition cables are labelled with a number/letter combination on the resistance spark plug connector side (1 T, 1 B, 2 T, 2 B, 3 T, 3 B, 4 T, 4B).

The label marks the position of the ignition cable on the ignition coil.

1, 2, 3 and 4 = cylinder
T, B = Top, Bottom

e.g.: 3 T = ignition coil for cyl. 3 at the top connector.

NOTE: The cables are only available as complete parts (ignition cable, protection hose, ignition coil side connector).

SPARK PLUGS

The spark plugs are not shielded but use a resistance type suppressor to prevent interference. The connecting bolt for the high-voltage ignition cables complies with ISO/DIN standard guidelines.

WIRING HARNESS

All the components necessary for the engine are connected to the wiring harness. See also section 76-00-00 Engine management.

FUSE BOX

The fuse box contains the capacitors and all the fuses. See also section 76-00-00 Engine management.

SAFETY INFORMATION

WARNING

Danger of electric shock! Switch off the ignition and pull out the ignition key!

WARNING

Danger of death due to high voltage!
Only carry out work on the ignition unit with the appropriate protective measures and devices!

WARNING

Follow the general safety instructions during all work on the engine and the assemblies around it. See section Introduction.
See also section 70-00-00 Standard work on the engine.

CONNECTIONS FOR DISPLAY SYSTEMS

NOTICE

Follow the instructions in the installation manual regarding connections for instrumentation.

CRANKSHAFT POSITION SENSOR

The crankshaft position sensor sends information to the control unit about the rotation speed and crankshaft position.

MAINTENANCE

As well as the maintenance and special checks, see the relevant Maintenance Manual Line for the respective 912 i Series engine type.

REMOVAL

Preparation

- General visual inspection. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Engine cleaning. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Carry out an engine test run. See relevant Maintenance Manual Line for the 912 i Series engine type.

NOTE: Some work can only be carried out on the whole unit!

INTERNAL GENERATOR - REMOVAL

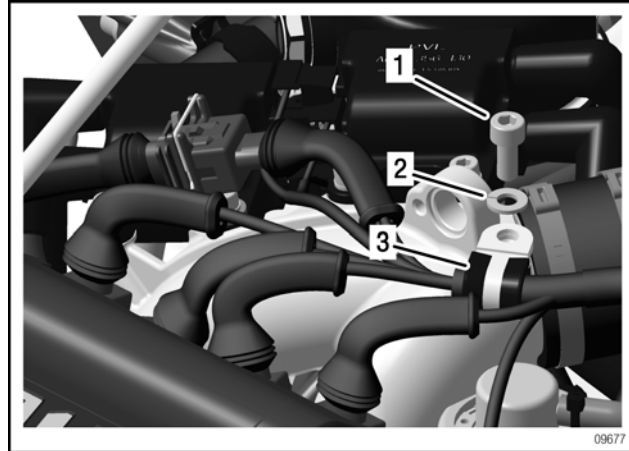
See also section 24-20-00 Internal generator.

DOUBLE IGNITION COIL - REMOVAL

NOTICE	
<p>The Allen screws go into the intake duct, they are therefore glued in with LOCTITE 243. See Fig. 20. Leaking Allen screws can cause an excessively lean mixture!</p>	

Step	Procedure
1	Take the cable clamps off the wiring harness.

Fig. 2

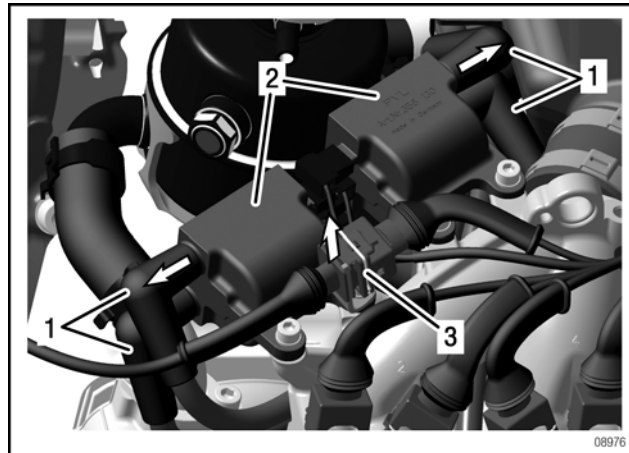


1. M6x14 Allen screw 2. Lock washer
 3. Cable clamp

See Fig. 3

Step	Procedure
2	Disconnect 4 ignition coil connectors on each side. NOTE: Use a suitable tool to disconnect the ignition coil connectors.

Fig. 3

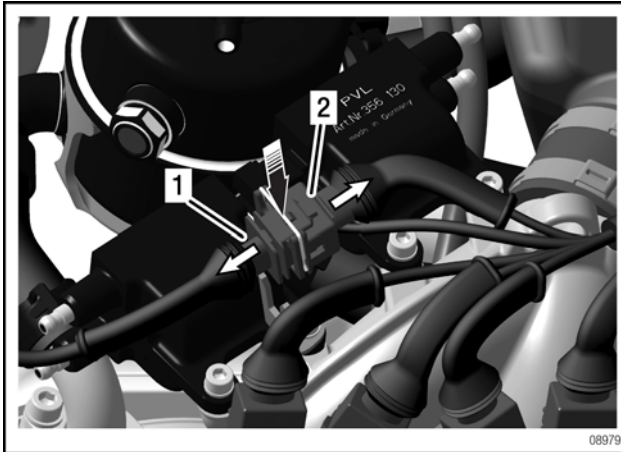


1. Ignition coil connector 2. Double ignition coils
 3. EGT connector

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Step	Procedure
3	Carefully pull EGT 1 and EGT 2 (cylinders 1 and 2) out of the locking plate.
4	Press the metal bracket and unplug the connectors.

Fig. 4



1. EGT connector 2. Connector

Step	Procedure
6	Unplug the connectors to the double ignition coils.
7	Remove the double ignition coils

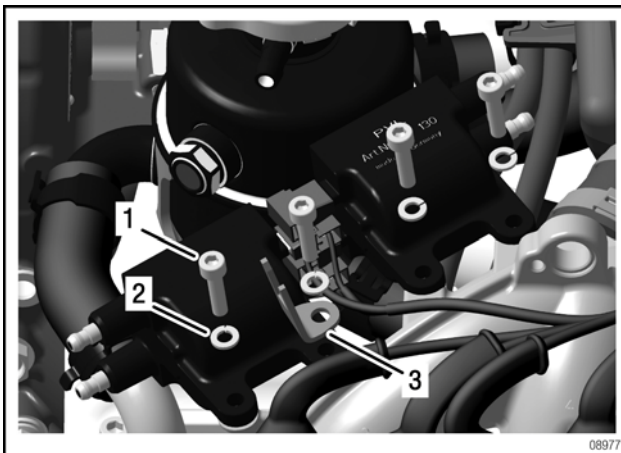
Fig. 6



1. Double ignition coils 2. Ignition coil connector
 (coil 1, coil 2, coil 3, coil 4)

Step	Procedure
5	Loosen M5x16 Allen screws with A5 lock washers.

Fig. 5



1. M5x16 Allen screw 2. A5 lock washer
 3. Cable holder

RESISTANCE SPARK PLUG CONNECTOR AND IGNITION CABLE ASSY. - REMOVAL

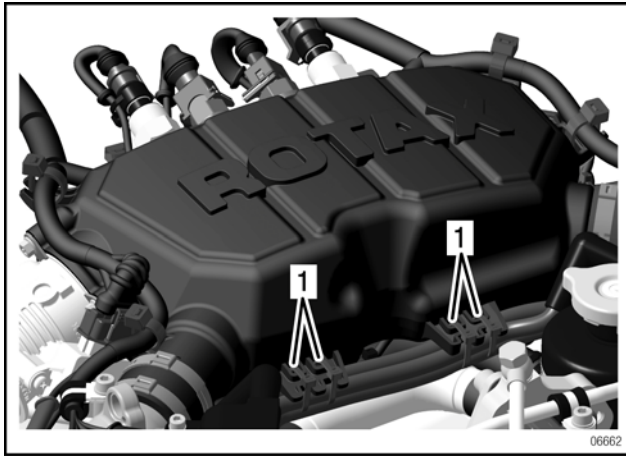
See [Fig. 7](#) and [Fig. 8](#)

Step	Procedure
1	Remove cable ties.
2	Unplug the resistance spark plug connector.
3	Unplug ignition cable from ignition coils and remove it. NOTE: If this proves difficult, push down with a hex. socket wrench or similar. Do not use a sharp tool!

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Fig. 7



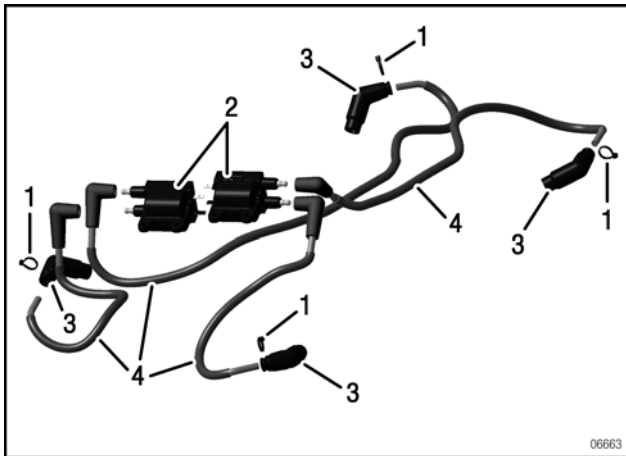
SPARK PLUG - REMOVAL

Step	Procedure
1	Remove the M14x1.25 SW16 spark plugs anti-clockwise from the corresponding cylinder head.

NOTICE

Risk of damage to spark plugs!
 The spark plugs must only be removed with the spark plug wrench!

Fig. 8



KNOCK SENSOR - REMOVAL

See section 76-70-00 Sensors and actuators and section 76-50-00 Wiring harness.

NOTE: The knock sensor must only be removed if necessary!

Fig. 9

- 1. Cable ties
- 2. Ignition coils
- 3. Resistance spark plug connector
- 4. Ignition cable assy.

INSPECTION

Components can only be replaced, not repaired. If the ignition spark fails, search systematically for the possible cause of the fault. The BUDS-LITE diagnostic tool must be used for this.

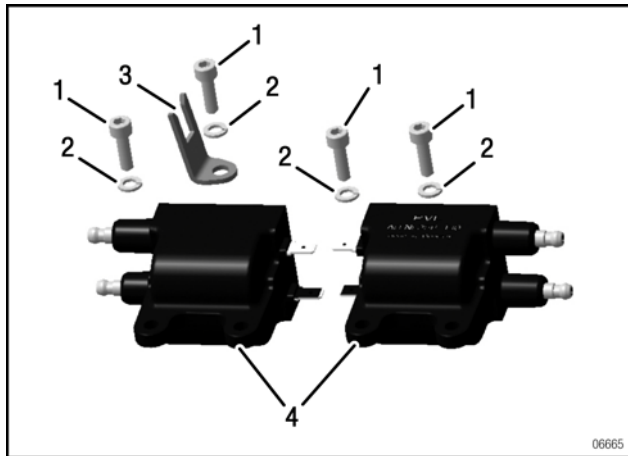
DOUBLE IGNITION COIL ASSY. INSPECTION

Preparation

- Carry out a visual inspection. See also section 05-00-00 Maintenance.
- Carry out a voltage and resistance test. To do this, see section 76-70-00 Sensors and actuators.

Step	Procedure
1	Check fastening elements (screws, washers and plug holders) for damage, corrosion and deformation.

Fig. 10

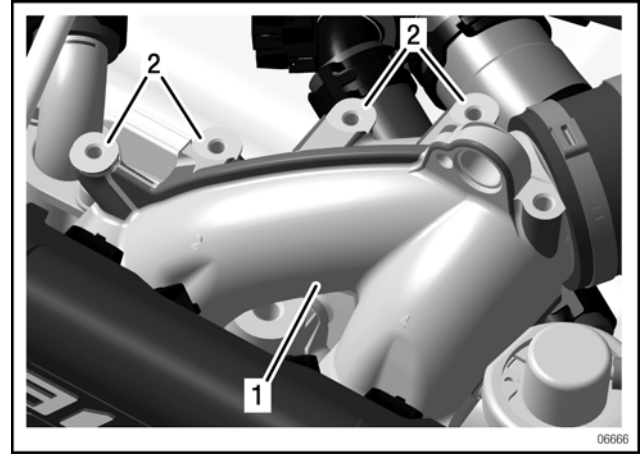


1. M5x20 Allen screw 2. A5 lock washer
3. Plug holder 4. Double ignition coils

Step	Procedure
2	Check double ignition coils for damage, corrosion and deformation.
3	Check contact faces: Indentations up to a max. of 0.5 mm (0.0197 in.). Bumps up to a max. of 0.5 mm (0.0197 in.).

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Fig. 11



1. Intake manifold 2. Contact face

RESISTANCE SPARK PLUG CONNECTOR AND IGNITION CABLE ASSY. - INSPECTION

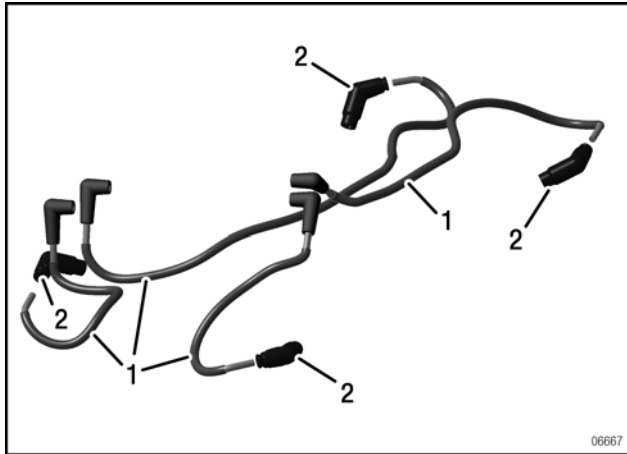
- Carry out resistance test on ignition cable assy. To do this, see section 76-70-00 Sensors and actuators.

NOTICE

Cracking and other obvious damage to the ignition cable is not permitted! If in doubt, always replace the cable and connectors in question.

Step	Procedure
1	Check resistance spark plug connector for corrosion and damage.

Fig. 12

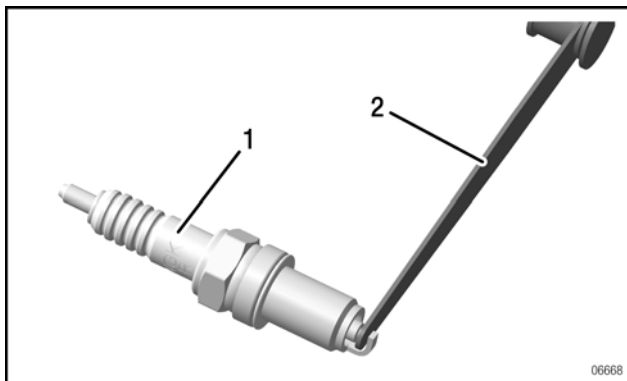


1. Ignition cable assy. 2. Resistance spark plug connector

SPARK PLUG - INSPECTION

Step	Procedure
1	Check the electrode gap of the spark plug with a feeler gauge and adjust it if necessary. See also section 74-20-00 Wear limits.

Fig. 13



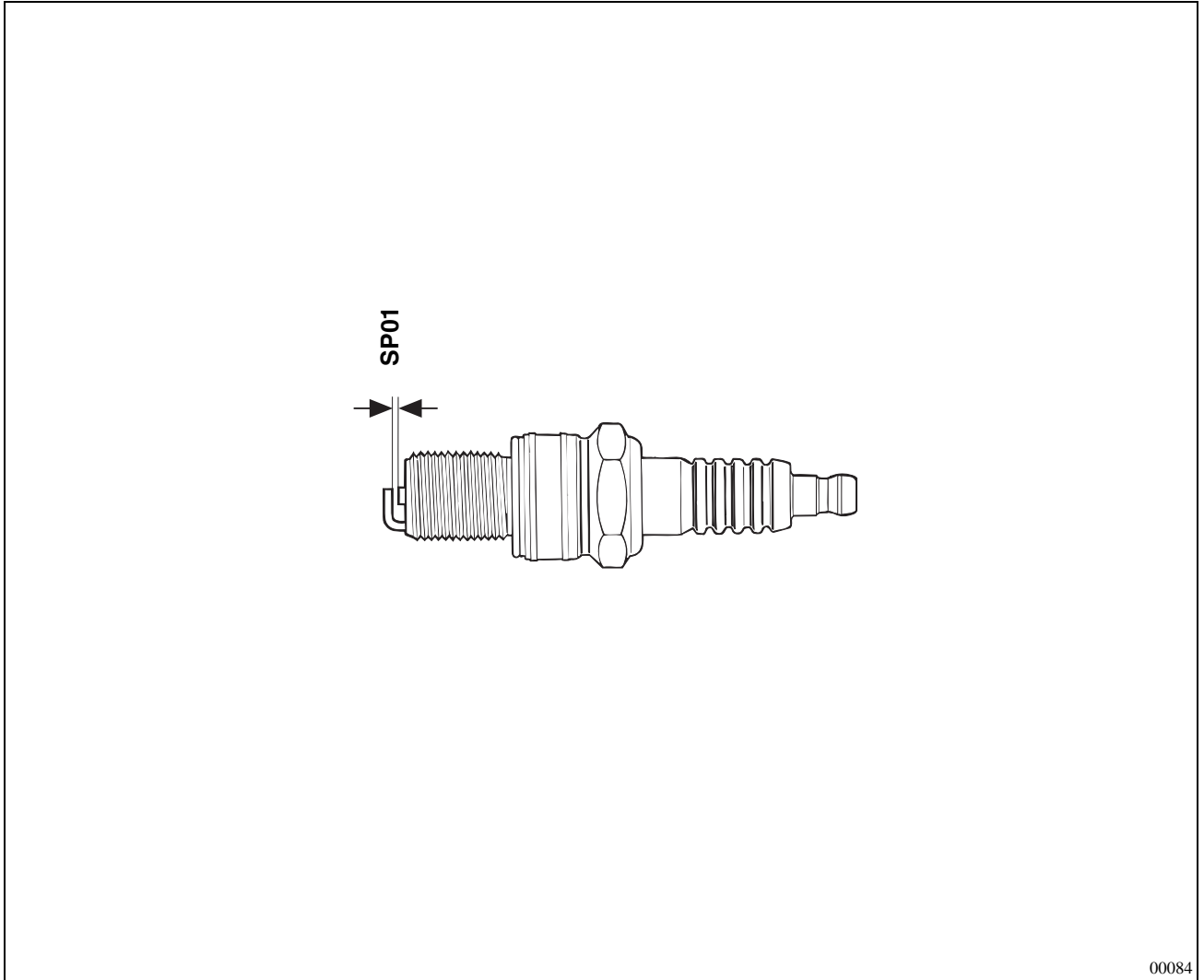
1. Spark plug 2. Feeler gauge

KNOCK SENSOR (KNOCK) - INSPECTION

To do this, see section 76-70-00 Sensors and actuators.

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 MAINTENANCE MANUAL

WEAR LIMITS



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Spark plug

Description	Code	Current measurement value		Tolerance limit	Tolerance limit	Measurements
		min	max	100 %	50 %	
Electrode gap	SP01	0.6 mm 0.0236 in.	0.7 mm 0.0276 in.	0.9 mm 0.0354 in.		current replaced

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INSTALLATION

KNOCK SENSOR - INSTALLATION

See section 76-70-00 Sensors and actuators and section 76-50-00 Wiring harness.

SPARK PLUG - INSTALLATION

NOTICE

Risk of damage to spark plugs!
 The spark plugs must only be installed with the spark plug wrench!

Step	Procedure
1	Lubricate M14x1.25 SW16 spark plugs with SILIKON heat conduction compound and install clockwise in the corresponding cylinder head. Tightening torque 20 Nm (176.96 in. lb.).

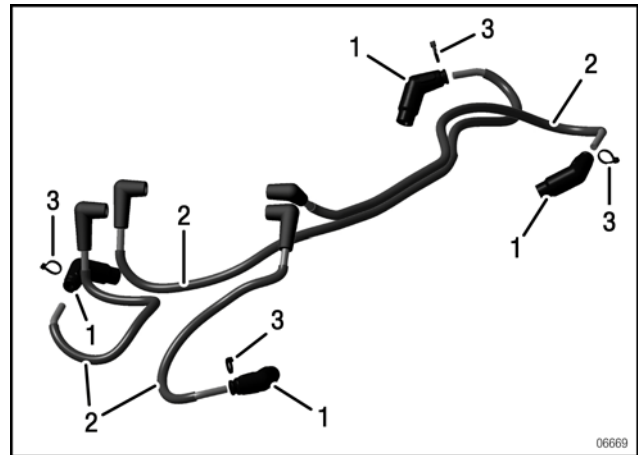
RESISTANCE SPARK PLUG CONNECTOR AND IGNITION CABLE ASSY. - INSTALLATION

NOTICE

Risk of damage to resistance spark plug connector!
 The resistance spark plug connectors must only be installed using the spark plug pliers.
 If using an equivalent tool, ensure that it has no pointed or sharp edges!

Step	Procedure
1	Install the resistance spark plug connector on the ignition cable assy. and secure it with a cable tie.

Fig. 14

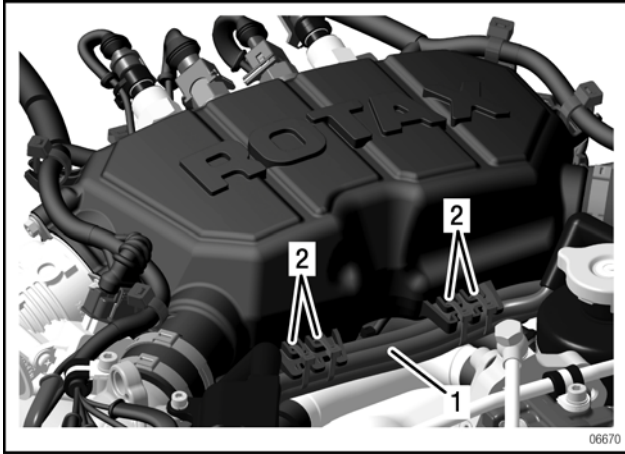


- 1. Resistance spark plug connector
- 2. Ignition cable assy.
- 3. 94x2.5 cable ties

Step	Procedure
2	Route the ignition cable assy. correctly and secure it with a cable tie.

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Fig. 15



1. Ignition cable assy. 2. Cable ties

DOUBLE IGNITION COIL - INSTALLATION

The double ignition coil is installed and removed in the same way. The following should be noted.

NOTE: The red cable is positive (+), the red cable with the black dash is negative (-). Double ignition coils are labelled + and -!

Step	Procedure
1	Plug in the double ignition coil connectors.

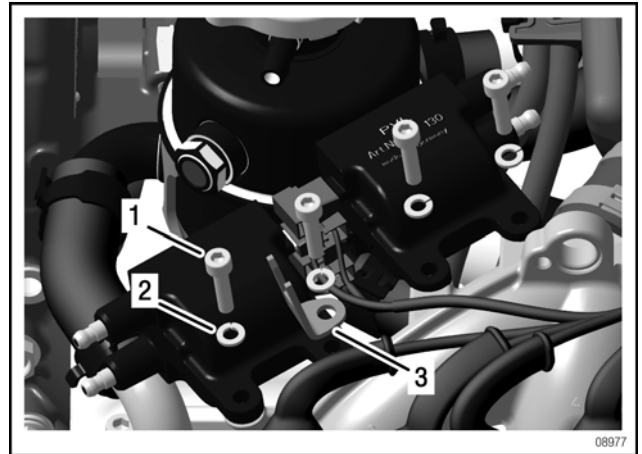
Fig. 16



1. Double ignition coils 2. Ignition coil connector (coil 1, coil 2, coil 3, coil 4)

Step	Procedure
2	Fix the double ignition coils with M5x16 Allen screws with plug holders and A5 lock washers. Tightening torque 5 Nm (44.25 in. lb.).

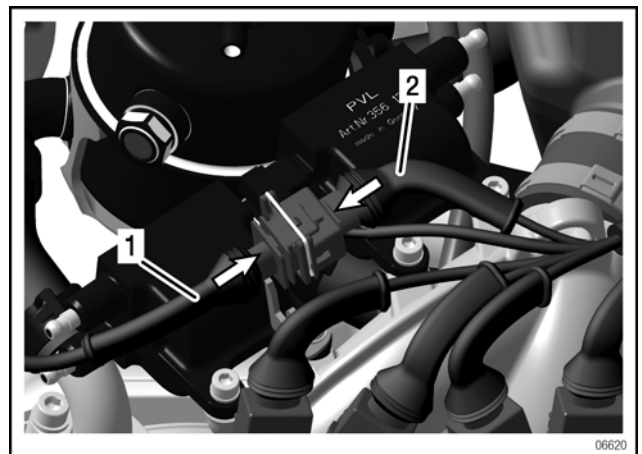
Fig. 17



1. M5x16 Allen screw 2. A5 lock washer
3. Plug holder

Step	Procedure
3	Plug in the connector to the EGT connector. NOTE: Compress the connector with the EGT connector so that the spring clip latches in.

Fig. 18



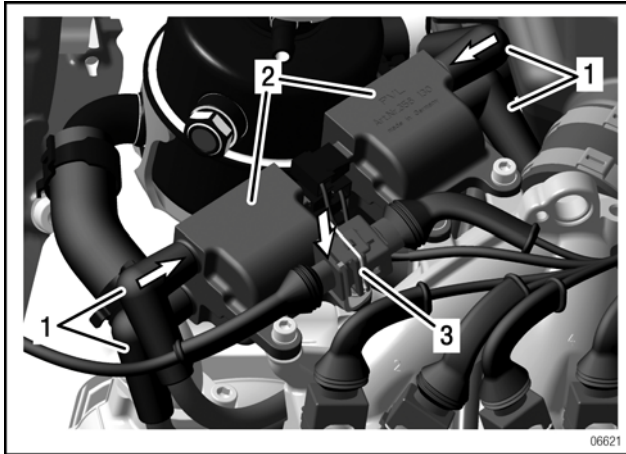
1. EGT connector 2. Connector

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Step	Procedure
4	Plug the ignition coil connector into the double ignition coils and press the EGT connector into the plug holder. NOTE: Check for secure connection.

Fig. 19



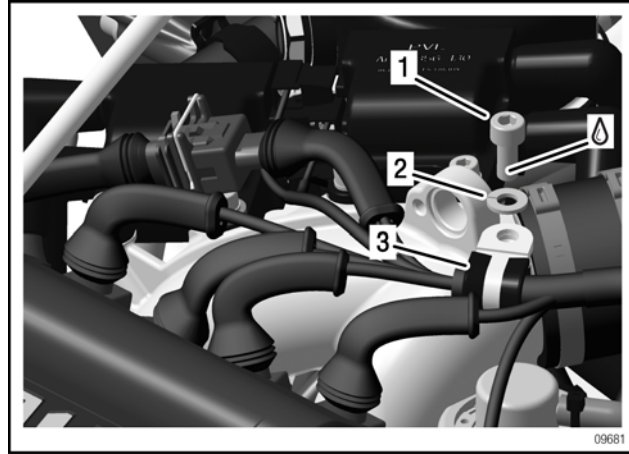
1. Ignition coil connector 2. Double ignition coils
 3. EGT connector

NOTICE

The Allen screws for the spring type hose clips go into the intake duct, they are therefore glued in with LOCTITE 243.
 Leaking Allen screws can cause an excessively lean mixture!

Step	Procedure
5	Secure the 12/M6 cable clamp with an M6x14 Allen screw and washer with LOCTITE 243. Tightening torque 10 Nm (88.48 in. lb.).

Fig. 20



1. M6x14 Allen screw 2. A6 lock washer
 3. 12/M6 cable clamp

INTERNAL GENERATOR - INSTALLATION

See also section 24-20-00 Internal generator.

FINISHING WORK

- Carry out an engine test run. See also section 12-20-00 Planned maintenance and section 70-00-00 Standard work on the engine.

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Chapter: 75-00-00
COOLING SYSTEM

Introduction

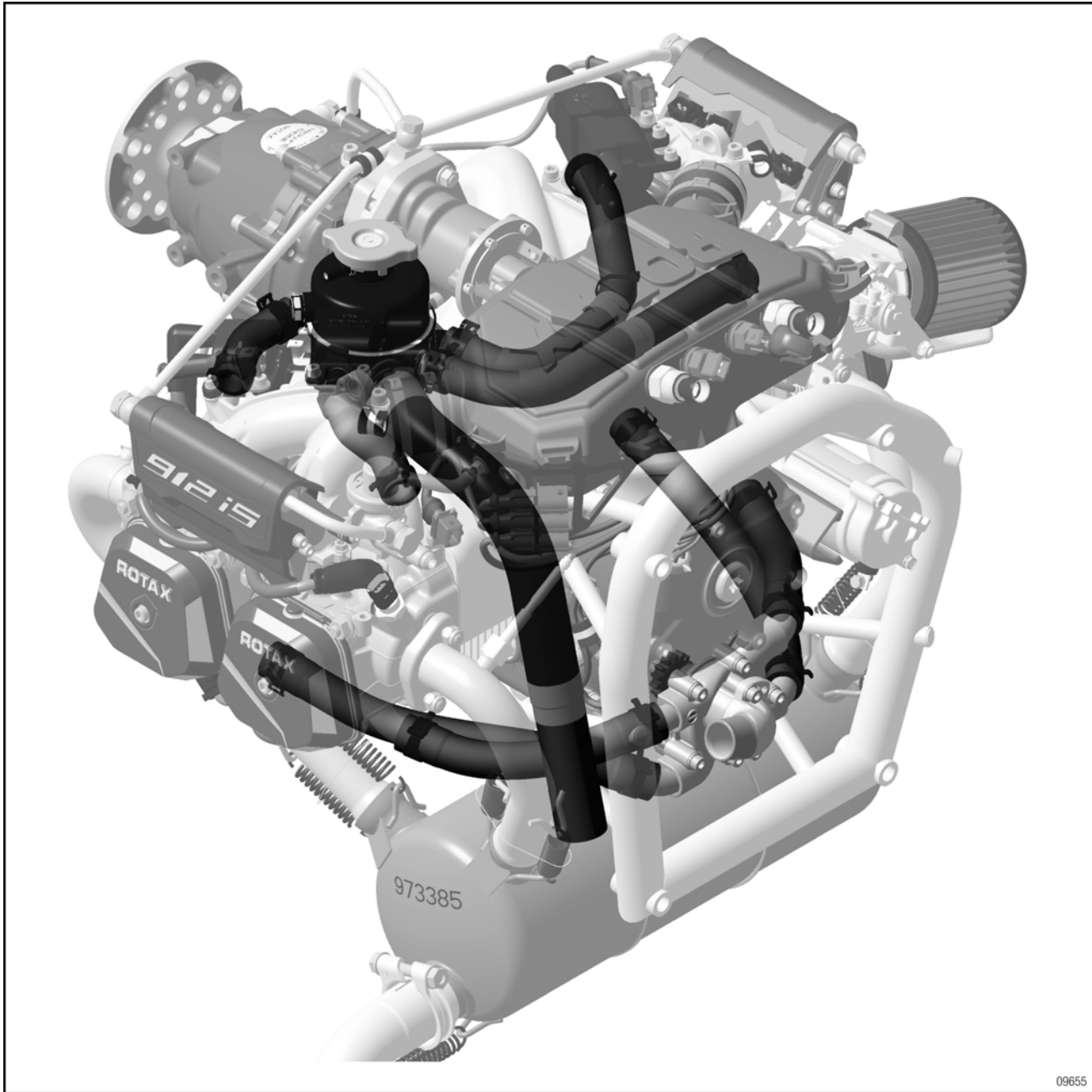
This section describes the maintenance of the ROTAX 912 i Series cooling system. The description is divided into sub-sections and explanations of system functions.

Subject	Section
1. Introduction	Page 1
2. Special tools	Page 3
3. Service products	Page 3
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6. Removal	Page 6
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B. Expansion tank and coolant hose (preformed hose) - removal	Page 7
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D. Ignition housing - disassembly	Page 9
(1) Water pump shaft - removal	Page 9
(2) Oil seal and rotary seal - removal	Page 9
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(4) Water pump housing - disassembly	Page 10
8. Inspection	Page 11
E. Cooling system parts - inspection	Page 11
(1) Axial position of water pump shaft - inspection	Page 11
(2) Expansion tank - inspection	Page 11
(3) Water pump housing - inspection	Page 12
9. Wear limits	Page 13
10. Assembly	Page 14
F. Ignition housing - assembly	Page 14
(1) Oil seal - installation	Page 14
(2) Water pump housing - installation	Page 14
(3) Water pump housing - assembly	Page 15
(4) Coolant hose - installation	Page 16
11. Installation	Page 19
G. Ignition housing - installation	Page 19
H. Expansion tank and coolant hose (preformed hose) - installation	Page 19
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Position on the engine



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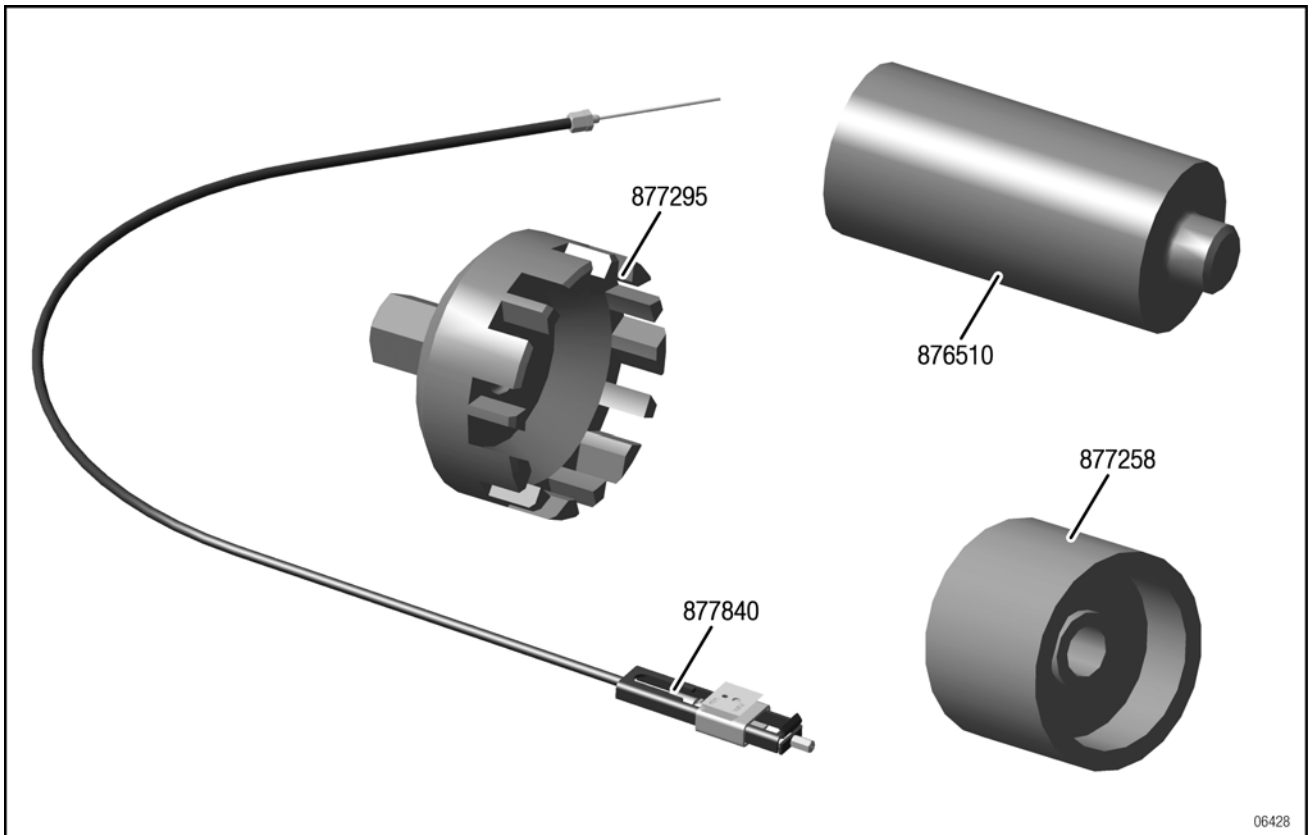
Chapter: 75-00-00
COOLING SYSTEM

SPECIAL TOOLS

Description	Part no.
Spring clamp pliers	877840
Impeller wrench assy.	877295
Insertion jig	876510
Insertion jig	877258

SERVICE PRODUCTS

Description	Part no.
LOCTITE 243	897651
Engine oil	n.a.

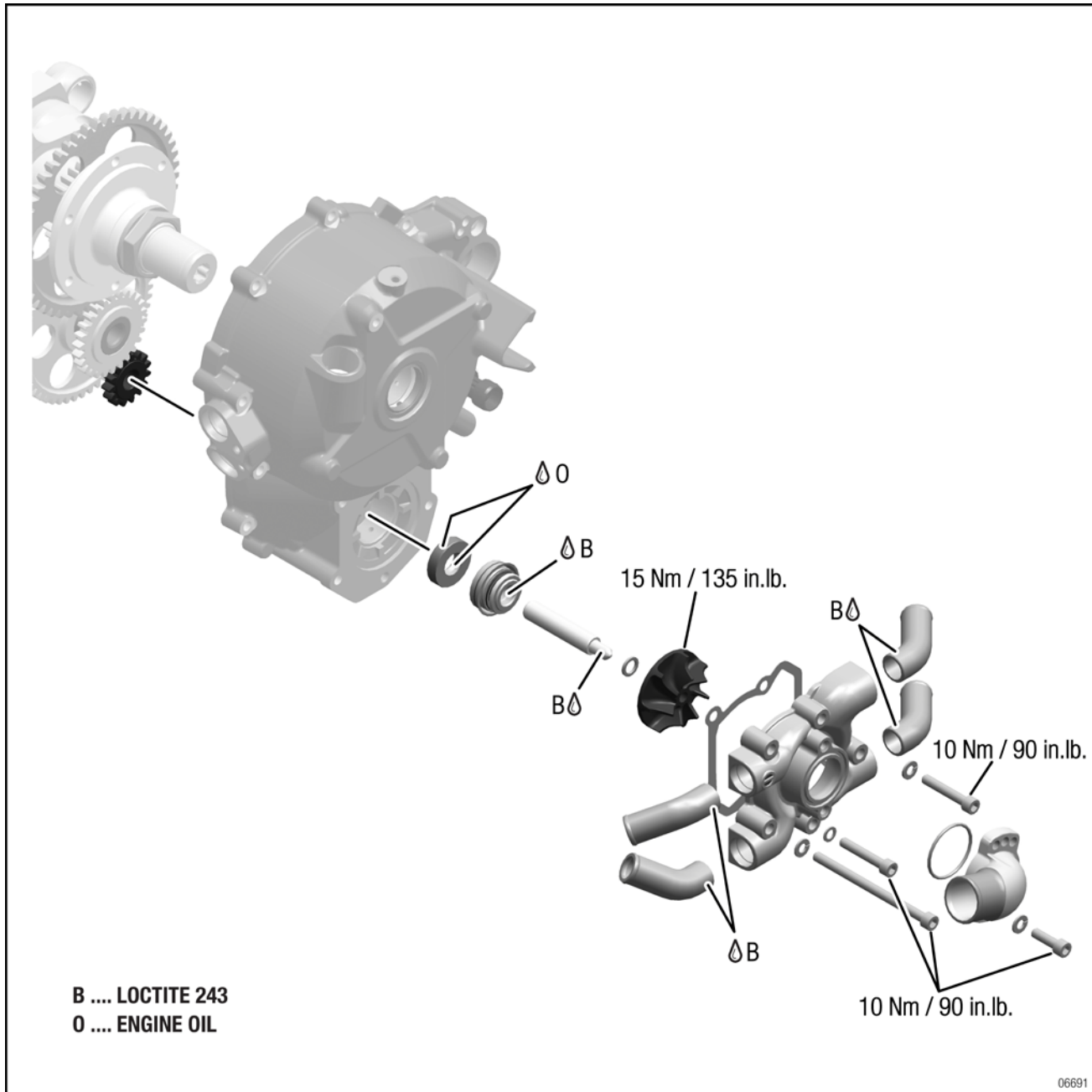


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Cooling system



SYSTEM DESCRIPTION

The engine is cooled by liquid-cooled cylinder heads and ram-air-cooled cylinders. The cooling system of the cylinder heads is a closed cooling circuit with an expansion tank and overflow bottle.

COOLANT

The coolant is pumped by a water pump, driven by the camshaft, from the radiator to the individual cylinder heads. The coolant flows out of the top of the cylinder heads and is collected in the expansion tank. Since the standard location of the radiator is below engine level, the expansion tank located on top of the engine allows for coolant expansion.

RADIATOR

See the current 912 i Series Installation Manual. For more detailed information on operation, maintenance, safety or flight, consult the documentation provided by the aircraft manufacturer and dealer.

WATER PUMP

The water pump is integrated in the ignition housing. The ignition housing must be removed for repair work on the water pump. See also section 74-00-00 Ignition unit.

EXPANSION TANK

The expansion tank is closed by a pressure cap (with pressure relief valve and return valve). When the coolant heats up and expands, it opens the pressure relief valve can flow via a thin hose at atmospheric pressure into the transparent overflow bottle. When the coolant cools down, it is sucked back into the cooling circuit.

OVERFLOW BOTTLE

See the current 912 i Series Installation Manual. For more detailed information on operation, maintenance, safety or flight, consult the documentation provided by the aircraft manufacturer and dealer.

SAFETY INFORMATION

WARNING

Danger of severe burns and scalds!
Always allow the engine to cool down to ambient temperature before starting any work.
The radiator cap on the expansion tank must only be opened when the engine has cooled down!

Ensure that the engine is in the horizontal position!

CONNECTIONS FOR DISPLAY SYSTEMS

NOTICE

Follow the instructions in the installation manual regarding connections for instrumentation.

TEMPERATURE SENSOR

Coolant flows around the temperature sensor, which measures the coolant temperature directly.

The temperature sensor is situated in cylinder head 4.

MAINTENANCE

As well as the maintenance and special checks, see the relevant Maintenance Manual Line for the respective 912 i Series engine type.

Before the cooling system is removed, the work described below must be carried out to identify any further malfunctions in the cooling system and rectify them as part of the repair work.

NOTICE

If these checks are omitted, it may be necessary to dismantle the cooling system again to rectify any malfunctions after it has been repaired.

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- General visual inspection. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Carry out an engine test run. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Engine cleaning. See relevant Maintenance Manual Line for the 912 i Series engine type.

REMOVAL

Preparation

NOTICE
Use appropriate protective coverings to prevent the ingress of debris particles into all disconnected lines and connections.

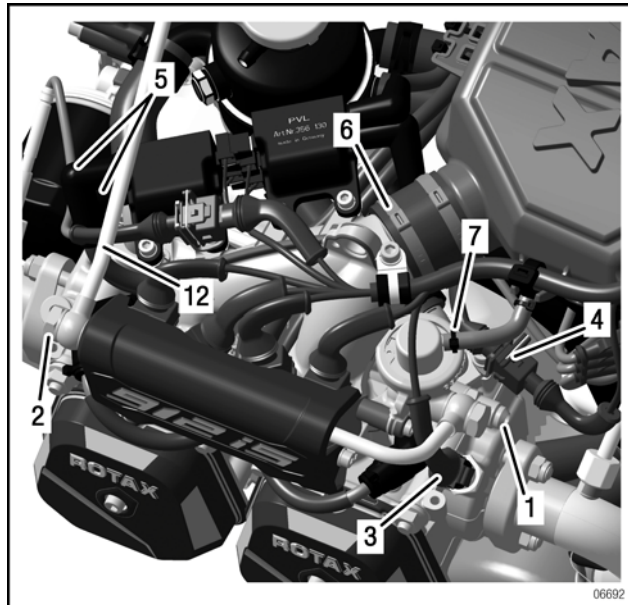
- Switch the ignition key OFF
- Drain coolant. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Drain the fuel. See the current Maintenance Manual Line, section 12-20-00 Planned maintenance.
- Disconnect the preformed hose KA in accordance with the aircraft manufacturer's specifications.

NOTE: The assemblies and lines are only to be removed if necessary and only as far as is necessary!

Step	Procedure, cyl. 2/4
1	Remove the fuel outlet and inlet line on the fuel rail.
2	Unplug temperature sensor CTS. See section 76-70-00.
3	Remove temperature sensor EGT 1/3/4 from the cable bracket and unplug it. See section 76-70-00.
4	Unplug throttle position sensor TPS. See section 76-70-00.
5	Unplug the resistance spark plug connector. See section 74-20-00.
6	Remove the 1-ear clamp.
7	Remove the cable ties from the fuel pressure regulator.

Step	Procedure, cyl. 2/4
8	Loosen the M6x16 Allen screw of the fuel line assy. with the lock washer.
9	Loosen the M12x1.5x24 banjo bolt from cyl. 2/4 and 1/3 and remove the fuel line assy.
10	Loosen 4 Allen screws on the intake manifold (cyl. 2/4). See section 73-10-00.
11	Remove the intake manifold (cyl. 2/4) with all its attached parts.
12	Remove the air filter including the heat shield.
13	Remove the double ignition coils from the intake manifold (cyl. 1/3). See section 74-20-00.
14	Remove the 2 cable ties from the knock sensor line.

Fig. 1(Cyl. 2/4):

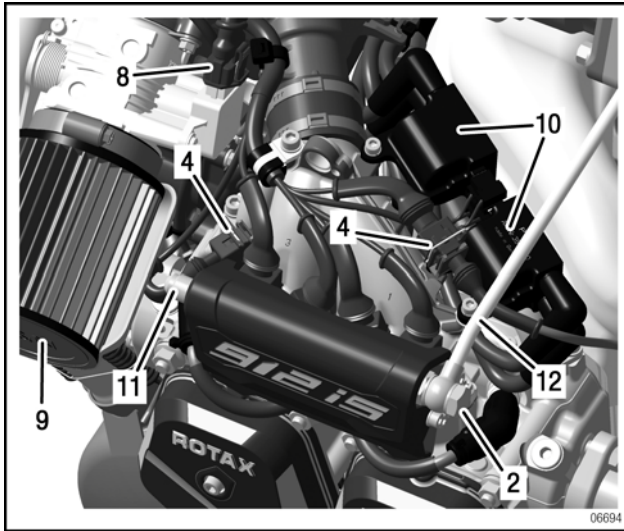


- | | |
|------------------------------------|---------------------------|
| 1. Fuel outlet | 2. M12x1.5x24 banjo bolt |
| 3. Temperature sensor | 4. Temperature sensor EGT |
| 5. Resistance spark plug connector | 6. 1-ear clamp |
| 7. Cable ties | |

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Fig. 2(Cyl. 1/3):



- 8. Throttle potentiometer TPS
- 9. Oil filter
- 10. Double ignition coil
- 11. Fuel inlet
- 12. Fuel hose assy.

EXPANSION TANK AND COOLANT HOSE (PREFORMED HOSE) - REMOVAL

NOTICE

Mark the position of the spring type hose clips. The spring type hose clips must be re-installed in the same position, otherwise it may not be possible to install the intake manifold. Risk of pressure and scuffing marks!

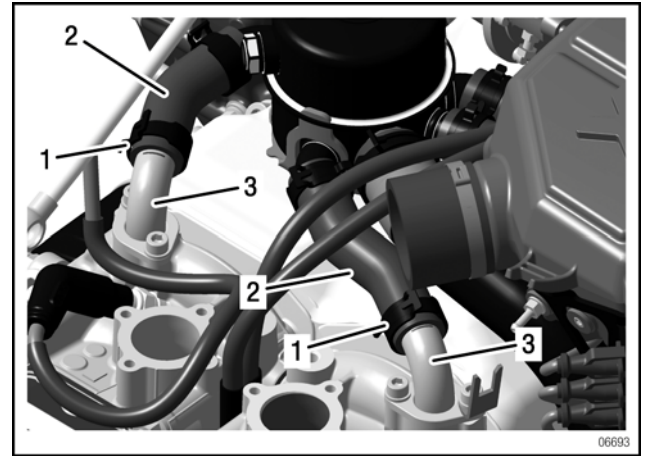
NOTICE

When removing the preformed hoses, ensure that the coolant elbows are not damaged!

Step	Procedure
1	Take off the spring type hose clip using spring clamp pliers part no. 877840.
2	Remove the preformed hose from the coolant elbow with a suitable tool.

Preformed hose, cylinders 2 and 4

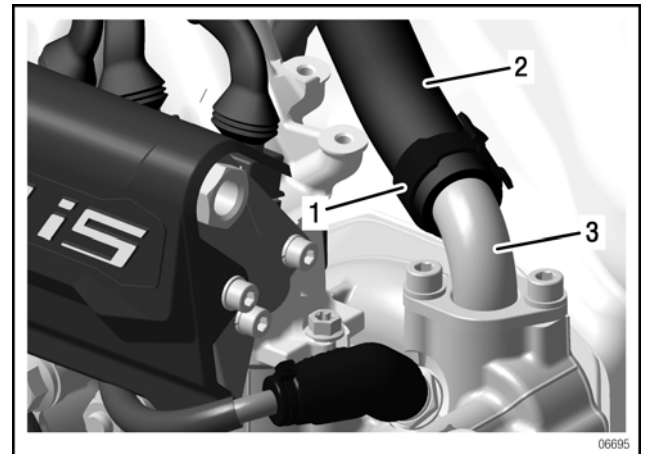
Fig. 3



- 1. Spring type hose clip
- 2. Preformed hose
- 3. Coolant elbow

Preformed hose, cylinder 1

Fig. 4



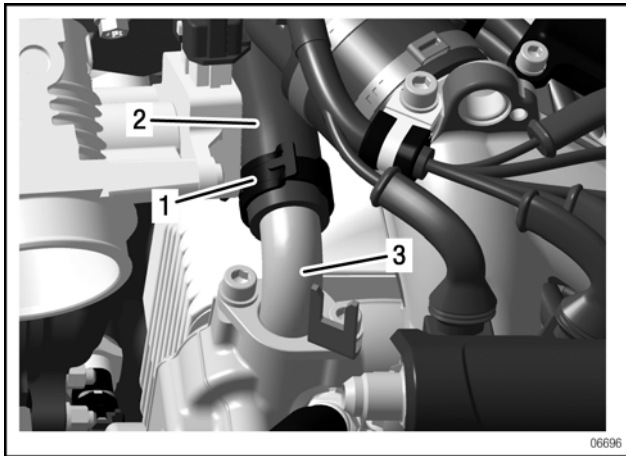
- 1. Spring type hose clip
- 2. Preformed hose
- 3. Coolant elbow

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Preformed hose, cylinder 3

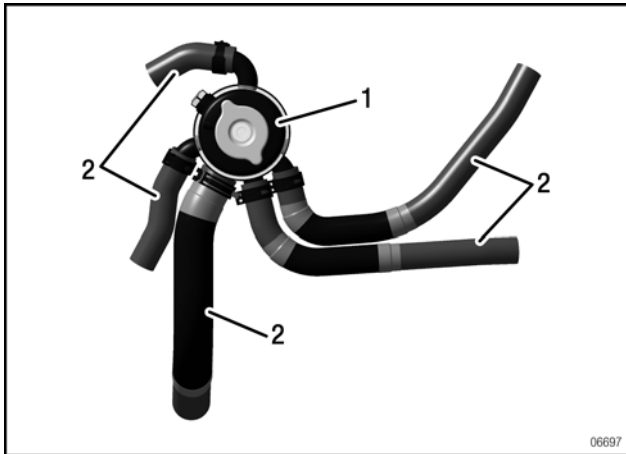
Fig. 5



1. Spring type hose clip 2. Preformed hose
 3. Coolant elbow

Step	Procedure
3	Remove the expansion tank assy. with all its preformed hoses.

Fig. 6



1. Expansion tank assy. 2. Preformed hoses

WATER PUMP HOUSING - REMOVAL

Preparation

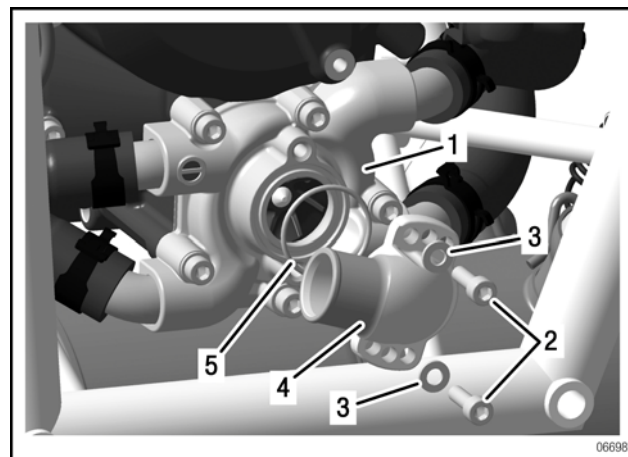
- Remove the coolant hose according to the aircraft manufacturer's specifications.

NOTICE

When removing the preformed hoses, do not damage the coolant elbow on the expansion tank!

Step	Procedure
1	Loosen the 2 M6x20 Allen screws of the water inlet elbow with washers and remove the water inlet elbow with the 32x2 o-ring. NOTE: Mark the position of the coolant elbow with a suitable pen (touch-up pen).

Fig. 7

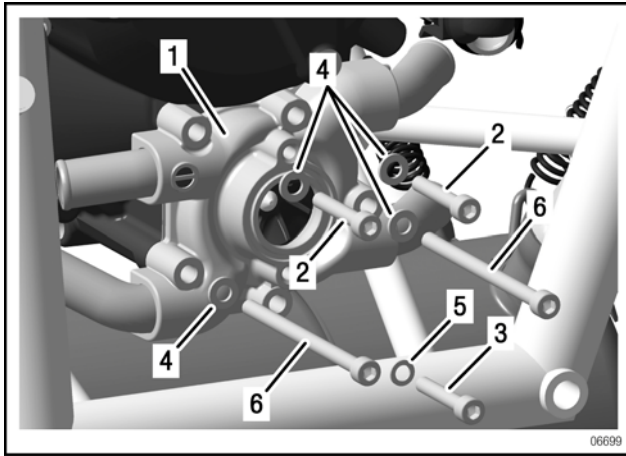


1. Water pump housing 2. M6x20 Allen screws
 3. 6.4 washer 4. Water inlet elbow
 5. 32x2 o-ring

Step	Procedure
2	Remove all 4 spring type hose clips using spring clamp pliers part no. 877840 and detach the coolant hoses from the water pump housing.
3	The water pump housing and gasket can be removed by loosening the other 5 M6 screws.

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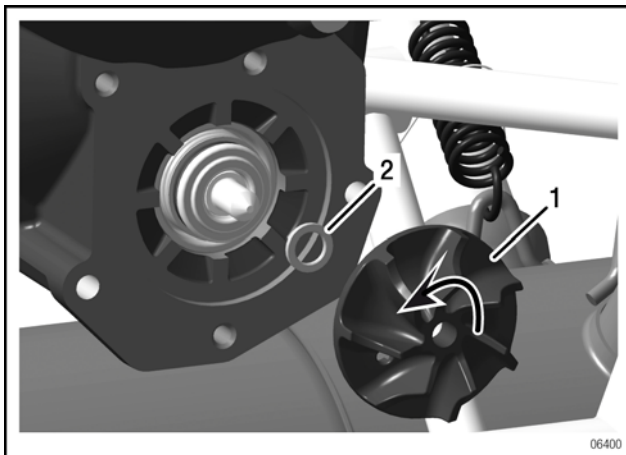
Fig. 8



- | | |
|---|------------------------------|
| 1. Water pump housing | 2. M6x35 Allen screw |
| 3. M6x35 Allen screw
(stainless steel) | 4. 6.4 washer |
| 5. 6x10 DIN 7603 gasket | 6. M6x90 Allen screw
ring |

Step	Procedure
4	Remove the impeller anti-clockwise with the special tool part no. 877295 with the crankshaft immobilised. NOTE: To immobilise the crankshaft, see section 12-20-00 in the Maintenance Manual Line.

Fig. 9



- | | |
|-------------|------------------------|
| 1. Impeller | 2. 8.2/12.5/1.5 washer |
|-------------|------------------------|

DISASSEMBLY

IGNITION HOUSING - DISASSEMBLY

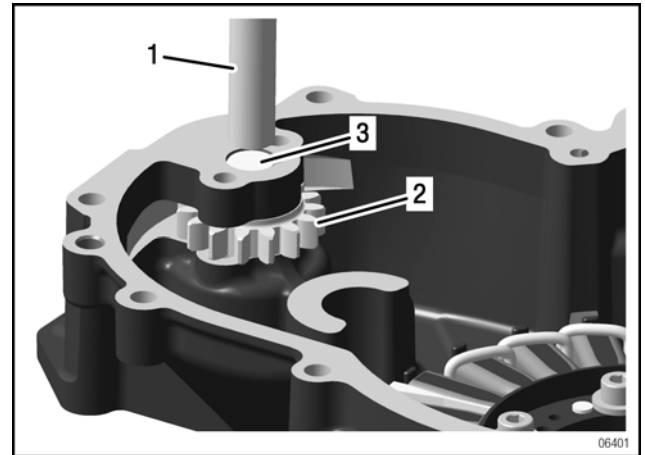
Preparation

- Remove the ignition housing. See also section 24-20-00 Internal generator.

WATER PUMP SHAFT - REMOVAL

Step	Procedure
1	Place the ignition cover on a suitable flat surface.
2	Press out the water pump shaft with a suitable tool.
3	Pull out the water pump gear.

Fig. 10



- | | |
|---------------------|------------------------|
| 1. Press-out tool | 2. Water pump gear 15T |
| 3. Water pump shaft | |

OIL SEAL AND ROTARY SEAL - REMOVAL

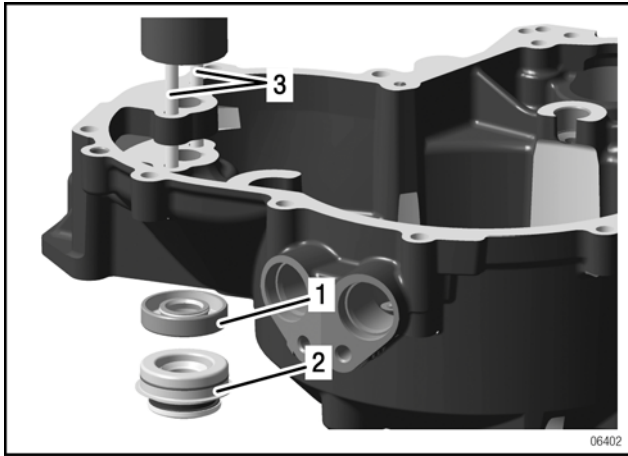
NOTICE

The oil seal and rotary seal are destroyed by this process and must be replaced.

Step	Procedure
1	Press out the old oil seal and the rotary seal with two bolts and a suitable jig. NOTE: The diameter of the bolt is 5 mm (0.1969 in.).

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Fig. 11

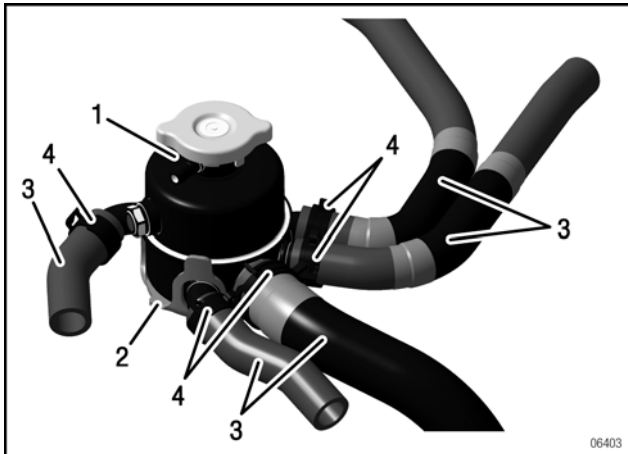


- 1. Oil seal
- 2. Rotary seal
- 3. Press-out tool

**COOLANT HOSES -
 REMOVAL**

Step	Procedure
1	Take off the spring type hose clips using spring clamp pliers part no. 877840.
2	Remove the preformed hoses from the coolant elbows on the expansion tank with a suitable tool.
3	Remove the rubber plate.

Fig. 12



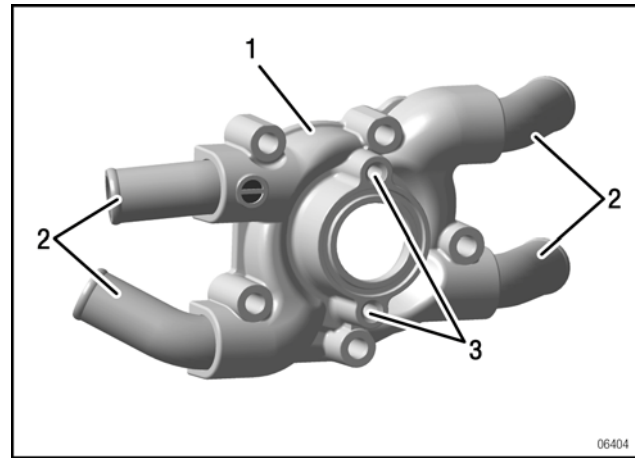
- 1. Expansion tank
- 2. Rubber plate
- 3. Preformed hoses
- 4. Spring type hose clips

WATER PUMP HOUSING - DISASSEMBLY

NOTE: Only remove the coolant elbow when absolutely necessary!

Step	Procedure
1	Mark the position of the coolant elbow.
2	Heat the water pump housing to approx. 80°C and unscrew the coolant elbow.
3	Clean the thread (remove LOCTITE residues).

Fig. 13



- 1. Water pump housing
- 2. Coolant elbow
- 3. Thread

INSPECTION

**COOLING SYSTEM
 SINGLE PARTS - CHECK**

NOTICE

Cracks in cooling system components are not permissible! If in doubt, check the affected parts for cracks using the dye penetrant method.

NOTICE

Preformed hoses must not be shortened, as this affects the position of the expansion tank. Replace non-reusable or damaged hoses.

- Clean all parts carefully.
- Check the preformed hoses for damage and wear.
- Check the temperature sensor. To do this, see section 76-70-00 Sensors and actuators.

NOTE: Scuffing marks (including scratches) are permissible up to a maximum depth of 0.50 mm (0.0197 in.).

- Check the spring type hose clips for damage or deformation.

**AXIAL POSITION OF WATER PUMP
 SHAFT INSPECTION**

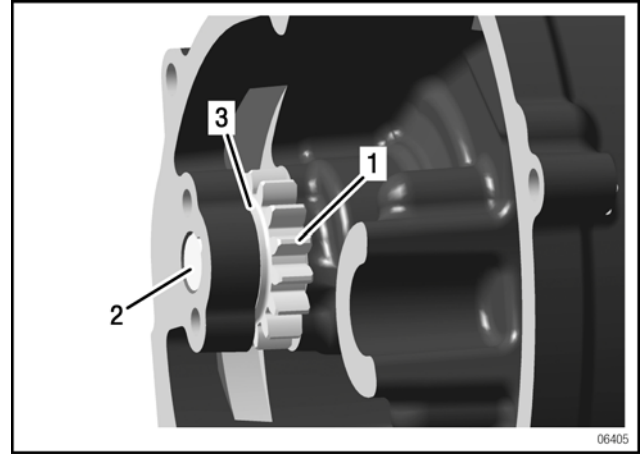
See also section 75-20-00 Wear limits.

- Check the water pump shaft for wear and corrosion.

NOTE: If corrosion is found, the water pump shaft must be replaced.

Step	Procedure
1	Check the axial position of the water pump shaft and pump gear. NOTE: The wide collar of the gear points inwards towards the crankcase.

Fig. 14

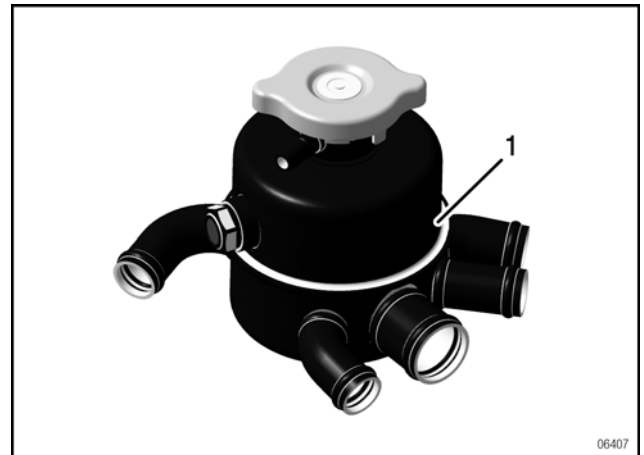


1. Water pump gear 15T 2. Water pump shaft
 3. Wide collar

EXPANSION TANK - INSPECTION

Step	Procedure
1	Check the expansion tank for damage, deformation and leaks.

Fig. 15



1. Expansion tank

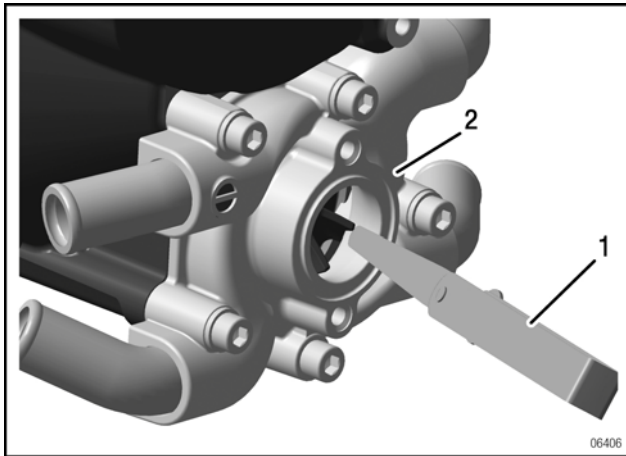
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WATER PUMP HOUSING - INSPECTION

Step	Procedure
1	Check the water pump housing for damage, deformation and leaks.
2	Check the inner side for any signs of contact with the impeller. NOTE: If signs of contact are found, the water pump housing must be replaced.

Fig. 16

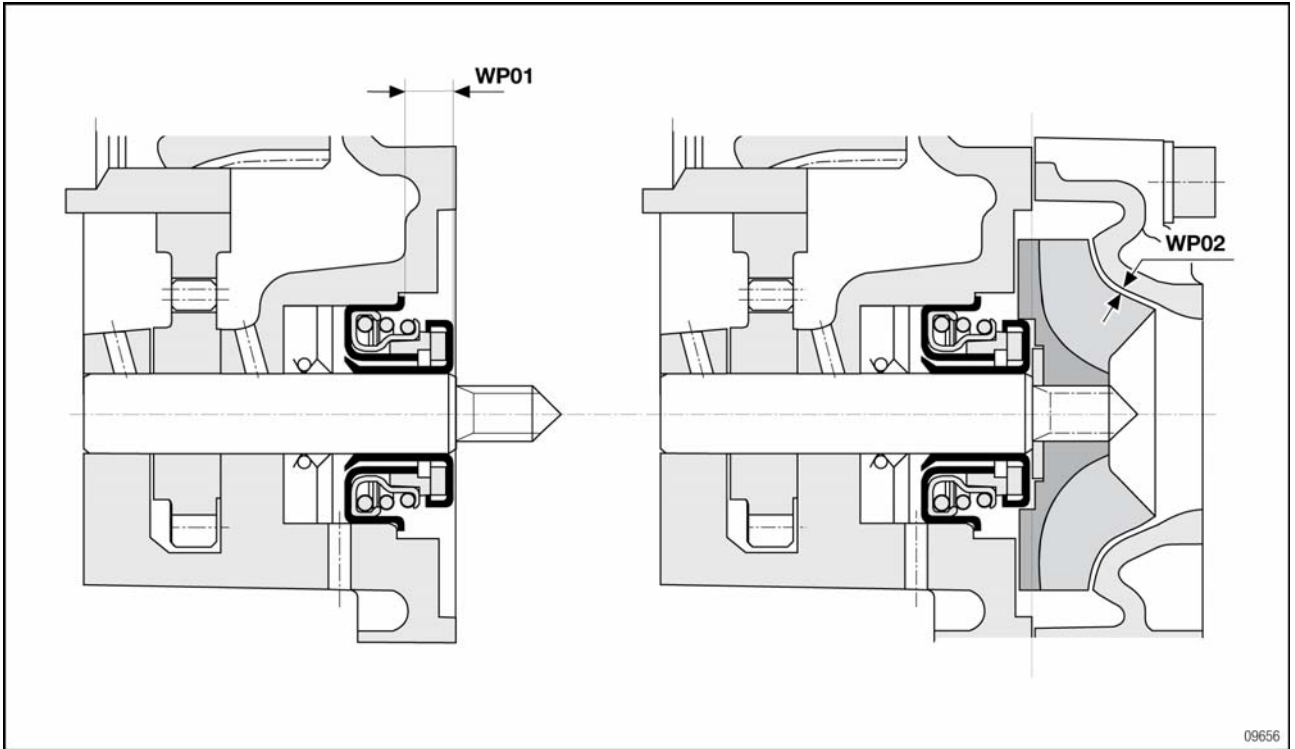


1. Feeler gauge

2. Water pump housing

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WEAR LIMITS



Description	Code	Current measurement value		Tolerance limit	Tolerance limit	Measurements
		min	max	100 %	50 %	
Water pump						
Reference to flat surface	WP01	8.55 mm 0.3366 in.	8.85 mm 0.3484 in.	8.85 mm 0.3484 in.		current replaced
Distance from impeller	WP02	0.3 mm 0.012 in.	0.5 mm 0.020 in.	0.7 mm 0.028 in.	0.6 mm 0.024 in.	current replaced

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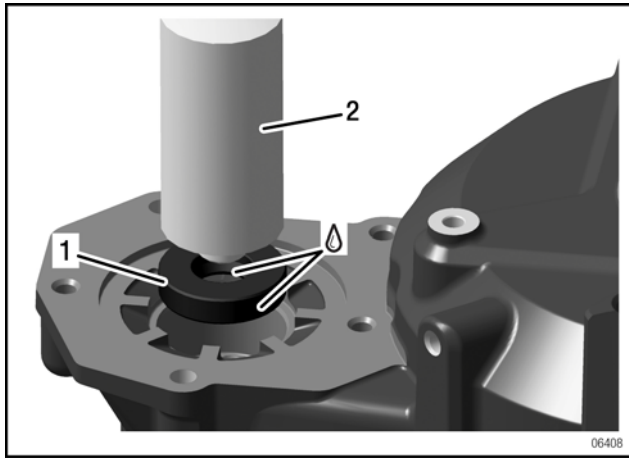
ASSEMBLY

IGNITION HOUSING - ASSEMBLY

OIL SEAL - INSTALLATION

Step	Procedure
1	Lubricate the outside of a new oil seal and press it into the ignition housing as far as the bottom with a suitable jig part no. 876510.

Fig. 17



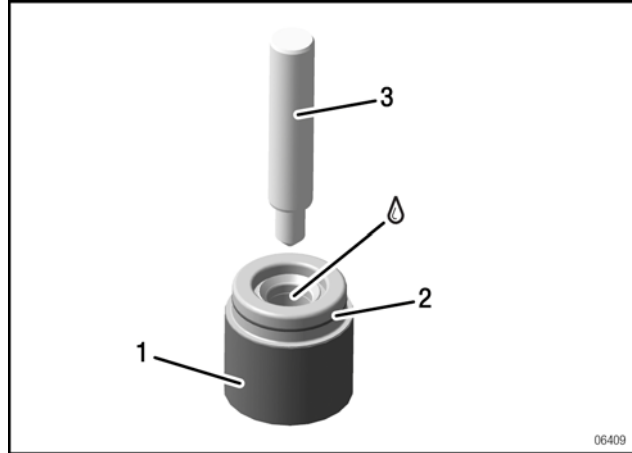
1. Oil seal

2. Insertion jig

WATER PUMP SHAFT - INSTALLATION

Step	Procedure
1	Lubricate the rotary seal on the inner diameter with LOCTITE 243 and press it into the insertion jig part no. 877258. Then press in the water pump shaft as far as it will go.
2	Insert the pump gear in the ignition housing.

Fig. 18



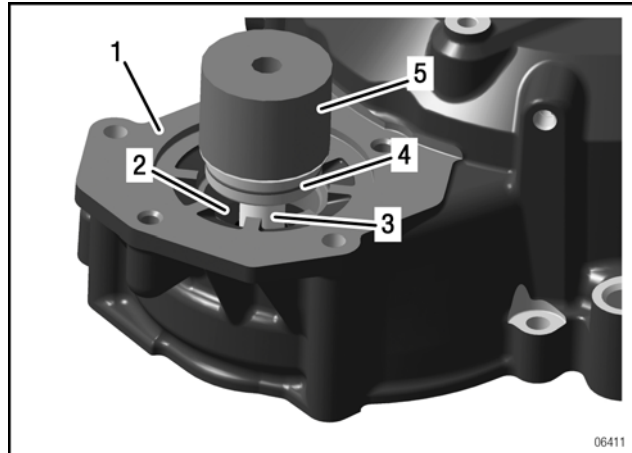
1. Insertion jig

2. Rotary seal

3. Water pump shaft

Step	Procedure
3	Press the pump shaft with the rotary seal already compressed into the ignition housing using the insertion jig part no. 877258. NOTE: Ensure that the pump gear is aligned with the pump shaft.

Fig. 19



1. Ignition housing

2. Oil seal

3. Pump shaft

4. Rotary seal

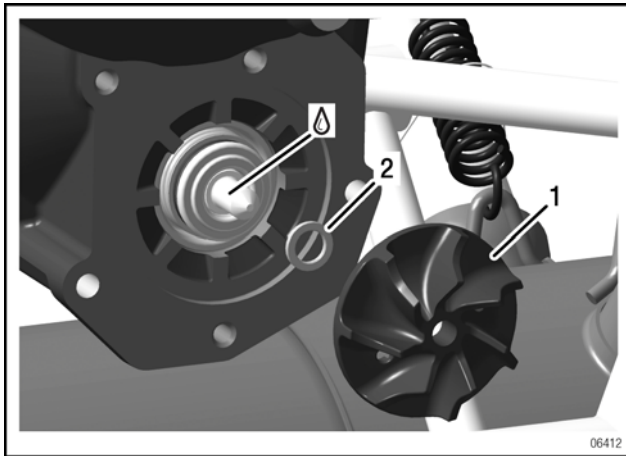
5. Insertion jig

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Step	Procedure
5	Install the ignition housing. See also section 24-20-00 Internal generator.
6	Push on the stainless compensating shim and apply LOCTITE 243 to the thread of the water pump shaft. Then fasten the impeller with the special tool part no. 877295 (with the crankshaft immobilised, see section 12-20-00 Maintenance Manual Line). Tightening torque 15 Nm (88.48 in. lb.). NOTE: Ensure that the impeller runs true. If there is noticeable run-out, this, and possibly also the pump shaft, must be replaced.

Fig. 20



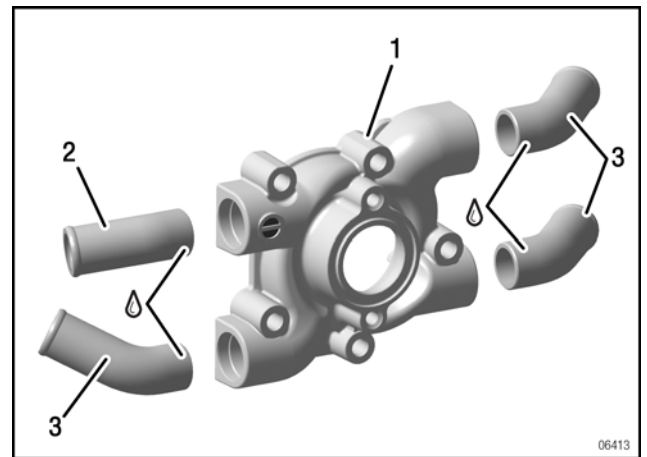
1. Impeller

2. 8.2/12.5/1.5 washer

WATER PUMP HOUSING - ASSEMBLY

Step	Procedure
1	Lubricate the new coolant elbow with LOCTITE 243.
2	Screw the coolant elbow at least 5 revolutions into the water pump housing and position it. NOTE: Usually, 3 coolant elbows with a bend angle of 45° and 1 coolant elbow with a bend angle of 20° are installed.

Fig. 21



1. Water pump housing

2. 20° coolant elbow (blue)

3. 45° coolant elbow (red)

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COOLANT HOSE - INSTALLATION

NOTICE

The push-on length of the expansion tank is 25 mm (0.9843 in.)!

NOTICE

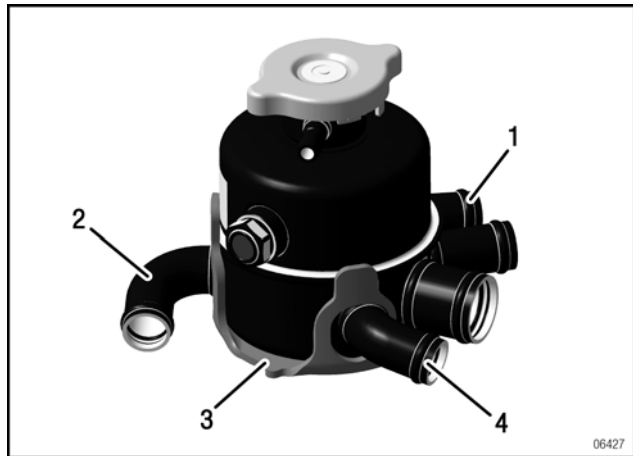
Hoses must not be shortened!

NOTE: The hoses are all preformed and cut to length in the factory, and the hose length and push-on length therefore defines the position of the expansion tank. The correct position of the expansion tank ensures trouble-free installation of the governor.

NOTE: Mark the push-on lengths of the hoses on the water elbows.

Step	Procedure
1	Install a new rubber plate on preformed hose connection 2, 4 and 1.

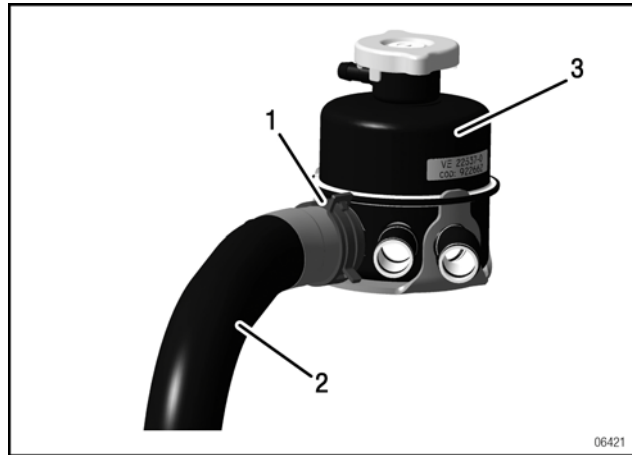
Fig. 22



- 1. Preformed hose connection 1
- 2. Preformed hose connection 2
- 3. Rubber plate
- 4. Preformed hose connection 4

Step	Procedure
2	Install the spring type hose clip 35 on the preformed hose radiator outlet.
3	Push on the preformed hose radiator outlet and align it vertically. NOTE: Align the spring type hose clip 35 vertically too so that the remaining coolant hoses can be installed.

Fig. 23



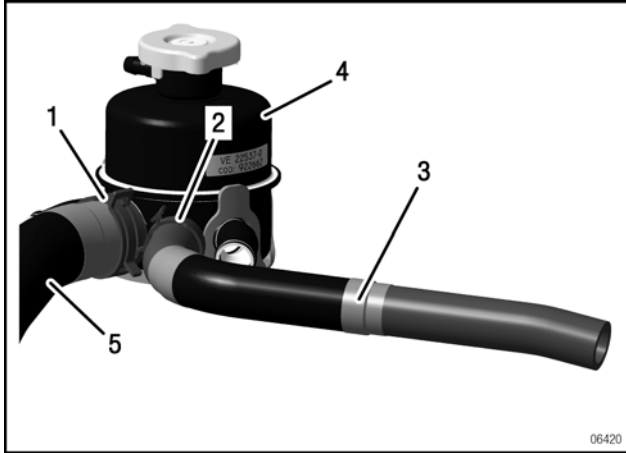
- 1. spring type hose clip 35
- 2. Preformed hose radiator outlet
- 3. Expansion tank

Step	Procedure
4	Install the spring type hose clip 25 on the preformed hose 3 and align it vertically. NOTE: Align the spring type hose clip 25 so that it does not come into contact with the other spring type hose clips.
5	Push on preformed hose 3 and align it horizontally.

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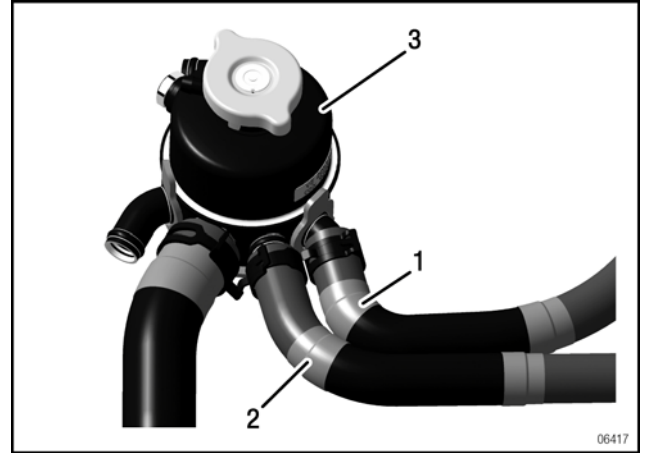
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Fig. 24



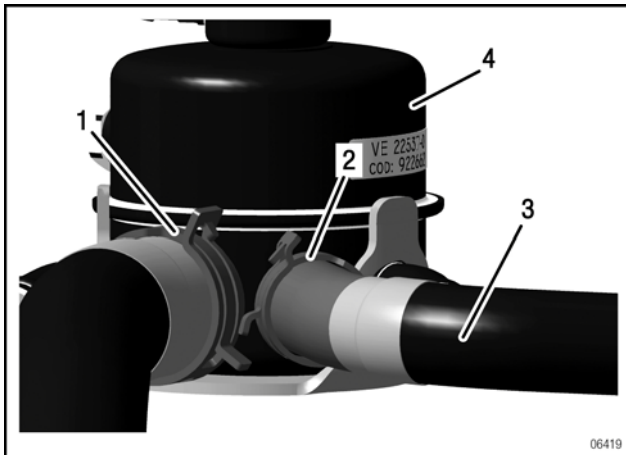
- 1. Spring type hose clip 35
- 2. Spring type hose clip 25
- 3. Preformed hose 3
- 4. Expansion tank
- 5. Preformed hose radiator outlet

Fig. 26



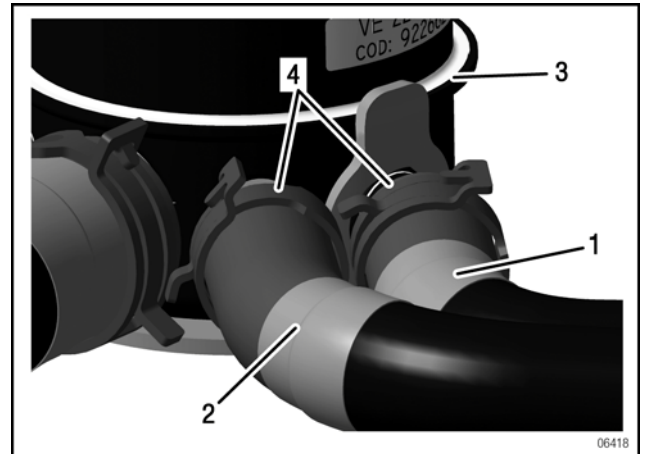
- 1. Preformed hose 1
- 2. Preformed hose 3
- 3. Expansion tank

Fig. 25



- 1. Spring type hose clip 35
- 2. Spring type hose clip 25
- 3. Preformed hose 3
- 4. Expansion tank

Fig. 27



- 1. Preformed hose 1
- 2. Preformed hose 3
- 3. Expansion tank
- 4. Spring type hose clips

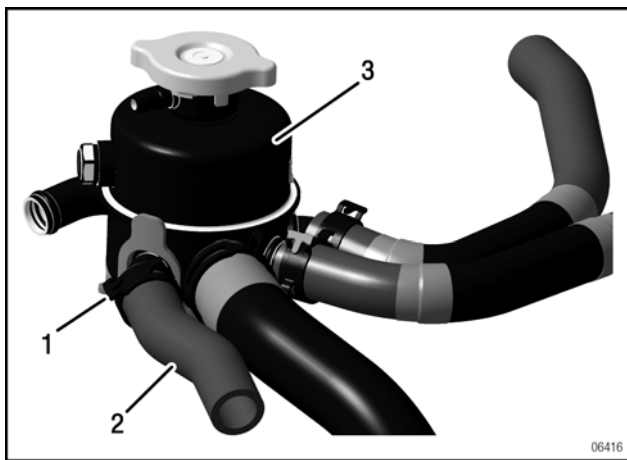
Step	Procedure
6	Install the spring type hose clip 25 on preformed hose 1. NOTE: Align the spring type hose clip 25 so that it is 2 mm (0.0787 in.) away from the spring type hose clip on preformed hose 3.
7	Push on preformed hose 1 and align it horizontally like preformed hose 3.

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Step	Procedure
8	Install the spring type hose clip 25 on preformed hose 4. NOTE: Align the spring type hose clip 25 so that it does not come into contact with the other spring type hose clips.
9	Push on preformed hose 4 and align it horizontally like preformed hoses 3 and 1. NOTE: Preformed hose 4 is symmetrical.

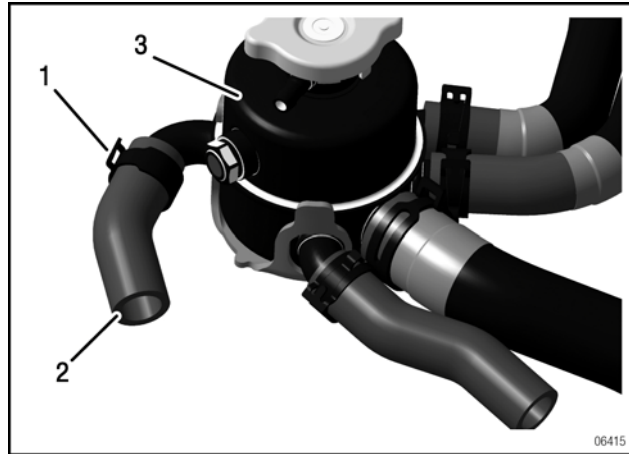
Fig. 28



1. Spring type hose clip 25 2. Preformed hose 4
 3. Expansion tank

Step	Procedure
10	Install the spring type hose clip 25 on preformed hose 2 and position it vertically.
11	Push on preformed hose 2 and align it horizontally. NOTE: Preformed hose 2 is symmetrical.

Fig. 29



1. Spring type hose clip 25 2. Preformed hose 2
 3. Expansion tank

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INSTALLATION

IGNITION HOUSING - INSTALLATION

See also section 24-20-00 Internal generator.

WATER PUMP HOUSING - INSTALLATION

NOTICE

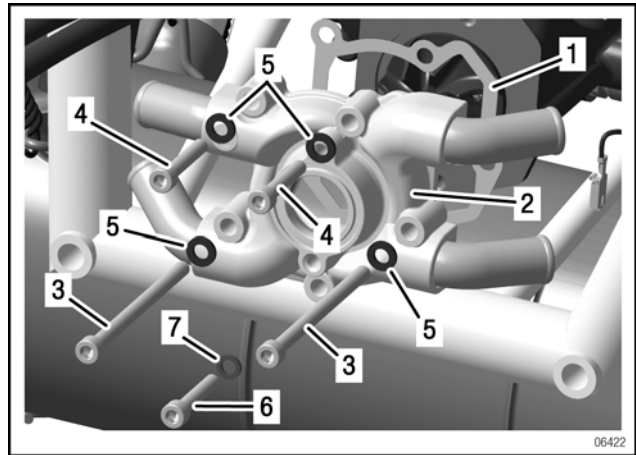
The bottom M6x35 Allen screw extends into the water chamber and is therefore stainless and sealed with a gasket ring.

NOTICE

The impeller must not touch the pump housing. If necessary, the axial position of the impeller must be optimised. See section 75-20-00 Water pump housing inspection

Step	Procedure
1	Put on a new gasket and fasten the water pump housing to the ignition housing with 2 M6x90 Allen screws and 3 M6x35 Allen screws with washers 6.4. Tightening torque 10 Nm (88.48 in. lb.).

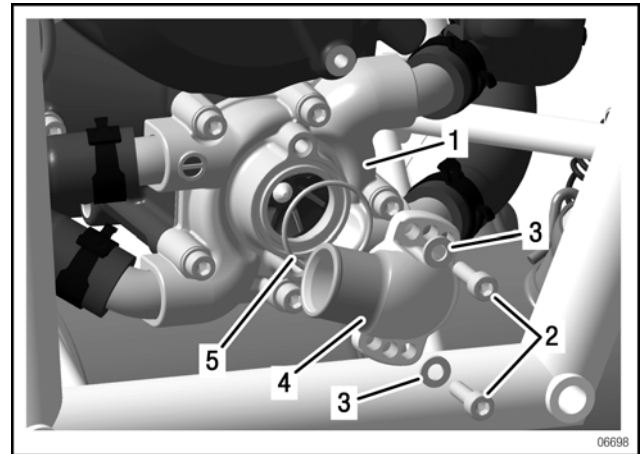
Fig. 30



- | | |
|----------------------|----------------------------------|
| 1. Gasket | 2. Water pump housing |
| 3. M6x90 Allen screw | 4. M6x35 Allen screw |
| 5. 6.4 washers | 6. M6x35 Allen screw (stainless) |
| 7. Gasket ring | |

Step	Procedure
2	Insert the o-ring in the water pump housing and fasten the water inlet elbow in the marked position with 2 M6x20 Allen screws and lock washers. Tightening torque 10 Nm (88.48 in. lb.).

Fig. 31



- | | |
|-----------------------|----------------------|
| 1. Water pump housing | 2. M6x20 Allen screw |
| 3. 6.4 washer | 4. Water inlet elbow |
| 5. O-Ring | |

EXPANSION TANK AND COOLANT HOSE - INSTALLATION

NOTICE

Ensure that the expansion tank is fixed without tension.

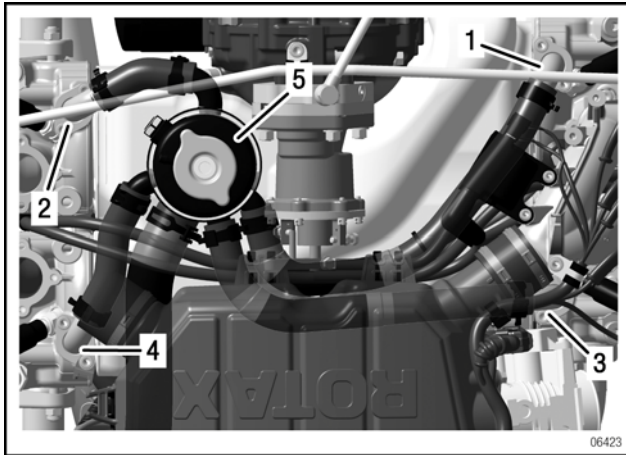
NOTE: Check the push-on lengths, readjust the preformed hoses if necessary.

Step	Procedure
1	Install coolant elbows 1 to 4. See also section 72-30-00 Cylinder head.
2	Mount 1 spring type hose clip 35 on the preformed hose radiator outlet and mount 1 spring type hose clip 25 each on preformed hoses 1, 2, 3, and 4.
3	Position the expansion tank assy. with the 5 preformed hoses on the engine.

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Fig. 32



- 1. Coolant elbow 1
- 2. Coolant elbow 2
- 3. Coolant elbow 3
- 4. Coolant elbow 4
- 5. Expansion tank

NOTICE

Ensure that the push-on length is correct!
 The push-on length onto the coolant elbow on the cylinder head is 27 mm (1.06 in.).

Step	Procedure
4	Fasten preformed hoses 1 to 4 with spring type hose clips. NOTE: Start with the shortest hose (preformed hose 2). Then preformed hose 1, then preformed hose 3 and preformed hose 4.

Fig. 33

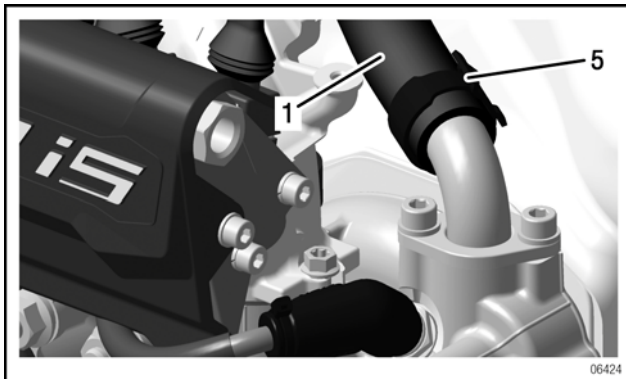


Fig. 34

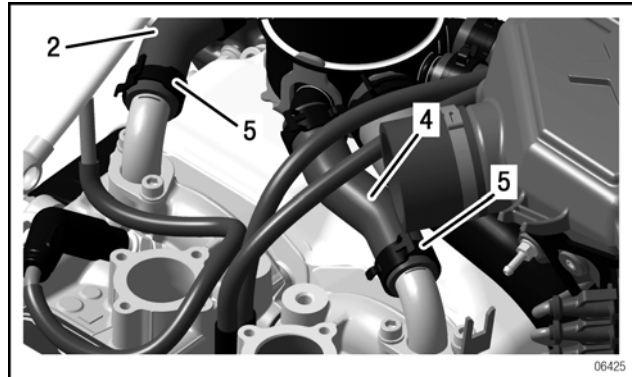
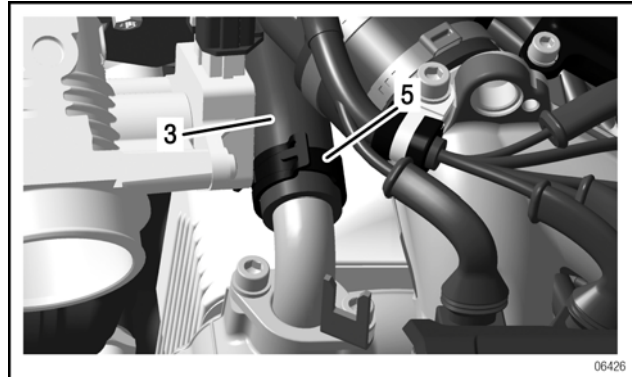


Fig. 35



- 1. Preformed hose 1
- 2. Preformed hose 2
- 3. Preformed hose 3
- 4. Preformed hose 4
- 5. Spring type hose clip

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FINISHING WORK

- Put the 2 cable ties on the knock sensor line.
See also section 76-50-00 Wiring harness.
- Install the double ignition coils and resistance spark plug connectors. See also section 74-20-00 Ignition unit.
- Install the air filter with the heat shield. See the current Maintenance Manual Line.
- Fill with coolant. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Bleed the engine cooling system. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Fill with fuel. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Carry out an engine test run. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Install the fuel line assy. See also section 73-10-00 Fuel system.
- Install the 1-ear clamps.
- Install the cable ties for the fuel pressure regulator. See also section 73-10-00 Fuel system.
- Install the wiring harness.
See also section 76-50-00 Wiring harness.
- Install the fuel hose inlet and return line. See also section 73-10-00 Fuel system.

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Chapter: 76-00-00
ENGINE CONTROL

Introduction

The Engine Management System (EMS) consists primarily of:

- Control unit (Electronic Control Unit = ECU)
- ECU (actuators)
- ECU signals
- EMS power supply
- Fuse box (FUSE BOX)
- Switches
- Wiring

Table of contents

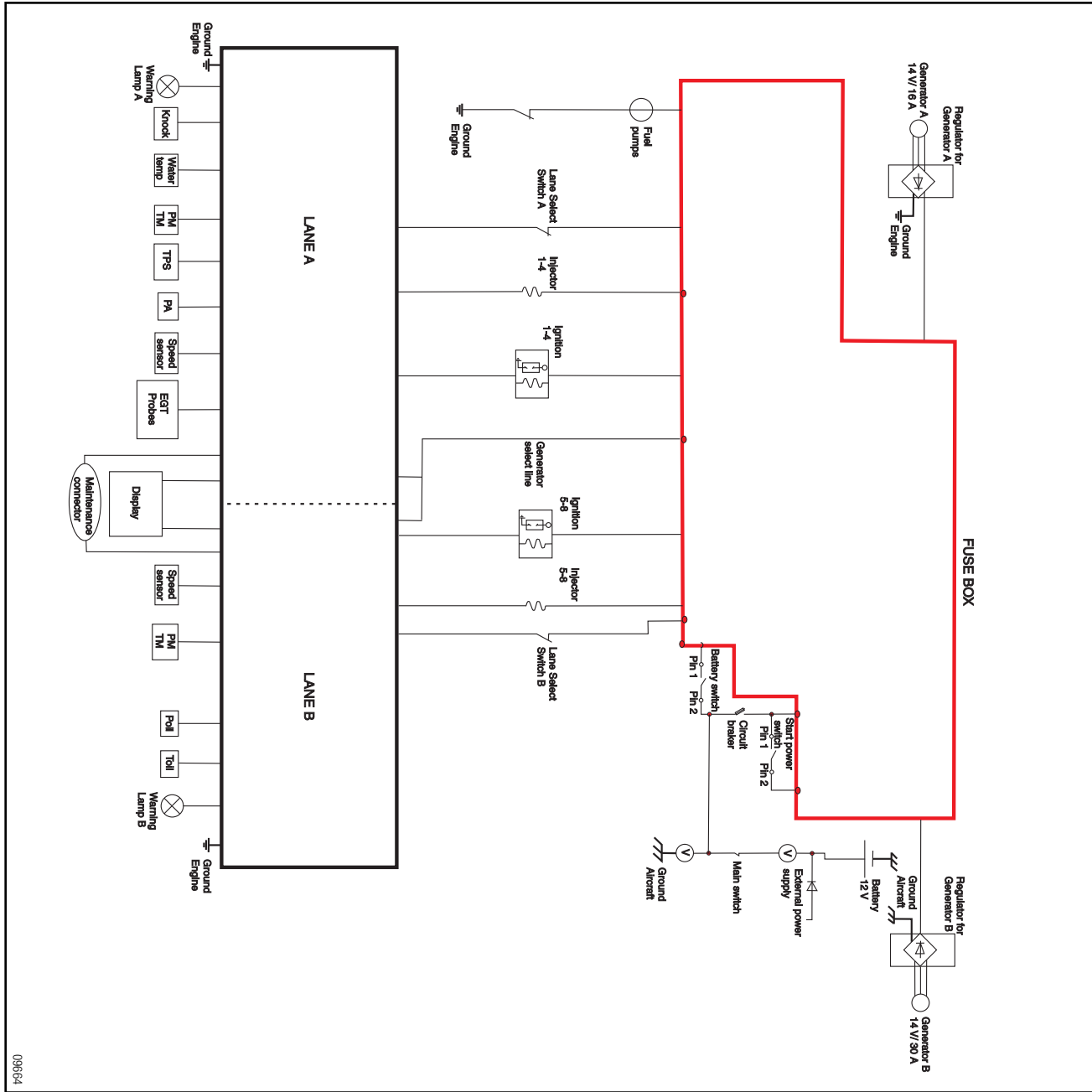
This section describes the maintenance of the ROTAX 912 i Series engine management unit assembly. The description is divided into sub-sections and explanations of system functions.

Subject	Section
1. Introduction A. Overview of engine management	Chapter 76-00-00 Page 2
2. Control unit (ECU)	Chapter 76-10-00
3. Fuse box (FUSE BOX)	Chapter 76-10-00
4. Wiring harness	Chapter 76-50-00
5. Sensors and actuators	Chapter 76-70-00

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MAINTENANCE MANUAL

Overview of engine management



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Chapter: 76-10-00
CONTROL UNIT (ECU)

Introduction

This section describes the system, the removal, installation and inspection of the control unit (ECU) assembly of the ROTAX 912 i Series engine. In addition also the extraction of the ECU-Log files and the procedure of flashing ECU Software is described. The description is divided into sub-sections and explanations of system functions.

Subject	Page
1. Introduction	Page 1
2. Special tools	Page 3
3. System description	Page 5
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4. Safety information	Page 5
5. Removal	Page 7
A. Preparation	Page 7
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6. Inspection	Page 8
A. Control unit - inspection	Page 8
7. Installation	Page 8
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A. Introduction	Page 9
B. Situation 1: Extracting Log files from a removed ECU (on workbench)	Page 9
(1) Connect computer with ECU	Page 10
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C. Situation 2: Extracting Log files an installed ECU (on aircraft)	Page 14
(1) Connect computer with ECU	Page 14
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9. ECU Software flashing	Page 19
A. Situation1: Flashing Software on a removed ECU (on workbench)	Page 19
(1) Set up wiring for the ECU Software flashing process	Page 20
(2) Software flashing process with B.U.D.S. Aircraft	Page 21
(3) Check of the Software version	Page 23
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(1) Set up wiring for the ECU Software flashing process	Page 24
(2) The ECU Software flashing process with B.U.D.S. Aircraft	Page 25
(3) Check of the Software version	Page 27
10. Finishing work	Page 36

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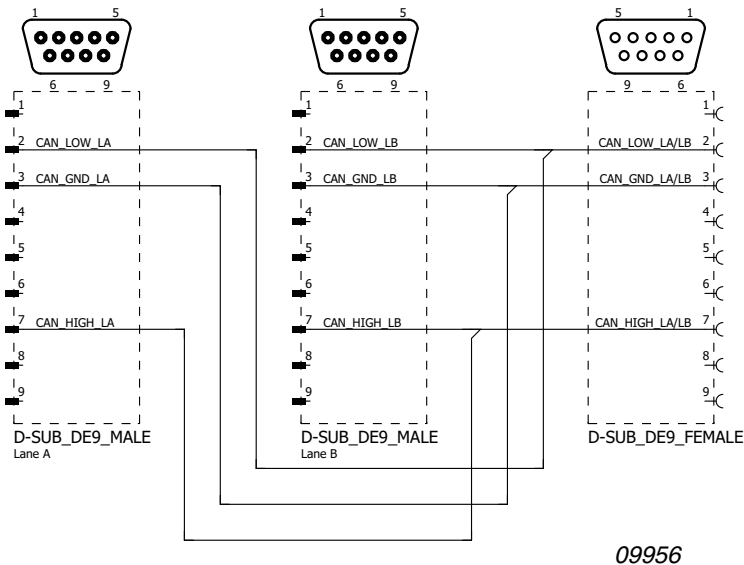
Chapter: 76-10-00
CONTROL UNIT (ECU)

SPECIAL TOOLS

Description	Part no.
B.U.D.S SET LEVEL 1	864021
B.U.D.S SET LEVEL 2	864022
B.U.D.S SET LEVEL 3	864023
ECU Adapter	277012
Service Wiring Harness ¹⁾	864280
Y-Cable (Sub-D DE9 female on male/male junction) ^{1) 2) 3)}	n.a.
Power Supply (Output: DC; 12 V; 1 A; with Banana jack sockets) ¹⁾	na.
B.U.D.S. Aircraft Software	n.a.
Computer/Notebook/Netbook	n.a.

- 1) Only required if ECU is detached from the wiring harness.
- 2) Only required if the Aircraft has two separated Sub-D DE9 connectors.
- 3) The y-cable must be be according to the wiring diagram in Fig. 1.

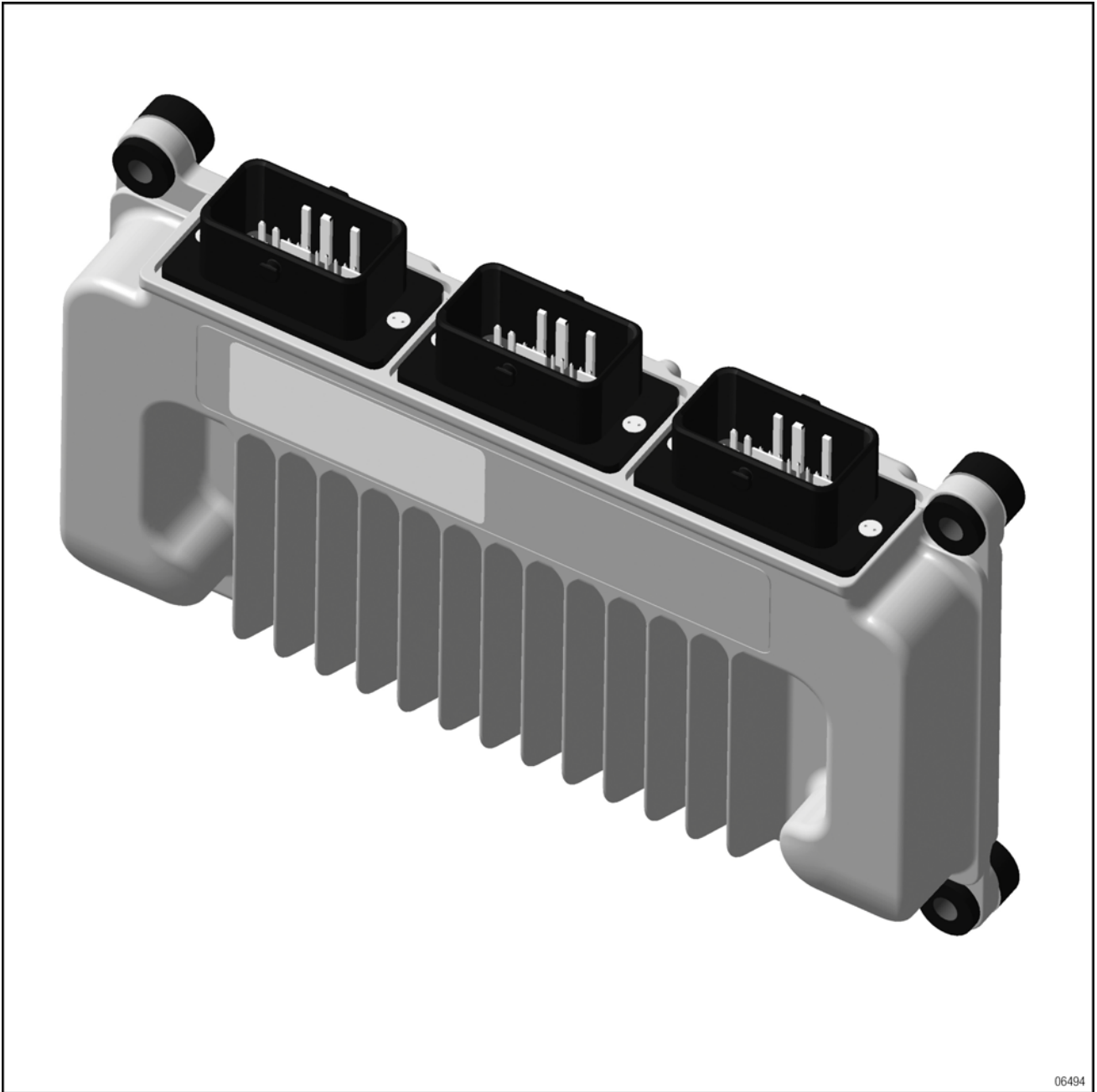
Fig. 1



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MAINTENANCE MANUAL

Control unit (ECU)



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SYSTEM DESCRIPTION

GENERAL NOTE

The control unit is the central module in the engine management system.

Sensors continuously measure pressure, rotation speed, temperature, load and knock signals and send these measurement values to the ECU.

The digital ECU uses these measurement values to determine not only the mixture but also the optimum injection point for the fuel and ignition points specifically for each cylinder.

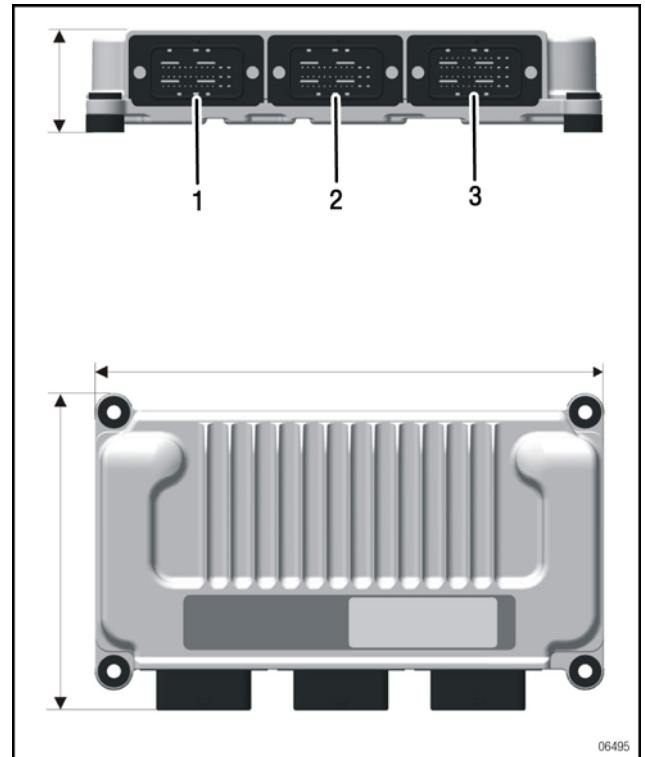
NOTE: The general safety instructions must be followed during all work on the ECU!

TECHNICAL DATA

NOTICE

The coupler must be only installed into respective sockets of the ECU (pay attention to the marking). If excessive force is used or the position is wrong, the pins can be bent and the ECU must be replaced.

Fig. 2



1. Connector socket A1 2. Connector socket A2
3. Connector socket B

SAFETY INFORMATION

WARNING

Danger of damage to engine!

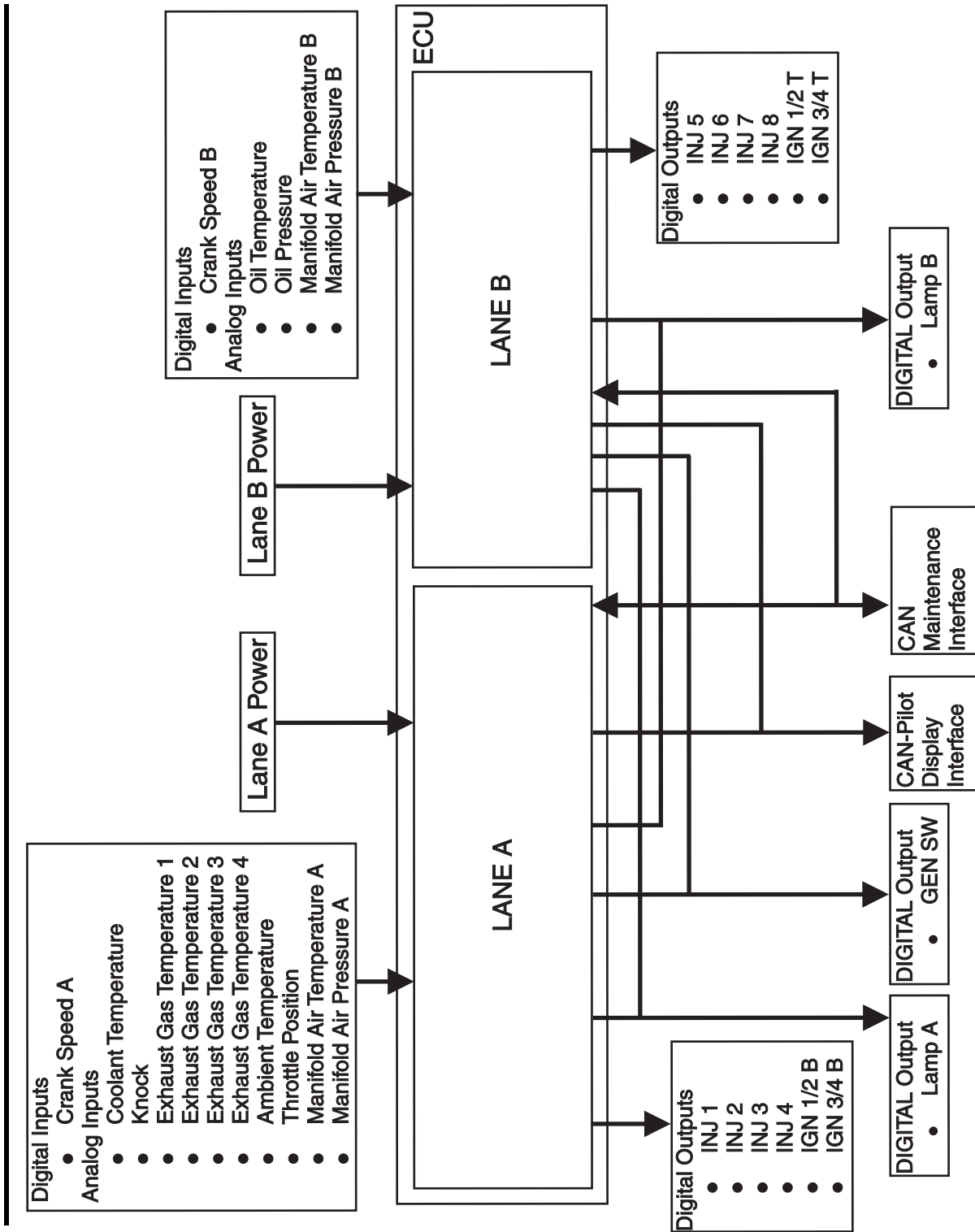
There is a risk of short circuits and cable fires during work on the engine management system. All installation work on the engine management system should be carried out with the engine switched off and the battery (negative terminal) disconnected.

“Backup Battery” - “Master” and “LANE A” and “LANE B” switches must be “OFF”!

NOTICE

Danger of damage to the fuel distribution system and ignition unit!

Fig. 3



Control unit ECU

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MAINTENANCE

Beside maintenance and special checks, see the relevant Maintenance Manual Line for the respective 912 i Series engine type.

REMOVAL

Preparation

Before the ECU is removed, the work and checks described below must be carried out to identify any malfunctions and rectify them as part of the repair work.

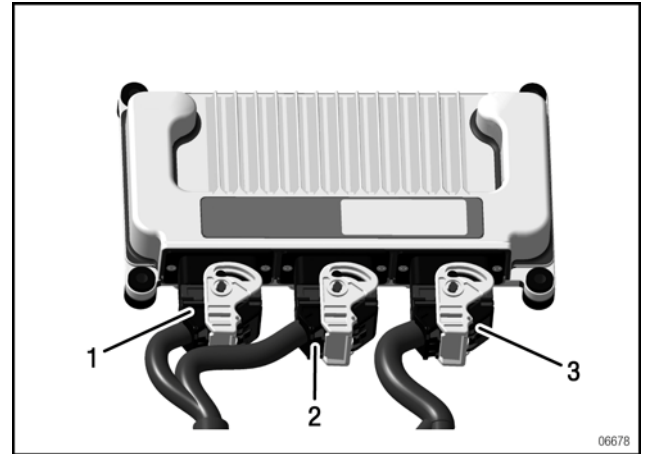
- General visual inspection. See section 05-00-00 and 12-20-00 in the corresponding Maintenance Manual Line for the 912 i Series engine type.

NOTICE	
<p>The plug connection of the ECU must be opened and closed no more than 20 times! This must be shown on the device by a clearly visible sealing with a stamped numerical sequence (1-20) and by documentation conforming to self-monitoring guidelines.</p>	

CONTROL UNIT - REMOVAL

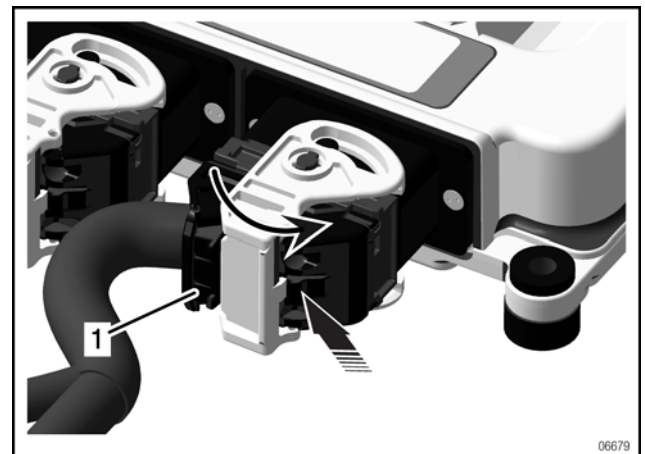
Step	Procedure
1	Unplug the couplers (LANE A1, LANE A2 and LANE B). <ul style="list-style-type: none"> - Press in the lock so that the clamp can be rotated. - Press the clamp down until it latches. - Remove the coupler.

Fig. 4



- 1. Coupler (LANE A1)
- 2. Coupler (LANE A2)
- 3. Coupler (LANE B)

Fig. 5



- 1. Lock

NOTICE	
<p>Removal must be carried out according to the aircraft manufacturer's instructions.</p>	

Step	Procedure
2	Remove the battery grounding cable according to the aircraft manufacturer's specifications.
3	Remove the screws according to the aircraft manufacturer's specifications. Remove the ECU.

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MAINTENANCE MANUAL

INSPECTION

CONTROL UNIT - INSPECTION

NOTICE

The functional test of the ECU can only be carried out with the corresponding software (B.U.D.S. Aircraft), as part of an engine test run (see section 12-20-00, section 70-00-00) or on an approved test bench.

- General visual inspection. See section 05-00-00 and 12-20-00 in the corresponding Maintenance Manual Line for the 912 i Series engine type.

Step	Procedure
1	Check the component surfaces of the ECU for damage. NOTE: Deformation and deep scratches are not permissible.
2	Check flat and contact surfaces for Allen/hex. screws und nuts.
3	Check the screws and nuts for damage and wear. NOTE: Replace damaged screws and nuts. Check the corresponding internal thread too when changing the screws.
4	Check the locking plates for damage and wear.
5	Check the rubber grommets for damage.
6	Check the label on the ECU for readability.

INSTALLATION

Preparation

NOTICE

The plug connection of the ECU must be opened and closed no more than 20 times! This must be shown on the device by a clearly visible sealing with a stamped numerical sequence (1-20) and by documentation conforming to self-monitoring guidelines.

NOTE: The ECU can only be replaced as a complete spare part.

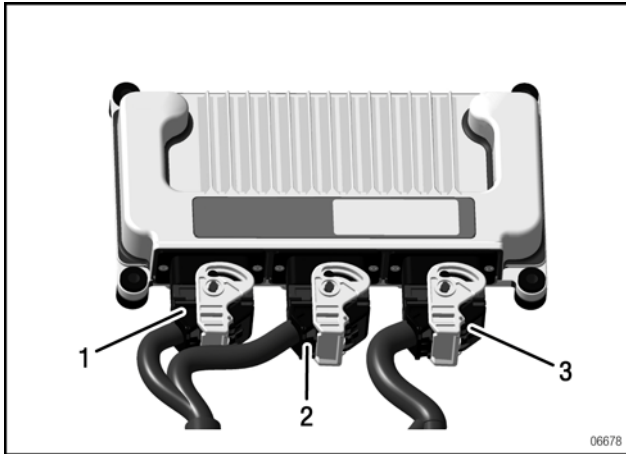
CONTROL UNIT - INSTALLATION

NOTICE

Installation must be carried out according to the aircraft manufacturer's and to the specifications of the Installation Manual.

Step	Procedure
1	Install the control unit according to the aircraft manufacturer's instructions.
2	Plug the wiring harness (main strand) into the ECU. NOTE: Ensure that the correct connection is made to the corresponding LANE by using the marking. - Plug in coupler LANE A1 - Plug in coupler LANE A2 - Plug in coupler LANE B
3	Install the battery grounding cable according to the aircraft manufacturer's instructions.

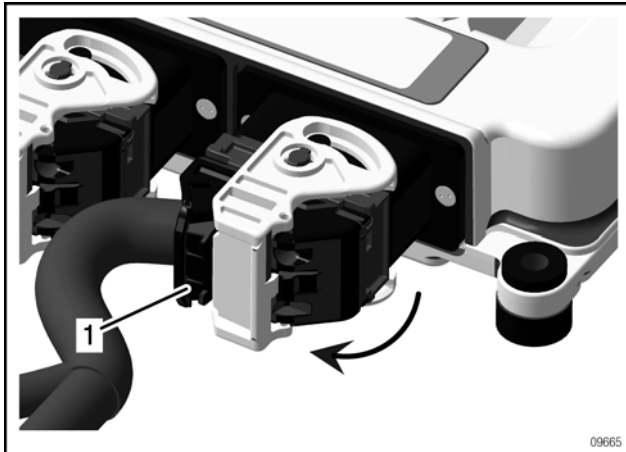
Fig. 6



1. Coupler (LANE A1)
2. Coupler (LANE A2)
3. Coupler (LANE B)

NOTE: Put the clamp completely horizontal, place on the connector, then close the clamp 90°. The nose must latch.

Fig. 7



1. Lock

EXTRACTING ENGINE CONTROL UNIT (ECU) LOGS

INTRODUCTION

The intention of this procedural instruction is to guide users through a log-extraction process from an Engine Control Unit (ECU) with BRP

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Utility and Diagnostic Software (B.U.D.S. Aircraft).

Generally the extraction of logs from an ECU can be performed in two different ways:

- **Situation 1:** Extracting logs from a removed ECU. That means the ECU has been disconnected from the wiring harness and removed from the aircraft.
- **Situation 2:** Extracting logs from an installed ECU. The ECU is connected to the wiring harness and installed in the Aircraft.

Because the situations are essentially different, those two situations will be described independently in this chapter.

NOTE: Before loading new ECU Software make sure that you have installed the latest version B.U.D.S. Aircraft in accordance SI-912 i-002 on your computer. See also SI-912 i-003.

SITUATION 1: EXTRACTING LOGS FILES FROM A REMOVED ECU (ON WORKBENCH)

NOTICE

Do not open and close the ECU connectors more than 20 times, otherwise it is required to change the ECU and the wiring harness. If it is possible it is recommended to perform the software loading process as described in Situation 2 to save connection cycles. For a flawless software loading procedure ensure that the selected power supply is able to provide constant voltage.

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Connect Computer with ECU

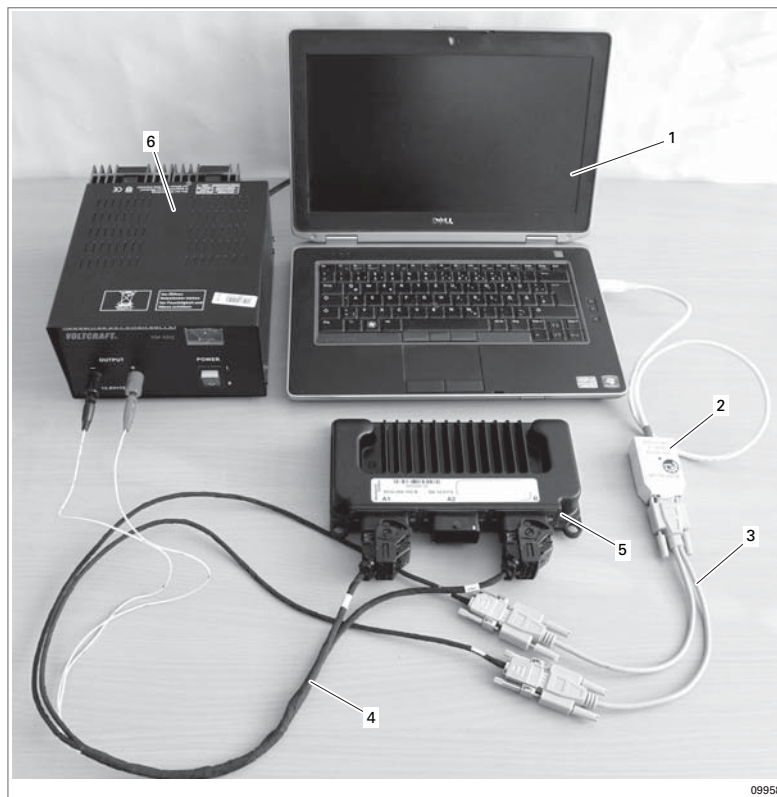
Step	Procedure
1	Connect B.U.D.S. Aircraft Set with the USB-Port of your computer. If the device is connected and installed the RED indicator light should light up.
2	Connect the B.U.D.S. Aircraft Set Sub-D DE9 connector with the Sub-D DE9 socket of the Y-cable.
3	Connect both Sub-D DE9 connectors of the Y-cable with the Sub-D DE9 sockets of the Service Wiring Harness.
4	Connect the Service Wiring Harness with the LANE A1 and LANE B connectors of the ECU.

NOTICE

Please note labeling of the ECU and the Service Wiring Harness.

Step	Procedure
5	Connect Banana jack connectors of Service Wiring Harness with adequate power supply. NOTE: Don't connect the power supply with the line voltage yet.
6	Now the setup should be as shown in Fig. 8 .

Fig. 8



- | | |
|-------------|---------------------------|
| 1. Computer | 2. B.U.D.S. Aircraft Set |
| 3. Y-cabel | 4. Service Wiring Harness |
| 5. ECU | 6. Power Supply |

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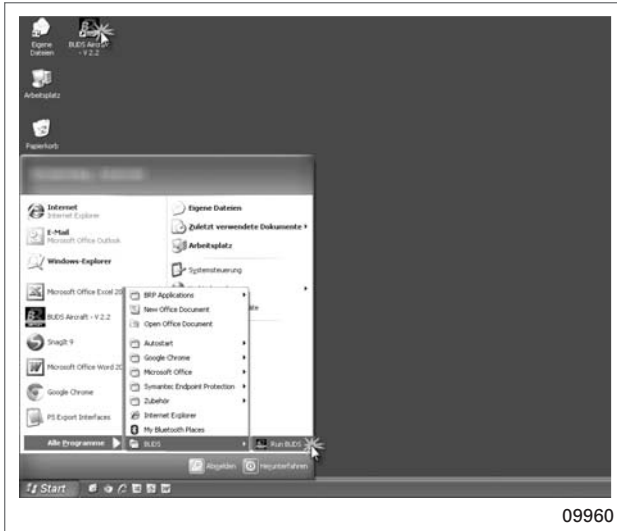
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Extracting of log-files

Step	Procedure
1	Launch B.U.D.S. Aircraft by double clicking the desktop icon. Alternatively B.U.D.S. Aircraft can also be started through the start menu entry (e.g. Start - Programs - BUDS - run BUDS).

Fig. 9

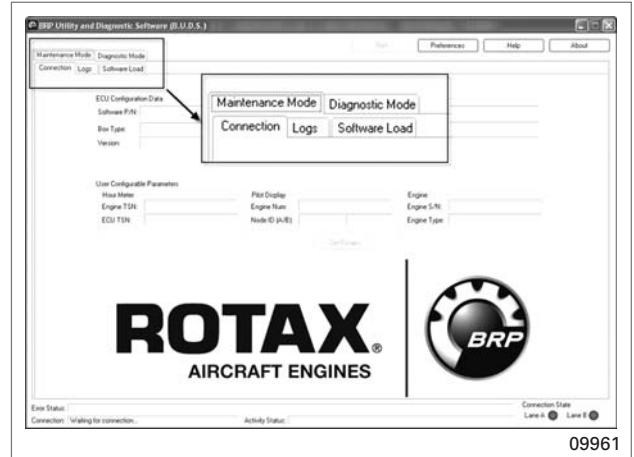


B.U.D.S. Aircraft Start

Step	Procedure
2	Wait until the program has been started (booted) completely.
3	Change from "Diagnostic Mode" Tab to "Maintenance Mode" Tab.

NOTE: If the ECU at the time is supplied with power, a restart is required.

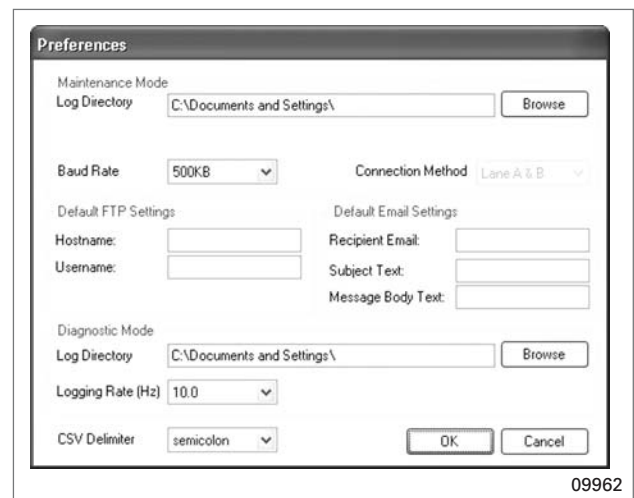
Fig. 10



B.U.D.S. Aircraft "Maintenance Mode"

Step	Procedure
4	Open the "Preferences" window by clicking on the Preferences Button.
5	In the "Maintenance Mode" section, the default Log directory can be set. Either the path to the Log directory can be set here or the user will be invited to declare a Log directory right before the extraction process.
6	Click "OK" to close the Window.

Fig. 11



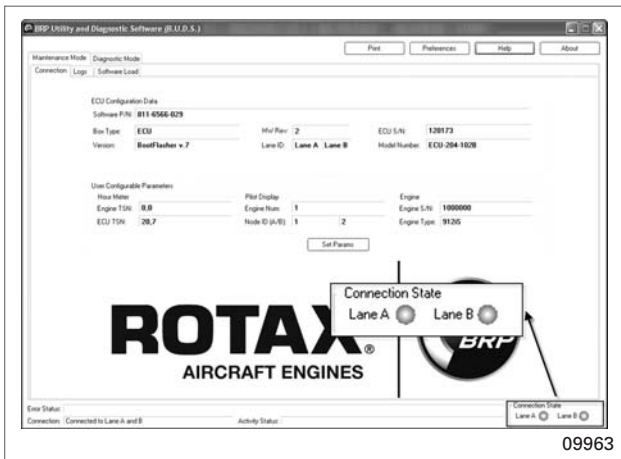
B.U.D.S. Aircraft "Preferences"

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Step	Procedure
7	Wait until connection state lights are "RED"
8	Connect power adapter with power supply.
9	The connection state (bottom-right corner of B.U.D.S.) for both LANES should turn "RED" to "ORANGE" and finally to "GREEN".

Fig. 12



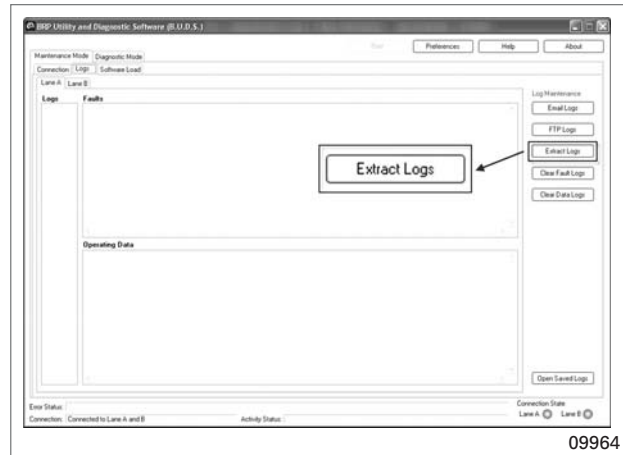
B.U.D.S. Aircraft "Maintenance Mode" (connect)

NOTICE

If connection status lamps would not turn to "GREEN", try to disconnect and reconnect the power adapter.

Step	Procedure
10	When both connection state indicators become "GREEN", change to "Logs" Tab.
11	Click on "Extract Logs". A settings window named "ECU Log Extraction" should open.

Fig. 13



„B.U.D.S. Aircraft „Maintenance Mode“ : Logs

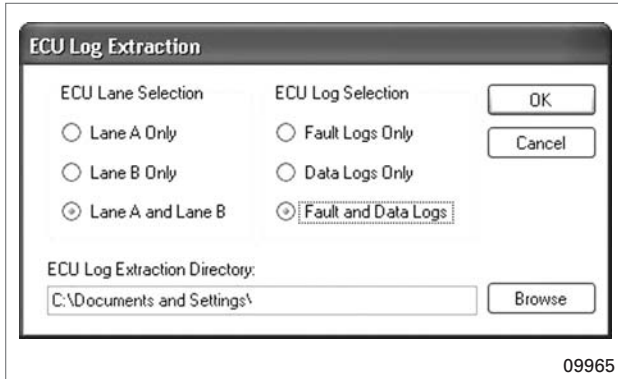
Step	Procedure
12	In this window ("ECU Log Extraction") choose "LANE A and LANE B" for Log-extraction (field:"ECU LANE Selection"). NOTE: If only one LANE has been connected or the user wants to extract the logs from one LANE, the corresponding option must be selected here.
13	In the field "ECU Log Selection" the type of extracting Logs must be chosen. Choose "Fault and Data logs".

NOTE: **Faultlogs:** Fault/Failure/Warning entries in the ECU.
Datalogs: ECU information stored in a circular buffer.

Step	Procedure
14	Furthermore select ECU Log Extraction Directory. NOTICE: The User must have writing permission for this folder.
15	Press "OK" subsequently. The extraction process will start.

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Fig. 14



B.U.D.S. Aircraft settings for Log-extraction

NOTICE

Extraction process could take several minutes depending on the number of logs.

Step	Procedure
16	Shut down the ECU (Unplug the power supply of the ECU).
17	Disconnect the wiring attached to connect the ECU with the computer. - Disconnect B.U.D.S. Aircraft Set - Disconnect Y-cable and Service Wiring Harness connectors
18	With the Windows Explorer navigate to the created Log-File. This file can now be copied and for example attached to an E-Mail.

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SITUATION 2: EXTRACTING LOGS FROM AN IN- STALLED ECU (ON AIRCRAFT)

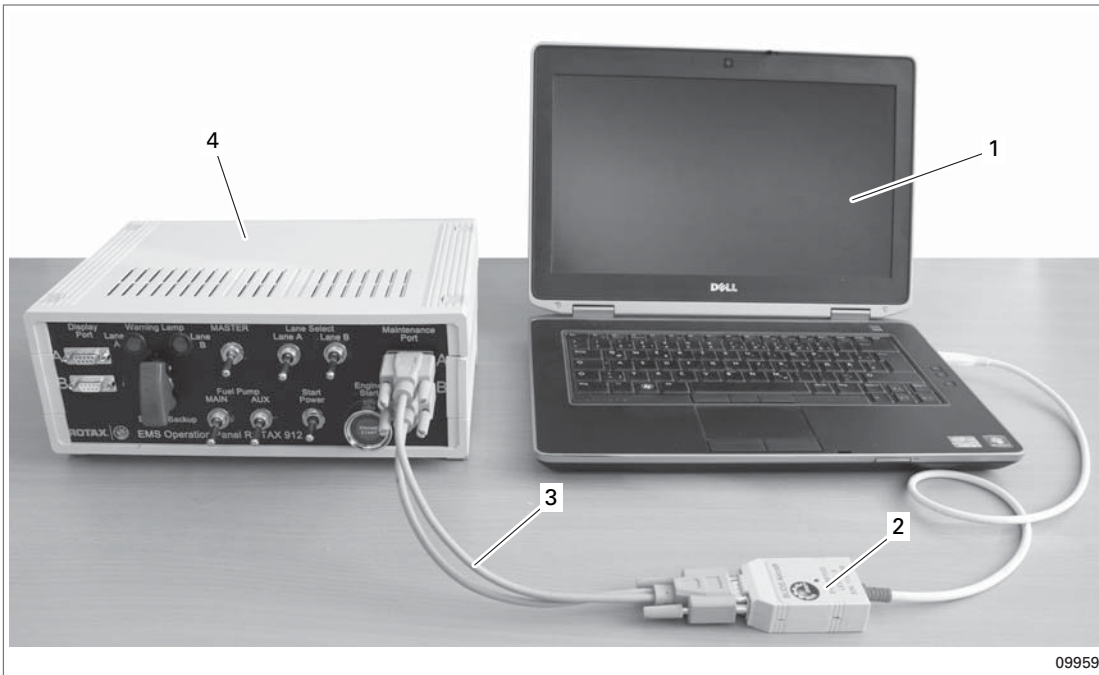
NOTICE

The battery must provide constant voltage thru the whole extraction process. If this can't be ensured, an external power supply must be used.

Connect Computer with ECU

Step	Procedure
1	Connect B.U.D.S. Aircraft Set with the USB-Port of your computer. If the device is connected and installed the RED indicator light should light up.
2	Connect the B.U.D.S. Aircraft Set Sub-D DE9 connector with the Sub-D DE9 socket of the Y-cable.
3	Connect both Sub-D DE9 sockets of the Maintenance CAN with the Sub-D DE9 connectors of the Y-cable.
4	Now the setup should be as shown in Fig. 15 .

Fig. 15



- 1. Computer
- 2. B.U.D.S. Aircraft Set
- 3. Y-cable
- 4. Cockpit (Simulation)

NOTE: If the maintenance interfaces of LANE A and LANE B are not conducted separately, the B.U.D.S. Aircraft Set Sub-D DE9 connector can be linked to the maintenance interface directly.

NOTE: In case of using an USB extension cable, the length should not exceed 2 meters.

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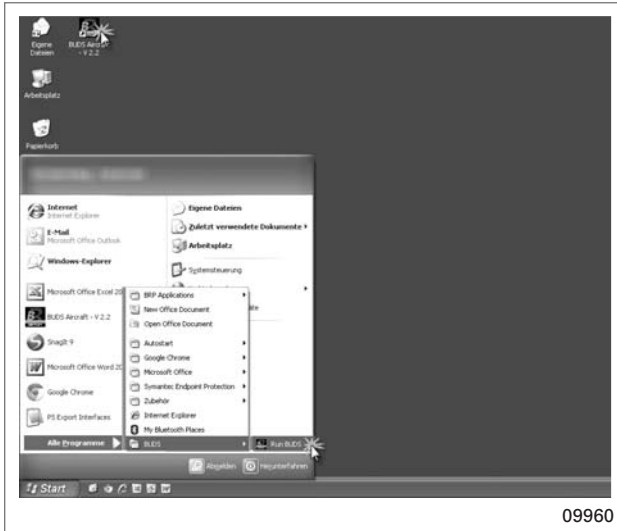
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Extracting of log-files

Step	Procedure
1	Launch B.U.D.S. Aircraft by double clicking the desktop icon. Alternatively B.U.D.S. Aircraft can also be started through the start menu entry (e.g. Start - Programm - BUDS - run BUDS).

Fig. 16

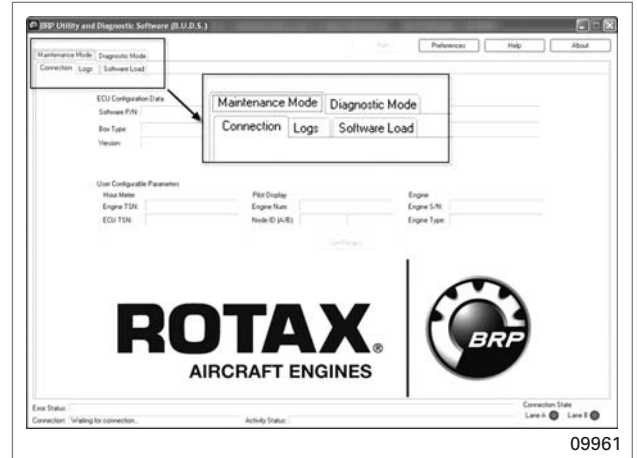


B.U.D.S.Aircraft Start

Step	Procedure
2	Wait until the program has been started completely.
3	Change from "Diagnostic Mode" Tab to "Maintenance Mode" Tab.

NOTE: If the ECU at the time is supplied with power, a restart is required.

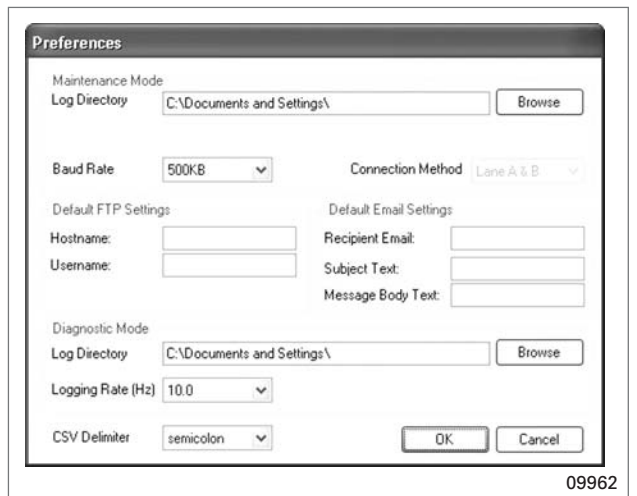
Fig. 17



B.U.D.S. Aircraft "Maintenance Mode"

Step	Procedure
4	Open the "Preferences" window by clicking on the Preferences Button.
5	In the "Maintenance Mode" section, the default Log directory can be set. Either the path to the Log directory can be set here or the user will be invited to declare a Log directory right before the extraction process.
6	Click "OK" to close the window.

Fig. 18



B.U.D.S. Aircraft "Preferences"

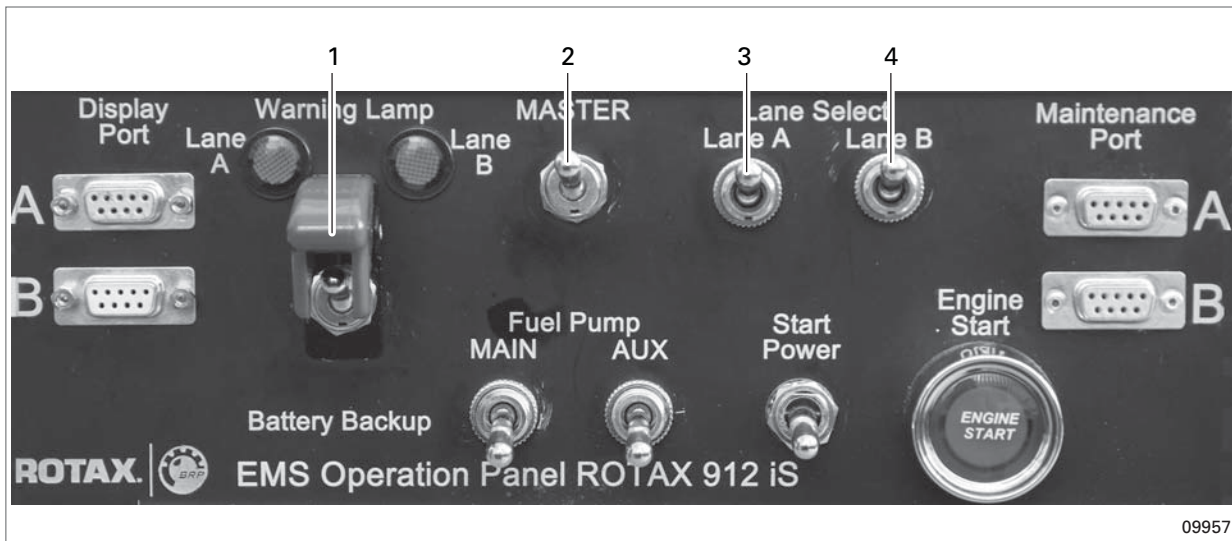
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Step	Procedure
7	Wait until connection state lamps are "RED".
8	Set "Backup-Battery" and "Master" Switch to "ON". Set "LANE A" and "LANE B" Switches to "ON" (if connection Mode in "Preferences" Menu set to "LANE A" and "LANE B").

Fig. 19



- | | |
|-------------------|------------------|
| 1. Backup Battery | 2. Master Switch |
| 3. LANE A Switch | 4. LANE B Switch |

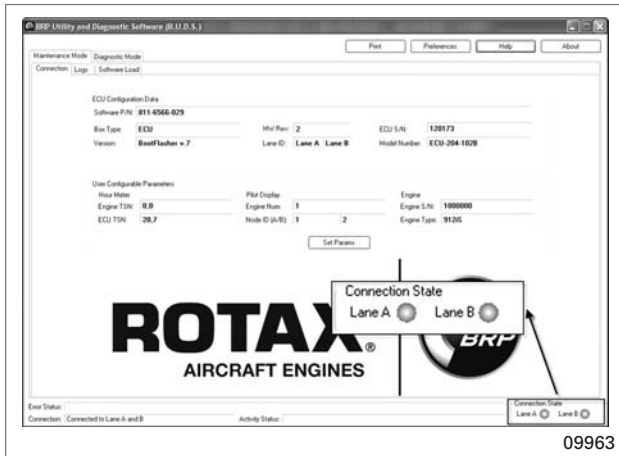
Step	Procedure
9	The connection state (bottom-right corner of B.U.D.S.) for both LANES should turn "RED" to "ORANGE" and finally to "GREEN". See also Fig. 20 .

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Fig. 20



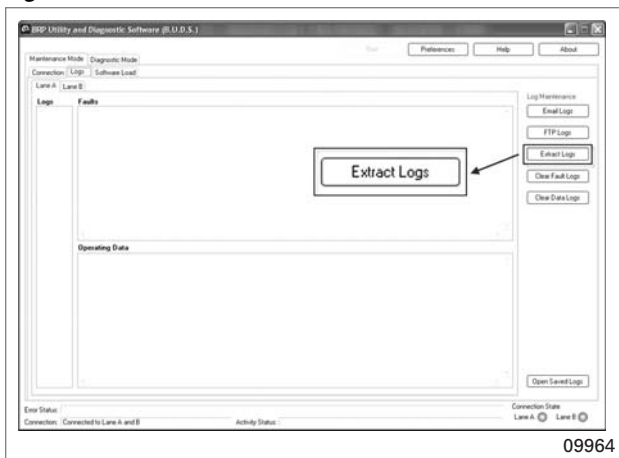
B.U.D.S. Aircraft "Maintenance Mode" (connect)

NOTICE

If connection status lamps would not turn to GREEN, try turning the LANES to "OFF" and then to "ON" again.

Step	Procedure
10	When both connection state indicators become "GREEN", change to "Logs" Tab.
11	Click on "Extract Logs". A settings window named "ECU Log Extraction" should open.

Fig. 21



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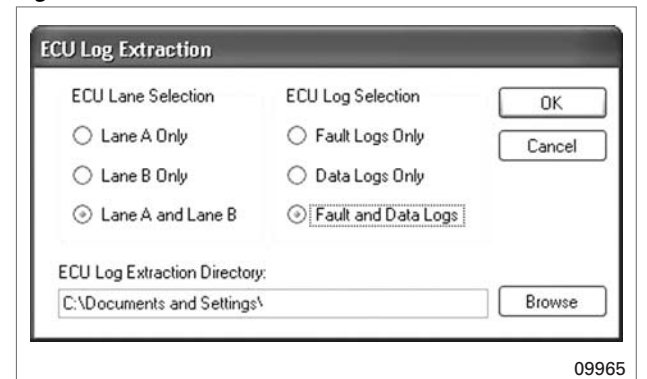
„B.U.D.S. Aircraft „Maintenance Mode“ : Logs

Step	Procedure
12	In this window ("ECU Log Extraction") choose respective LANE A and LANE B for Log-extraction (field: "ECU LANE Selection"). NOTE: If only one LANE has been connected or the user wants to extract the logs from one LANE, the corresponding option must be selected here.
13	In the field "ECU Log Selection" the type of extracting Logs must be chosen. Choose "Fault and Data logs".

NOTE:
Faultlogs: Fault/Failure/Warning entries in the ECU.
Datalogs: ECU information stored in a circular buffer.

Step	Procedure
14	Furthermore select ECU Log Extraction Directory. NOTICE: The User must have writing permission for this folder.
15	Press "OK" subsequently. The extraction process will start.

Fig. 22



B.U.D.S. Aircraft settings for Log-extraction

NOTICE

Extraction process could take several minutes depending on the number of logs.

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Step	Procedure
16	Shut down the ECU.
17	Switch "OFF" "Backup Battery" switch and "Master" switch. "LANE A" and "LANE B" switches "OFF".
18	Disconnect the wiring specifically attached to connect the ECU with the computer. - Disconnect USB to CAN Converter
19	With the Windows Explorer navigate to the created Log-File. This file can now be copied and for example attached to an E-Mail.

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ECU SOFTWARE FLASHING

INTRODUCTION

This section describes the process of flashing a 912 iSeries ECU Software.

Generally the ECU Software flashing process can be done in two different ways:

- **Situation 1:** Flashing ECU Software on a removed ECU. That means the ECU has been disconnected at least from the wiring harness.
- **Situation 2:** Flashing ECU Software on an installed ECU. The ECU is connected to the wiring harness and is installed in an Aircraft.

Because the situations are essentially different, those two situations will be described independently in this chapter.

NOTE: The description of the Software flashing process itself is valid for all ECU Software versions as long as there is no additional information given by ROTAX in form of Service Bulletins. Before loading new ECU Software make sure that you have installed the latest version B.U.D.S. Aircraft according to SI-912 i-002 on your computer. See also SI-912 i-003.

SITUATION 1: UPDATING SOFTWARE OF A REMOVED ECU (ON BENCH)

NOTICE

Removal must be carried out according to the aircraft manufacturer's instructions.

NOTICE

Do not open and close the ECU connectors more than 20 times, otherwise it is required to change the ECU and the wiring harness. If it is possible it is recommended to perform the Software flashing process as described in situation 2 to save connection cycles. For a flawless software flashing procedure ensure that the selected power supply is able to provide constant power.

⚠ WARNING

When detaching the ECU from the Aircraft make sure that

- ECU is powered down
 - "Backup Battery", "Start Power", "Master", "LANE A and "LANE B" Switches must be set to "OFF"
 - Aircraft Battery is disconnected (negative terminal) and
 - External power supplies must be disconnected from the Aircraft.
-

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Set up wiring for the ECU Software flashing process

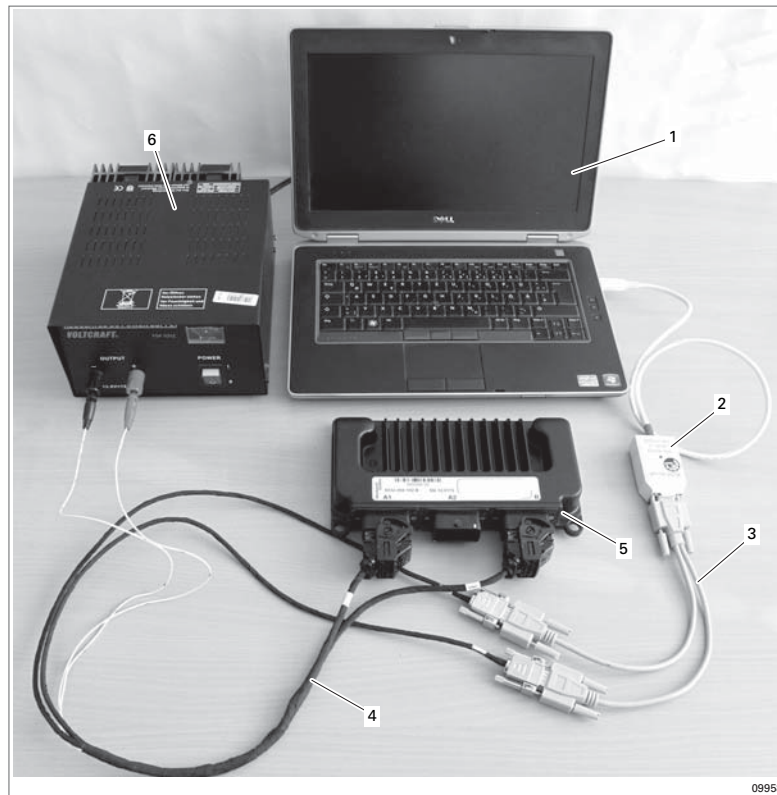
Step	Procedure
1	Connect B.U.D.S. Aircraft Set with the USB-Port of your computer. If the device is connected and installed the RED indicator light should light up.
2	Connect the B.U.D.S. Aircraft Set 3 Sub-D DE9 connector with the Sub-D DE9 socket of the Y-cable.
3	Connect both Sub-D DE9 connectors of the Y-cable with the Sub-D DE9 sockets of the Service Wiring Harness.
4	Connect the Service Wiring Harness with the LANE A1 and LANE B connectors of the ECU.

Fig. 23

NOTICE

Please note labeling of the ECU and the Service Wiring Harness

Step	Procedure
5	Connect Banana jack connectors of Service Wiring Harness with adequate power supply. NOTE: Don't connect the power supply with the line voltage yet.
6	Now the setup should be as shown in Fig. 23 .



- | | |
|-------------|--------------------------------|
| 1. Computer | 2. B.U.D.S. Aircraft Set Level |
| 3. Y-cable | 4. Service Wiring Harness |
| 5. ECU | 6. Power Supply |

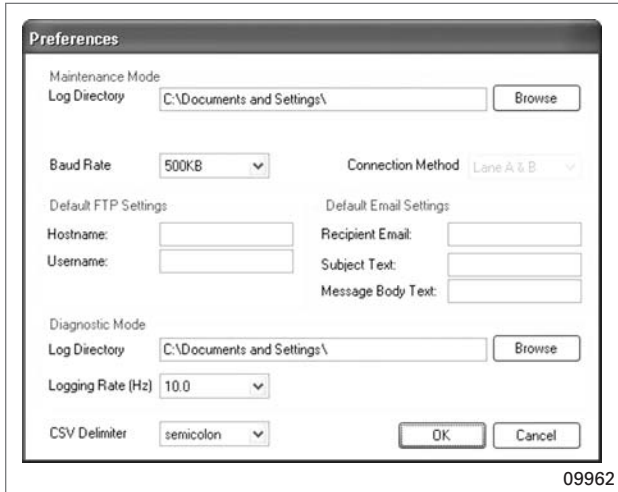
BRP-Powertrain

MAINTENANCE MANUAL

Software flashing process with B.U.D.S. Aircraft

Step	Procedure
1	Open B.U.D.S. Aircraft Software.
2	Open the "Preferences" Window and make sure that a Baud Rate of 500 kbs is selected (Field: Maintenance "Mode").

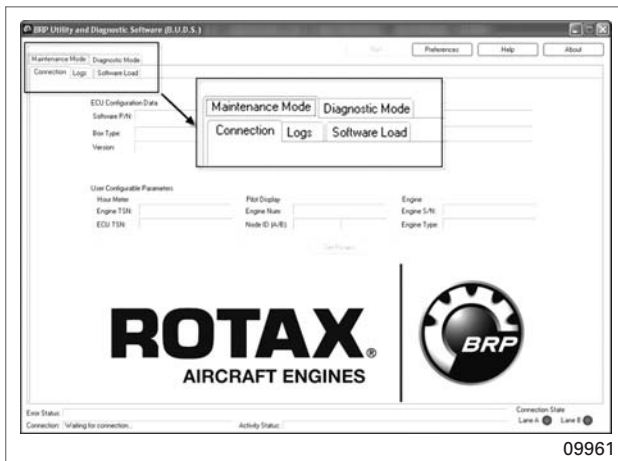
Fig. 24



B.U.D.S. Aircraft "Preferences"

Step	Procedure
3	Closed the window "Preferences" with "OK".
4	Change to "Maintenance Mode" Tab.

Fig. 25



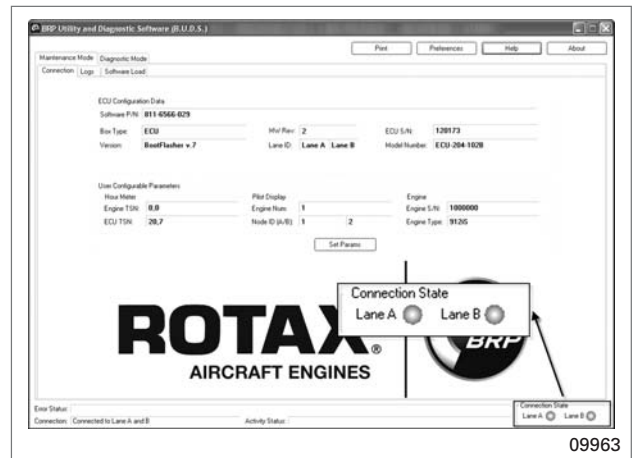
B.U.D.S. Aircraft "Maintenance Mode"

NOTE: If the ECU at this time is supplied with power, a restart is required.

Step	Procedure
5	Wait until the Connection State Indicators (Bottom-Right) turn to RED.
6	Now connect the power supply with the line voltage.
7	Wait until the Connection State Indicators turn to "GREEN" and the fields in the "Connection"-Tab (ECU Configuration Data and User Configurable Parameters) fill with data.

NOTE: If connection status lamps do not turn to GREEN, try to disconnect and re-connect the power adapter.

Fig. 26



B.U.D.S. Aircraft "Maintenance Mode"

Step	Procedure
8	Check the currently installed ECU Softwareversion and the set Engine type.

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MAINTENANCE MANUAL

NOTE: The currently installed ECU Software version (“Software P/N”/section “ECU Configuration Data”) and the set Engine Type (section “User Configurable Parameters”) can be seen in the “Connection” Tab. The last three digits of the “Software P/N” illustrate the currently installed ECU Software version.

⚠ WARNING

Only Software that suits to a specific engine type is allowed to be flashed on an ECU (see SB-912 i-002iS). If the Engine Type in the ECU deviates from the hardware configuration of the engine, contact a ROTAX Distributor immediately.

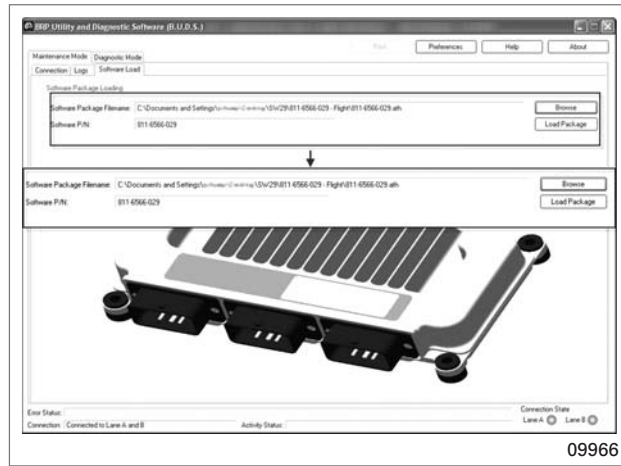
Fig. 27



B.U.D.S. Aircraft “Connection”

Step	Procedure
9	Switch to “Software Load“-Tab.
10	Select “Browse“ in the Software Package Loading section.
11	Navigate to the appropriate ECU Software file (.ath) and confirm with “Open“.
12	The path to this file and the Software P/N will be shown in the “Software Package Loading“ section.

Fig. 28



B.U.D.S. Aircraft “Maintenance Mode“ : Software Load

Step	Procedure
13	Select “Load Package“.
14	Consequently a window will open to ensure that the user is aware of flashing the ECU Software. Confirm this window with “OK“.
15	Please wait until the Software flashing process is finished. The process itself should take approximately 1 minute (a status display will indicate the progress).
16	After the Software flashing process has finished, the “Connection“-Tab will be shown. Check if the Software P/N equals the Software version which was intended to be installed.

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SITUATION 2: FLASHING SOFTWARE ON A INSTALLED ECU (ON AIRCRAFT)

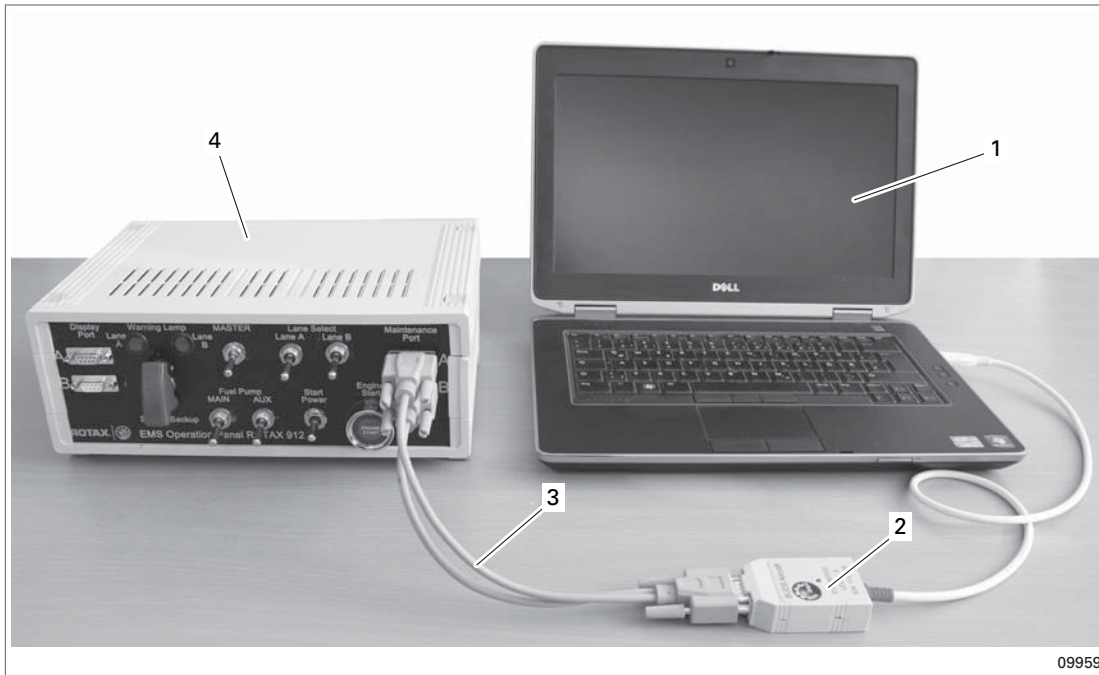
NOTICE

For a flawless Software flashing procedure ensure that the selected power supply is able to provide constant power. Preferably use an additional power supply connection to the aircraft battery. Before starting with the flashing process, make sure that the ECU is powered down. “Backup Battery“-, “Start Power“-, “Master“-, and “LANE“ Switches must be set to “OFF“.

Set up wiring for the ECU Software flashing process

Step	Procedure
1	Connect B.U.D.S. Aircraft Set with the USB-Port of your computer. If the device is connected and installed the RED indicator light should light up.
2	Connect the B.U.D.S. Aircraft Set 3 Sub-D DE9 connector with the Sub-D DE9 socket of the Y-cable.
3	Connect both Sub-D DE9 connectors of the Y-cable with the Sub-D DE9 sockets of the Service Wiring Harness.
4	Now the setup should be as shown in Fig. 30 .

Fig. 30



- | | |
|-------------|--------------------------|
| 1. Computer | 2. B.U.D.S. Aircraft Set |
| 3. Y-cable | 4. Cockpit (Simulation) |

NOTE: If the maintenance interfaces of LANE A and LANE B are not conducted separately, the B.U.D.S. Aircraft Satz Sub-D DE9 connector can be linked to the maintenance interface directly.

NOTE: In case of using an USB extension cable, the length should not exceed 2 meters.

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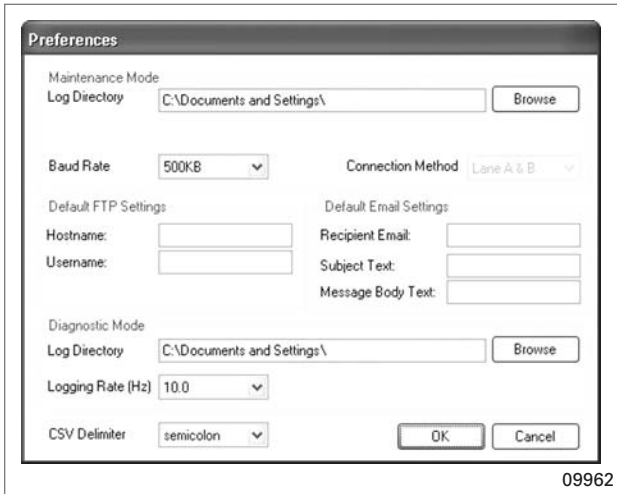
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MAINTENANCE MANUAL

The ECU software flashing process with B.U.D.S. Aircraft

Step	Procedure
1	Open B.U.D.S. Aircraft Software.
2	Open the "Preference"-Window and make sure that a Baud Rate of 500 kbs is selected.
3	Close the window "Preferences" with "OK".

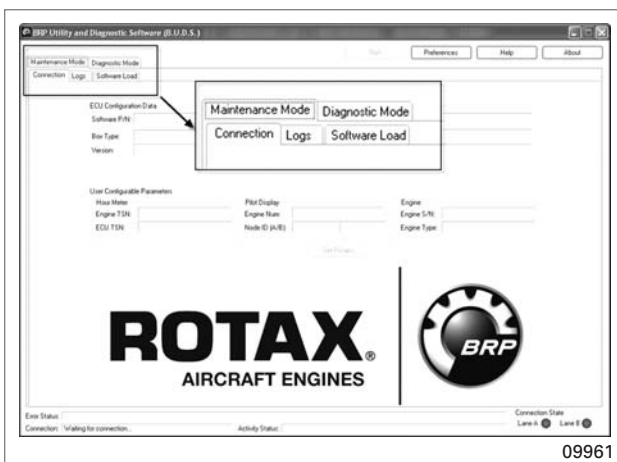
Fig. 31



B.U.D.S. Aircraft „Preferences“

Step	Procedure
4	Change to "Maintenance Mode"-Tab.

Fig. 32



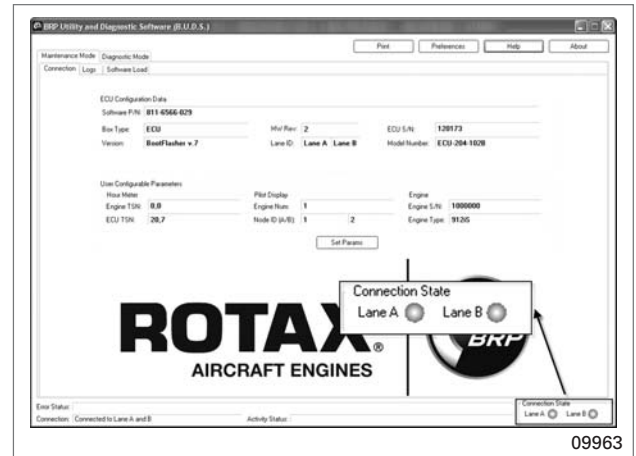
B.U.D.S. Aircraft „Maintenance Mode“

NOTE: If the ECU at this time is supplied with power, a restart is required.

Step	Procedure
5	Wait until the Connection State Indicators (Bottom-Right) turn to RED.
6	"Master" Switch to "ON".
7	"Backup Battery" Switch to "ON".
8	Turn "LANE A" Switch and "LANE B" Switch to "ON". The Connection State Indicators will turn to YELLOW if all connections are done properly.
9	Please wait until the Connection State Indicator turn to GREEN and the fields in "Connection"-Tab (ECU Configuration Data and User Configurable Parameters) fill with data.

NOTE: If connection status lamps would not turn to GREEN, try to disconnect and reconnect the power adapter or try turning the "LANE A" and "LANE B" Switches to "OFF" and then to "ON" again.

Fig. 33



B.U.D.S. Aircraft „Maintenance Mode“

Step	Procedure
10	Check the currently installed ECU Softwareversion and the set Engine Type.

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MAINTENANCE MANUAL

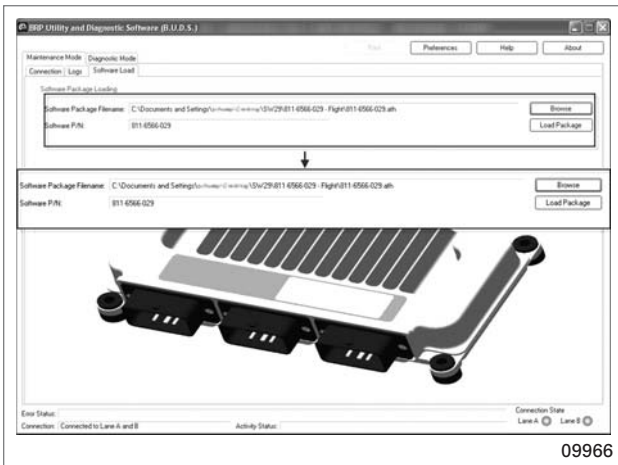
NOTE: The currently installed ECU Software version (“Software P/N“/section “ECU Configuration Data“) and the set Engine Type (section “User Configurable Parameters“) can be seen in the “Connection“ Tab. The last three digits of the “Software P/N“ illustrate the currently installed ECU Software version.

⚠ WARNING

Only Software that is suits a specific engine type is allowed to be flashed on an ECU (see SB-912 i-002iS). If the set Engine Type set in the ECU deviates from the hardware configuration of the engine, contact a ROTAX Distributor immediately.

Step	Procedure
11	Switch to “Software Load“-Tab.
12	Select “Browse“ in the “Software Package Loading“ section.
13	Navigate to the appropriate ECU Software file. (.ath) and confirm with “Open“.
14	The path to this file and the Software P/N will be shown in the “Software Package Loading“ section.

Fig. 34



B.U.D.S. Aircraft Maintenance Load“: Software Load“

Step	Procedure
15	Select “Load Package“.
16	Consequently a window will open to ensure that the user is aware of flashing the ECU Software. Confirm this window with “OK“.
17	Wait until the Software flashing process is finished. The process itself should take approximately 1 minute (a status display will indicate the progress).

⚠ WARNING

Do not disconnect or power down the ECU during the Software flashing process.

NOTE: If the Software flashing process was interrupted (e.g. the ECU was disconnected from the computer) it is necessary to restart the flashing process with the desired Software. If this flashing process also fails, flash the initial software on the ECU and afterwards retry flashing the desired Software-version

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Check of the Software version

Step	Procedure
1	After the Software flashing process has finished, the "Connection"-Tab will be shown. Check if the Software P/N equals the Softwareversion which was intended to be installed.
2	Change to section "Diagnostic" Mode.
3	A window will open to inform the user that a reboot of the ECU is required when changing from "Maintenance" to "Diagnostic"-Mode. Confirm the information with "OK".
4	Reboot the ECU by turning the "Master Switch" or the "LANE A", "LANE B" Switches to "OFF" and "ON" again.
5	Check warning lamp indicators. If both warning lamp indicators (section "LANE Health"/top toolbar) start to flash "RED" after rebooting the ECU, check compatibility between set Engine type and ECU Softwareversion.
6	Change to "Health"-Tab and check the Sensor Status and Device Status. If there are Errors/Events the ECU might be damaged and further investigation needs to be done.
7	The Software flashing process itself is now complete. Turn the "Master" Switch", the "Battery Backup"-Switch and the "LANE A/B" Switches back to "OFF".
8	Remove all wiring connections.

FINISHING WORK

- Attach all the necessary fastenings (e.g. cable ties, holders, clamps etc.) of the wiring harness.
- Transfer the actual data documented when removing the old ECU to the newly installed ECU.
- Delete the error memory of the new ECU.
- Carry out an engine test run. See section 70-00-00.
- Read out the ECU.

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NOTES

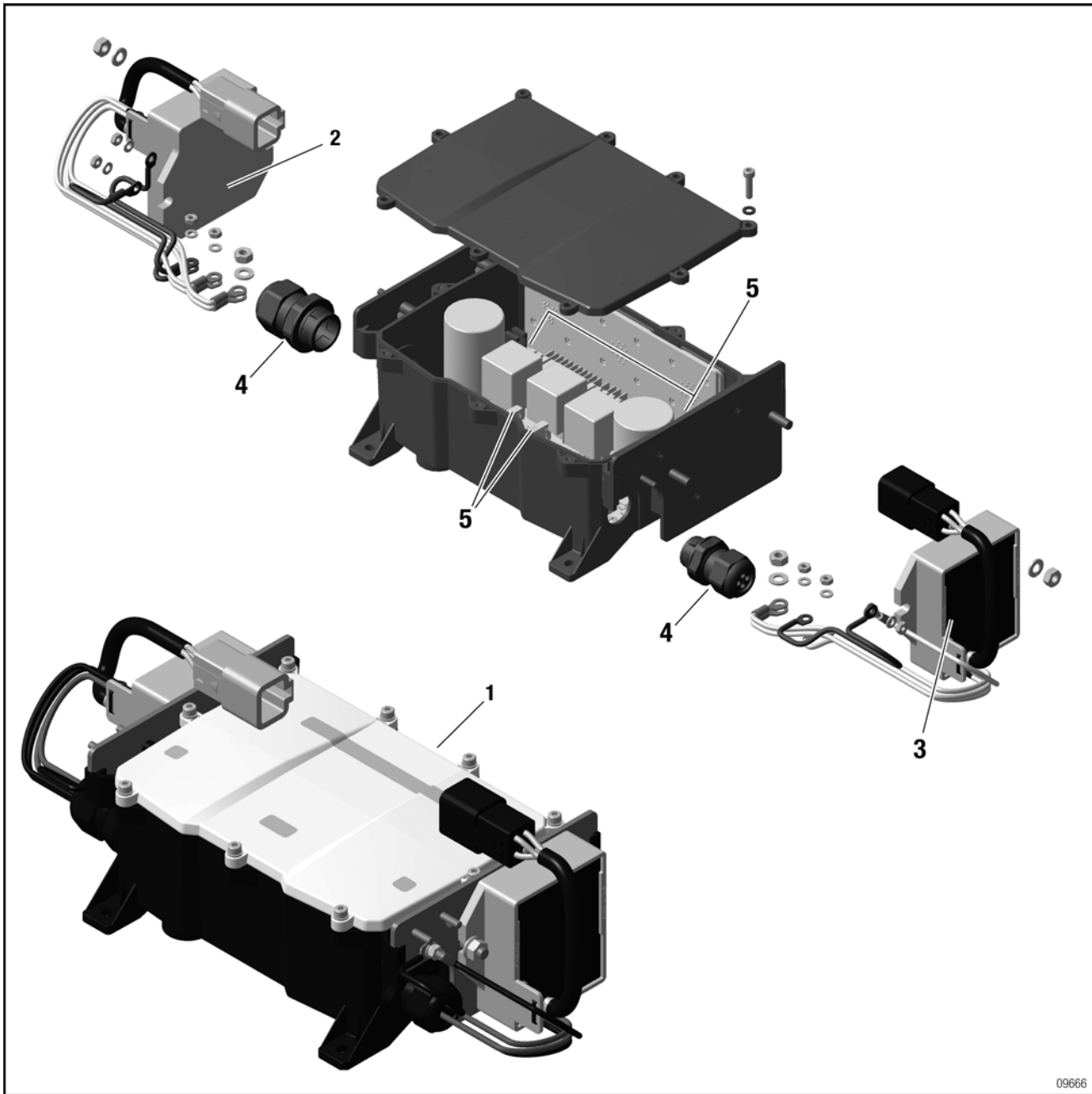
Chapter: 76-10-00
FUSE BOX (FUSE BOX)

Introduction

This section describes the system, the removal, installation and inspection of the fuse box (FUSE BOX) assembly of the ROTAX 912 i Series engine. The description is divided into sub-sections and explanations of system functions.

Subject	Page
1. Introduction	Page 29
2. System description	Page 31
3. Safety information	Page 31
4. Removal	Page 31
A. Preparation	Page 31
B. Fuse box - removal	Page 31
C. Regulator B - removal	Page 31
D. Regulator A - removal	Page 33
5. Fuses	Page 33
6. Installation	Page 34
A. Regulator A - installation	Page 34
B. Regulator B - installation	Page 35
C. Fuse box - installation	Page 36
7. Finishing work	Page 36

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1. Fuse box assy.

2. Rectifier regulator B

3. Rectifier regulator A

4. Sealing insert

5. Fuses

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SYSTEM DESCRIPTION

GENERAL NOTE

All the components of the voltage supply, e.g. fuses, are included in the power supply unit.

SAFETY INFORMATION

⚠ WARNING	
<p>Danger of damage to engine! There is a risk of short circuits and cable fires during work on the engine management system. All installation work on the fuse box should be carried out with the engine switched off and the battery (negative terminal) disconnected. “Backup Battery-“, “Master-“ and “LANE A/B“ Switches must be “OFF“.</p>	

NOTE: The general safety instructions must be followed during all work on the fuse box!

MAINTENANCE

Beside the maintenance and special checks, see the relevant Maintenance Manual Line for the respective 912 i Series engine type.

REMOVAL

Preparation

Before the fuse box is removed, the work and checks described below must be carried out to identify any further malfunctions in the engine and rectify them as part of the repair work.

- General visual inspection. See section 05-00-00 and 12-00-00 in the corresponding Maintenance Manual Line for the 912 i Series engine type.

FUSE BOX - REMOVAL

Step	Procedure
1	Unplug the engine wiring harness from the fuse box. See also section 76-50-00 Wiring harness.
2	Unplug the aircraft wiring harness.

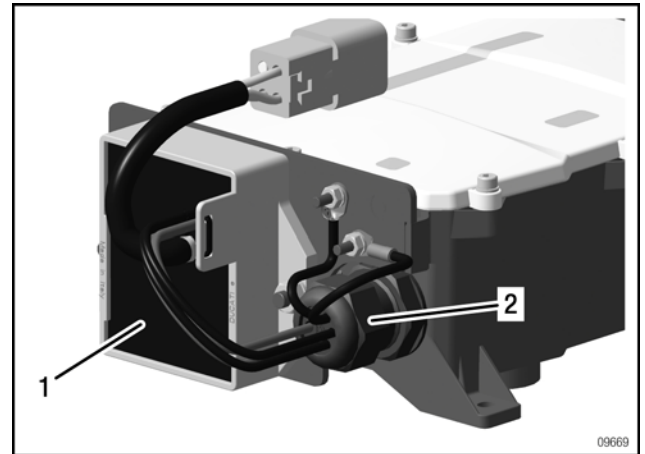
NOTICE	
<p>Removal must be carried out according to the aircraft manufacturer's instructions.</p>	

Step	Procedure
3	Remove the screws according to the aircraft manufacturer's specifications. Remove the wiring harness.

REGULATOR B - REMOVAL

Step	Procedure
1	Loosen the gasket screw connection.

Fig. 35



1. Regulator B

2. Gasket screw connection

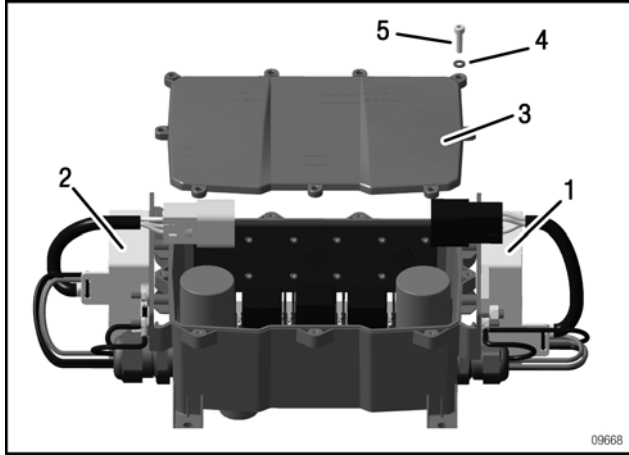
Step	Procedure
2	Loosen 9 M4 Allen screws along with washers and remove the cover.

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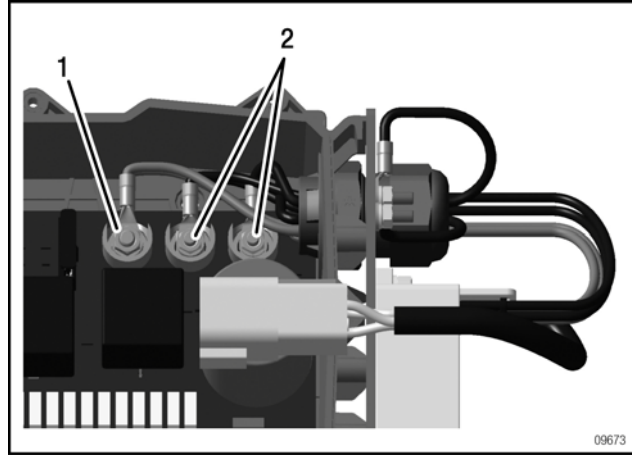
Fig. 36



- 1. Regulator A
- 2. Regulator B
- 3. Cover
- 4. Washer
- 5. M4 Allen screws

Step	Procedure
3	Disconnect the RED/WHITE cable from B+.
4	Disconnect the BLACK cable from B and B-.

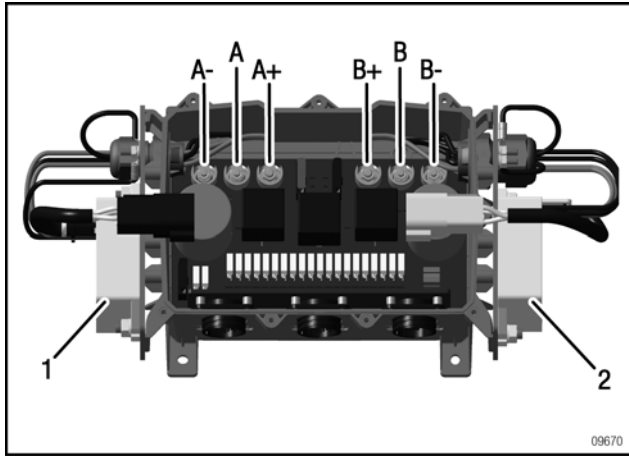
Fig. 38



- 1. M5 nut + washer
- 2. M4 nut + washer

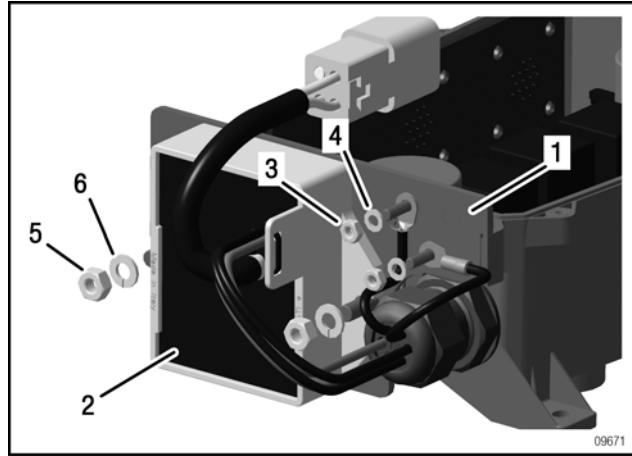
Step	Procedure
5	Disconnect the BLACK cable from the regulator plate.
6	Loosen the 2 M6 lock nuts with washers on the regulator B.
7	Pull the cables out of the fuse box..
8	Remove the regulator.

Fig. 37



- 1. Regulator A
- 2. Regulator B

Fig. 39

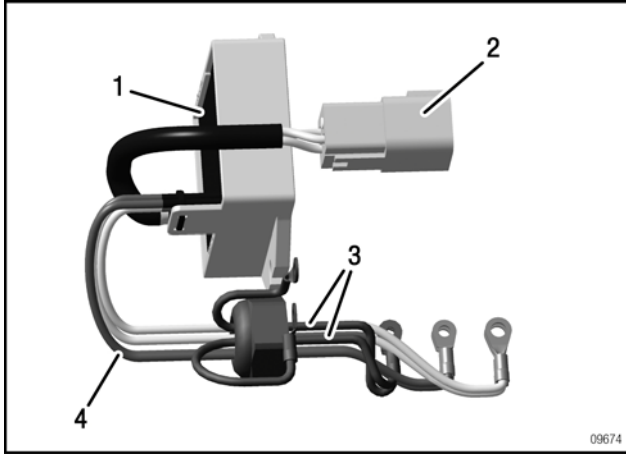


- 1. Regulator plate
- 2. Regulator B
- 3. M4 lock nut
- 4. 4.3 washer
- 5. M6 lock nut
- 6. 6.4 washer

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Fig. 40



- 1. Regulator B
- 2. DEUTSCH connector
- 3. Earthing cable B
- 4. Earthing cable B-

REGULATOR A - REMOVAL

- The regulator A is removed in the same way as regulator B.

NOTICE

The ground cables are different for regulators A and B.

FUSES

If a fuse is damaged, it must be replaced by a new one with the same values.

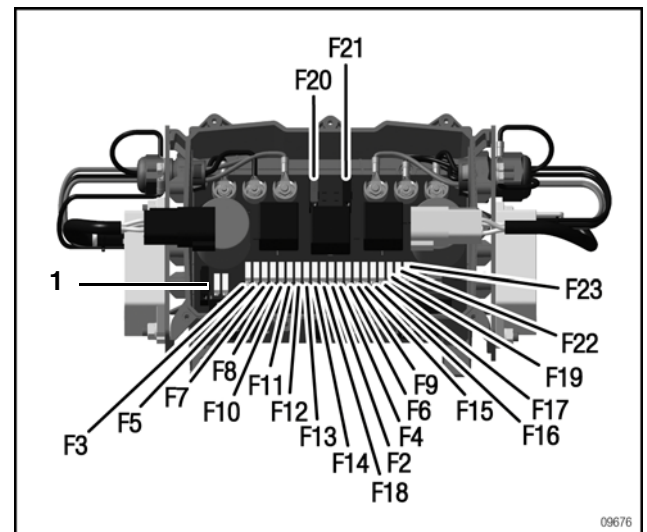
WARNING

A fuse with a higher amperage must not be used, as this can lead to severe damage.

The fuses are situated in the fuse box.

Arrangement of the fuses	
F2	7.5 A Selector switch B
F3	7.5 A Selector switch A
F4	10 A Fuel pump B
F5	10 A Fuel pump A
F6	10 A Ignition 3t
F7	10 A Ignition 1b

Arrangement of the fuses	
F8	10 A Ignition 3b
F9	10 A Ignition 1t
F10	5 A Injector 4
F11	5 A Injector 3
F12	5 A Injector 2
F13	5 A Injector 1
F14	2 A Caution lamp A
F15	2 A Caution lamp B
F16	5 A Injector 8
F17	5 A Injector 7
F18	5 A Start switch
F19	5 A Turbocharger
F20	30 A ATO fuse
F21	35 A ATO fuse
F22	5 A Injector 6
F23	5 A Injector 5



1. Reserve fuses

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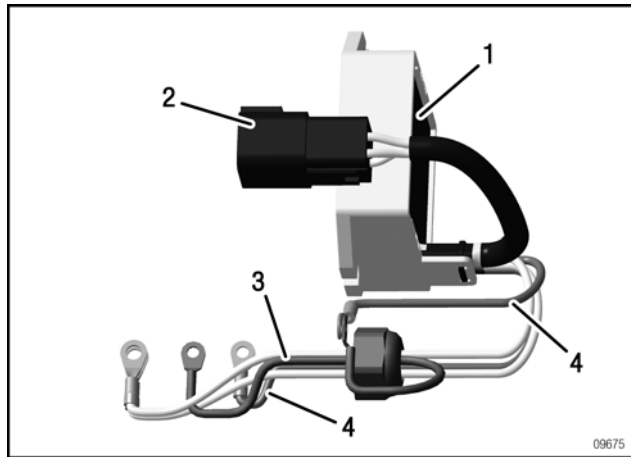
INSTALLATION

- The regulator is installed and removed in the same way. The following should be noted.

NOTE: When broken cable or defective connector of the respective damage can be repaired. The cable must be long enough, when the connector is separated. The repair with the described tools must comply with the national requirements of the respective countries.

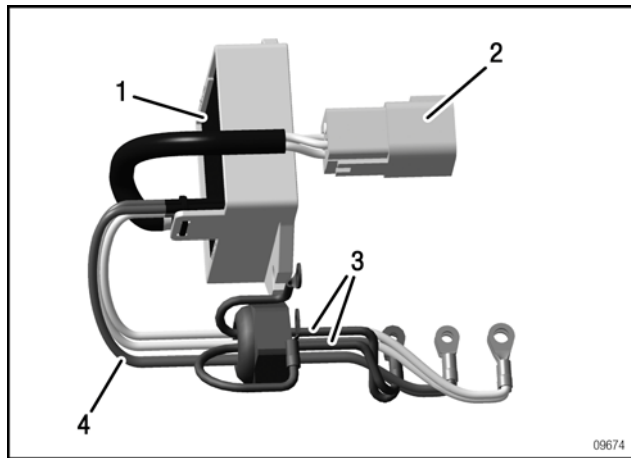
part no. from the Connector Set	associated Tool
866420	DEUTSCH HDT- 48 - 00
866422	

Fig. 41



- 1. Regulator A
- 2. DEUTSCH connector
- 3. Ground cable
- 4. Regulator ground cable

Fig. 42

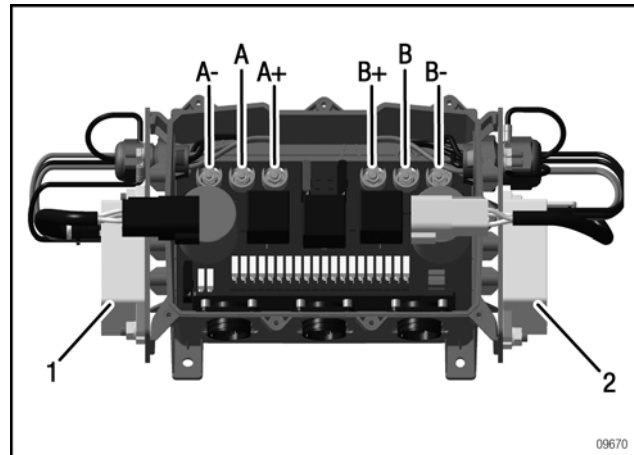


- 1. Regulator B
- 2. DEUTSCH connector
- 3. 2x ground cable
- 4. Regulator ground cable

REGULATOR A - INSTALLATION

Step	Procedure
1	Fasten regulator A to the fuse box with 2 M6 lock nuts and washers.
2	Pull the cables (2x RED/WHITE + 1x BLACK) into the fuse box.
3	Fasten both cables (RED/WHITE) to A+ with 2 M6 lock nuts and washers.

Fig. 43



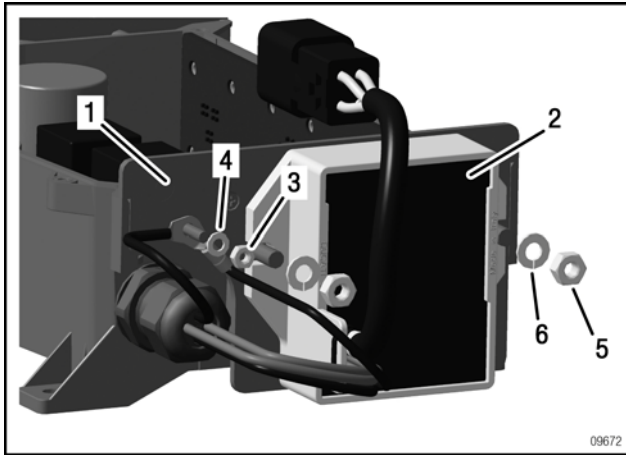
- 1. Regulator A
- 2. Regulator B

Step	Procedure
4	Fasten a grounding cable (regulator) to A and an ground cable part no. 866440 to A-.
5	Fasten the grounding cable from A- and a grounding cable from the regulator to the regulator plate with an M4 lock nut and washer. Tightening torque 1.2 Nm (10.7 in.lb.)

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Fig. 44

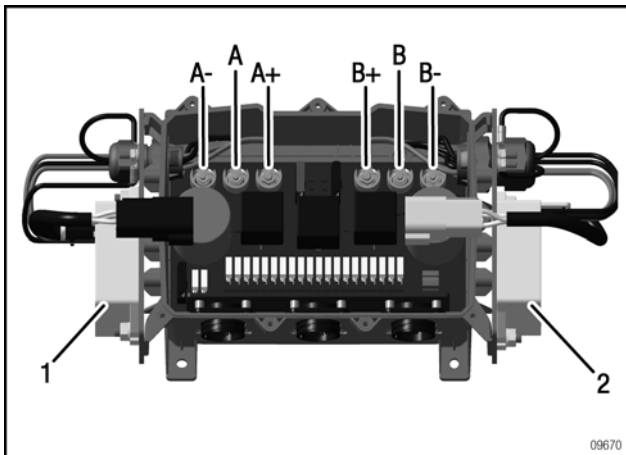


- | | |
|--------------------|----------------|
| 1. Regulator plate | 2. Regulator A |
| 3. M4 lock nut | 4. 4.3 washer |
| 5. M6 lock nut | 6. 6.3 washer |

REGULATOR B - INSTALLATION

Step	Procedure
1	Fasten regulator B (with grey pin connector) to the fuse box with 2 M6 lock nuts and washers.
2	Pull all the cables (RED/WHITE + BLACK) into the fuse box.

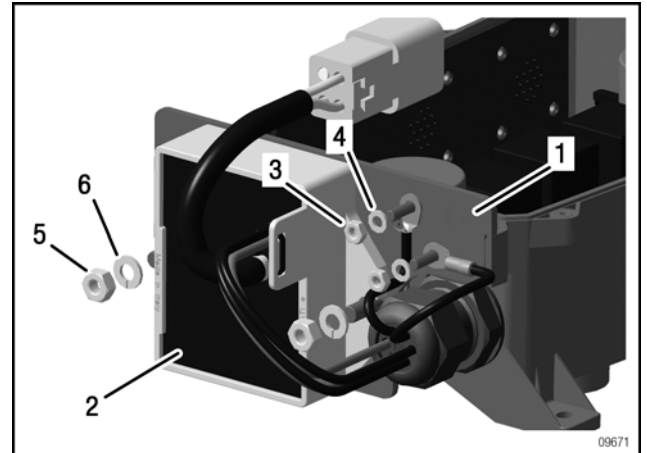
Fig. 45



- | | |
|----------------|----------------|
| 1. Regulator A | 2. Regulator B |
|----------------|----------------|

Step	Procedure
3	Fasten both cables (RED/WHITE) to B+ with an M5 lock nut and washer.
4	Fasten both grounding cables (regulator) to B and 2 grounding cables part no. 866440 to B-.
5	Fasten both grounding cables coming from B- to the regulator plate with M4 lock nuts and washers. Tightening torque 1.2 Nm (10.7 in.lb.)

Fig. 46



- | | |
|--------------------|----------------|
| 1. Regulator plate | 2. Regulator B |
| 3. M4 lock nut | 4. 4.3 washer |
| 5. M6 lock nut | 6. 6.4 washer |

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FUSE BOX - INSTALLATION

NOTICE

Installation must be carried out according to the aircraft manufacturer's instructions and specifications by the Installation Manual.

Step	Procedure
1	Install the fuse box according to the aircraft manufacturer's instructions.
2	Connect the fuse box to the wiring harness (main harness). NOTE: Ensure that the correct connection is made to the corresponding LANE, using the marking.

FINISHING WORK

- Attach all the necessary fastenings (e.g. cable ties, holders, clamps etc.) of the wiring harness.
- Carry out an engine test run. See section 70-00-00.

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Chapter: 76-50-00
WIRING HARNESS (MAIN STRAND)

Introduction

This section describes the system, the removal, installation and inspection of the wiring harness assembly of the ROTAX 912 i Series engine. The description is divided into sub-sections and explanations of system functions.

Subject	Page
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3. Service products	Page 3
4. System description	Page 6
5. Safety information	Page 6
6. Removal	Page 6
A. Preparation	Page 6
B. Wiring harness removal	Page 6
(1) Starter relay - disconnection	Page 6
(2) Ambient pressure sensor - disconnection	Page 7
(3) Fuse box (FUSE BOX) - disconnection	Page 7
(4) Fuel pump - disconnection	Page 8
(5) Control unit (ECU) - disconnection	Page 9
(6) EGT connector and ignition coil - disconnection	Page 10
(7) Temperature sensor CTS - disconnection	Page 12
(8) Injector - disconnection	Page 12
(9) Throttle potentiometer - disconnection	Page 13
(10) Temperature sensor (oil) and pressure sensor (oil) - disconnection	Page 14
(11) Crankshaft position sensor - disconnection	Page 14
(12) Knock sensor - disconnection	Page 15
(13) Airbox pressure sensor and temperature sensor - disconnection	Page 15
7. Inspection	Page 16
A. Electric test	Page 16
8. Installation	Page 17
A. Preparation	Page 17
B. Wiring harness - installation	Page 17
(1) Airbox pressure sensor and temperature sensor - connection	Page 19
(2) Knock sensor - connection	Page 19
(3) Crankshaft position sensor - connection	Page 19
(4) Temperature sensor (oil) and pressure sensor (oil) - connection	Page 19
(5) Throttle potentiometer - connection	Page 19
(6) Temperature sensor (CTS) and injectors	Page 19
(7) Strain relief - connection	Page 21
(8) Control unit (ECU) - connection	Page 22

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Subject	Page
(9) Fuel pump - connection	Page 22
(10) Fuse box (FUSE BOX) - connection	Page 22
(11) Ambient pressure sensor - connection	Page 22
(12) Starter relay - connection	Page 22
9. Finishing work	Page 22

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Chapter: 76-50-00
WIRING HARNESS (MAIN STRAND)

SPECIAL TOOLS

Description	Part no.
Maintenance Tool for EMS check	
ECU Adapter	277012

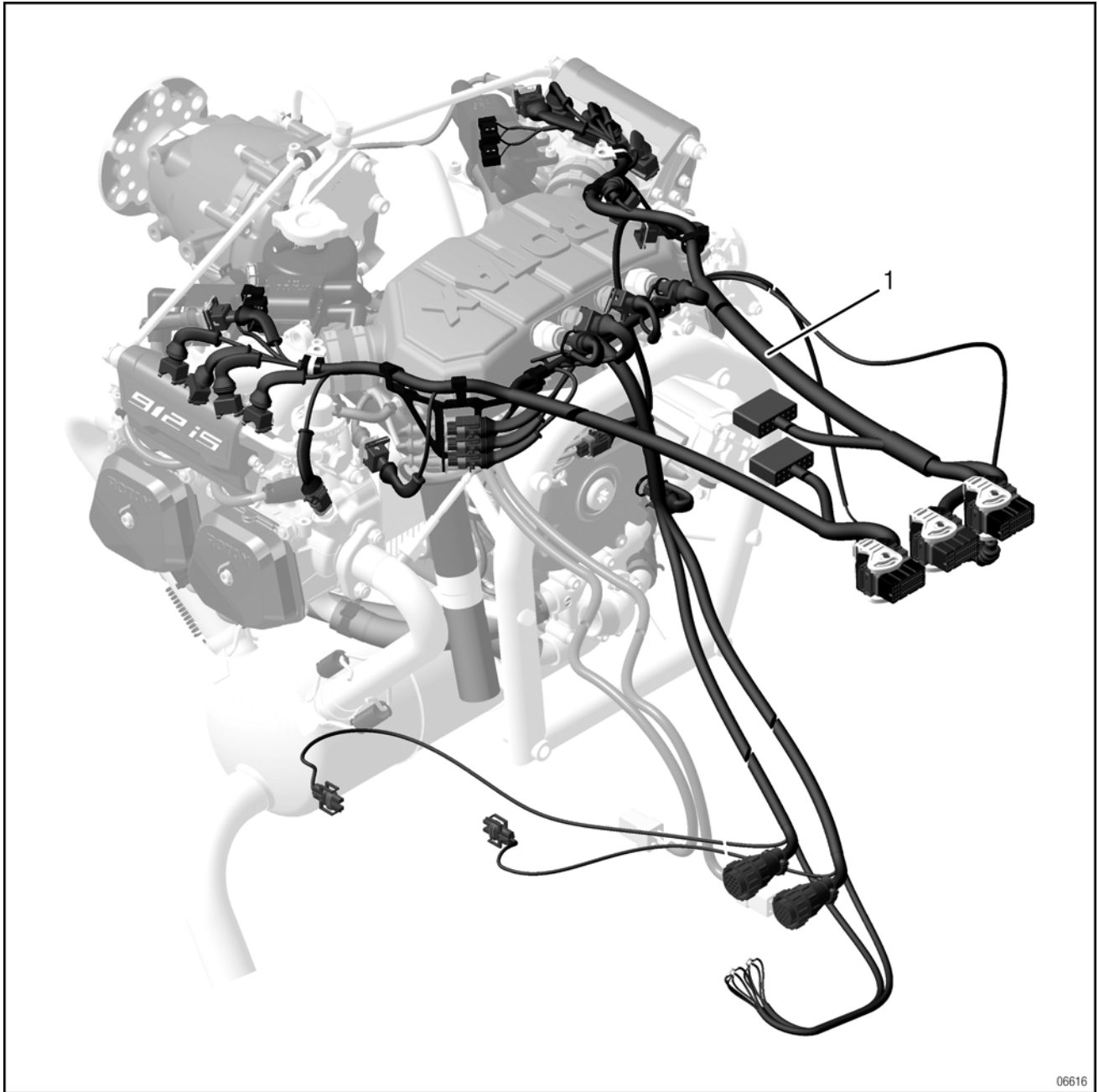
SERVICE PRODUCTS

Description	Part no.
LOCTITE 243	897651

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Wiring harness (main strand)

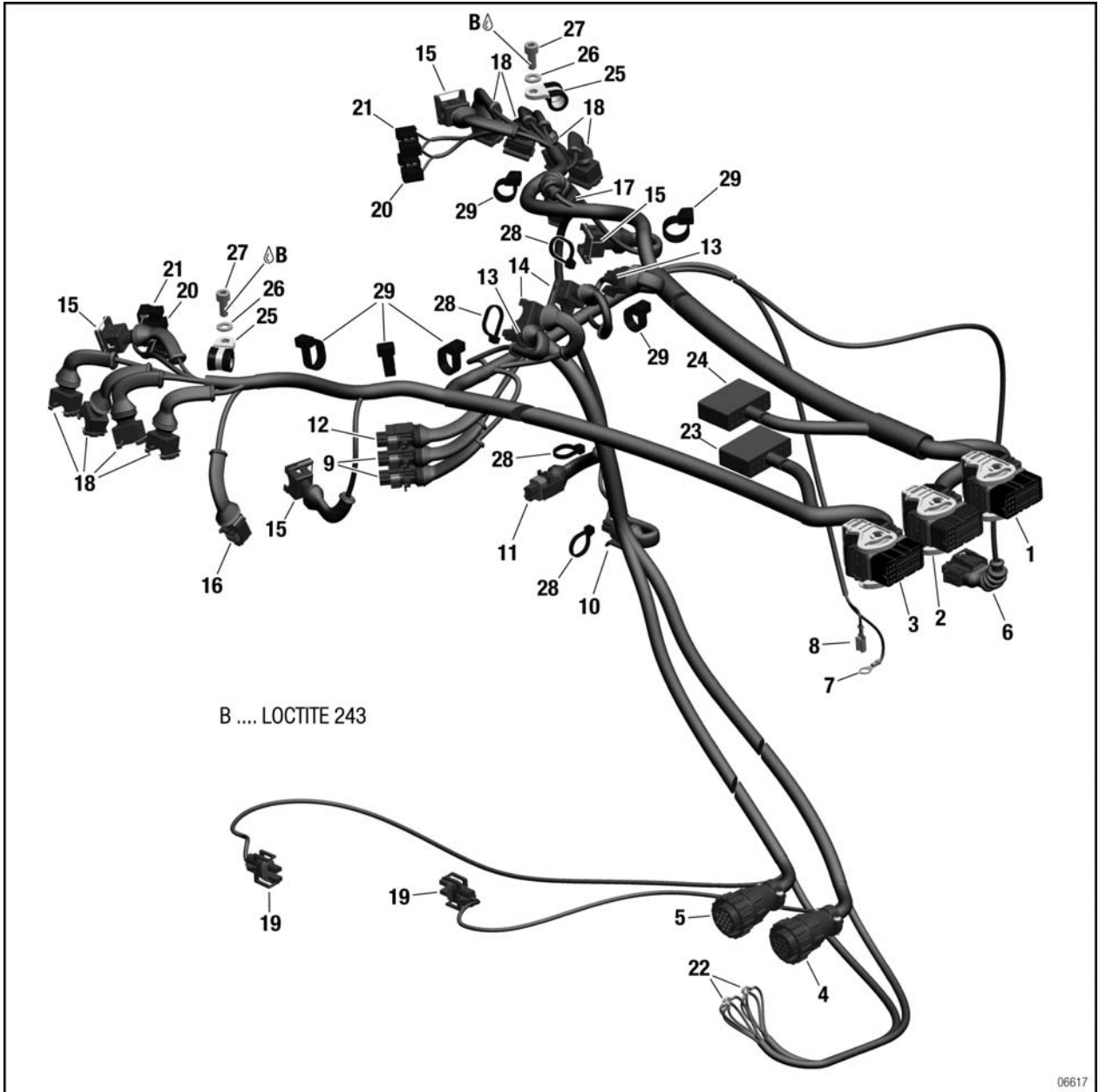


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1. Wiring harness

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MAINTENANCE MANUAL

Detailed view



- | | | | |
|--------------------------|--------------------------------|-------------------------|-------------------------|
| 1. ECU LANE A1 Connector | 2. ECU LANE A2 Connector | 3. ECU LANE B Connector | 4. FUSE BOX LANE B Con. |
| 5. FUSE BOX LANE A Con. | 6. APTS Sensor Connector | 7. Starter relay | 8. Starter relay |
| 9. CPS 1/2 Connector | 10. OPS Connector | 11. OTS Connector | 12. Knock Connector |
| 13. MAPS Connector | 14. MATS Connector | 15. EGT Connector | 16. CTS Connector |
| 17. TPS Connector | 18. Injector Connector | 19. Fuel pump Connector | 20. Coil Connector |
| 21. Coil Connector | 22. Ground Connector | 23. HIC B Connector | 24. HIC A Connector |
| 25. 12/M6 cable clamp | 26. DIN 128-A6-FST lock washer | 27. M6x14 Allen screw | 28. 203x7.6 cable tie |
| 29. 142x3.2 cable tie | | | |

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SYSTEM DESCRIPTION

GENERAL NOTE

The wiring harness consists essentially of two main parts, one for LANE A and one for LANE B. Both are each connected with connectors to the ECU and to the individual connectors to the sensors and actuators.

The wiring harness connects all the engine parts necessary for operation. In this way it provides the electric supply for these parts and the exchange of control and regulation signals.

SAFETY INFORMATION

WARNING

Non-compliance can result in serious injuries or death!

The wiring harness and connectors may only be disassembled by the manufacturer, by an authorised distributor or by an aerospace company.

NOTICE

Danger of damage to the power plant and aircraft!

It must be ensured that no electric voltage is connected and that repairs are carried out properly.

NOTE: The general safety instructions must be followed during all work on the wiring harness!

MAINTENANCE

As well as the maintenance and special checks, see the relevant Maintenance Manual Line for the respective 912 i Series engine type.

REMOVAL

Preparation

Before the wiring harness is removed, the work and checks described below must be carried out to identify any further malfunctions in the cylinder head and rectify them as part of repair work.

- General visual inspection. See section 05-00-00 and 12-00-00 in the corresponding Maintenance Manual Line for the 912 i Series engine type.
- Carry out an engine test run. See section 12-20-00 in the corresponding Maintenance Manual Line for the 912 i Series engine type.
- Disconnect the wiring harness from the aircraft frame.
- Disconnect all detachable connections (all cable ties, cable holders, clamps etc.).

NOTE: All connectors must be provided with a protective covering after being removed or detached.

WIRING HARNESS REMOVAL

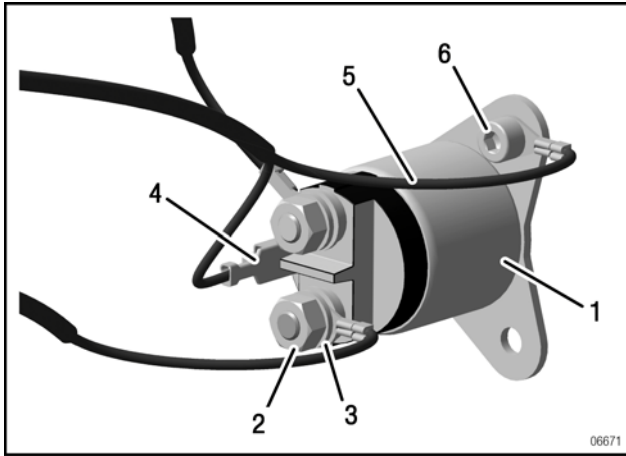
STARTER RELAY - DISCONNECTION

See [Fig. 1](#).

Step	Procedure
1	Loosen M6 hex. nut and remove it along with the 6.4 washer. Pull off faston connector. Press the lock to pull off the faston connector.
2	Loosen the grounding Allen screw.

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Fig. 1



- | | |
|------------------|---------------------|
| 1. Starter relay | 2. M6 hex. nut |
| 3. 6.4 washer | 4. Faston connector |
| 5. Grounding | 6. Allen screw |

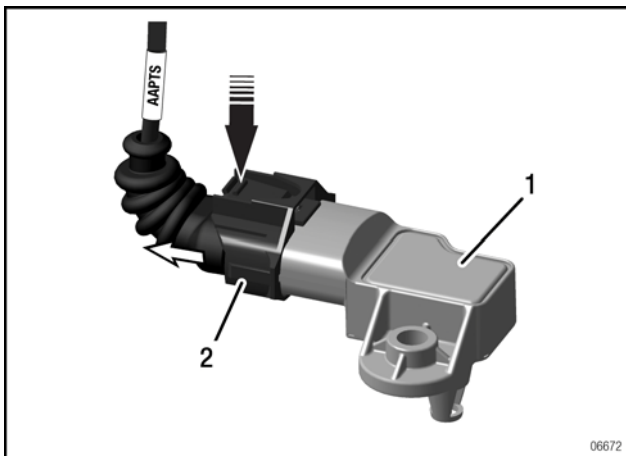
AMBIENT PRESSURE SENSOR - DIS-CONNECTION

Wiring harness designation:

- AAPTS

Step	Procedure
1	Push in the tab on the top of the connector and at the same time pull the connector out of the connection socket.

Fig. 2



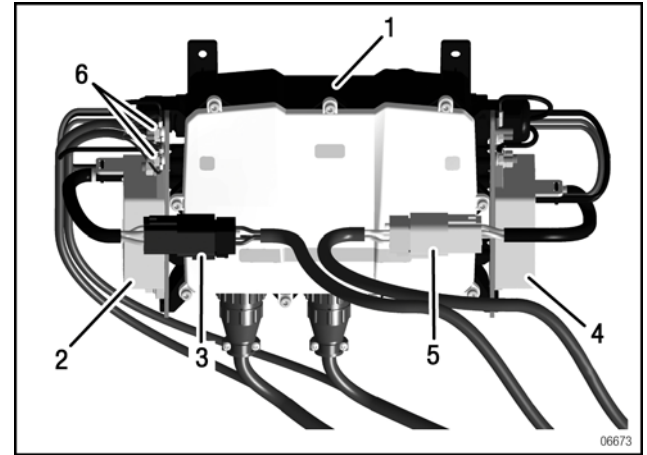
- | | |
|--------|----------------------|
| 1. Tab | 2. Connection socket |
|--------|----------------------|

FUSE BOX (FUSE BOX) - DISCONNECTION

- See also section 76-10-00 Fuse box.

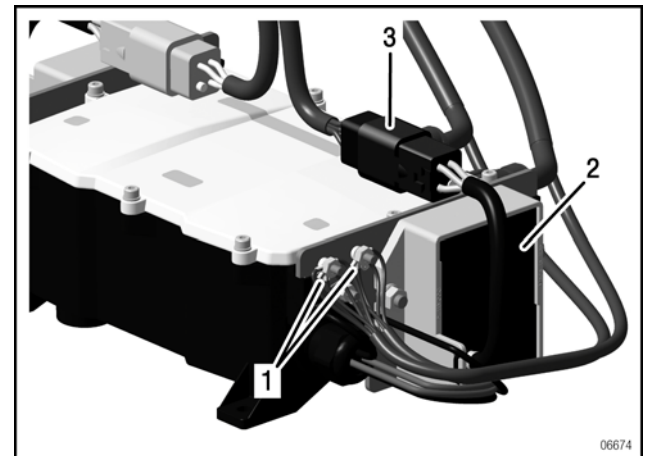
Step	Procedure
1	Loosen M5 hex. nut from the earthing cable on controller A.

Fig. 3



- | | |
|---------------------------|---------------------------|
| 1. Fusebox | 2. Controller LANE A |
| 3. Controller connector A | 4. Controller LANE B |
| 5. Controller connector B | 6. Earthing cable harness |

Fig. 4



- | | |
|---------------------------|----------------------|
| 1. Earthing cable | 2. Controller LANE A |
| 3. Controller connector A | |

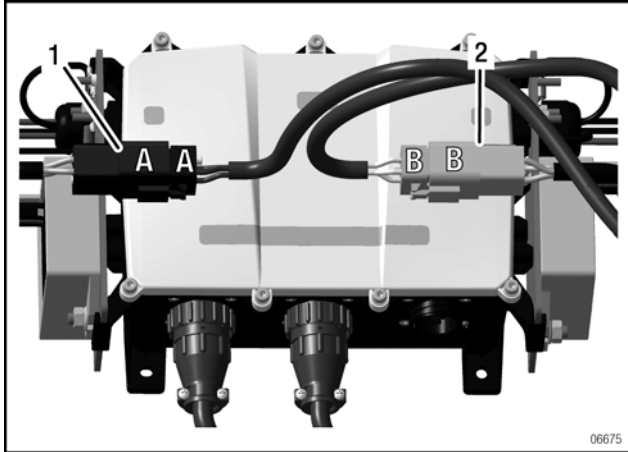
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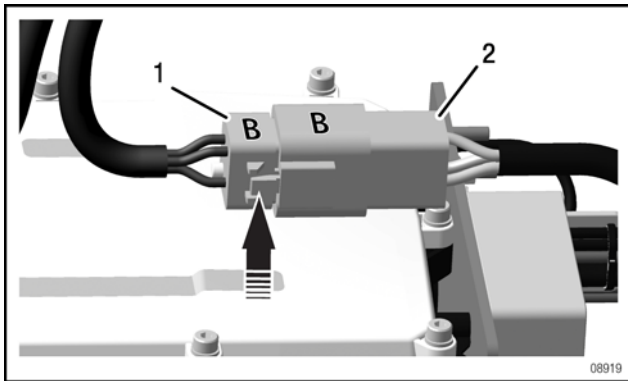
Step	Procedure
2	Mark the controller connector before detaching.
3	Push in the tab on the top of the connector and at the same time pull the connector out of the connection socket.

Fig. 5



1. Controller connector A 2. Controller connector B

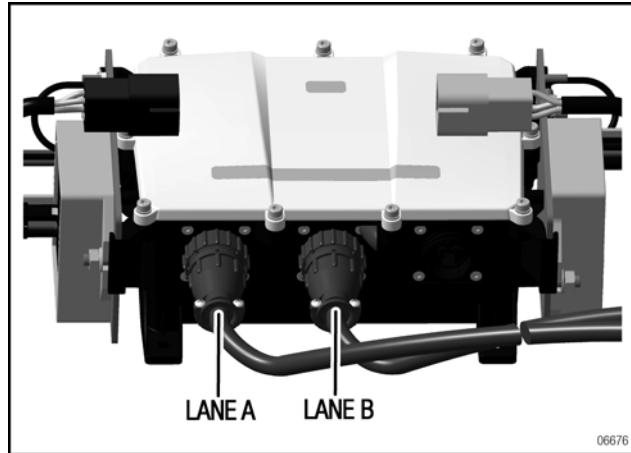
Fig. 6



1. Connection socket 2. Controller connector

Step	Procedure
4	Loosen the two round connectors (labelled LANE A, LANE B) from fuse box. NOTE: Unscrew the connector cap nut anti-clockwise.

Fig. 7



NOTE: Round connectors have different grooves and cannot be mixed up.

Step	Procedure
5	Pull the connectors in the two grooves out of the connector socket.

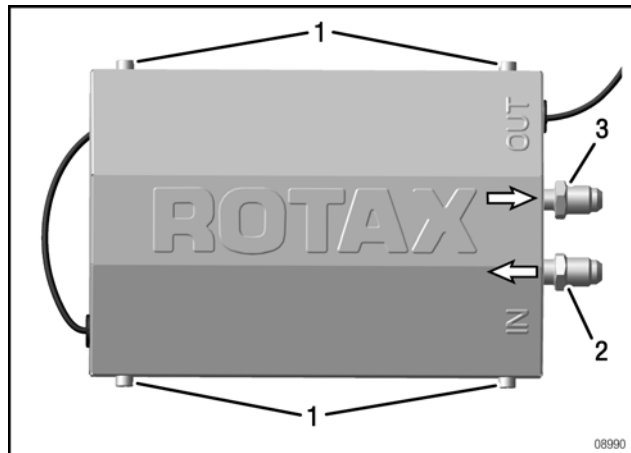
FUEL PUMP - DISCONNECTION

Wiring harness designation:

- FUEL PUMP_1 (MAIN pump)
- FUEL PUMP_2 (AUX pump)

Step	Procedure
1	Loosen the 4 M5x12 Allen screws from cover of the fuel pump assy.

Fig. 8



1. M5x12 Allen screws 2. LANE IN
3. LANE OUT

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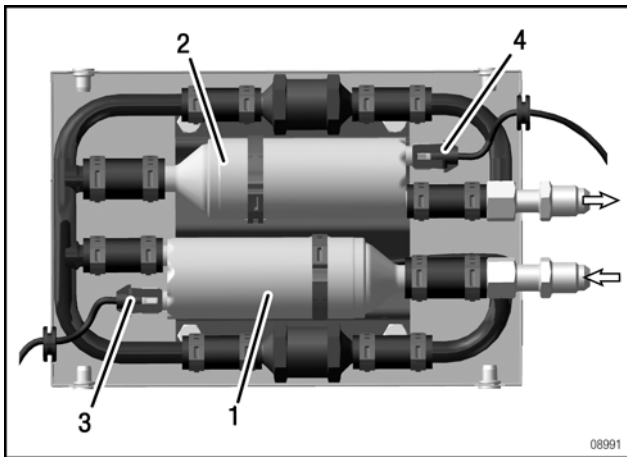
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Step	Procedure
2	Unplug the connectors (FUEL PUMP 1, FUEL PUMP 2) from the fuel pumps. NOTE: First lift one side with a screwdriver, fix the tab and then lift the lower tab with the screwdriver and pull out the connector.

NOTICE

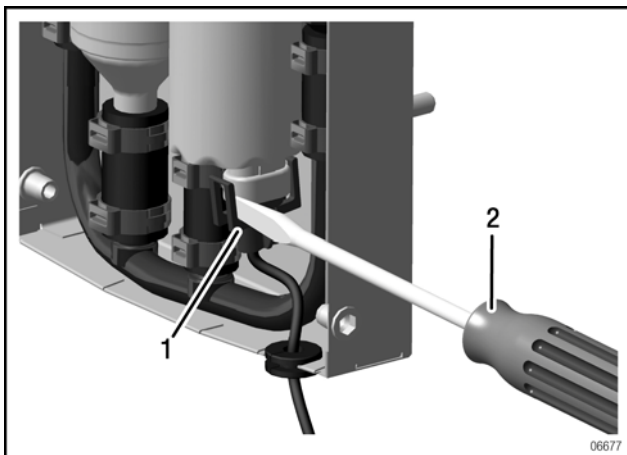
Do not pull on the cable!

Fig. 9



1. Fuel pump (main) 2. Fuel pump (auxiliary)
3. Connector (fuel pump 1) 4. Connector (fuel pump 2)

Fig. 10



1. Connector (fuel pump 1) 2. Screwdriver

CONTROL UNIT (ECU) - DISCONNECTION

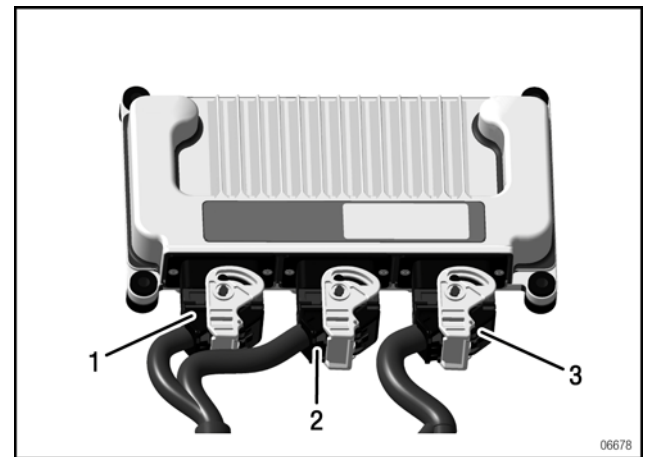
See also section 76-10-00 Control unit.

Wiring harness designation:

- ECU LANE A1
- ECU LANE A2
- ECU LANE B

Step	Procedure
1	Unplug the couplers (ECU LANE A1, ECU LANE A2 and ECU LANE B).

Fig. 11



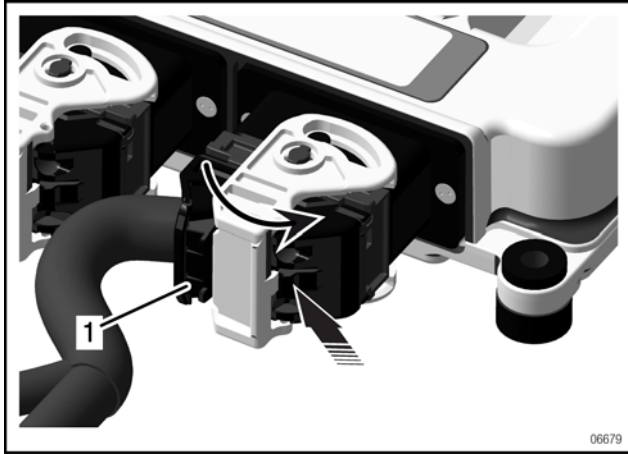
1. Coupler (LANE A1)
2. Coupler (LANE A2)
3. Coupler (LANE B)

Step	Procedure
2	Press in the lock so that the clamp can be rotated.
3	Press the clamp down until it latches.
4	Remove the coupler.

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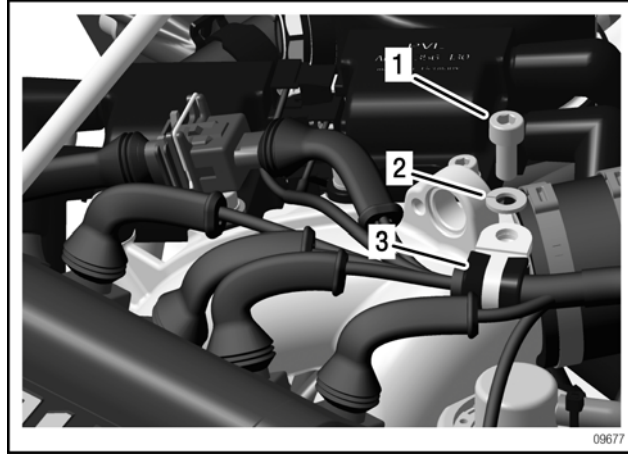
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Fig. 12



1. Lock

Fig. 13



1. M6x14 Allen screw 2. 6.4 washer
3. 12/M6 cable clamp

EGT CONNECTOR AND IGNITION COIL - DISCONNECTION

See also section 74-20-00 Ignition unit.

Wiring harness designation:

- EGT_1, EGT_2
- EGT_3, EGT_4
- COIL_1
- COIL_2
- COIL_3
- COIL_4

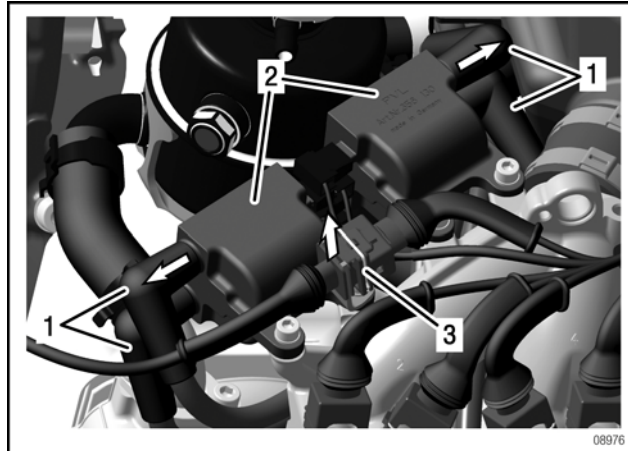
Step	Procedure
1	Remove the cable clamps of the wiring harness on the intake manifold.

NOTICE

The Allen screws go into the intake duct. The Allen screws are therefore secured with LOCTITE 243. Leaking Allen screws can cause an excessively lean mixture!

Step	Procedure
2	Pull out 4 ignition coil connectors from each side. NOTE: Use a suitable tool to pull out the ignition coil plugs.

Fig. 14



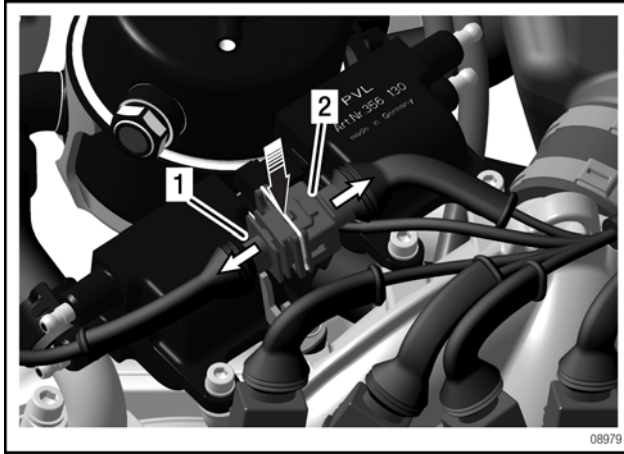
1. Ignition coil connector 2. Double ignition coils
3. EGT connector

Step	Procedure
3	Carefully pull EGT_1 and EGT_2 (cylinder 1 and 2) out of the locking plate.
4	Press the metal bracket and separate the connectors.

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Fig. 15



1. EGT_1 2. EGT_2

Step	Procedure
5	Loosen the M5x16 Allen screws with washers from double ignition coils.

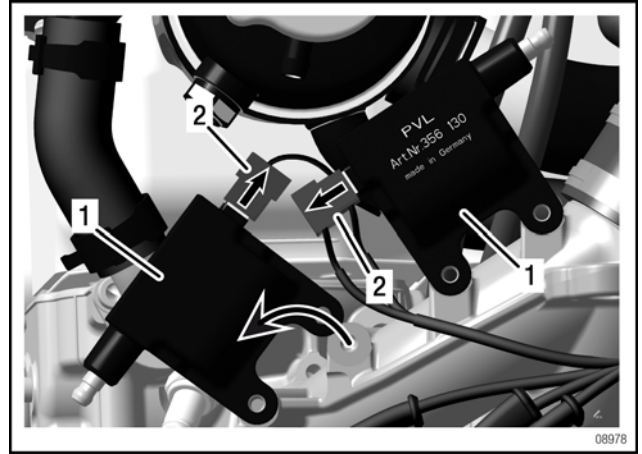
Fig. 16



1. M5x16 Allen screw 2. 5.3 washer
 3. Plug holder

Step	Procedure
6	Unplug the connection to the double ignition coils.

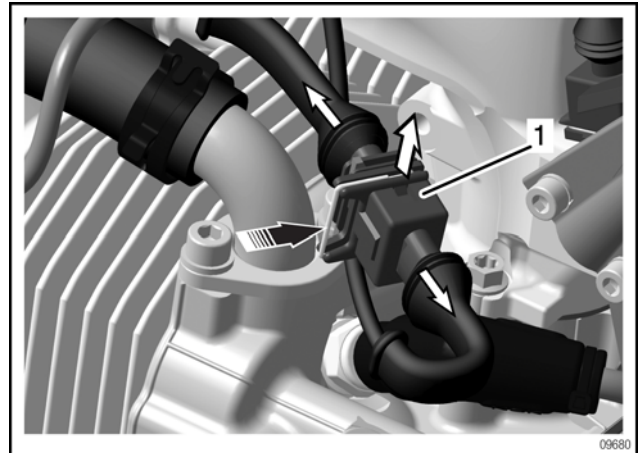
Fig. 17



1. Double ignition coils 2. Ignition coil connector
 (COIL_1, COIL_2,
 COIL_3, COIL_4)

Step	Procedure
7	Carefully pull EGT_3 and EGT_4 (cylinder 3/4) out of the locking plate.
8	Press the metal bracket and separate the connectors.

Fig. 18



1. EGT connector

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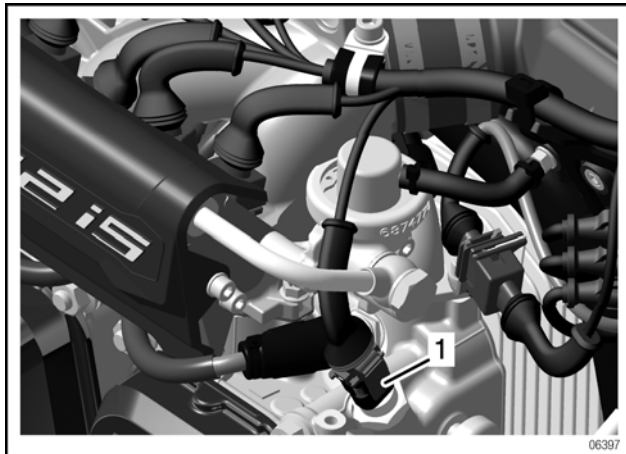
TEMPERATURE SENSOR - DISCONNECTION

Wiring harness designation:

- CTS

Step	Procedure
1	Disconnect the plug connection to the temperature sensor.

Fig. 19



1. Temperature sensor

INJECTOR - DISCONNECTION

Wiring harness designation:

- INJ_1 to INJ_8

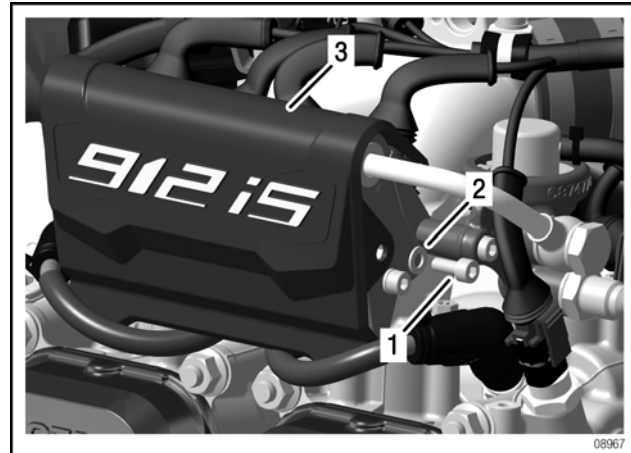
Preparation

- Drain the fuel. See also section 12-20-00 Planned maintenance.
- Unscrew the feed line to fuel rail 1/3 and the return line to fuel rail 2/4 and fuel pressure regulator and close them with the appropriate caps.
- Loosen the M6x16 Allen screw from fuel line assy.
- Remove the fuel line assy.

See Fig. 20 to Fig. 24.

Step	Procedure
1	Loosen the 2 M5 x12 Allen screws from cover of the fuel rail.
2	Lift off the cover.

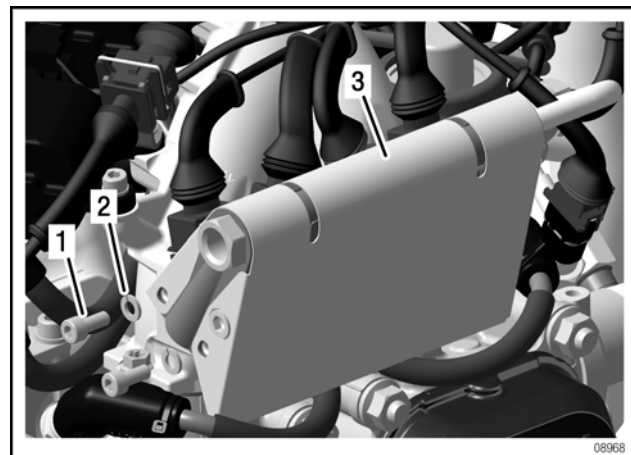
Fig. 20



1. M5x12 Allen screw 2. 5.3 washer
3. Fuel rail cover

Step	Procedure
3	Loosen 4 M5x12 Allen screws.
4	For cylinder 2 and cylinder 4, loosen the fuel pressure regulator and the M5x35 Allen screw.
5	Raise the heat shield on both sides in the region of the rivet nut and lift it off.

Fig. 21

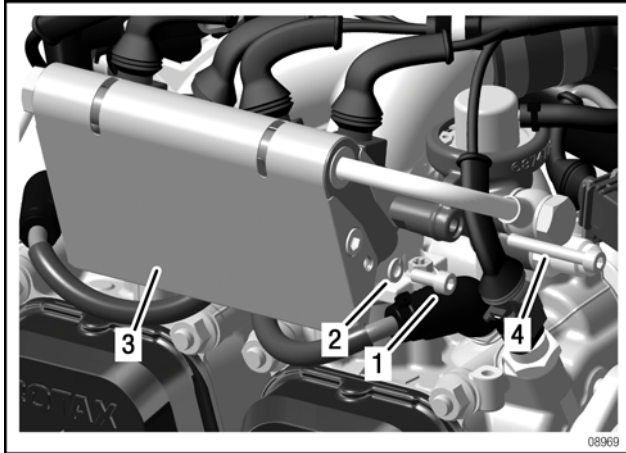


1. M5x12 Allen screw 2. 5.3 washer
3. Heat shield

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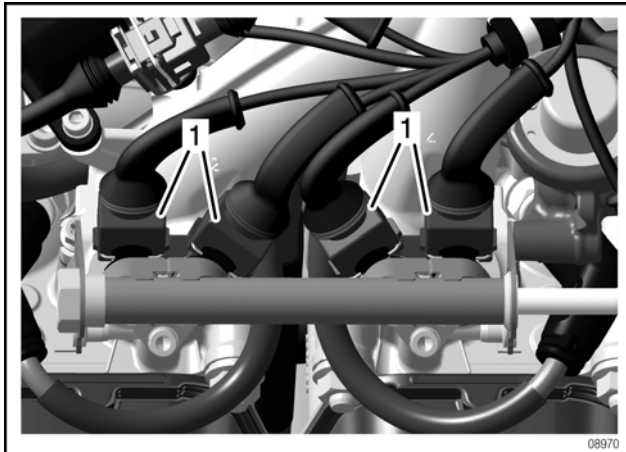
Fig. 22



- 1. M5x12 Allen screw
- 2. 5.3 washer
- 3. Heat shield
- 4. M5x35 Allen screw

Step	Procedure
6	Disconnect the injectors. NOTE: The cables are labelled INJ_1 to INJ_8.

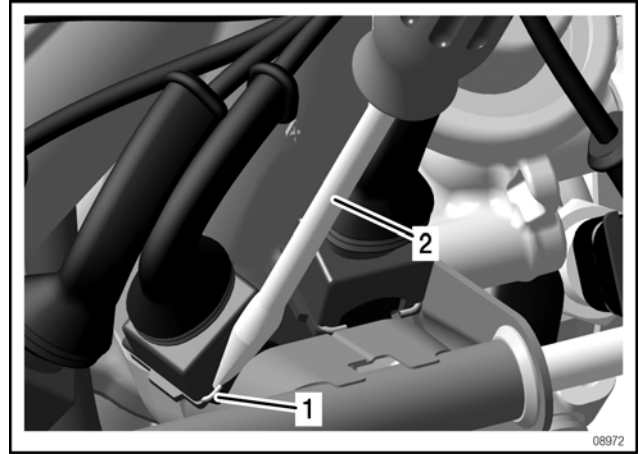
Fig. 23



- 1. Injector connectors

Step	Procedure
7	Use a screwdriver to lever out the spring clip and then unplug the connector. NOTE: Let the wire clip snap back in after the connector has been disconnected so that it does not get lost.

Fig. 24



- 1. Injector
- 2. Screwdriver

THROTTLE POTENTIOMETER (TPS) - DISCONNECTION

NOTICE

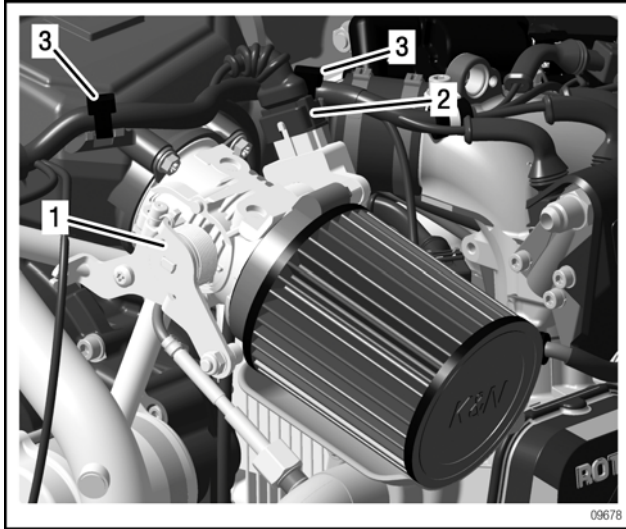
Do not damage the wiring harness. Always cut open on the side of the support plate facing away from the wiring harness.

Step	Procedure
1	Cut open the 2 cable ties on the airbox.
2	Unplug the throttle potentiometer. <ul style="list-style-type: none"> - Lift the latches. - Unplug the connector.

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Fig. 25



- 1. Throttle valve
- 2. Throttle potentiometer
- 3. Cable ties

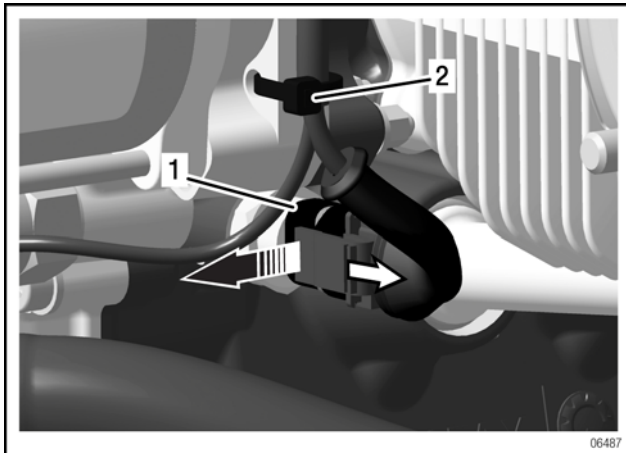
TEMPERATURE SENSOR (OIL) AND PRESSURE SENSOR (OIL) - DISCON.

Wiring harness designation:

- Temperature sensor OTS
- Pressure sensor OPS

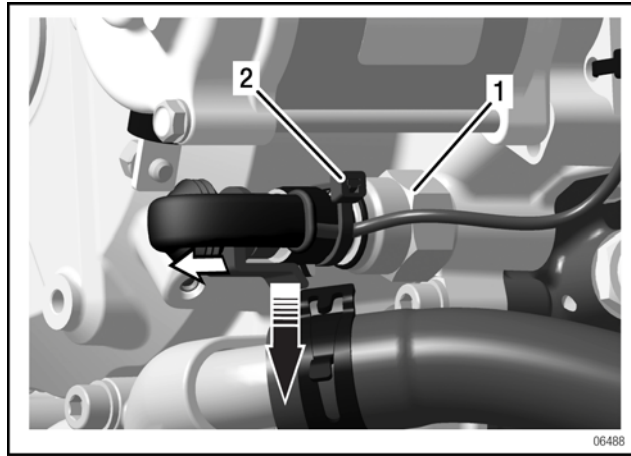
Step	Procedure
1	Remove cable ties.
2	Unplug the temperature sensor and pressure sensor: Lift the latches + pull out the connectors.

Fig. 26



- 1. Temperature sensor

Fig. 27



- 1. Pressure sensor
- 2. Cable ties

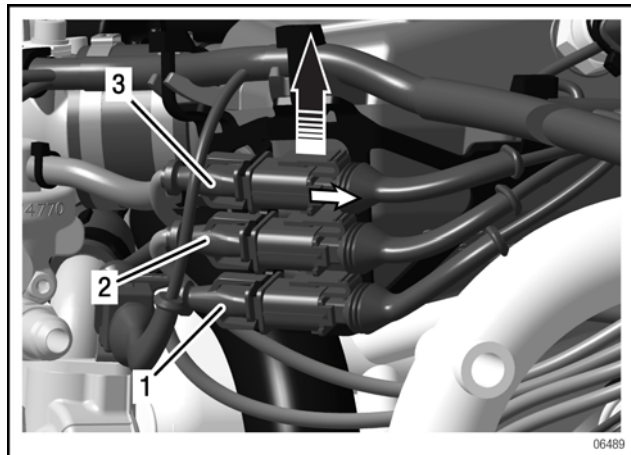
CRANKSHAFT POSITION SENSOR - DISCONNECTION

Wiring harness designation:

- CPS_1 for LANE A (yellow mark)
- CPS_2 for LANE B

Step	Procedure
1	Unplug CPS 1 and CPS 2

Fig. 28



- 1. CPS_1 LANE A
- 2. CPS_2 LANE B
- 3. KNOCK knock sensor

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KNOCK SENSOR - DISCONNECTION

Wiring harness designation:

- KNOCK

See Fig. 28.

Step	Procedure
1	Lift the latch and pull apart.

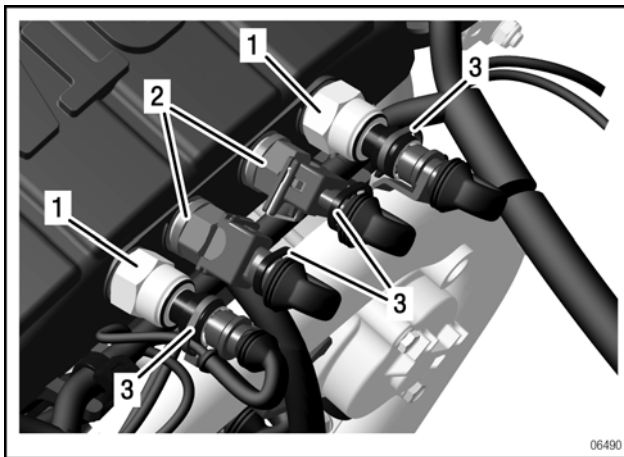
AIRBOX PRESSURE SENSOR AND TEMPERATURE SENSOR - DISCONNECTION

Wiring harness designation:

- MAPS_1 and MATS_1 for LANE A
- MAPS_2 and MATS_2 for LANE B

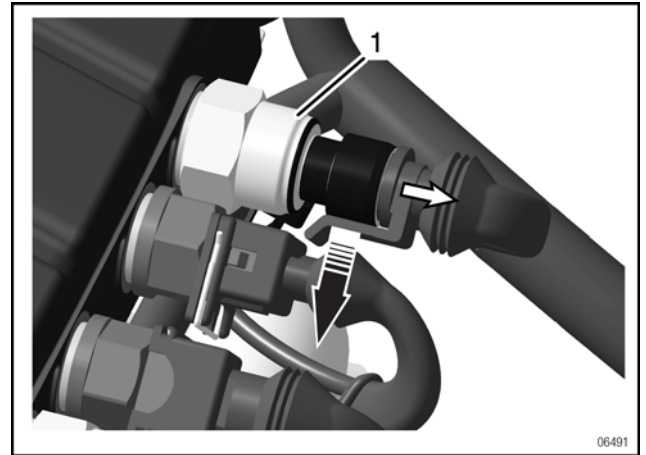
Step	Procedure
1	Remove the 4 cable ties.
2	Unplug the connectors of the 2 pressure sensors.
3	Lift the latch and pull off.

Fig. 29



- 1. Pressure sensors
- 2. Temperature sensor
- 3. Cable ties

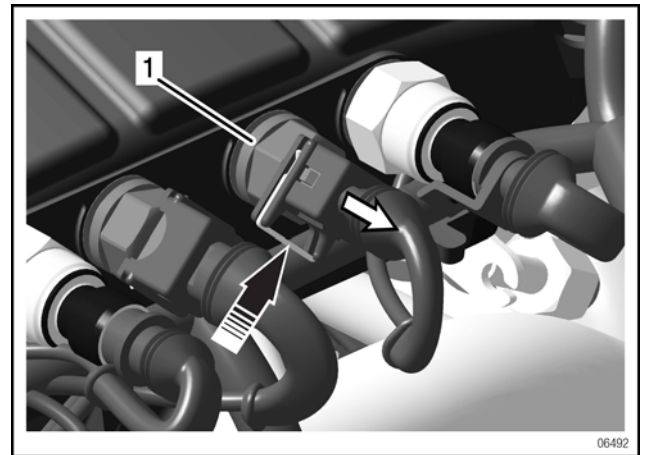
Fig. 30



- 1. Pressure sensor

Step	Procedure
4	Unplug the connectors of the 2 temperature sensors.
5	Press the metal bracket and separate the connectors.

Fig. 31

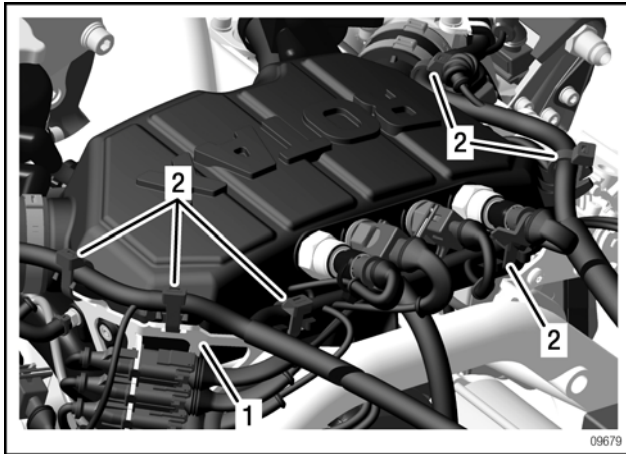


- 1. Temperature sensor

Step	Procedure
6	Remove the cable ties on the airbox.

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Fig. 32



1. Airbox

2. Cable ties

WIRING HARNESS REMOVAL

- The wiring harness can be removed.

INSPECTION

NOTICE

When work is carried out on the components of the engine management system, there is a risk that these might get damaged. Never put measuring probes in plug connectors or use other "aids" to carry out tests in the plug connectors.

NOTICE

All electronic components must be in the original state. Any modification e.g. to the wiring harness can lead to incorrect inputs or operating faults.

- General visual inspection. See section 05-00-00 and 12-20-00 in the corresponding Maintenance Manual Line for the 912 i Series engine type.

NOTE: It must be ensured that all plug-in connections are properly crimped with the cables. (There must be no bent, deformed or loose pins in the plug connections!)

Electric test

The electric test of the wiring harness takes place in the installed state.

Step	Procedure
1	Unplug the wiring harness at the ECU and connect adapter part no. 277012.

Fig. 33



1. Adapter

INSTALLATION

WIRING HARNESS - INSTALLATION

Preparation

- Check all the wiring harness sections provided.

NOTE: If necessary, clean the pins of the connector and coat them as follows:
 AMP/ECU connector with a thin layer of Deoxit contact spray.
 All the other connectors with a dielectric silicone-based lubricant or an equivalent lubricant.

⚠ WARNING

Non-compliance can result in serious injuries or death!
 The wiring harness must not be routed through areas or fastened to components in which the maximum permissible temperature of 120 °C can be exceeded during engine operation.

NOTICE

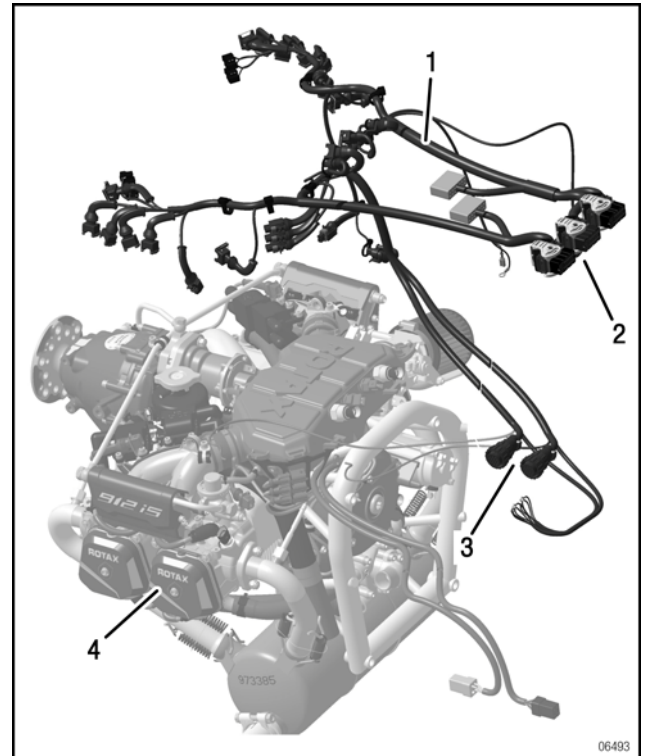
The plug connection of the ECU must be opened and closed no more than 20 times!
 This must be shown on the device by a clearly visible sealing with a stamped numerical sequence (1-20) and by documentation conforming to self-monitoring guidelines.

NOTICE

Danger due to damage to the wiring harness!
 For correct operation of the engine, it is necessary for the wiring harness to be in full working order and protected from scuffing, wear, tearing, extreme bending radii and other types of stress.
 Do not route the wiring harness in the vicinity of belt drives or rollers without the use of appropriate protective measures.

Step	Procedure
1	Lay the wiring harness correctly according to the routing plan.

Fig. 34

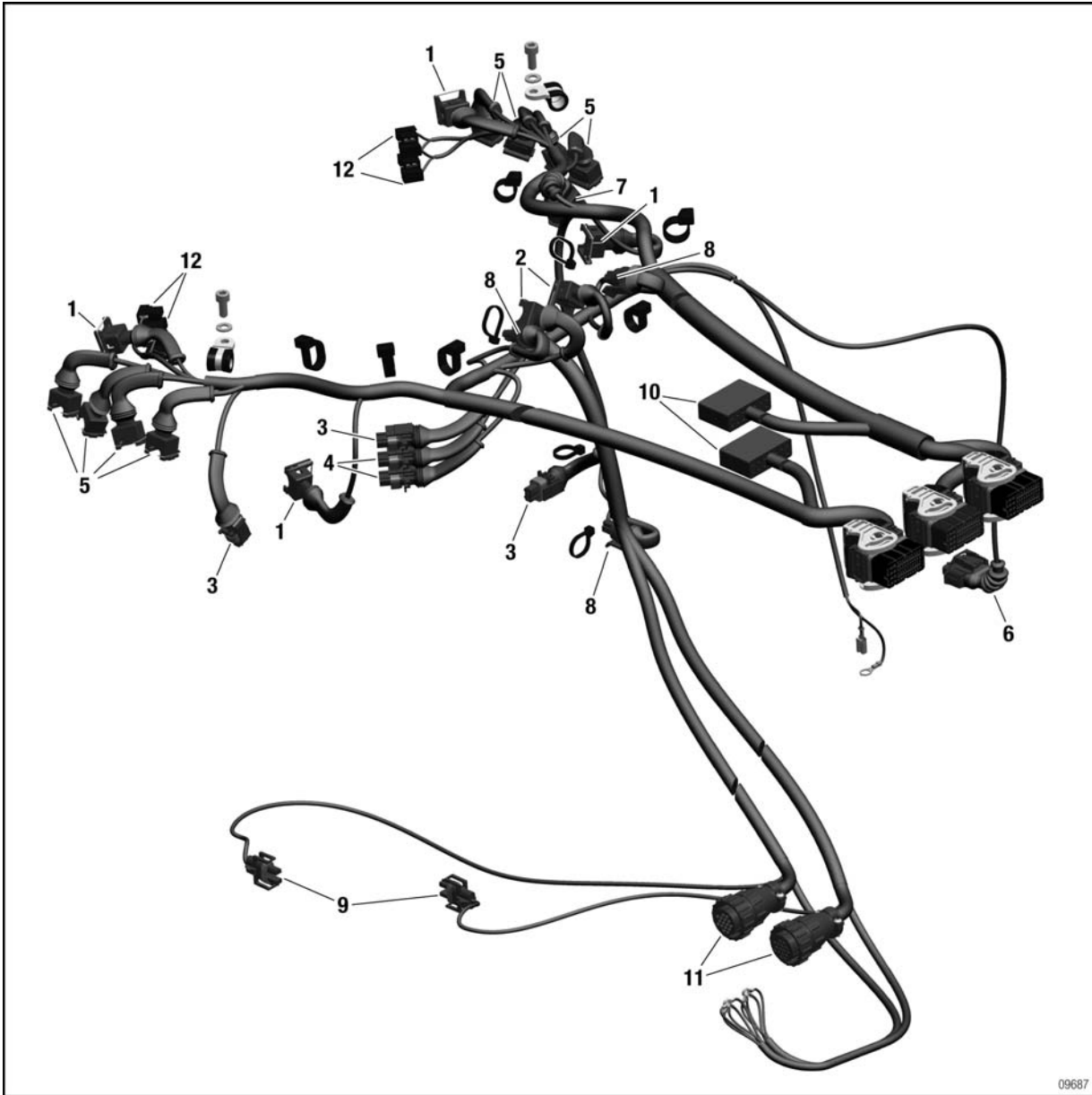


- | | |
|-------------------|--------------------------|
| 1. Wiring harness | 2. ECU connection socket |
| 3. FUSE BOX | 4. Engine |

NOTE: Before connecting a connector, remove the protective covering which may be attached both to the connector and to the connection socket.

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NOTE: If the wire is broken or the connector is defective, the damage can be repaired. The cable must be long enough if the connector is cut off. Repair with the tools described here must comply with the aircraft standard of the respective country.

Pos.	Part no. of connector set	Corresponding tool
1	881290	Crimping pliers TYCO 539 635-1
2	881292	Jaws TYCO 539 737-2
3	881296	Disassembly tool TYCO 1-1579007-6
4	881298	
5	881300	

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Pos.	Part no. of connector set	Corresponding tool
6	881306	Crimping pliers TYCO 539 635-1 Jaws TYCO 539 737-2
7	881308	Disassembly tool DELPHI 12094429
8	881302	Crimping pliers DELPHI 12155975 Disassembly tool DELPHI 12094429
9	881304	
10	881294	Crimping pliers MOLEX 0638114400 Disassembly tool MOLEX 63813-1500
11	881312	Crimping pliers TYCO 58495-1' Disassembly tool TYCO 305 183
12	881310	Crimping pliers TYCO 180319

AIRBOX PRESSURE SENSOR AND TEMPERATURE SENSOR - CONNECTION

The sensors are connected and disconnected in the same way. See section 76-50-00 Removal.

KNOCK SENSOR - CONNECTION

The sensors are connected and disconnected in the same way. See section 76-50-00 Removal.

CRANKSHAFT POSITION SENSOR - CONNECTION

The sensors are connected and disconnected in the same way. See section 76-50-00 Removal.

Note:

- CPS_1 for LANE A (upper crankshaft position sensor)
- CPS_2 for LANE B (lower crankshaft position sensor)

NOTE: The sensors are identical, they are not labelled.

TEMPERATURE AND PRESSURE SENSOR (OIL) - CONNECTION

The sensors are connected and disconnected in the same way. See section 76-50-00 Removal.

THROTTLE POTENTIOMETER - CONNECTION

The sensors are connected and disconnected in the same way. See section 76-50-00 Removal.

TEMPERATURE SENSOR CTS AND INJECTOR - CONNECTION

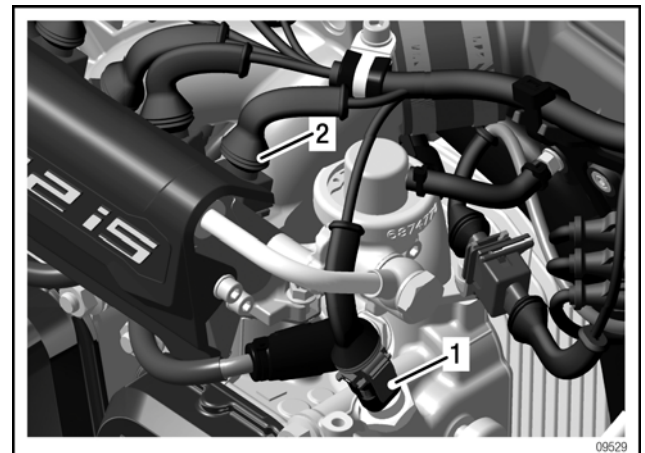
The sensors are connected and disconnected in the same way. See section 76-50-00 Removal.

Note:

NOTICE	
Do not clamp the cables for INJ_4 and CTS (Coolant Temperature Sensor) together.	

Step	Procedure
1	Screw on the cable clamp finger-tight with an M6x14 screw and 6.4 washer.
2	Plug in the temperature sensor with the CTS cable.

Fig. 35



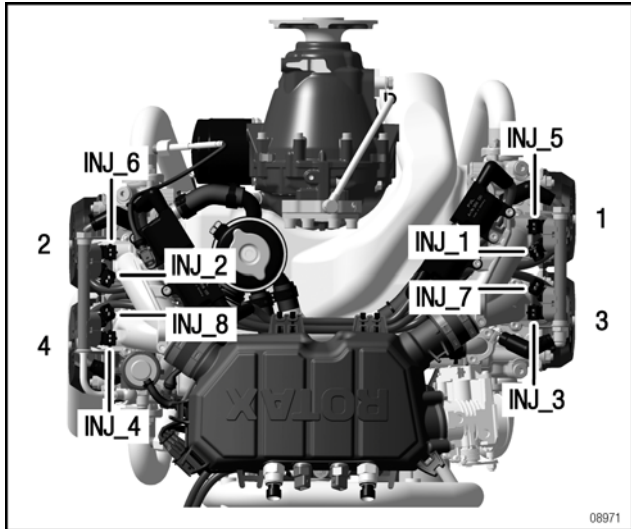
1. Temperature sensor CTS 2. INJ_4

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Step	Procedure
3	Plug in the injectors according to the labelling diagram.

Fig. 36



Labelling diagram

EGT CONNECTOR AND IGNITION COIL - CONNECTION

The sensors are connected and disconnected in the same way. See section 76-50-00 Removal.

To be observed:

NOTICE

The ignition coils are arranged like the cylinders (COIL_1, COIL_2, COIL_3, COIL_4). Ignition coils 1 and 2 are the other way round from ignition coils 2 and 4.

NOTE: The red cable is positive (+), the red cable with the black dash is negative (-). Double ignition coils are labelled + and -!

Step	Procedure
1	Plug in the connection to the double ignition coils.

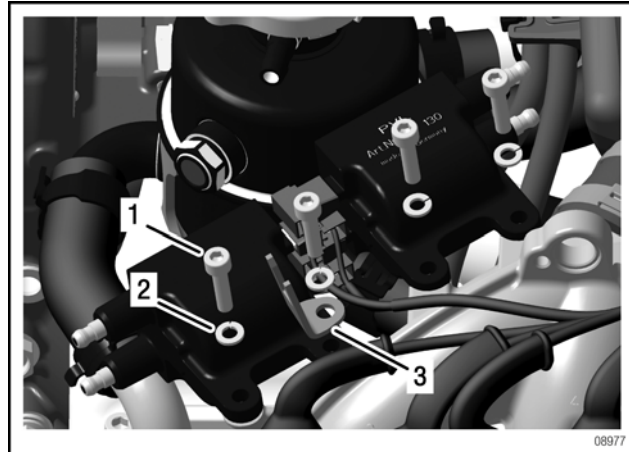
Fig. 37



1. Double ignition coil 2. Plug connection

Step	Procedure
2	Tighten the M5x16 Allen screws and 5.3 washer. Tightening torque 5 Nm (44.25 in. lb.).

Fig. 38

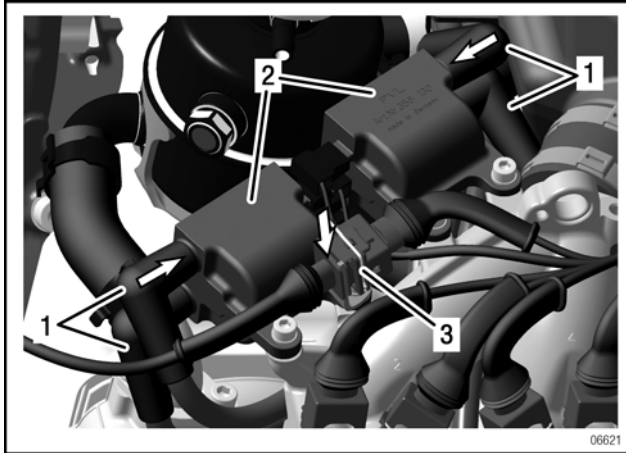


1. M5x16 Allen screw 2. 5.3 washer
 3. Plug holder

Step	Procedure
3	Plug in the ignition coil connector and EGT connector.

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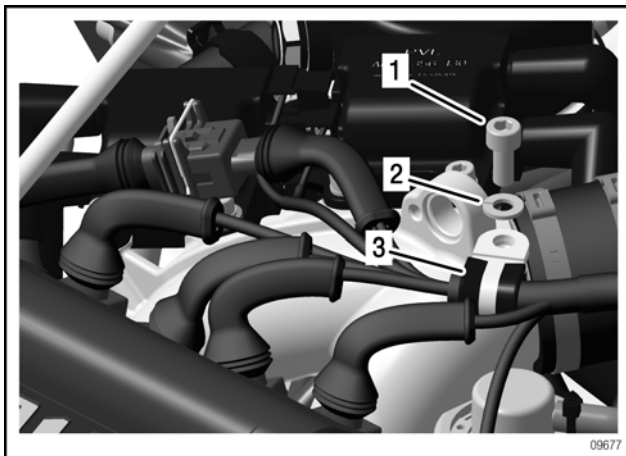
Fig. 39



- 1. Ignition coil connector
- 2. Double ignition coils
- 3. EGT Connector

Step	Procedure
4	Align the cables, they must not be stretched.
5	Secure the cable clamp with an M6x14 Allen screw and 6.4 washer with LOCTITE 243 and tighten it. Tightening torque 10 Nm (88.48 in. lb.).

Fig. 40



- 1. M6x14 Allen screw
- 2. 6.4 washer
- 3. 12/M6 cable clamp

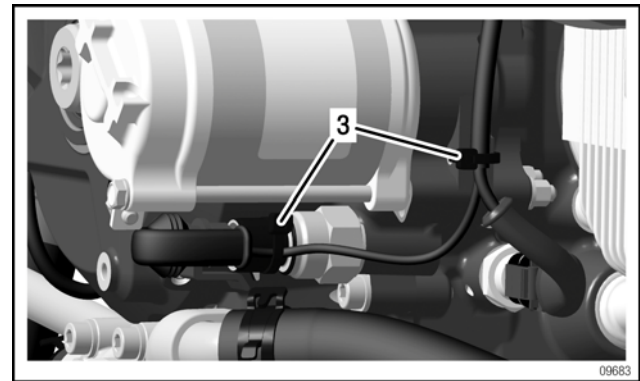
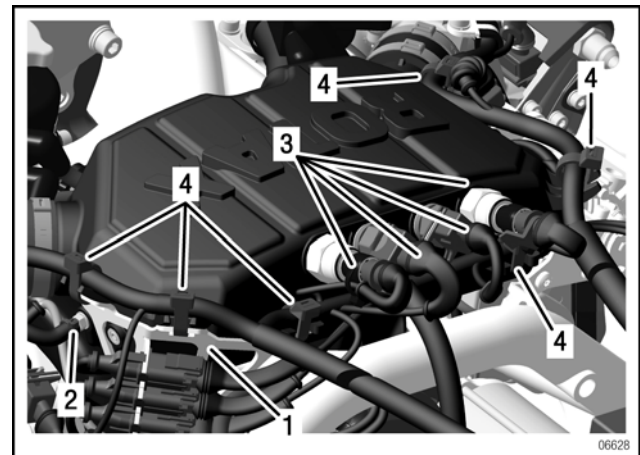
NOTICE

The Allen screws for the spring type hose clips go into the intake duct, they are therefore glued in with LOCTITE 243.
 Leaking Allen screws can cause an excessively lean mixture!

STRAIN RELIEF - CONNECTION

Step	Procedure
1	Attach strain reliefs to the wiring harness with cable ties.

Fig. 41



- 1. Plug holder
- 2. 203x7.6 mm cable tie
- 3. 142x3.2 mm cable tie

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CONTROL UNIT (ECU) - CONNECTION

The sensors are connected and disconnected in the same way. See section 76-50-00 Removal.

FUEL PUMP - CONNECTION

The sensors are connected and disconnected in the same way. See section 76-50-00 Removal.

FUSE BOX (FUSE BOX) - CONNECTION

The sensors are connected and disconnected in the same way. See section 76-50-00 Removal.

AMBIENT PRESSURE SENSOR - CONNECTION

The sensors are connected and disconnected in the same way. See section 76-50-00 Removal.

STARTER RELAY - CONNECTION

The sensors are connected and disconnected in the same way. See section 76-50-00 Removal.

FINISHING WORK

- Check that all plug connections are secure, contacted and free from corrosion and dirt.
 - Check the grounding for good contact and cleanliness.
 - Carry out an engine test run. See section 12-20-00 in the corresponding Line Maintenance Manual for the 912 i Series engine type.
-

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Chapter: 76-70-00
SENSORS AND ACTUATORS

Introduction

This section describes the maintenance of the sensor and actuator assembly of the ROTAX 912 i Series engine. The description is divided into sub-sections and explanations of system functions.

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Chapter: 76-70-00
SENSORS AND ACTUATORS

SPECIAL TOOLS

Description	Part no.
Multimeter	n.a.
21x12.5 insert for MAPS and OPS	876075
19x12.5 insert for CTS and OTS	876130

SERVICE PRODUCTS

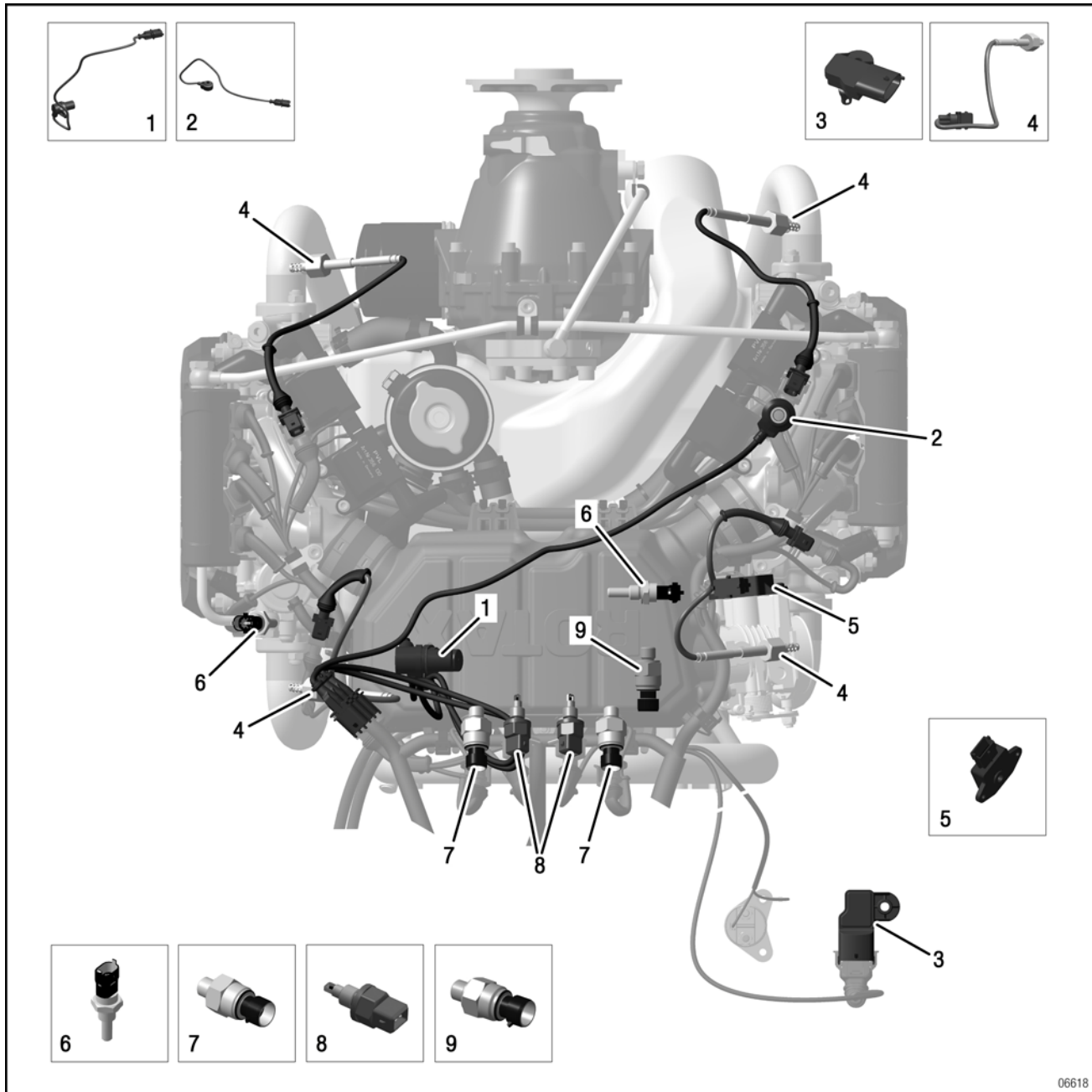
Description	Part no.
LOCTITE 243	897651
LOCTITE ANTI SEIZE	297434

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Sensors



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1. Crankshaft position sensor
(CPS 1 + 2)

2. Knock sensor
(KNOCK)

3. Ambient pressure sensor
(AAPTS)

4. Temperature sensor
(EGT)

5. Throttle potentiometer (TPS)

6. Temperature sensor
(CTS and OTS)

7. Pressure sensor
(MAPS 1 + 2)

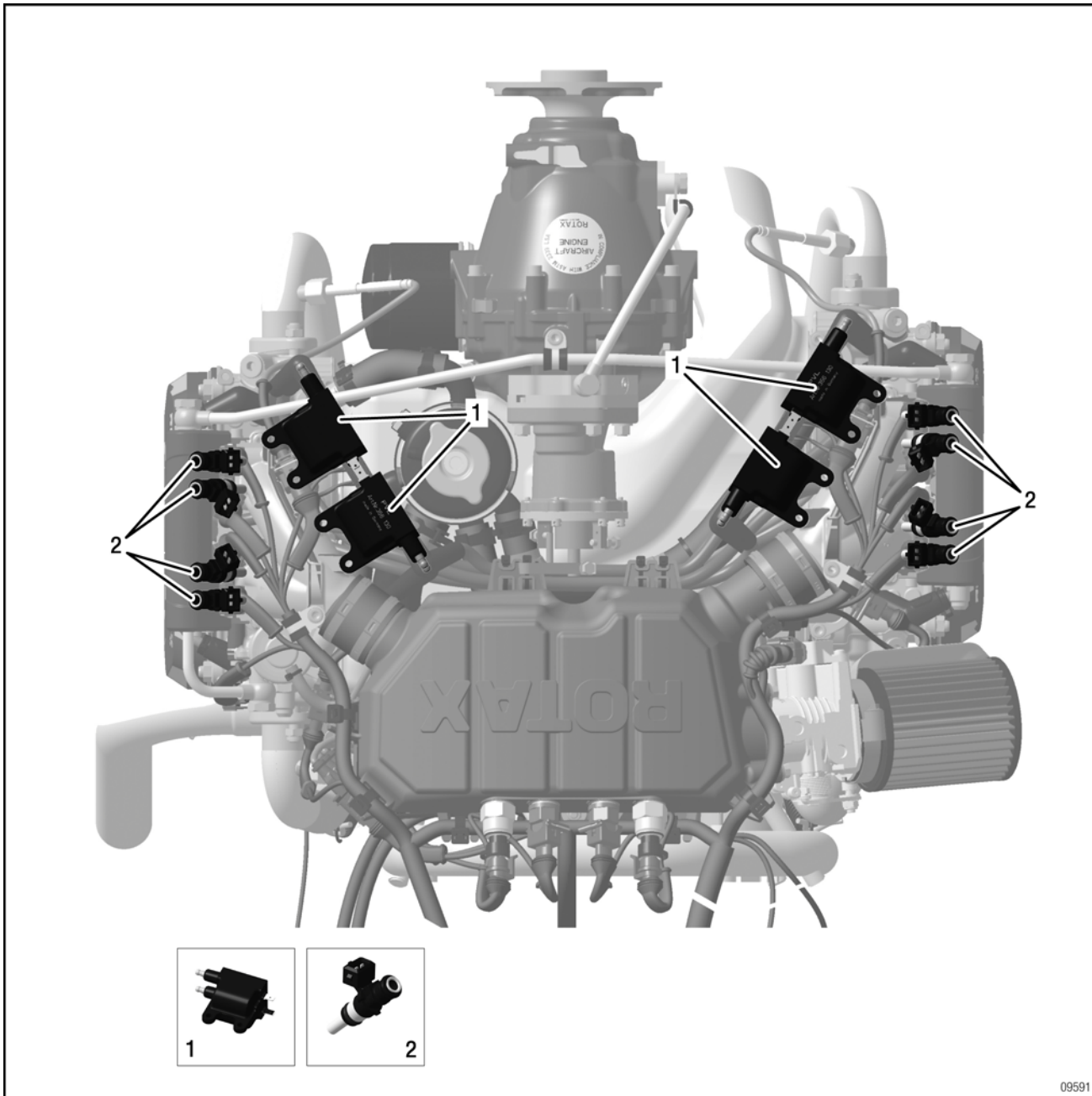
8. Temperature sensor
(MAPS 1 + 2)

9. Pressure sensor (OPS)

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Actuators



1. Ignition coils

2. Injection valves

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SYSTEM DESCRIPTION

GENERAL NOTE

In order to ensure that the engine is in the desired operating state and in full working order, a number of sensors are placed on it and used for the Engine Management System (EMS). The information captured by the sensors is transmitted to the ECU where it is processed, and the corresponding signals are sent on to the actuators.

SENSORS

1 Pressure/temperature sensor – ambient pressure

Wiring harness designation: AAPTS

Ambient air pressure and ambient temperature are measured with a combined pressure/temperature sensor. These measurement values are used to compensate for the different altitude and external temperatures.

1 Pressure sensor – oil pressure

Wiring harness designation: OPS

The pressure sensor measures the oil pressure of the engine.

2 Pressure sensors – airbox

Wiring harness designation: MAPS_1/MAPS_2

The pressure sensors measure the pressure of the intake air in the airbox.

2 Temperature sensors – airbox

Wiring harness designation: MATS_1/MATS_2

The temperature sensors measure the temperature of the intake air in the airbox.

4 Temperature sensors – exhaust

Wiring harness designation: EGT_1/EGT_2/
EGT_3/EGT_4

The temperature sensors measure the temperature of the exhaust gas and are used to regulate the injection quantity.

1 Temperature sensor – cooling system

Wiring harness designation: CTS

The temperature sensor measures the coolant temperature directly in the cylinder head of cylinder 4.

1 Temperature sensor – oil temperature

Wiring harness designation: OTS

The temperature sensor measures the oil temperature.

1 Knock sensor

Wiring harness designation: KNOCK

"Knocking" means uncontrolled combustion in petrol engines, which is caused by auto-ignition of the mixture in the combustion chamber. This undesirable combustion results in increased mechanical loads in the engine.

Operation in this condition over a long period can damage or even destroy the piston. Characteristic frequencies are generated during knocking. These frequencies are detected by the knock sensor and sent to the control unit (ECU).

1 Potentiometer – throttle valve

Wiring harness designation: TPS

The potentiometer measures the position of the throttle valve in the throttle body.

4 Double ignition coils

Wiring harness designation: COIL_1/COIL_2/
COIL_3/COIL_4

Each double ignition coil supplies 2 spark plugs with high voltage.

2 Crankshaft position sensors

Wiring harness designation: CPS_1/CPS_2

The control unit (ECU) requires the current position of the crankshaft for exact control of the ignition and injection points. The crankshaft position sensors measure the revolutions of the crankshaft and give the ECU information about the position of the pistons and the position of the crankshaft.

ACTUATORS AND INDICATORS

Injection valve (INJ_1 to INJ_8): (Injector)

In the engine, eight injection valves (INJ) are used, two for each cylinder.

Ignition coil (IGN): (Ignition Coil)

Four double ignition coils (with one primary coil and one secondary coil each) are attached to the engine. Each end of the secondary coil is connected to a spark plug of different cylinders by ignition cables.

SAFETY INFORMATION

WARNING

Danger of injury when removing hose connections, sensors and actuators!
Risk of fire due to flammable substances (e.g. fuel)
Naked flames and smoking in the installation area is not permitted!

NOTICE

Danger of damage to the fuel distribution system and ignition unit!
Do not touch or pull out ignition cables when the engine is running or at starting speed.

NOTE: The general safety instructions must be followed during all work on the sensors and actuators!

MAINTENANCE

For maintenance and special checks, see the relevant Maintenance Manual Line for the respective 912 i Series engine type.

REMOVAL

Preparation

Before the sensors and actuators are removed, the procedures and checks described below must be carried out to identify any further faults in the cylinder head and rectify them as part of repair work.

NOTE: This work can only be carried out on the whole unit.

- General visual inspection. See relevant Maintenance Manual Line for the 912 i Series engine type.
- Use the BUDS diagnostic unit for troubleshooting and to read out the error memory.

Plausibility test

BUDS (check the plausibility of the values of the sensors with the aid of the Maintenance Tool):

Step	Procedure
1	Engine standstill (cold engine).
2	Activate ECU.
3	Check the plausibility of the pressure, temperature values.
4	Start the engine.
5	Check the plausibility of the sensors.

Elimination process for pressure sensors (MAPS), temperature sensors (MATS) and injection valves (INJ)

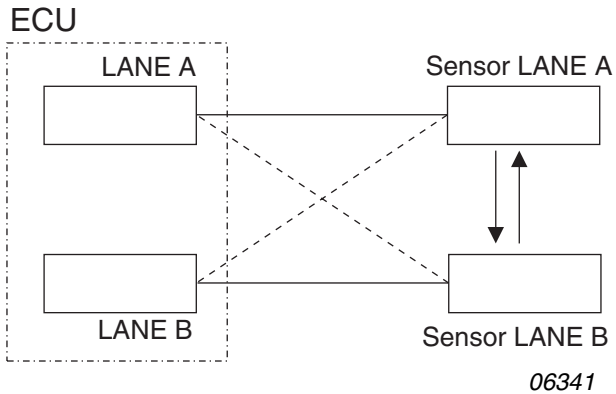
In order to identify a component clearly as defective, you should follow the process of elimination, e.g. change round the wiring harness connectors on the sensor. See [Fig. 1](#).

- If the error on the LANE remains the same, this means the wiring harness is not in working order.

If the error appears on the other LANE after the changeover, this means the sensor is not in working order.

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Fig. 1



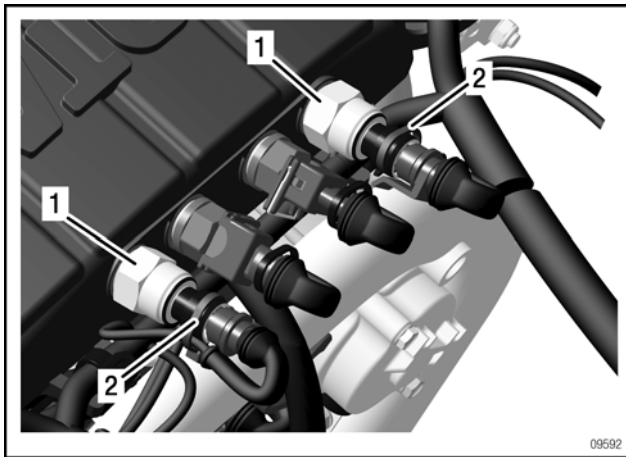
Wiring diagram – elimination process

PRESSURE SENSOR (MAPS_1/MAPS_2) - REMOVAL

Installation position: Airbox

Step	Procedure
1	Cut open the cable ties.

Fig. 2



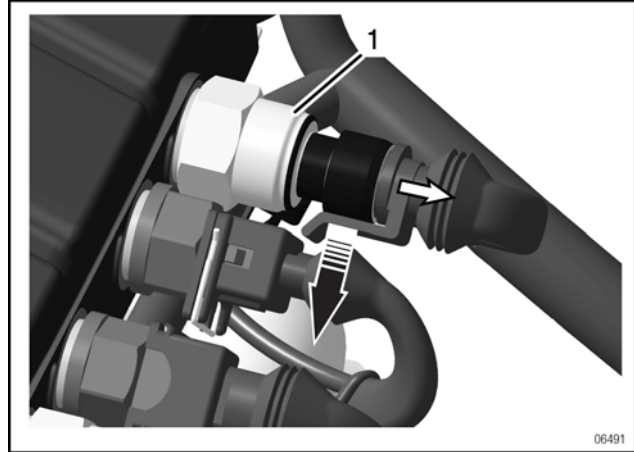
1. Pressure sensors

2. Cable ties

Step	Procedure
2	Pull the respective connector of the wiring harness out of the corresponding pressure sensor (MAPS_1/MAPS_2). See also section 76-50-00 Wiring harness (main strand).
3	Lift the latch and pull off.

Step	Procedure
4	Loosen the pressure sensor with an SW 21 open-ended spanner (or a similar tool) and remove it.
5	Close the threaded bore with the appropriate protective covering.

Fig. 3



1. Pressure sensor

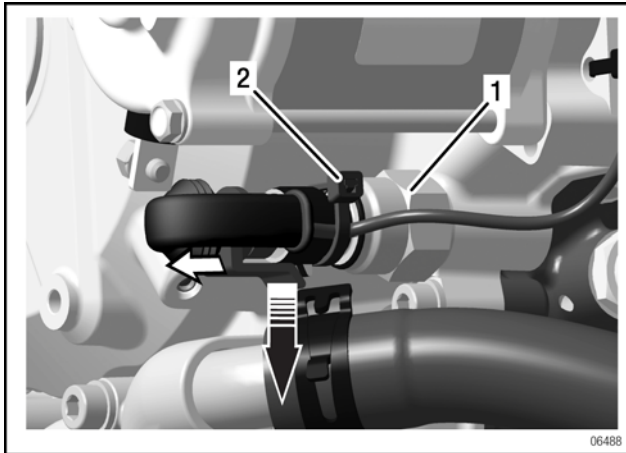
PRESSURE SENSOR (OPS) - REMOVAL

Installation position: Ignition housing

Step	Procedure
1	Cut open the cable ties on the pressure sensor.
2	Pull the respective connector of the wiring harness out of the corresponding pressure sensor (OPS). See also section 76-50-00 Wiring harness (main strand).
3	Lift the latch and pull out the connector.

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Fig. 4



1. Pressure sensor 2. Cable ties

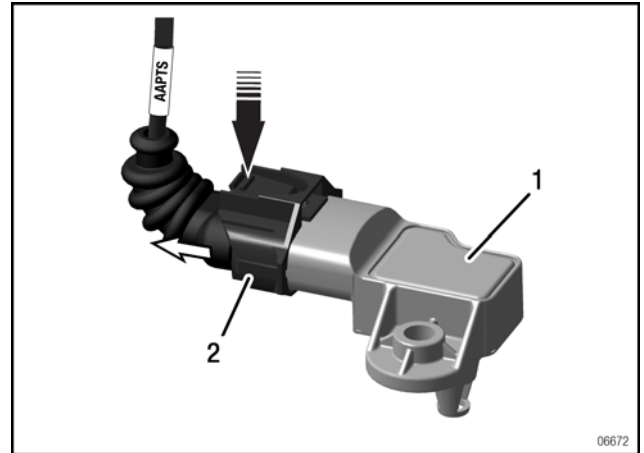
Step	Procedure
4	Loosen the pressure sensor with an SW 19 open-ended spanner part no. 876130 (or a similar tool) and remove it.
5	Close the threaded bore with the appropriate protective covering.

PRESSURE/TEMPERATURE SENSOR (APTS) - REMOVAL

Installation position: Aircraft frame

Step	Procedure
1	Push in the tab on the top of the connector and at the same time pull the connector out of the connection socket.
2	Follow the aircraft manufacturer's instructions for disassembly.

Fig. 5



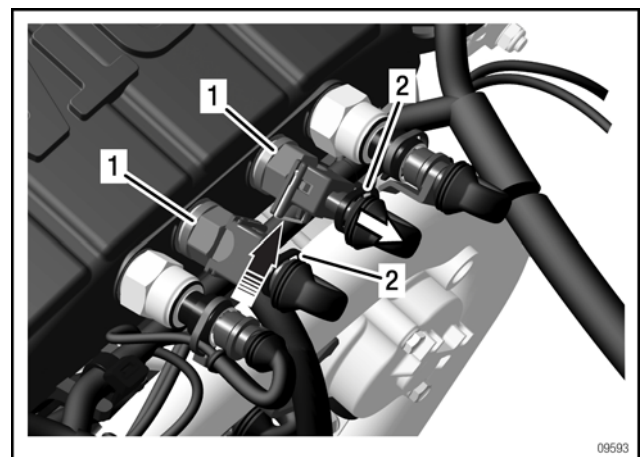
1. Pressure/temperature sensor 2. Connection socket

TEMPERATURE SENSOR (MATS_1+MATS_2) - REMOVAL

Installation position: Airbox.

Step	Procedure
1	Cut open the cable ties.
2	Unplug the relevant connector of the wiring harness from the corresponding temperature sensor (MATS). See also section 76-50-00 Wiring harness (main strand).

Fig. 6



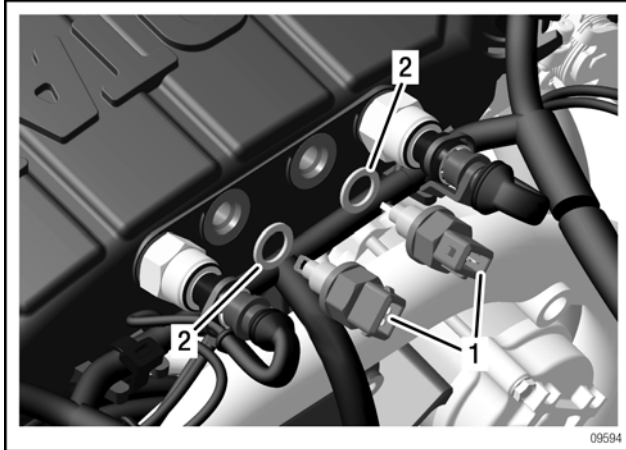
1. Temperature sensor Cable ties

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Step	Procedure
3	Unscrew the temperature sensor with an SW 19 open-ended spanner part no. 876130 (or similar tool) and remove it together with the sealing ring.
4	Close the threaded bore with the appropriate protective covering.

Fig. 7



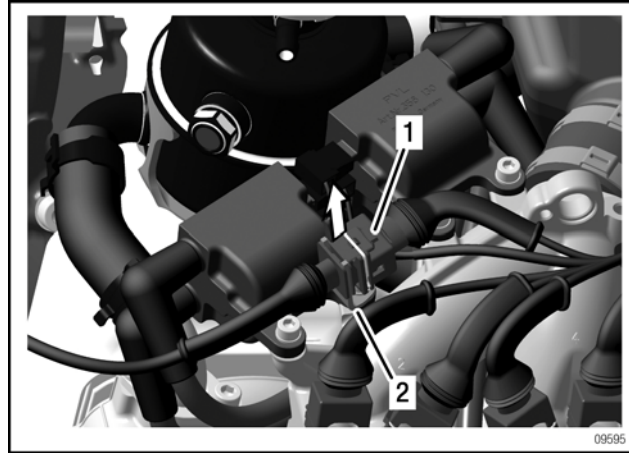
1. Temperature sensor 2. Sealing ring

**TEMPERATURE SENSOR (EGT1/EGT2/
EGT3/EGT4) - REMOVAL**

Installation position: Exhaust pipes

Step	Procedure
1	Carefully pull temperature sensor (EGT) out of the locking plate.

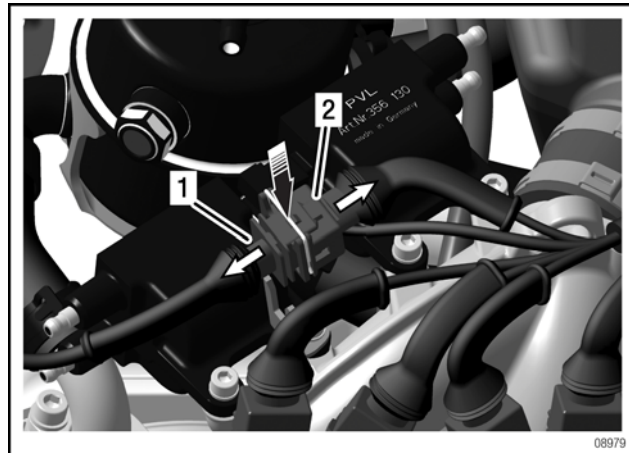
Fig. 8



1. Temperature sensor (EGT) 2. Locking plate

Step	Procedure
2	Remove the respective wiring harness plug from the corresponding temperature sensor (EGT1/EGT2/EGT3/EGT4). See also section 76-50-00 Wiring harness (main strand).
3	Press the metal bracket and separate the connectors.

Fig. 9

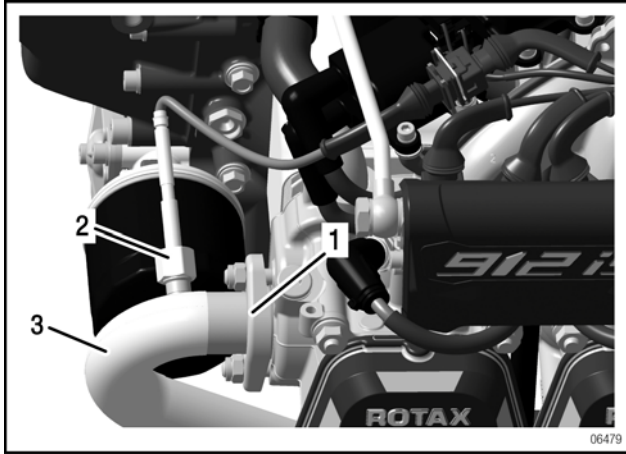


1. Temperature sensor 2. Washer

Step	Procedure
4	Use a size 17 open-ended spanner (or similar tool) to detach the temperature sensor from the exhaust pipe.

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Fig. 10



1. Exhaust flange 2. Temperature sensor
 3. Exhaust pipe

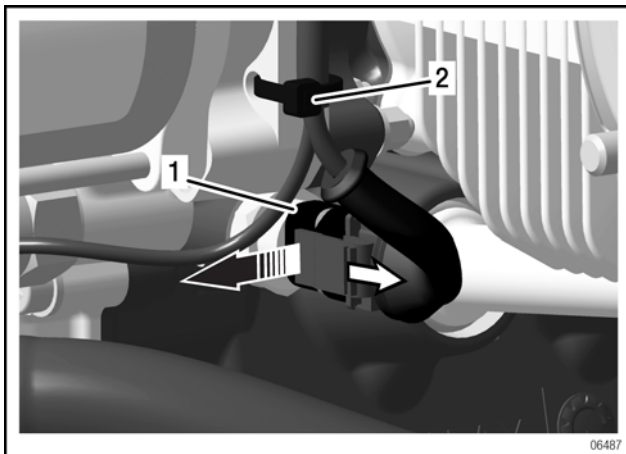
TEMPERATURE SENSOR (OTS) - REMOVAL

Installation position: Crankcase

See Fig. 11.

Step	Procedure
1	Cut open the cable ties.
2	Unplug the respective connector of the wiring harness (main strand) from the corresponding temperature sensor. See also section 76-50-00 Wiring harness (main strand).
3	Lift the latch and pull out the connector.

Fig. 11



1. Temperature sensor 2. Cable ties

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Step	Procedure
4	Use an SW19 open-ended spanner part no. 876130 (or a similar tool) to remove the temperature sensor from the crankcase.
5	Close the bore with the appropriate protective covering.

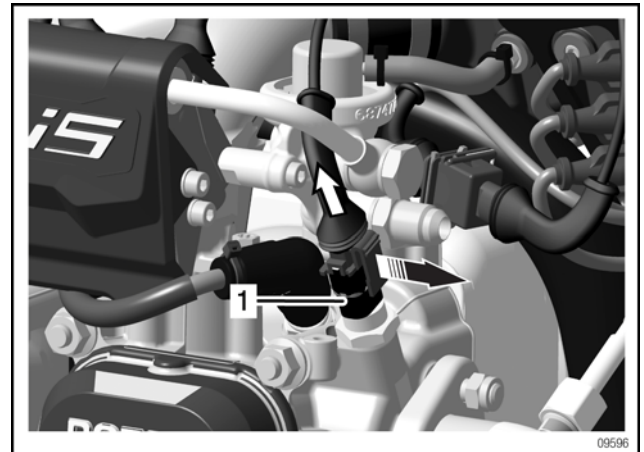
TEMPERATURE SENSOR (CTS) - REMOVAL

Installation position: Cylinder head (cylinder 4)

Step	Procedure
1	Unplug the respective connector of the wiring harness from the corresponding temperature sensor. See also section 76-50-00 Wiring harness (main strand).

Step	Procedure
2	Use an SW19 open-ended spanner part no. 876130 (or a similar tool) to remove the temperature sensor from the cylinder head.

Fig. 12



1. Temperature sensor

KNOCK SENSOR - REMOVAL

Preparation

- Remove the fuel line assy. See also section 73-10-00 Fuel system.
- Unplug EGT 1/3. See also section 76-50-00 Wiring harness.

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- Open the 1-ear clamp on the intake manifold 1/3.
- Remove the intake manifold 1/3 assy. with the fuel rail and put it to one side. See also section 73-10-00 Fuel system.

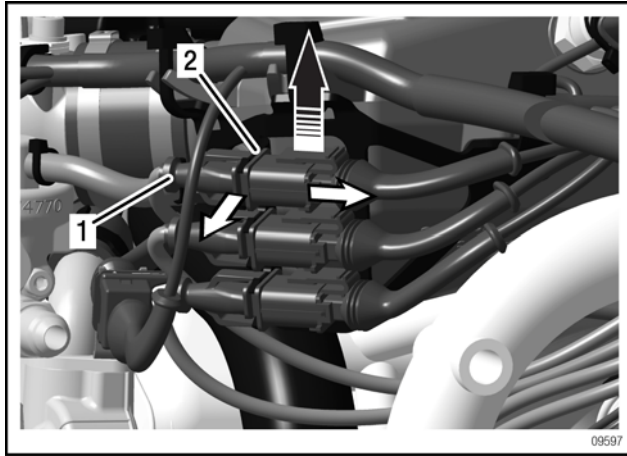
NOTE: The assemblies and lines are only to be removed if necessary and only as far as is necessary!

Installation position: Cylinder head 1

See Fig. 13.

Step	Procedure
1	Unplug the connector of the wiring harness from the knock sensor. See also section 76-50-00 Wiring harness (main strand).
2	Lift the latch and pull apart.
3	Pull the connector out of the support plate.

Fig. 13

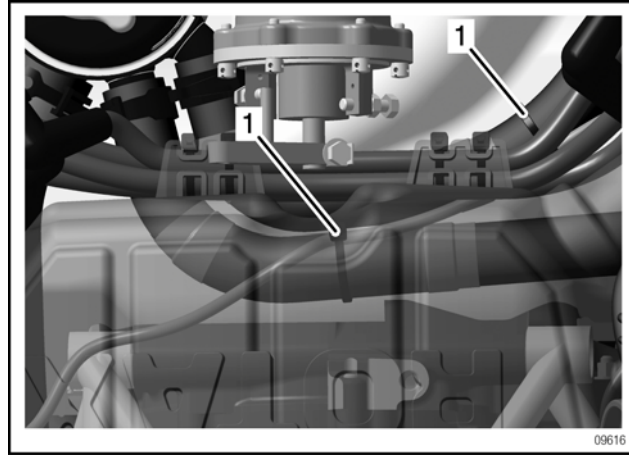


1. Connector

2. Support plate

Step	Procedure
4	Cut open the cable ties.

Fig. 14



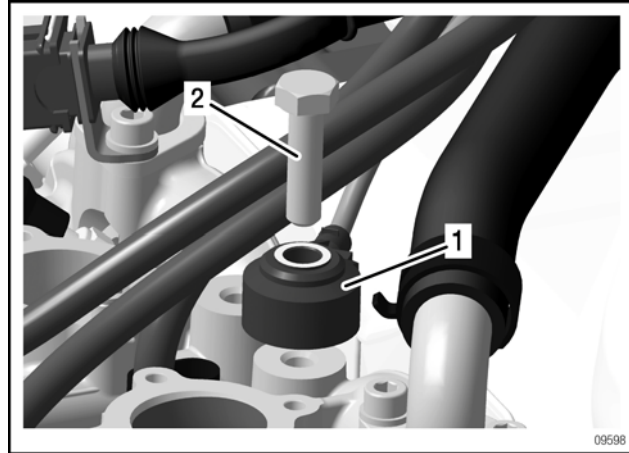
1. Cable ties

NOTICE

Mark the position of the sensor!

Step	Procedure
5	Loosen the M8x30 hex. screw.
6	Remove the knock sensor.

Fig. 15



1. Knock sensor

2. Hex. screw

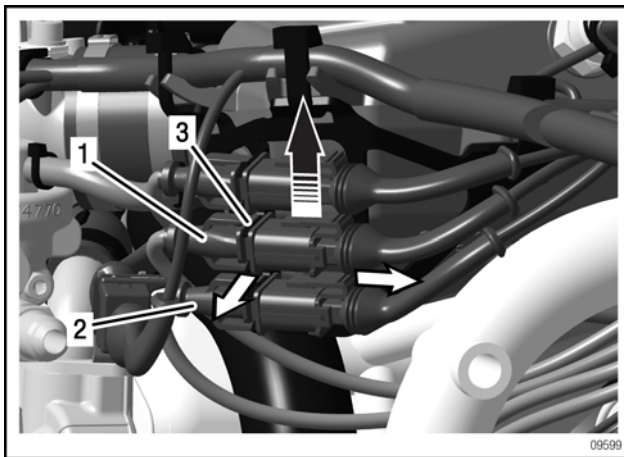
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**CRANKSHAFT POSITION SENSOR ASSY.
(CPS_1, CPS_2) - REMOVAL**

Installation position: Ignition housing

Step	Procedure
1	Unplug the respective connector of the wiring harness (main strand) from the corresponding crankshaft position sensor assy. See also section 76-50-00 Wiring harness (main strand).
2	Lift the latch and pull apart.
3	Pull the connector out of the support plate.

Fig. 16



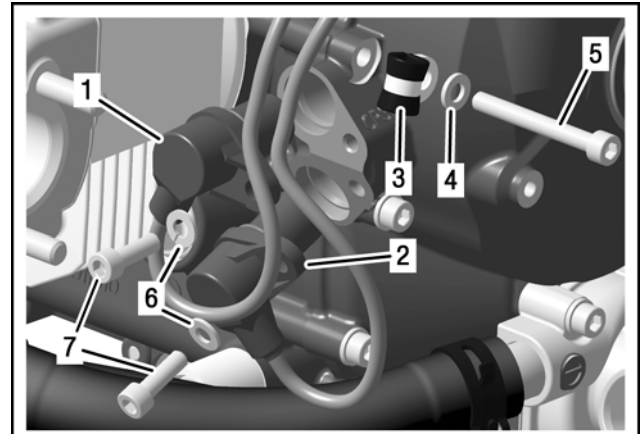
- 1. Connector CPS_1
- 2. Connector CPS_2
- 3. Support plate

Step	Procedure
4	Loosen the M6x20 Allen screw and washer with an Allen key 5 (or similar tool) and remove the cable clamp.
5	Remove crankshaft position sensor assy.
6	Close the bore with the appropriate protective covering.

NOTICE

Ensure that the O-ring is positioned on the crankshaft position sensor assy.

Fig. 17



- 1. Crankshaft position sensor CPS_1
- 2. Crankshaft position sensor CPS_2
- 3. Cable clamp
- 4. Washer
- 5. M6x20 allen screw

THROTTLE POTENTIOMETER (TPS) - REMOVAL

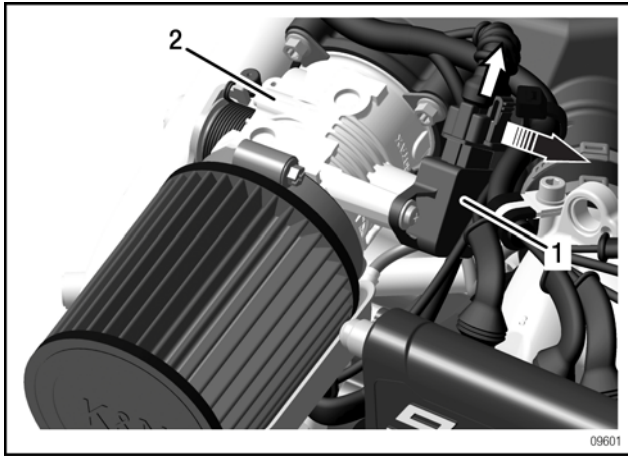
Installation position: Throttle body

NOTE: The throttle potentiometer is not available as a spare part.

Step	Procedure
1	Unplug the respective connector of the wiring harness from the throttle potentiometer. See also section 76-50-00 Wiring harness (main strand).
2	Remove the throttle body assy. To do this, see section 73-10-00 Fuel pump and distribution.

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Fig. 18



1. Throttle valve potentiometer 2. Throttle body assy.

INJECTION VALVE (INJ) - REMOVAL

To do this, see section 73-10-00 Fuel pump and distribution.

GOVERNOR - REMOVAL

See also section 61-20-00 Governor.

DOUBLE IGNITION COIL - REMOVAL

See also section 74-20-00 Distribution.

FUEL PUMP - REMOVAL

To do this, see section 73-10-00 Fuel pump and distribution.

CAUTION LAMP - REMOVAL

See documentation of aircraft manufacturer.

INSPECTION

SENSORS AND ACTUATORS INSPECTION/MEASUREMENT

Preparation

NOTE: Before starting to inspect the sensors and actuators, ensure that the whole aircraft system is fully functional!

Aircraft components to be checked:

- Battery
- Fuses
- Grounding connections
- Cable connections

GENERAL TEST PROCEDURE

NOTICE

During work on the components of the engine management system, there is a risk of damage. Never put measuring probes in plug connectors or use paper clips to carry out tests in the plug connectors.

NOTE: The MAINTENANCE TOOL BUDS software must be used for diagnostics!

- After a problem has been solved, any error entries in the ECU must be documented with the MAINTENANCE TOOL and then deleted.

Functional test

The function of the sensors and actuators must be checked with the ECU activated.

GENERAL RESISTANCE MEASUREMENT

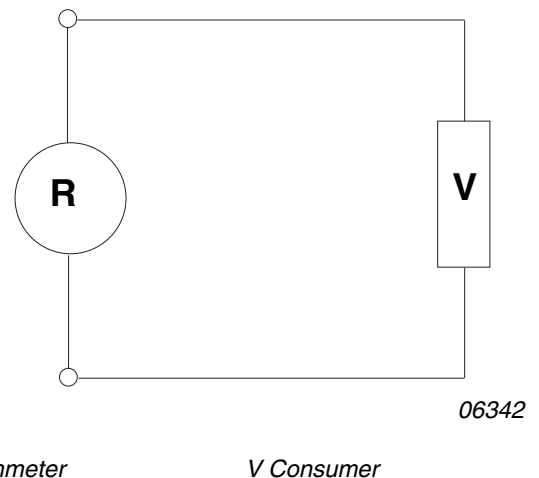
Before checking the resistance, ensure that there is no voltage present at the component to which the ohmmeter is connected. Always pull out the connectors beforehand. Switch off the ignition. Disconnect the battery. Otherwise the measurement unit can be damaged.

The ohmmeter is connected to the 2 connections of a consumer or to the 2 ends of an electric line. It doesn't matter which cable (+/-) of the measurement unit is clamped to which contact. Exceptions are resistance measurements on components which contain diodes.

The resistance measurement on the engine usually covers 2 areas:

- Resistance or component check
- Continuity check of an electric cable, a switch etc. This checks whether an electric cable is disconnected so that the connected electric device cannot function. The ohmmeter is connected to the two ends of the electric cable in question for the measurement. If the resistance is close to 0 (zero) then there is continuity. This means the electric cable is in working order. If the cable is broken, the measurement unit displays infinity.

Fig. 19



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RESISTANCE MEASUREMENT (TEMPERATURE SENSOR)

General note

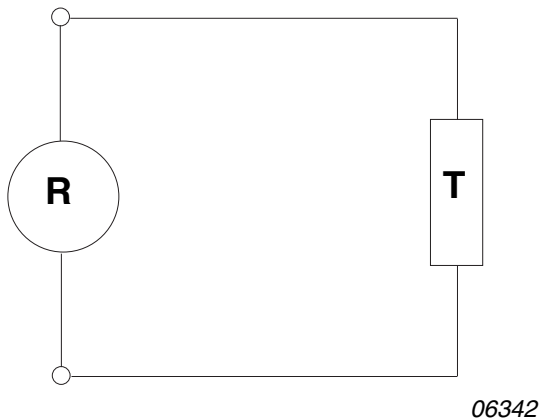
If resistance values are measured with an ohmmeter, all values are given at a temperature of approx. 20 °C. A resistance value changes with temperature.

The temperature sensors which are mostly used in the engine are NTC (Negative Temperature Coefficient) and operate in the opposite manner i.e. the resistance value essentially falls when the temperature rises. This must be taken into account when measuring at temperatures which differ from the specified values. The relationship between the resistance and the temperature can be found in the respective diagram of the relevant trigger coil.

The resistance value of a temperature sensor can appear to be in working order at ambient temperature but defective at other temperatures. If in doubt, replace the trigger coil.

NOTE: It should be remembered that the static measurement is only meaningful for the determined temperature ranges. Exact information can be obtained if the trigger coil has been tested over a wider temperature range.

Fig. 20



R Ohmmeter

T Temperature sensor

VOLTAGE MEASUREMENT

General note

NOTICE

Voltage supply:

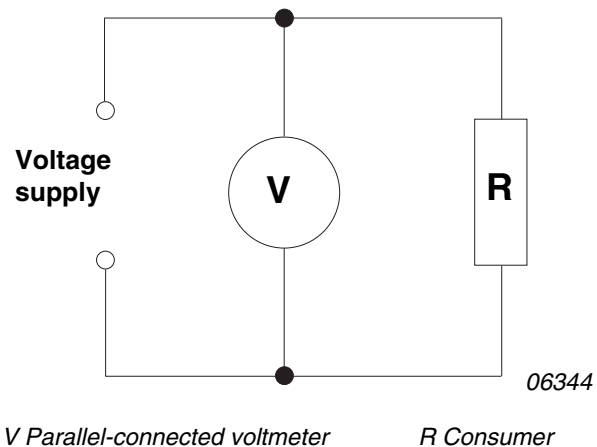
The secondary side of the ignition unit is an exception! The ignition voltage can be up to 30 000 volts!

This high voltage must only be measured with a special measurement unit or an oscilloscope with a special test probe.

Voltage can be detected with a simple test lamp or a voltage tester. However, this only indicates whether there any voltage is connected at all. To check the level of the voltage present, a voltmeter (= multimeter) must be connected.

Step	Procedure
1	The voltmeter must first be adjusted to the measurement range in which the voltage to be measured probably is. Voltages on the engine are generally no higher than approx. 28 volts.
2	Connect the cables of the measurement unit parallel to the consumer.

Fig. 21



V Parallel-connected voltmeter

R Consumer

06344

CURRENT MEASUREMENT

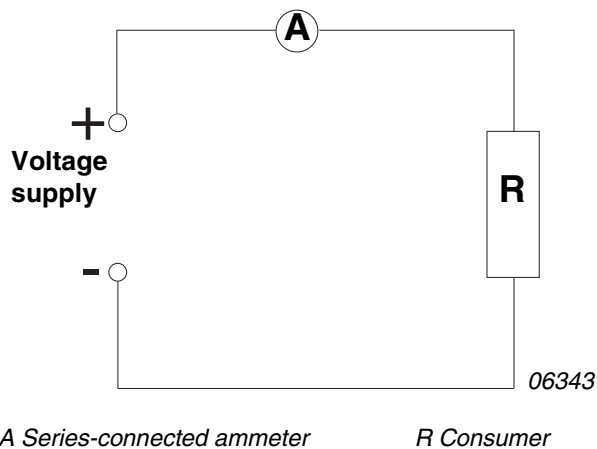
General note

It is not often necessary to measure the amperage on the engine. This requires an ammeter, which is usually integrated in a multi-meter.

NOTICE	
<p>Amperage: Never measure the amperage in the cable to the starter with a normal ammeter! The measurement unit can be destroyed by the high currents which occur here. A current clamp can be used for measuring such high amperages.</p>	

Step	Procedure
1	Before the current measurement, the measurement unit is adjusted to the measurement range in which the amperage you are measuring is likely to be found. If this is not known, set the highest measurement range, and if there is no display, switch down to the next measurement range, and so on.
2	The circuit must be disconnected in order to measure the amperage. The measurement unit (ammeter) is connected in between.

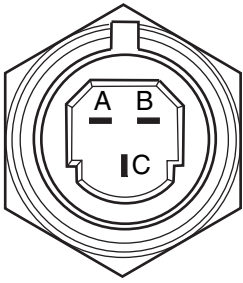
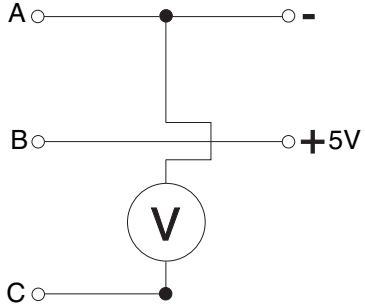
Fig. 22



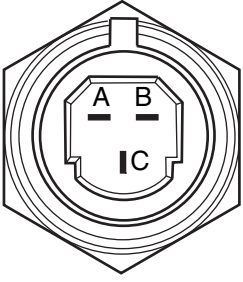
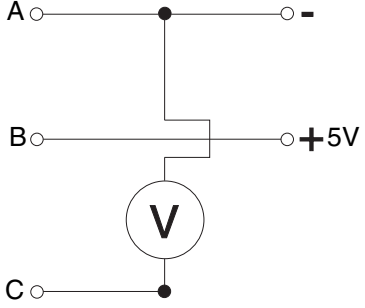
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BRP-Powertrain
MAINTENANCE MANUAL

PRESSURE SENSOR (MAPS_1, MAPS_2) - INSPECTION

Pressure sensor (MAPS_1, MAPS_2)			
Signal	PIN	Voltage [in V]	Remarks
Supply voltage	B	5 V ± 0.5	
OUT	C	0.5 4.5 V	corresponds to 0 to 2 bar
GROUND	A	0 V	
Measurement		 <p align="center">06345</p>	 <p align="right">06353</p>
Pressure (bar/psi)	Current [in V]		
2 bar / 29 psi	4.5 V		
0	0 V		

PRESSURE SENSOR (OPS) - INSPECTION

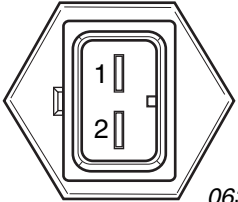

Pressure sensor (OPS)			
Signal	PIN	Voltage [in V]	Remarks
Supply voltage	B	5 V ± 0.5	
OUT	C	0.5 4.5 V	corresponds to 0 to 10 bar
GROUND	A	0 V	
Measurement		 <p align="center">06345</p>	 <p align="right">06353</p>
Pressure (bar/psi)	Current [in V]		
10 bar / 145 psi	4.5 V		
0	0 V		

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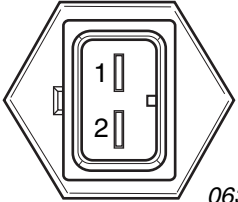

TEMPERATURE SENSOR (MATS_1/MATS_2) - INSPECTION

Temperature sensor (MATS 1, MATS 2)	
Measurement	
Temperature [°C/°F]	Resistance [Ω]
-10 °C	9217 +/- 9 %
0	5808 +/- 7 %
20 °C	2500 +/- 5 %
80 °C	331 +/- 10 %

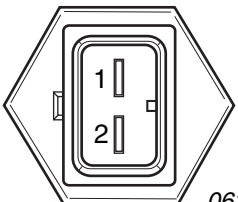

TEMPERATURE SENSOR (OTS) - INSPECTION

Temperature sensor (OTS)	
Measurement	
Temperature [°C/°F]	Resistance [Ω]
-10 °C/14 °F	9395 +/- 7 %
0/32 °F	5895 +/- 7 %
20 °C/38 °F	2499 +/-6 %
80 °C/176 °F	323 +/-3 %
100 °C/212 °F	187 +/- 2 %

TEMPERATURE SENSOR (CTS) - INSPECTION

Temperature sensor (CTS)	
Measurement	
Temperature [°C/°F]	Resistance [Ω]
-10 °C/14 °F	9395 +/- 7 %
0/32 °F	5895 +/- 7 %
20 °C/38 °F	2499 +/-6 %
80 °C/176 °F	323 +/-3 %
100 °C/212 °F	187 +/- 2 %

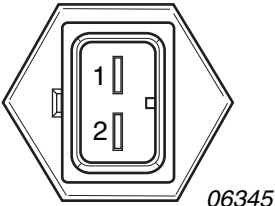
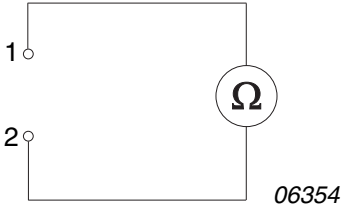



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TEMPERATURE SENSOR (EGT 1, EGT 2, EGT 3, EGT 4) - INSPECTION

Temperature sensor (EGT 1, EGT 2, EGT 3, EGT 4)	
Measurement	
Temperature [°C/°F]	Resistance [Ω]
-40 °C/-40 °F	169,7
0/32 °F	200,5
50 °C/122 °F	238,5
100 °C/212 °F	275,9
200 °C/392 °F	349
300 °C/572 °F	419,7
500 °C/932 °F	534,1

KNOCK SENSOR (KNOCK) - INSPECTION

- Corrosion or damage to the wiring, connector contacts or connections

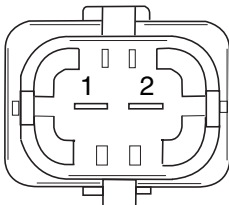

Preparation

Carry out a general visual inspection:
Check that the sensor is securely fitted.

Voltage and resistance test

cannot be tested

Knock sensor	
Measurement	
Messpunkte	Widerstand [Ω]
Between PIN1 and PIN 2	4 bis 10 MΩ
Between PIN and housing	≥ 1 MΩ

Voltage and resistance test

- cannot be tested

CRANKSHAFT POSITION SENSOR

(CPS_1/CPS_2

- INSPECTION

Preparation

Carry out a general visual inspection:

- Check that the sensors are fitted securely.
- Corrosion or damage to the wiring, connector contacts or connections
- Check the O-ring on the crankshaft position sensor
- Check the thread
- Check the crankshaft position sensor surface
- Check the crankshaft position sensor bore

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THROTTLE POTENTIOMETER (TPS) - INSPECTION

Preparation

Carry out a general visual inspection:

- Check the setting of the throttle valve actuation and travel (are both stops reached yes/no)
- Check that the pilot screw is fitted securely.
- Check that the throttle valve sensor is securely fitted
- Corrosion or damage to the connector and contacts
- Check that the sensor shaft moves freely
- Check the parameters of the throttle valve setting with the Maintenance Tool (especially if the ECU or the throttle valve sensor have been replaced)

Throttle potentiometer (TPS)			
Signal	PIN	Value [in V]	Remarks
Supply Voltage	1	+ 5 V	
Earth offset	2	0 V	
Signal	3	0.25 to 4.7 V	
Measurement			
Position	Voltage [in V]		
Closed	0.25 V		
Max. opened	4.7 V		

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BRP-Powertrain
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PRESSURE/TEMPERATURE SENSOR (AAPTS) - INSPECTION

Pressure/temperature sensor (AAPTS)			
Signal	PIN	Value [in V]	Remarks
Supply voltage	3	5 V +/- 0,25 V	
Earth offset	1	0 V	
Signal temperature	2	45 kΩ - 89 Ω	
Pressure	4	0,25 V - 4,75 V	
Measurement			
Pressure [bar/psi]	Voltage [in V]		
0,35 bar/5.08 psi	1,41 V +/- 0,065 V		
0,95 bar/13.78 psi	3,84 V +/- 0,065 V		
Temperature [°C/°F]	Resistance [Ω]		
-10	9395 Ω +/- 4 %		
0	5895 Ω +/- 3,8 %		
20	2499 Ω +/- 3,4 %		
30	1706 Ω +/- 3,1 %		
50	833,8 Ω +/- 2,8 %		
80	322,5 Ω +/- 2,3 %		
100	186,6 Ω +/- 2,0 %		

INJECTION VALVE - INSPECTION

Preparation

Carry out a general visual inspection:

- Corrosion or damage to the wiring, connector contacts or connections
- Check the labelling of the injection valves

Functional test

- Check flow rate
- Leakproofness
- Check the "spray pattern" using the map

NOTICE

Risk of damage to engine management system components! There is a risk of a permanent by-pass (fuel pressure surge).

Voltage and resistance test

- The internal resistance is about 12 Ω

GOVERNOR (ELECTRIC) - INSPECTION

See manual of aircraft manufacturer.

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 MAINTENANCE MANUAL

DOUBLE IGNITION COIL - INSPECTION

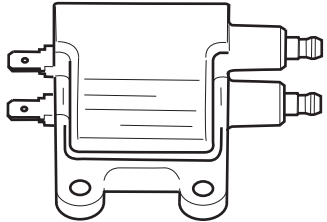
- Corrosion or damage to the wiring, connector contacts or connections
- Check the labelling of the connector

Preparation

Carry out a general visual inspection:

Doppelzündspule	
Messung/Werte	
Messpunkte	Widerstand [Ω]
Primärseite	0,65 Ω +/- 0,07 Ω
Sekundärseite	8,2 Ω +/- 0,8 k Ω

primary side



secondary side

06358

FUEL PUMP - INSPECTION

To do this, see section 73-10-00 Fuel pump and distribution.

CAUTION LAMP - INSPECTION

See also section 77-40-01 Caution lamps.

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INSTALLATION

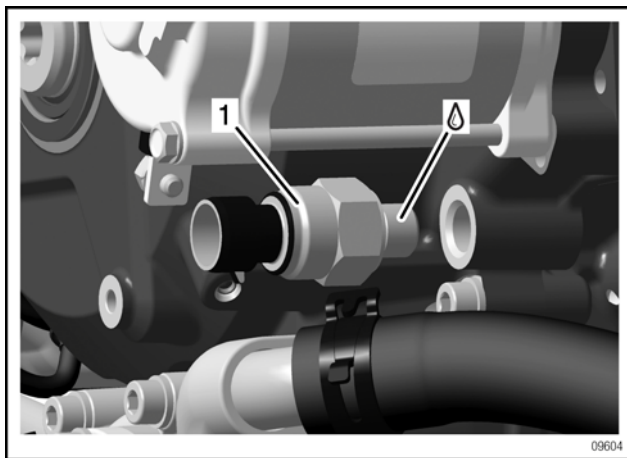
Preparation

- Clean all parts carefully
- Remove protective coverings

PRESSURE SENSOR (OPS) - INSTALLATION

Step	Procedure
1	Clean the thread of the pressure sensor.
2	Lubricate the thread of the pressure sensor with LOCTITE 243 and use an SW 19 open-ended spanner part no. 876075 (or a similar tool) to tighten it. Tightening torque 15 Nm (88.48 in. lb.).

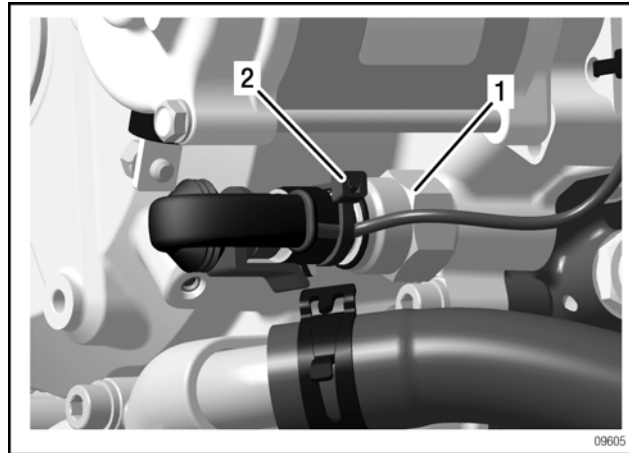
Fig. 23



1. Pressure sensor (OPS)

Step	Procedure
3	Plug the respective wiring harness connector into the corresponding pressure sensor. See section 76-50-00.
4	Attach cable ties (strain relief).

Fig. 24

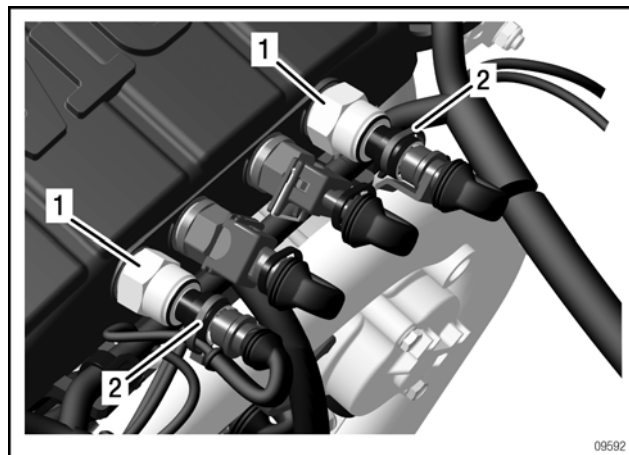


1. Pressure sensor (OPS) 2. Cable ties

PRESSURE SENSOR (MAPS_1/MAPS_2) - INSTALLATION

Step	Procedure
1	Clean the thread of the pressure sensor.
2	Tighten the pressure sensor with an SW 21 open-ended spanner part no. 876075 (or similar tool). Tightening torque 15 Nm (88.48 in. lb.).
3	Plug the respective wiring harness connector into the corresponding pressure sensor. See section 76-50-00.
4	Attach cable ties (strain relief).

Fig. 25



1. Pressure sensors (MAPS_1/MAPS_2) 2. Cable ties

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MAINTENANCE MANUAL

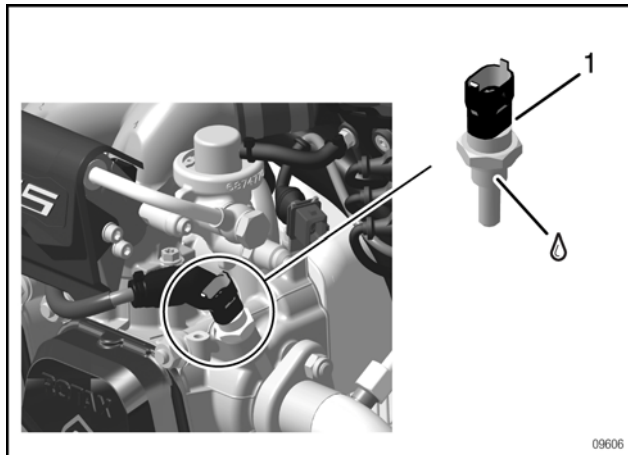
PRESSURE/TEMPERATURE SENSOR (APTS) - INSTALLATION

Step	Procedure
1	Follow the aircraft manufacturer's instructions for assembly.
2	Plug the respective wiring harness connector into the corresponding pressure or temperature sensor. See section 76-50-00.

TEMPERATURE SENSOR (CTS) - INSTALLATION

Step	Procedure
1	Clean the thread of the temperature sensor.
2	Lubricate the thread of the pressure sensor with LOCTITE 243 and use an SW 19 open-ended spanner part no. 876130 (or a similar tool) to tighten it. Tightening torque 15 Nm (88.48 in. lb.).
3	Plug the respective wiring harness connector into the corresponding temperature sensor. See section 76-50-00.

Fig. 26

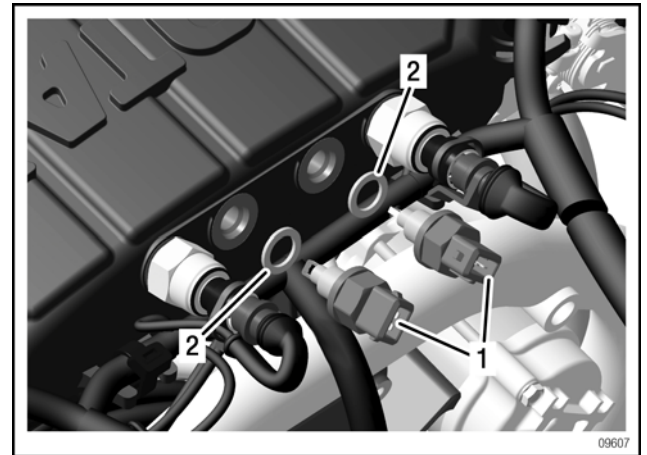


1. Temperature sensor (CTS)

TEMPERATURE SENSOR (MATS) - INSTALLATION

Step	Procedure
1	Clean the thread of the temperature sensor.
2	Fasten the temperature sensor and sealing ring with an SW 19 open-ended spanner part no. 876130 (or similar tool). Tightening torque 15 Nm (88.48 in. lb.).

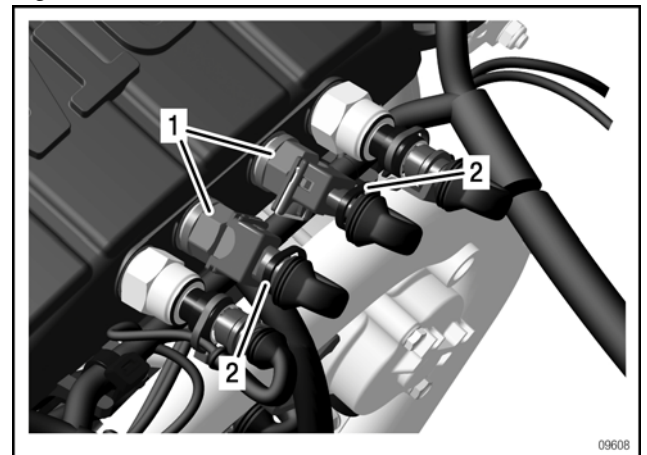
Fig. 27



1. Temperature sensor (MATS) 2. Sealing ring

Step	Procedure
3	Plug the respective wiring harness connector into the corresponding temperature sensor. See section 76-50-00.
4	Attach cable ties (strain relief).

Fig. 28



1. Temperature sensor (MATS) 2. Cable ties

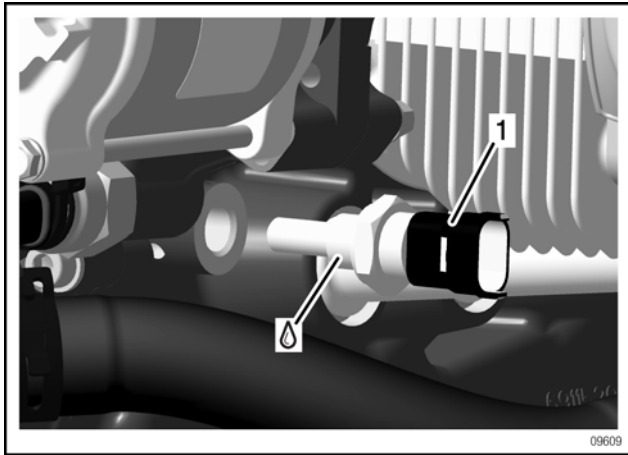
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TEMPERATURE SENSOR (OTS) - INSTALLATION

Step	Procedure
1	Clean the thread of the temperature sensor.
2	Lubricate the thread of the pressure sensor with LOCTITE 243 and use an SW 19 open-ended spanner part no. 876130 (or a similar tool) to tighten it. Tightening torque 15 Nm (88.48 in. lb.).
3	Plug the respective wiring harness connector into the corresponding temperature sensor. See section 76-50-00.

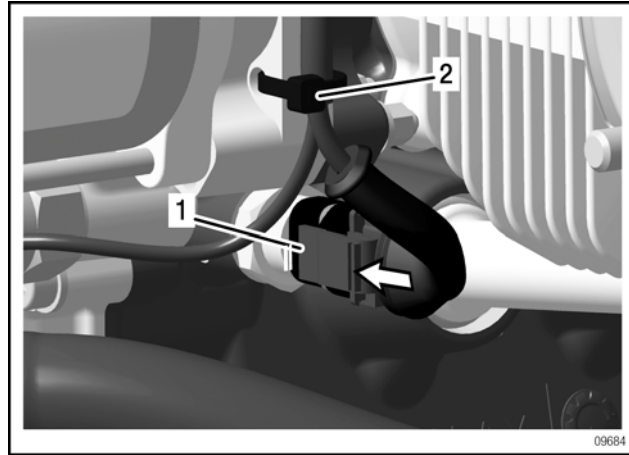
Fig. 29



1. Temperature sensor (OTS)

Step	Procedure
4	Attach cable ties.

Fig. 30

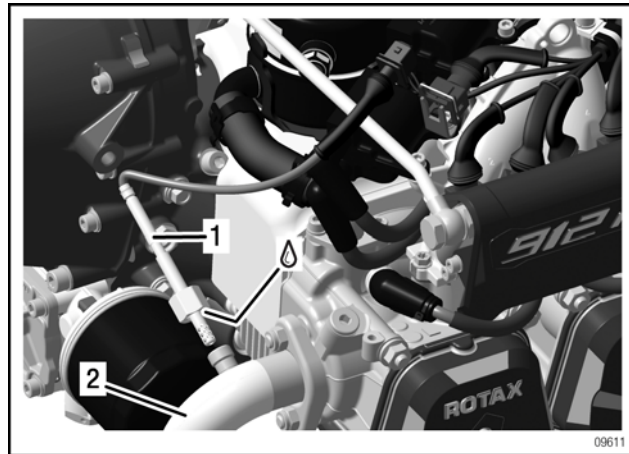


1. Temperature sensor (OTS) 2. Cable ties

TEMPERATURE SENSOR (EGT1/EGT2/EGT3/EGT4) INSTALLATION

Step	Procedure
1	Clean the thread of the temperature sensor.
2	Lubricate thread of temperature sensor with LOCTITE ANTI SEIZE.

Fig. 31

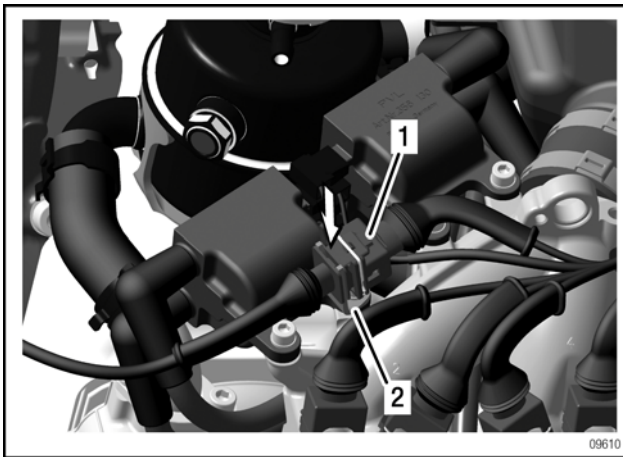


1. Temperature sensor 2. Inlet pipe

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Step	Procedure
3	Use an SW 17 torque wrench (or similar tool) to tighten the temperature sensors in the inlet pipes. Tightening torque 25 Nm (19 ft.lb.).
4	Plug the respective wiring harness connector into the corresponding pressure or temperature sensor. See section 76-50-00.
5	Carefully push the connector (EGT) in to the locking plate.

Fig. 32

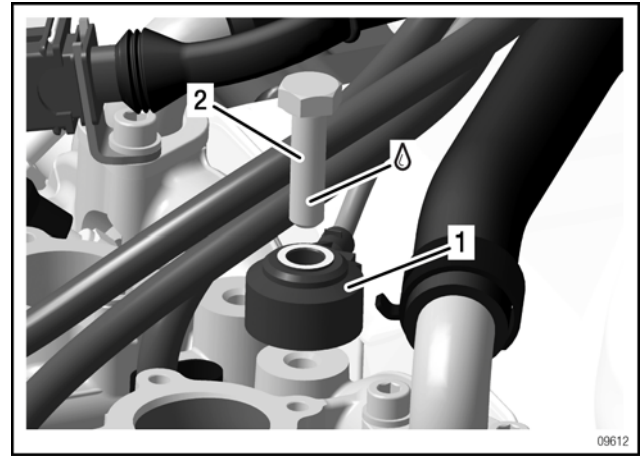


1. Connector (EGT) 2. Locking plate

KNOCK SENSOR (KNOCK) - INSTALLATION

Step	Procedure
1	Clean the end face of the knock sensor.
2	Screw the knock sensor hand-tight into engine block.
3	Adjust the knock sensor, do not let it come into contact with the intake manifold.
4	Tighten the knock sensor. Tightening torque 20 Nm (176.96 in.lb.).

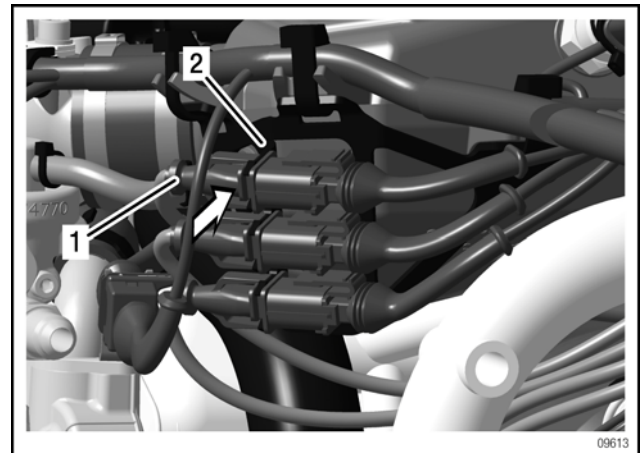
Fig. 33



1. Connector (KNOCK) 2. Locking plate

Step	Procedure
5	Plug the respective wiring harness connector into the knock sensor.
6	Carefully push the connector (KNOCK) in to the locking plate.

Fig. 34

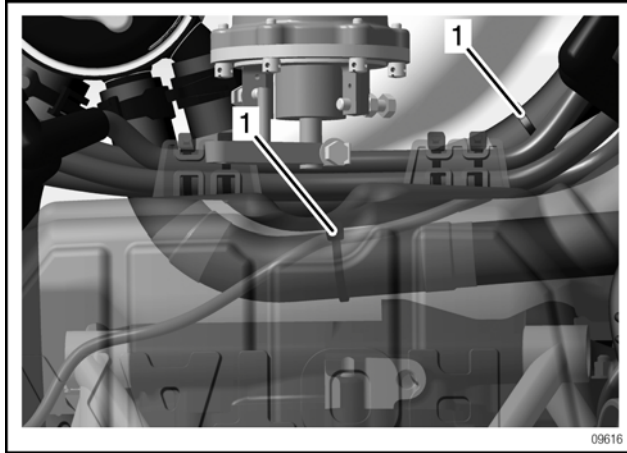


1. Connector (KNOCK) 2. Locking plate

Step	Procedure
7	Attach the cables of the knock sensor with 2 cable ties.

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Fig. 35



1. Cable ties

FINISHING WORK ON THE KNOCK SENSOR

Follow the same procedure as removal when doing this work. See section 76-70-00 Knock sensor removal – preparation

CRANKSHAFT POSITION SENSOR ASSY. (CPS_1/CPS_2) - INSTALLATION

NOTICE

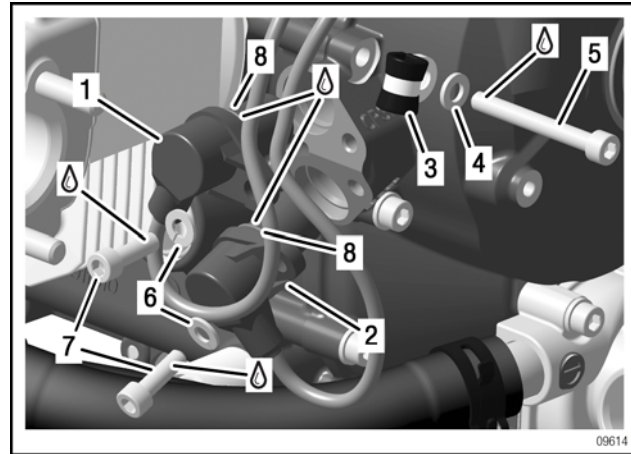
Ensure that the O-ring rests on the sensor.

Step	Procedure
1	Push the cable clamp onto the cable.

NOTICE

Arrange the cable so that it does not rest against the engine suspension frame or other components.

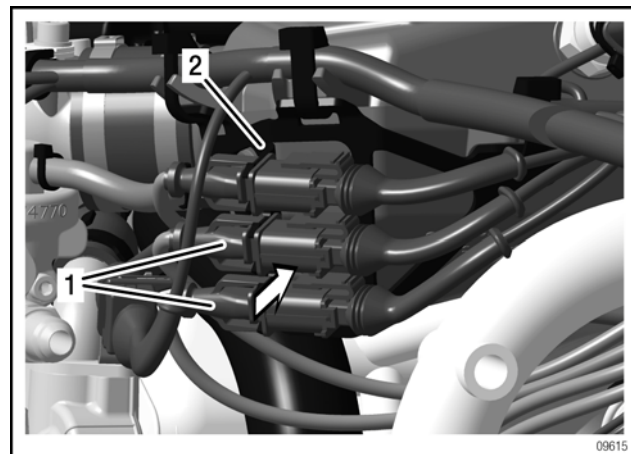
Fig. 36



- 1. Crankshaft position sensor CPS_1
- 2. Crankshaft position sensor CPS_2
- 3. M6x20 allen screw
- 4. Washer
- 5. Cable clamp
- 6. O-ring

Step	Procedure
2	Secure M6x20 Allen screw with LOCTITE 243 and tighten it. Tightening torque 10 Nm (88.48 in. lb.).
3	Plug the respective wiring harness connector into the crankshaft position sensor.
4	Carefully push the connector (CPS) into the locking plate.

Fig. 37



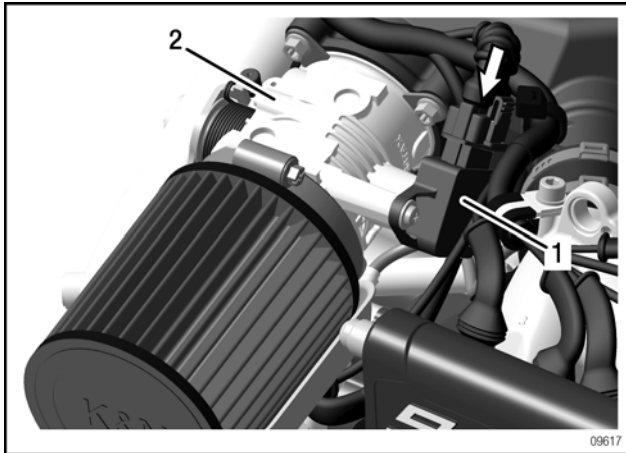
- 1. Connector (CPS)
- 2. Locking plate

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THROTTLE POTENTIOMETER (TPS) - INSTALLATION

Step	Procedure
1	Install the throttle body assy. To do this, see section 73-10-00 Fuel pump and distribution.
2	Plug the respective wiring harness connector into the throttle potentiometer.

Fig. 38



1. Throttle valve potentiometer 2. Throttle body assy.

FINISHING WORK

- Complete the engine
 - Fill with operating fluids (coolant, oil or fuel). See also section 12-20-00 Planned maintenance.
 - Carry out an engine test run. See also section 12-20-00 Planned maintenance
-

INJECTION VALVE (INJ) - INSTALLATION

To do this, see section 73-10-00 Fuel pump and distribution.

GOVERNOR - INSTALLATION

See also section 61-20-00 Governor.

DOUBLE IGNITION COIL - INSTALLATION

To do this, see section 73-10-00 Fuel pump and distribution.

FUEL PUMP - INSTALLATION

To do this, see section 73-10-00 Fuel pump and distribution.

CAUTION LAMP - INSTALLATION

See documentation of aircraft manufacturer.

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Chapter: 78-00-00
EXHAUST SYSTEM

Introduction

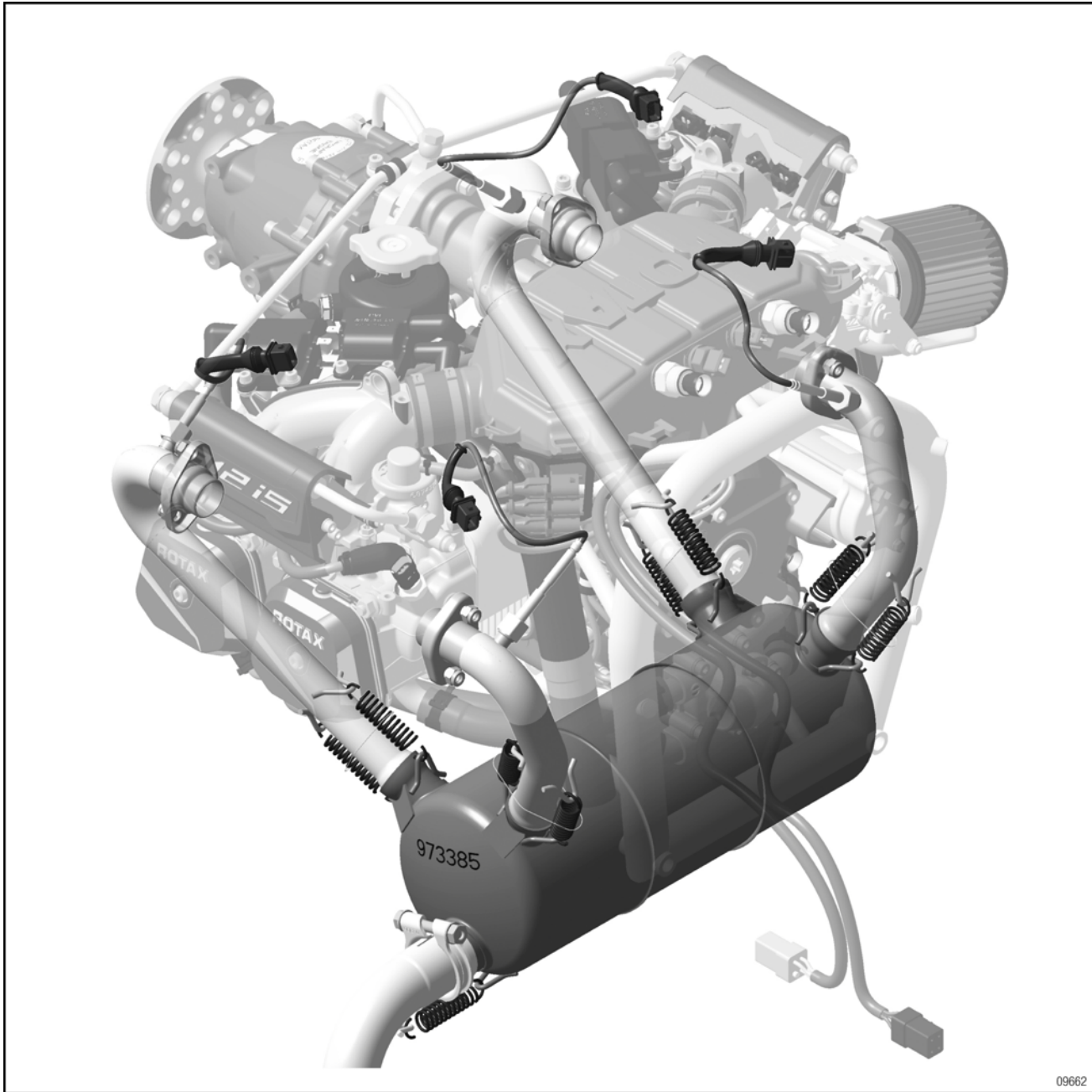
This section describes the maintenance of the exhaust system assembly of the ROTAX 912 i Series engine. The description is divided into sub-sections and explanations of system functions.

Subject	Page
1. Introduction A. System description B. Safety information C. Connections for display systems	Chapter 78-00-00 Page 3 Page 3 Page 3
2. Exhaust	Chapter 78-10-00

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MAINTENANCE MANUAL

Exhaust system



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SYSTEM DESCRIPTION

The exhaust system of the ROTAX 912 i Series engine is optional. If it was not ordered when the engine was purchased, only the 4 exhaust sockets on the cylinder head are supplied. The exhaust system must be designed and manufactured by the aircraft or aircraft frame manufacturer.

REMOVAL, INSPECTION, ASSEMBLY

Follow the aircraft manufacturer's instructions for removal, inspection and assembly.

NOTICE

The muffler assy. with part no. 973385 is also used in series 912 S/ULS engines and can optionally be used in series 912 UL/F/A engines.

SAFETY INFORMATION

 **WARNING**

Danger of severe burns and scalds! Allow the engine and exhaust system to cool to ambient temperature before starting work.

CONNECTIONS FOR DISPLAY SYSTEMS

NOTICE

Follow the instructions in the Installation Manual regarding connections for instrumentation.

EXHAUST GAS TEMPERATURE DISPLAY

The engine is equipped with 4 EGT temperature sensors for regulating the optimal fuel/air mixture. These can be installed in various ways depending on the exhaust system.

NOTICE

Corrosion damage on sensors! The sensors must be installed vertically from above.

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MAINTENANCE MANUAL

NOTES

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Chapter: 78-10-00
EXHAUST (OPTIONAL)

Introduction

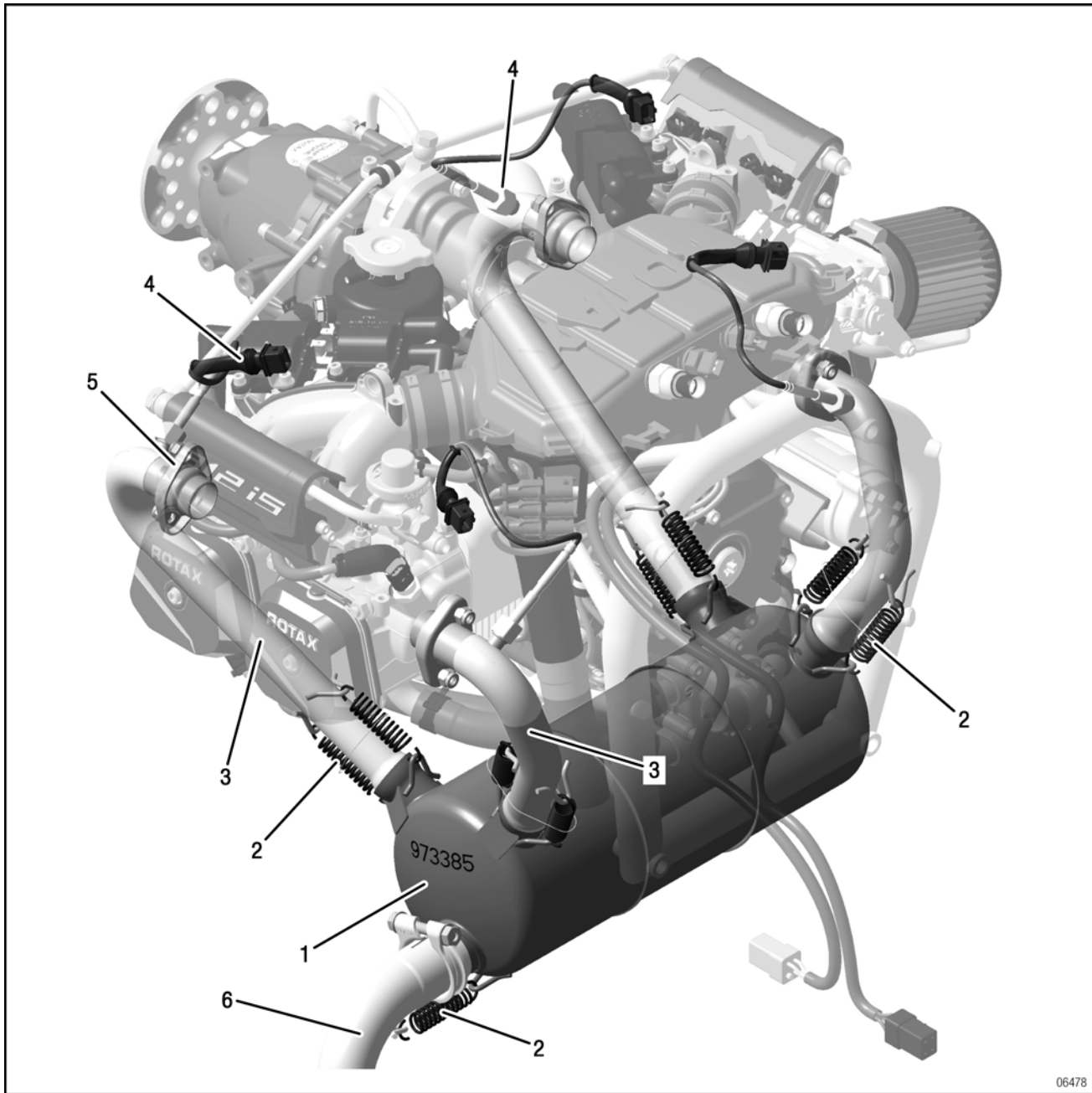
This section describes the maintenance of the optionally available exhaust of the ROTAX 912 i Series engine. The description is divided into sub-sections and explanations of system functions.

NOTE: For **non-ORIGINAL** ROTAX exhaust systems, use the maintenance manual of the aircraft manufacturer.

Subject	Page
1. Introduction	Page 1
2. Service products	Page 3
3. System description	Page 5
4. Removal	Page 5
A. Preparation	Page 5
B. Exhaust assy. - removal	Page 5
C. Exhaust pipe - removal	Page 5
5. Inspection	Page 6
A. Exhaust assy. - inspection	Page 6
B. Exhaust pipe and cylinder head - inspection	Page 6
6. Installation	Page 7
A. Exhaust pipe on cylinder head - installation	Page 7
B. Exhaust assy. - installation	Page 7

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MAINTENANCE MANUAL



1. Muffler assy.

2. Tension spring

3. Exhaust pipe

5. Exhaust flange

6. Outflow pipe / exhaust elbow

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Chapter: 78-10-00
EXHAUST

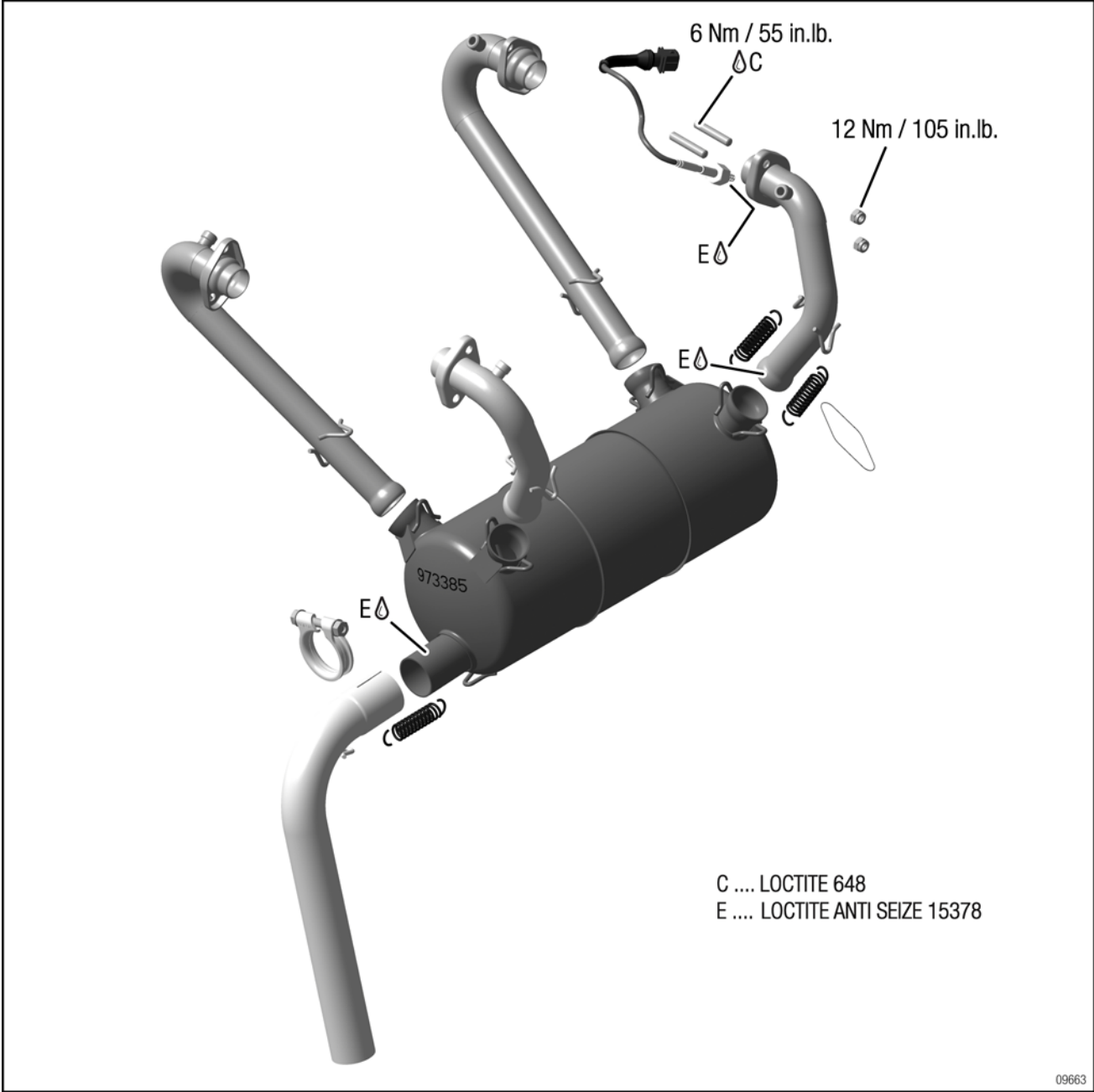
SERVICE PRODUCTS

Description	Part no.
LOCTITE 648	899788
LOCTITE ANTI SEIZE 15378	297434

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MAINTENANCE MANUAL

Exhaust



SYSTEM DESCRIPTION

The exhaust collects the gases produced in the combustion chamber, leads them via the exhaust manifold to the muffler, which is used to reduce noise. The exhaust gas passes via the outflow pipe through a tail pipe into the open.

MAINTENANCE

As well as the maintenance and special checks, see the relevant Maintenance Manual Line for the respective 912 i Series engine type.

REMOVAL

EXHAUST ASSY. - REMOVAL

⚠ WARNING

Danger of severe burns and scalds! Allow the engine and exhaust to cool to ambient temperature before starting work.

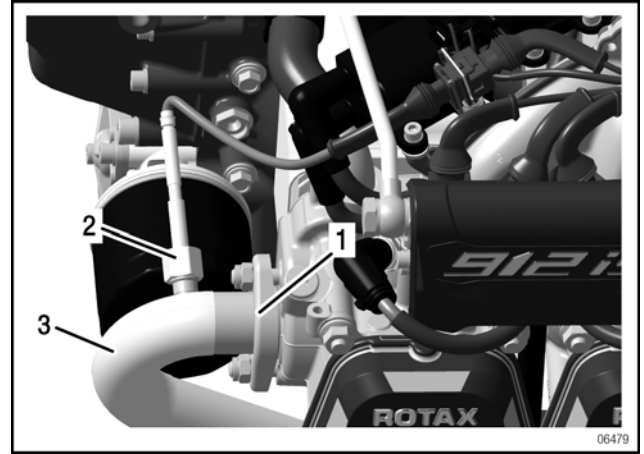
NOTICE

Follow the aircraft manufacturer's instructions for removal.

Preparation

See also section 76-50-00 Wiring harness.
 - Unplug the temperature sensor (EGT).

Fig. 1

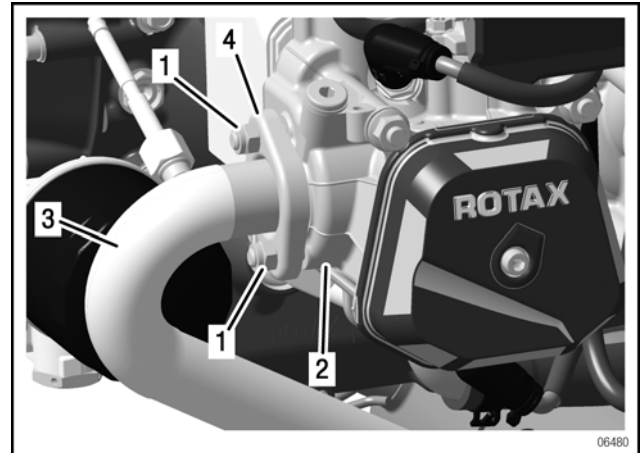


1. Exhaust flange 2. Temperature sensor (EGT)
 3. Exhaust pipe

EXHAUST PIPE - REMOVAL

Step	Procedure
1	Loosen 2 M8 hex. nuts. NOTE: This is a lock nut!

Fig. 2



1. M8 hex. nut 2. Cylinder head
 3. Exhaust pipe 4. Exhaust flange

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INSPECTION

EXHAUST ASSY. - INSPECTION

NOTICE

Follow the aircraft manufacturer's instructions for inspection.

Step	Procedure
1	Check the exhaust for cracks, dents and leaks.

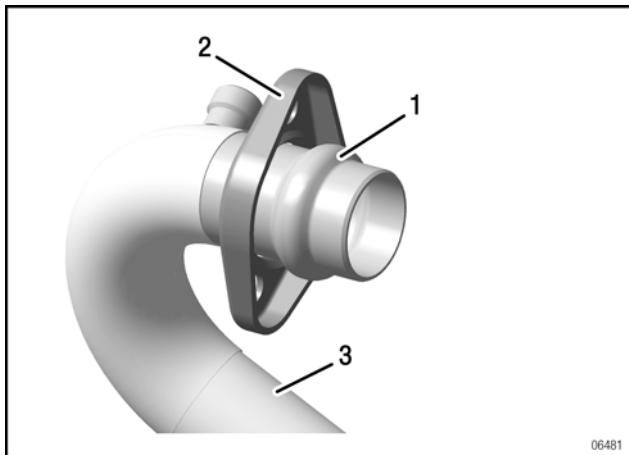
EXHAUST PIPE AND CYLINDER HEAD - INSPECTION

NOTICE

A deformed exhaust flange must be replaced!

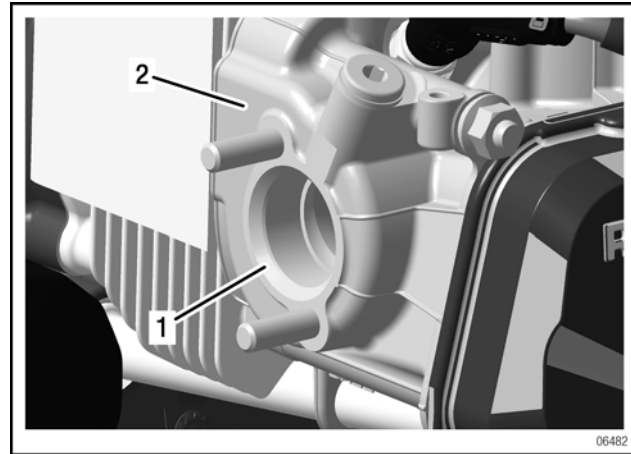
Step	Procedure
1	Check the conical seal in the cylinder head and on the exhaust pipe for deformation.

Fig. 3



1. Conical seal 2. Exhaust flange
 3. Exhaust pipe

Fig. 4



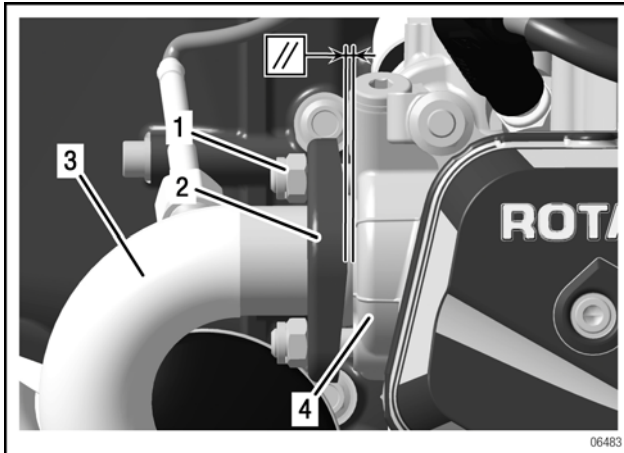
1. Conical seal 2. Cylinder head

INSTALLATION

EXHAUST PIPE ON CYLINDER HEAD - INSTALLATION

Step	Procedure
1	Check that the studs are firmly in place. Secure them with LOCTITE 648 if necessary and tighten them. Tightening torque 6 Nm (53.09 in. lb.)
2	Fasten the exhaust flange to the cylinder head with 2 new M8 hex. nuts. Tightening torque 12 Nm (106.18 in. lb.). NOTE: The exhaust flange must be parallel to the screw face on the cylinder head but must not rest against it.

Fig. 5



1. M8 hex. nut 2. Exhaust flange
3. Exhaust pipe 4. Cylinder head

EXHAUST ASSY. - INSTALLATION

<p style="text-align: center;">NOTICE</p> <p>Follow the aircraft manufacturer's instructions for installation.</p>

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BRP-Powertrain
MAINTENANCE MANUAL

NOTES

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Chapter: 79-00-00
LUBRICATION SYSTEM

Introduction

This section describes the maintenance of the lubrication system assembly of the ROTAX 912 i Series engine. The description is divided into subsections and explanations of system functions.

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1. Introduction	Page 1
2. Special tools	Page 5
3. Service products	Page 5
4. System description	Page 7
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6. Connections for display systems	Page 7
7. Removal	Page 7
A. Preparation	Page 7
B. Removal of the oil pump	Page 7
8. Disassembly	Page 9
C. Oil pump - disassembly	Page 9
9. Inspection	Page 11
A. Oil pump parts - inspection	Page 11
(1) Oil pump housing - inspection	Page 11
(2) Rotary piston/rotor - inspection	Page 11
(3) Oil pump shaft - inspection	Page 12
10. Wear limits	Page 13
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13. Finishing work	Page 18
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A. Preparation	Page 19
B. Removal of the oil tank	Page 19
15. Disassembly	Page 20
C. Oil tank - disassembly	Page 20
16. Inspection	Page 20
A. Oil tank parts - inspection	Page 20
17. Installation	Page 21
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18. Finishing work	Page 21

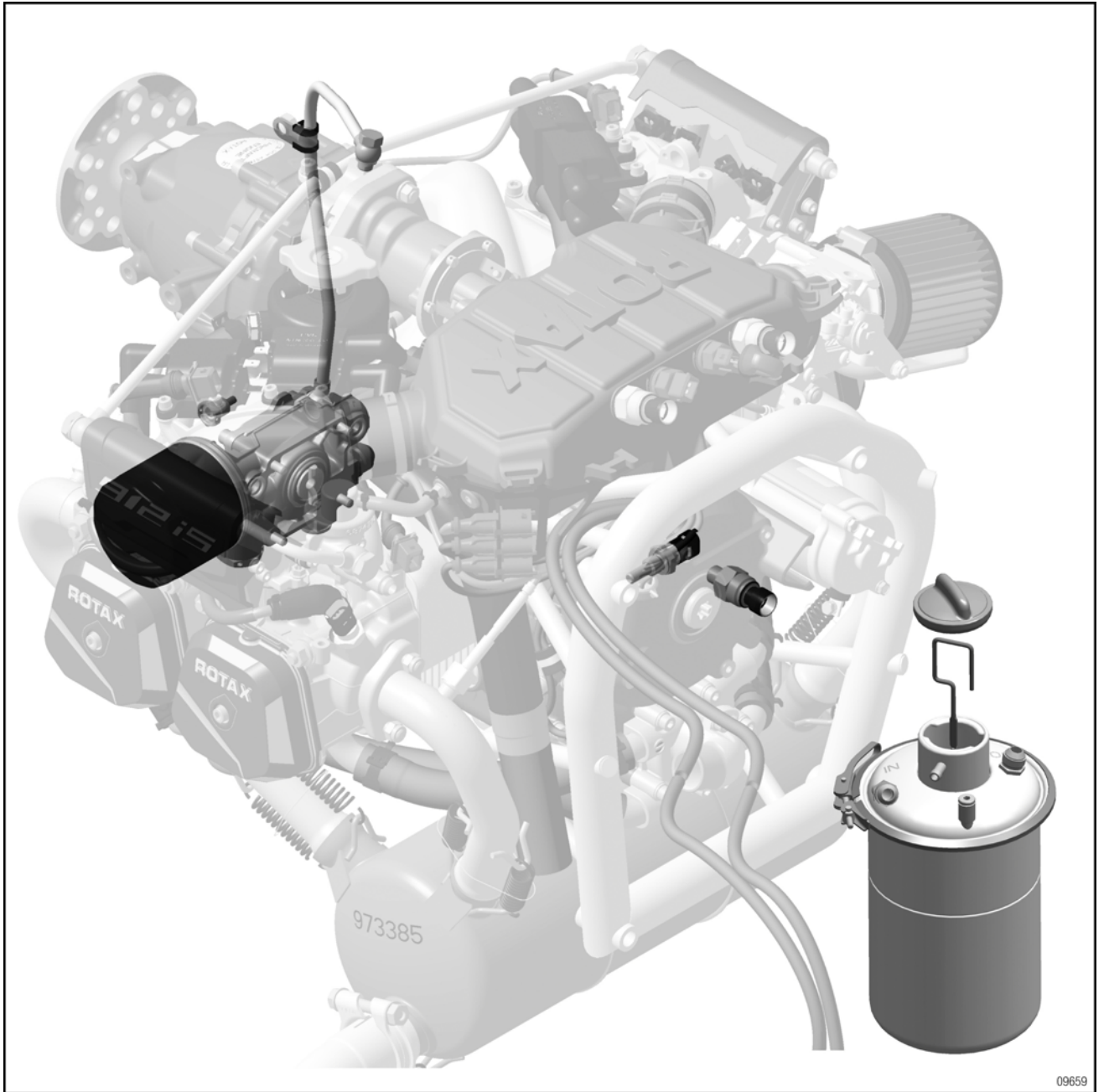
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Subject	Page
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20. Inspection A. Oil cooler - inspection	Page 22 Page 22
21. Installation A. Oil cooler - installation	Page 22 Page 22
22. Finishing work	Page 22
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NOTES

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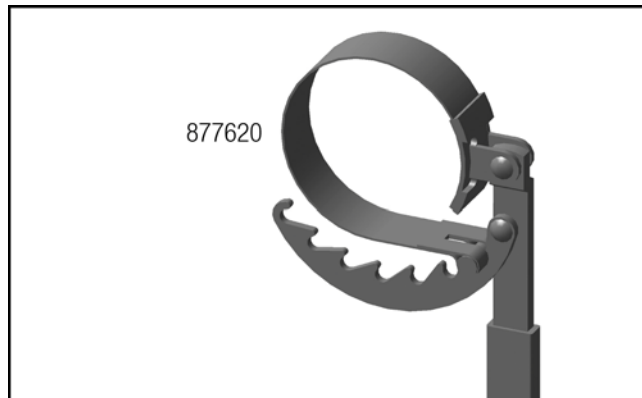
Chapter: 79-00-00
LUBRICATION SYSTEM

SPECIAL TOOLS

Description	Part no.
Oil filter wrench	877620
Dial gauge	n.a.
Straight-edge	n.a.
Aligning plate	n.a.

SERVICE PRODUCTS

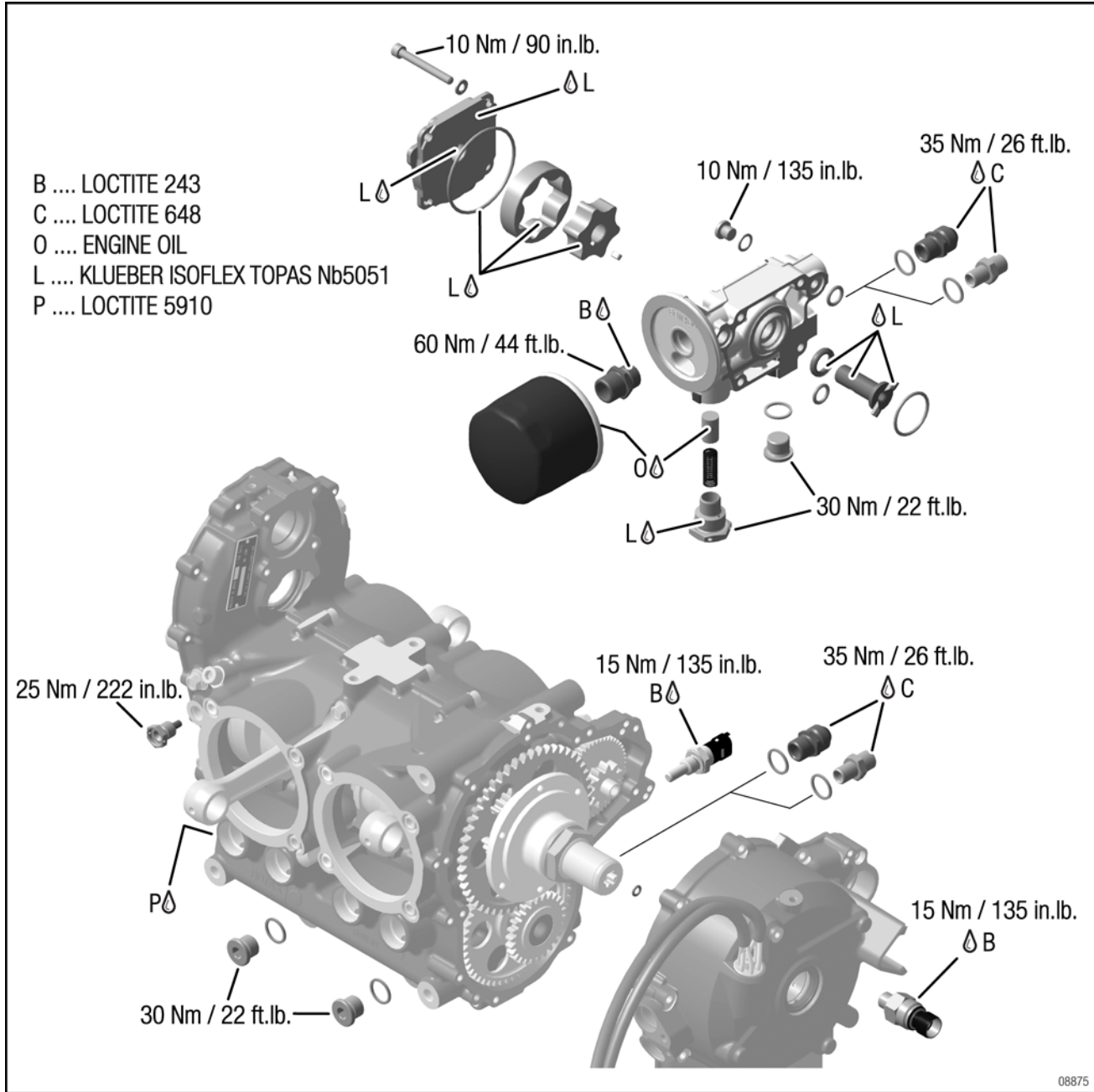
Description	Part no.
KLUEBER ISOFLEX TOBAS NB 5051	898351
LOCTITE 5910	899791
LOCTITE 243	897651
Insulating tape	n.a.



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Lubrication system



SYSTEM DESCRIPTION

The engine is lubricated with dry sump forced lubrication and is equipped with a trochoid oil pump with an integrated pressure regulator. The oil pump sucks the engine oil from the oil tank via the oil cooler (optional) and forces it through the oil filter to the individual lubrication points in the engine.

CRANKCASE

The engine oil emerging from the lubrication points accumulates on the bottom of crankcase and is forced back to the oil tank by the constant excessive pressure in the crankcase (blow-by gases).

OIL PUMP

The oil pump is driven by the camshaft.

PURGING OF LUBRICATION SYSTEM

The oil circuit is purged via the air bleed line attached to the oil tank.

SAFETY INFORMATION

WARNING

Danger of severe burns and scalds! Always allow the engine to cool down to ambient temperature before starting any work.

WARNING

Danger of serious injury!
During work on the lubrication system there is a risk of injury due to pressure!

- Ensure that the engine is in the horizontal position!
- Before starting repair work on the lubrication system, ensure that it is no longer pressurised!

CONNECTIONS FOR DISPLAY SYSTEMS

NOTICE

Follow the instructions in the Installation Manual regarding connections for instrumentation.

TEMPERATURE SENSOR

The temperature sensor is situated on the crankcase and measures the oil inlet temperature.

PRESSURE SENSOR

The pressure sensor is situated on the ignition housing and measures the oil pressure.

MAINTENANCE

As well as the maintenance and special checks, see the relevant Maintenance Manual Line for the respective 912 i Series engine type.

NOTE: Whenever the lubrication system is removed or disassembled, o-rings and other sealing elements must be disposed of.

REMOVAL

OIL PUMP ASSY. REMOVAL

Preparation

- Switch the ignition key OFF
- Drain the oil.

ENVIRONMENT NOTE

Dispose of used oil according to local environmental regulations.

NOTICE

Use appropriate protective coverings to prevent the ingress of debris particles into all disconnected lines and connections.

- Remove surrounding assemblies and detach oil lines.

NOTE: The assemblies and lines are only to be removed if necessary and only as far as is necessary!

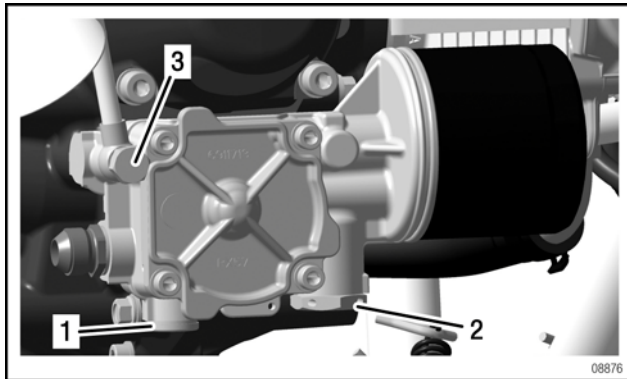
BRP-Powertrain

MAINTENANCE MANUAL

See Fig. 1 to Fig. 3

Step	Procedure
1	Disconnect the regulator pressure oil line (if present).
2	Remove the safety wire of the plug screw (regulator piston).
3	Loosen the plug screw (regulator piston), otherwise it is very difficult to unscrew when the oil pump is removed.

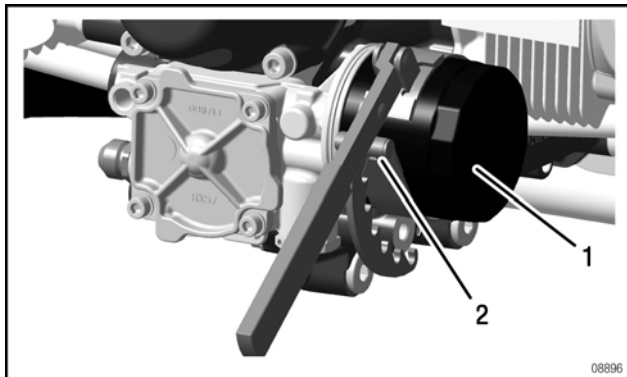
Fig. 1



1. Plug screw for regulator pressure oil line 2. Plug screw (regulator piston)
 3. Regulator pressure oil line

Step	Procedure
4	Unscrew the oil filter with oil filter wrench part no. 877620.

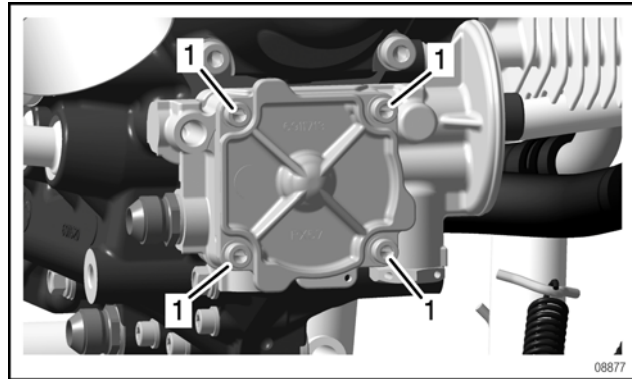
Fig. 2



1. Oil filter 2. Special tool

Step	Procedure
5	Loosen 4 Allen screws with lock washers.
6	Remove the whole oil pump unit and o-rings.

Fig. 3



1. Allen screws

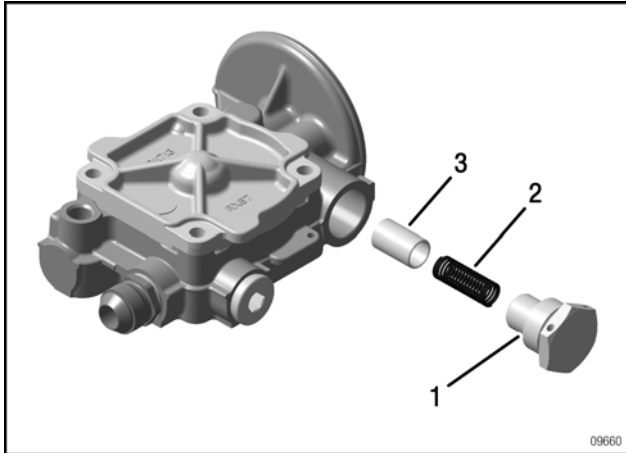
DISASSEMBLY

OIL PUMP - DISASSEMBLY

See Fig. 4 to Fig. 9.

Step	Procedure
1	Remove the plug screw, compression spring and regulator piston.

Fig. 4

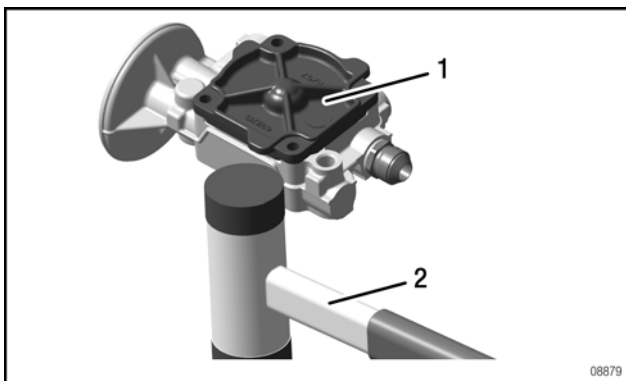


- 1. Plug screw
- 2. Compression spring
- 3. Regulator piston

Step	Procedure
2	Remove the oil pump cover.

NOTE: If the cover sticks, carefully release it with a soft-faced hammer.

Fig. 5

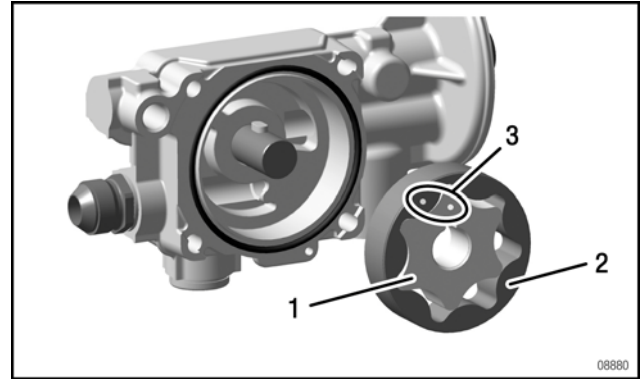


- 1. Oil pump cover
- 2. Soft-faced hammer

NOTICE

The rotary piston and rotor are marked.

Fig. 6



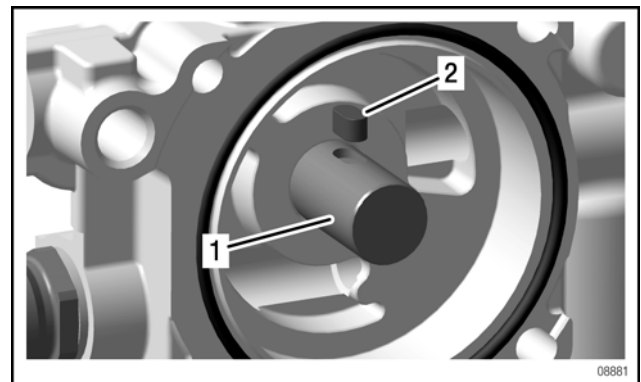
- 1. Rotor (inner rotor)
- 2. Rotary piston (outer rotor)
- 3. Mark

Step	Procedure
3	Pull out the rotor and rotary piston.
4	Remove the feather key.
5	Pull out the oil pump shaft.

NOTICE

The sealing lip of the oil seal is damaged when the oil pump shaft is pulled out and must be replaced.

Fig. 7

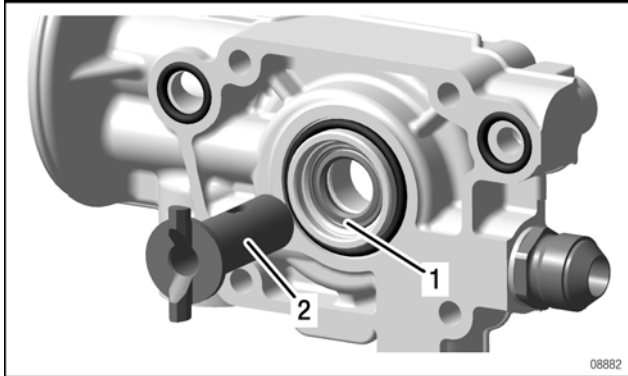


- 1. Oil pump shaft
- 2. Feather key

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Fig. 8

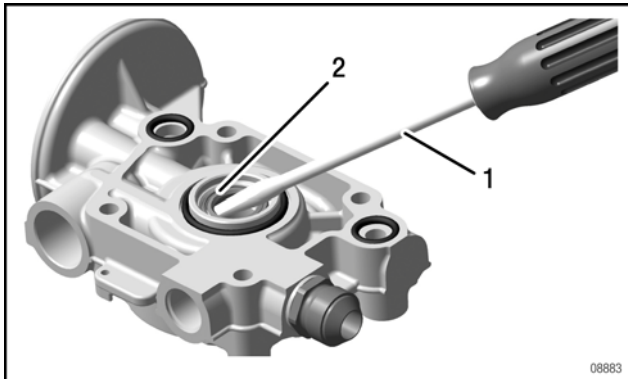


1. Oil seal

2. Oil pump shaft

Step	Procedure
6	Carefully lever the oil seal out of the oil pump housing with a screwdriver.

Fig. 9



1. Screwdriver

2. Oil seal

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INSPECTION

**OIL PUMP
 SINGLE PARTS - CHECK**

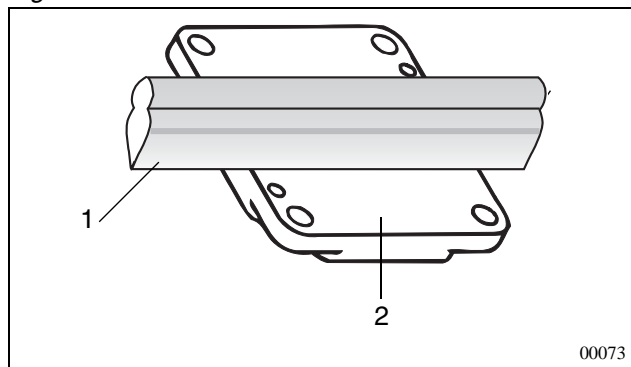
Preparatory work

- Clean all parts carefully. See also section 05-00-00 Procedures

OIL PUMP HOUSING - INSPECTION

Step	Procedure
1	Visually inspect all the components of the oil pump.
2	All the o-rings must be replaced.
3	Check the oil pump cover for wear on the inside using a straight-edge.

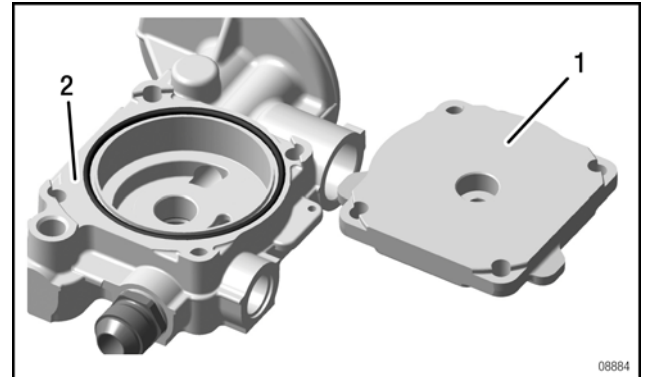
Fig. 10



1. Straight-edge 2. Oil pump cover

Step	Procedure
4	Check the sealing faces of the oil pump housing and pump cover for striations, where necessary pull them off on a pull-out plate.

Fig. 11



1. Oil pump cover 2. Oil pump housing

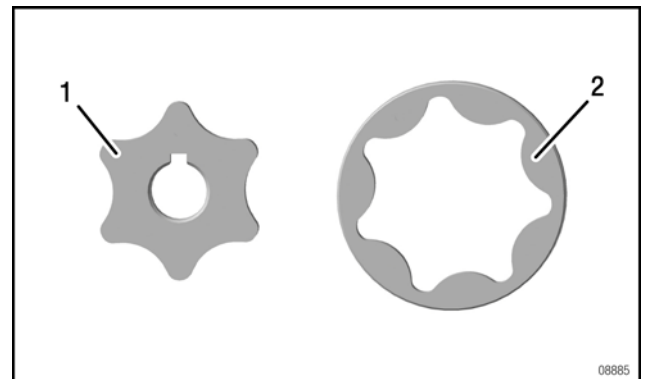
ROTARY PISTON/ROTOR - INSPECTION

See [Fig. 12](#).

Step	Procedure
1	Check the rotary piston and rotor for grooves.

NOTE: If there are noticeable grooves on the inner side of the rotor or outer side of the rotary piston, they must both be replaced.

Fig. 12



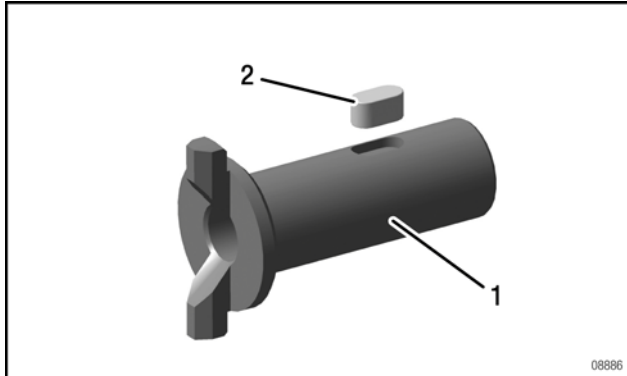
1. Rotor 2. Rotary piston

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OIL PUMP SHAFT - INSPECTION

Step	Procedure
1	Check the oil pump shaft at the bearing points.
2	Check the feather key groove and feather key for wear.

Fig. 13



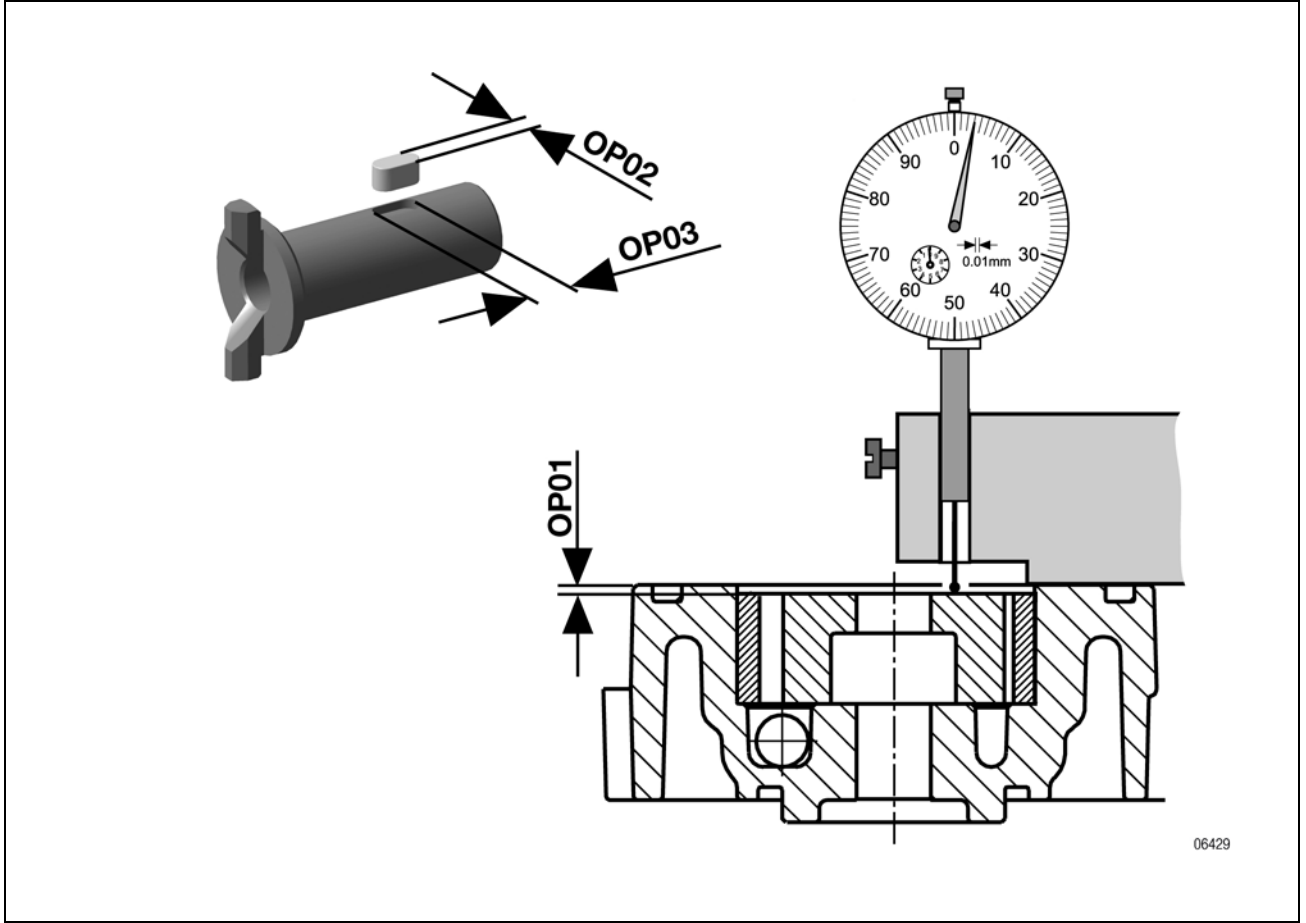
1. Oil pump shaft

2. Feather key

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MAINTENANCE MANUAL

WEAR LIMITS

Fig. 14



Oil pump

Description	Code	Current measurement value		Tolerance limit	Tolerance limit	Measurements
		min	max	100 %	50 %	
Main pump spacing (pump cover/rotor)	OP01	0.02 mm 0.00079 in.	0.07 mm 0.0027 in.	0.20 mm 0.0079 in.	0.14 mm 0.0056 in.	current replaced
Width of feather key in shaft	OP02	4 mm 0.157 in.	4.075 mm 0.160 in.	4.150 mm 0.163 in.		current replaced
Pressure spring length	OP03	65.6 mm (2.5827 in.)		62.6 mm (2.4646 in.)		current replaced

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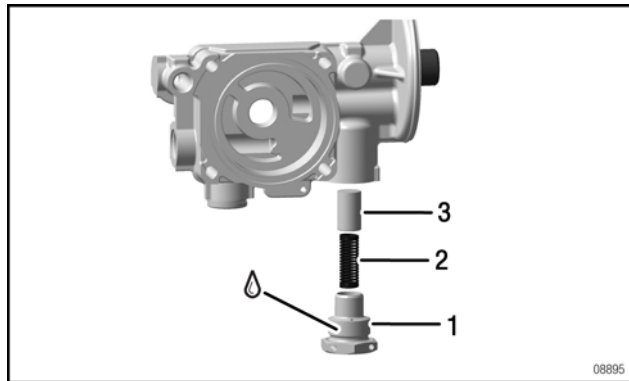
ASSEMBLY

OIL PUMP - ASSEMBLY

NOTE: Whenever the ignition housing is installed or assembled, new acid-free greased o-rings and other sealing elements must always be used correctly!

Step	Procedure
1	Apply Klueber grease to the plug screw.
2	Screw the plug screw with the pressure spring and the regulator piston finger-tight into the oil pump housing.

Fig. 15



- 1. Plug screw
- 2. Pressure spring DM9.1 D1.0 L65.6
- 3. Regulator piston

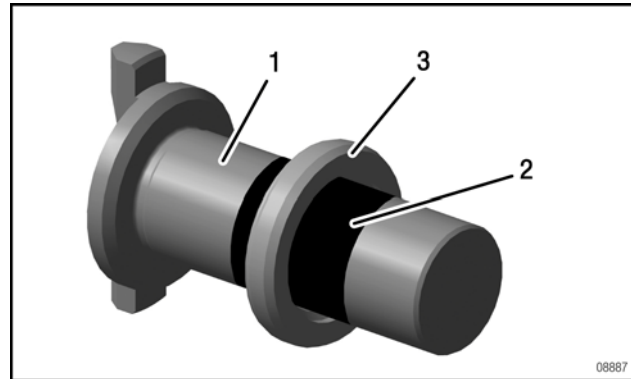
Step	Procedure
3	Stick insulating tape over the feather key groove.

NOTICE

Press in the oil seal so that the closed side points towards the oil pump housing.

Step	Procedure
4	Apply Klueber grease to the oil pump shaft and push oil seal A 14x22x4 onto the oil pump shaft while turning slightly.

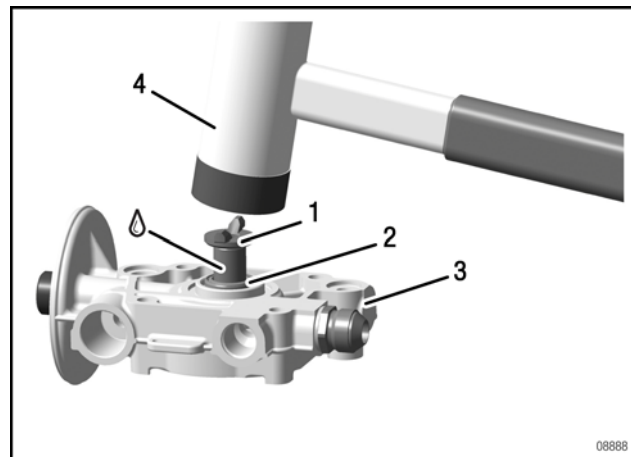
Fig. 16



- 1. Oil pump shaft
- 2. Insulating tape
- 3. Oil seal A 14x22x4

Step	Procedure
5	Place the oil pump housing on a firm surface.
6	Remove the insulating tape from the oil pump shaft.
7	Insert the oil pump shaft with the oil seal and press it in as far as it will go with a soft-faced hammer.

Fig. 17



- 1. Oil pump shaft
- 2. Oil seal
- 3. Oil pump housing
- 4. Soft-faced hammer

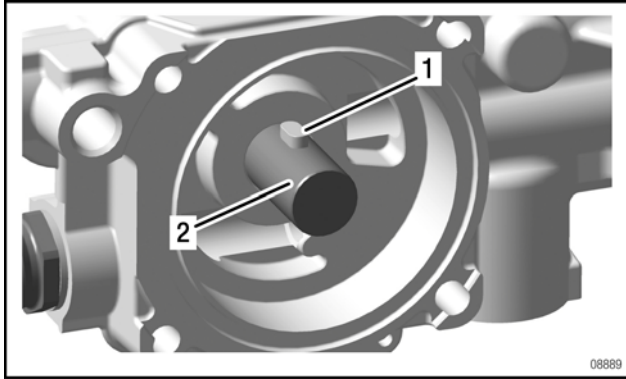
NOTICE

The oil pump shaft must not be pulled out again, otherwise the oil seal is unusable.

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Step	Procedure
8	Insert the feather key in the oil pump shaft.

Fig. 18



1. Feather key 2. Oil pump shaft

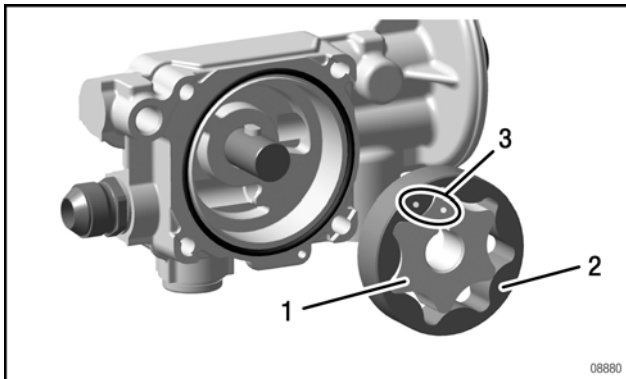
NOTICE

The rotor and rotary piston have a mark. The mark must be visible on both rotors.

Step	Procedure
9	Push on the rotor (inner rotor).
10	Insert the rotary piston (outer rotor).

NOTE: Apply KLUEBER ISOFLEX TOPAS Nb5051 to the rotor and rotary piston.

Fig. 19



1. Rotor (inner rotor) 2. Rotary piston (outer rotor)
 3. Mark

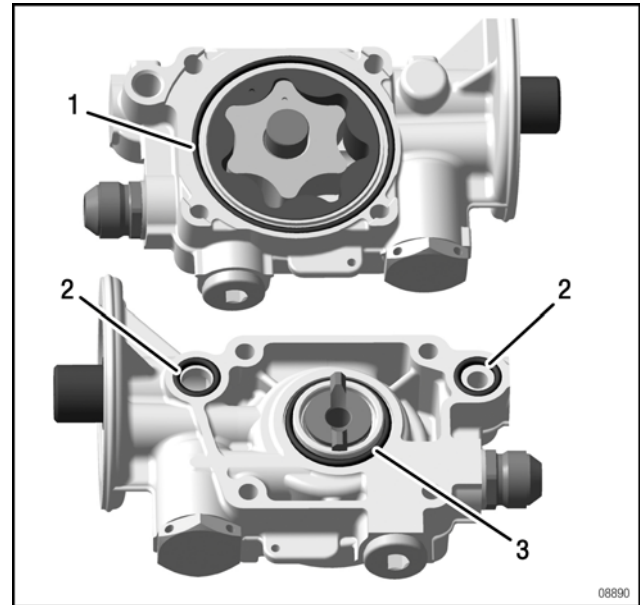
OIL PUMP HOUSING O-RINGS

NOTICE

All the o-rings must be replaced!

Step	Procedure
1	Insert new o-rings in the oil pump housing.

Fig. 20



1. 63x2.5 o-ring 2. 11x2.7 o-ring
 3. 30x2.5 o-ring

OIL PUMP COVER

Preparation

- Apply KLUEBER ISOFLEX TOPAS to the bearing point and flat.

NOTICE

Hold the oil pump shaft when putting the oil pump cover on it. Otherwise the oil pump shaft is pushed out by the air cushion.

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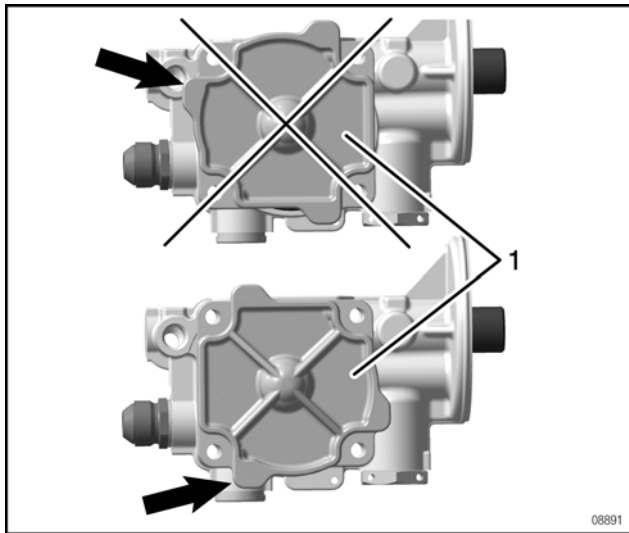
See Fig. 21

NOTICE

Make sure the oil pump cover is in the correct position when putting it on.

Step	Procedure
1	Place the oil pump cover on the oil pump housing.

Fig. 21



1. Oil pump cover

INSTALLATION

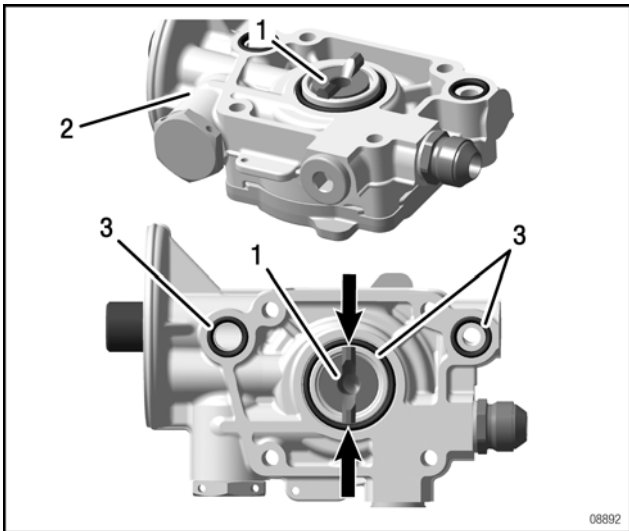
OIL PUMP - INSTALLATION

Preparation

- Check the fit of the o-rings on the oil pump housing.

NOTICE	
Ensure that the oil pump shaft is in the correct installation position.	

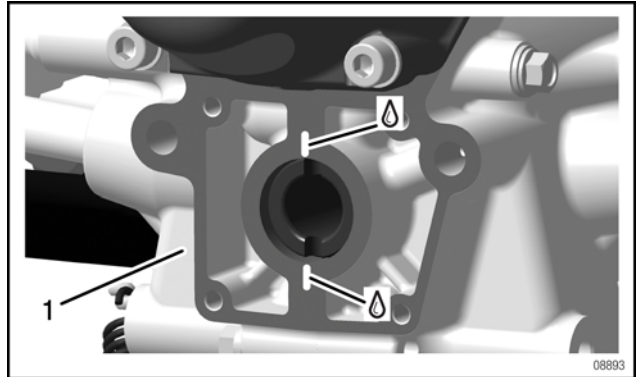
Fig. 22



1. Oil pump shaft 2. Oil pump housing
 3. O-rings

Step	Procedure
1	Apply LOCTITE 5910 to the support area on the crankcase.

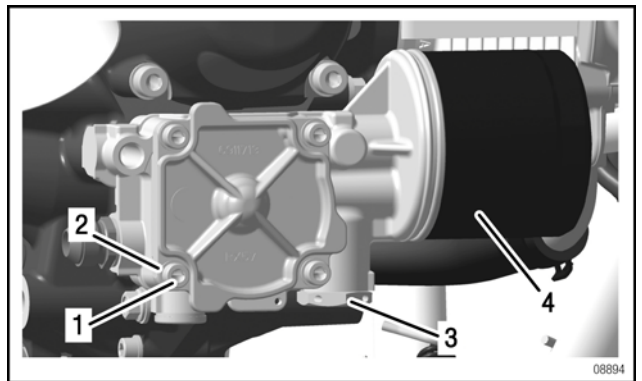
Fig. 23



1. Crankcase

Step	Procedure
2	Install the oil pump housing with M6x50 Allen screws and 6.4 washers crosswise and by hand. Then tighten the Allen screws crosswise. Tightening torque 10 Nm (88.48 in. lb.).
3	Tighten plug screw. Tightening torque 30 Nm (265.44 in. lb.).
4	Attach the safety wire.

Fig. 24



1. M6x50 Allen screws 2. 6.4 washers
 3. M22x1.5 plug screw 4. Oil filter

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OIL FILTER INSTALLATION

Step	Procedure
5	Install the oil filter. See relevant Maintenance Manual Line for the 912 i Series. NOTE: Oil the gasket of the oil seal.
6	Install the oil lines.

FINISHING WORK

- Fill with fresh oil.
See relevant Maintenance Manual Line for the 912 i Series.
- Bleed the oil system.
See relevant Maintenance Manual Line) for the 912 i Series.
- Carry out an engine test run and leakage check.

NOTE: Then check that the oil seal is securely fitted after the test run.

REMOVAL

REMOVAL OF THE OIL TANK

⚠ WARNING

Danger of severe burns and scalds! Always allow the engine to cool down to ambient temperature before starting any work.

⚠ WARNING

Danger of electric shock! Switch off the ignition and pull out the ignition key! Disconnect the negative terminal of the battery.

Preparation

- Switch the ignition key OFF
- Drain the oil
- Remove the oil tank according to the aircraft manufacturer's specifications.

ENVIRONMENT NOTE

Dispose of used oil according to local environmental regulations.

NOTICE

Use appropriate protective coverings to prevent the ingress of debris particles into all disconnected lines and connections.

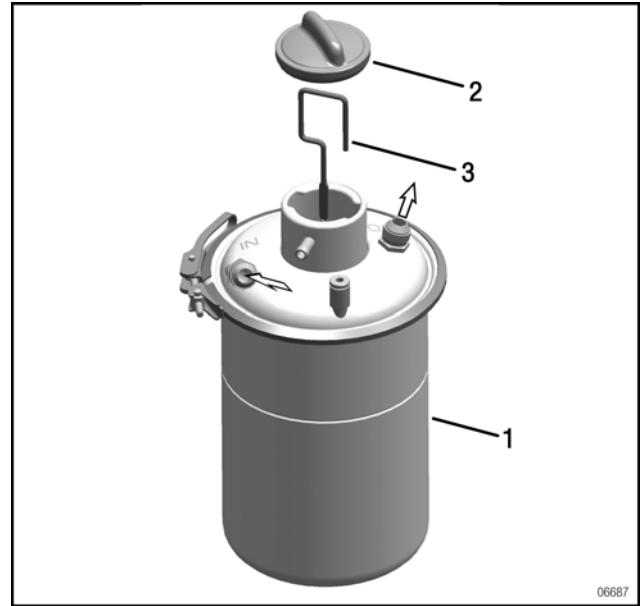
NOTE: The assemblies and lines are only to be removed if necessary and only as far as is necessary.

Step	Procedure
1	Remove surrounding assemblies and detach oil lines.

ENVIRONMENT NOTE

Ensure that no oil gets into the waste water system or the ground – risk of contaminating drinking water!

Fig. 25



1. Oil tank
3. Oil dipstick

2. Cover

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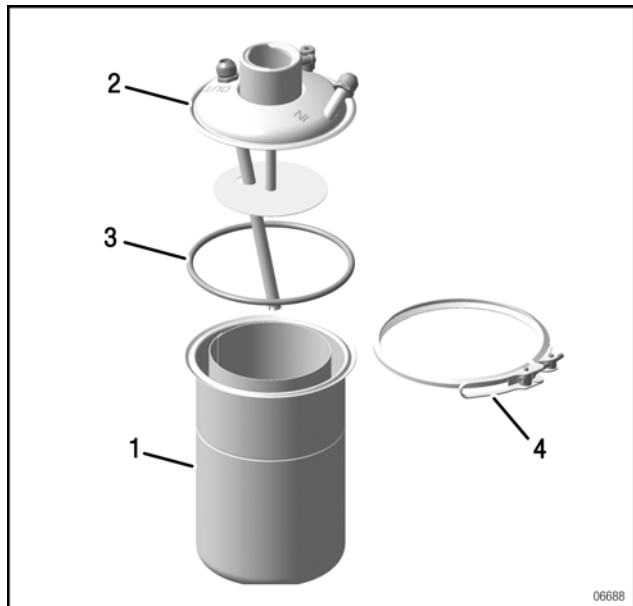
DISASSEMBLY

OIL TANK - DISASSEMBLY

See Fig. 26 to Fig. 27

Step	Procedure
1	Open profile clamp 163.
2	Remove the oil tank cover assy. and O-ring.

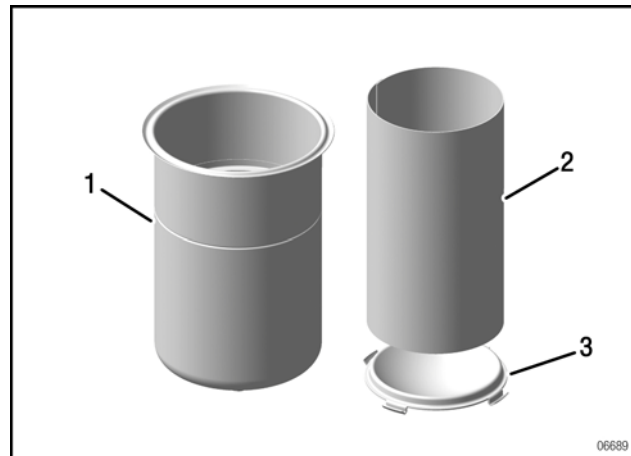
Fig. 26



- 1. Oil tank
- 2. Oil tank cover assy.
- 3. O-Ring
- 4. Profile clamp

Step	Procedure
3	Remove the baffle insert and partition from the oil tank.

Fig. 27



- 1. Oil tank
- 2. Baffle insert
- 3. Partition

INSPECTION

**OIL TANK
SINGLE PARTS - CHECK**

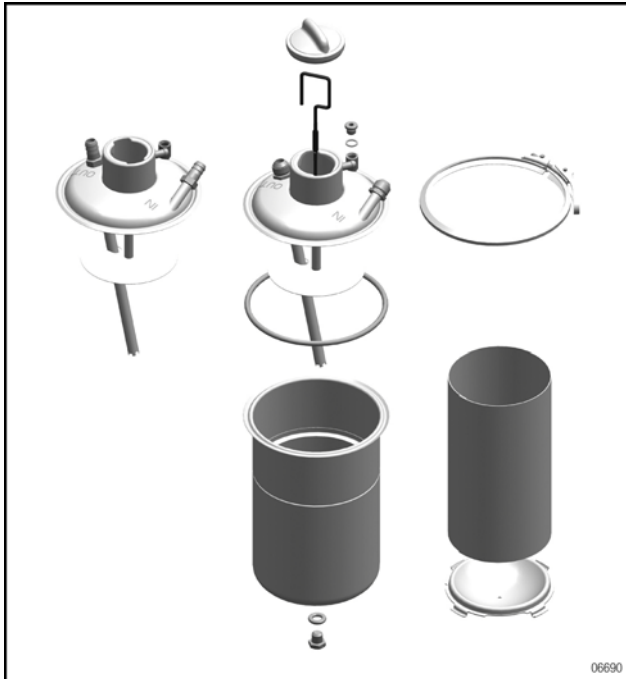
Preparation

- Clean all parts carefully. See also section 05-00-00 Procedures

Step	Procedure
1	General visual inspection. See relevant Maintenance Manual Line for the 912 i Series engine type.

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Fig. 28



INSTALLATION

OIL TANK - INSTALLATION

Preparation

- Install the oil tank according to the aircraft manufacturer's specifications.

FINISHING WORK

- Fill with fresh oil.
See relevant Maintenance Manual Line for the 912 i Series.
- Bleed the oil system.
See relevant Maintenance Manual Line for the 912 i Series.
- Carry out an engine test run and leakage check.

REMOVAL

REMOVAL OF THE OIL COOLER

NOTICE

The oil cooler is not included in the delivery of the engine. Maintenance must be carried out in accordance with the aircraft manufacturer's instructions.

⚠ WARNING

Danger of severe burns and scalds! Always allow the engine to cool down to ambient temperature before starting any work.

Preparation

- Switch the ignition key OFF
- Drain the oil

ENVIRONMENT NOTE

Dispose of used oil according to local environmental regulations.

NOTICE

Use appropriate protective coverings to prevent the ingress of debris particles into all disconnected lines and connections.

- Remove surrounding assemblies and detach oil lines.

NOTE: The assemblies and lines are only to be removed if necessary and only as far as is necessary!

Step	Procedure
1	Remove the oil lines and clamps according to the instructions in the aircraft manufacturer's manual.

ENVIRONMENT NOTE

Ensure that no oil gets into the waste water system or the ground – risk of contaminating drinking water!

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BRP-Powertrain
MAINTENANCE MANUAL

INSPECTION

OIL COOLER - INSPECTION

NOTICE

The oil cooler is not included in the delivery of the engine. Maintenance must be carried out in accordance with the aircraft manufacturer's instructions.

Preparation

- Clean all parts carefully. See also section 05-00-00 Procedures
- General visual inspection. See relevant Maintenance Manual Line for the 912 i Series engine type.

Step	Procedure
1	Clean the cooling fins of the oil cooler and straighten them out if necessary.
2	Rinse out the inside of the oil cooler.

NOTICE

If the engine is damaged so that chips can be found in the oil filter and on the magnetic plug, the oil cooler must be replaced.

INSTALLATION

OIL COOLER - INSTALLATION

Step	Procedure
1	Install the oil lines and clamps according to the instructions in the aircraft manufacturer's manual.

FINISHING WORK

- Fill with fresh oil.
See relevant Maintenance Manual Line for the 912 i Series.
 - Bleed the oil system.
See relevant Maintenance Manual Line for the 912 i Series.
 - Carry out an engine test run and leakage check.
-

REMOVAL

REMOVAL OF THE OIL LINE

NOTICE	
The oil lines are not included in the delivery of the engine and must be maintained according to the aircraft manufacturer's instructions.	

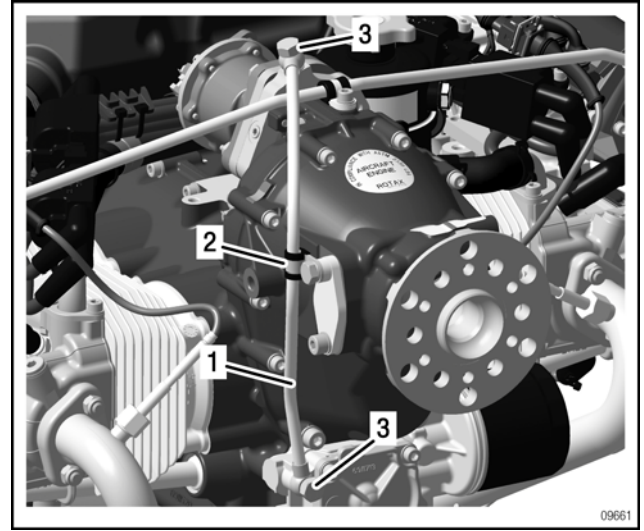
Step	Procedure
1	Remove the oil lines and clamps according to the instructions in the aircraft manufacturer's manual.

REMOVAL OF THE OIL LINE (STEEL LINE)

NOTICE	
The steel oil lines, which are included in the delivery, are only removed if they are damaged or for cleaning.	

Step	Procedure
1	Remove the cable clamp for supporting the line on the side of the gearbox.
2	Loosen the M10 banjo bolt and gasket ring on the governor flange. See also section 61-20-00 Governor.
3	Loosen the banjo bolt on the oil pump housing and remove it along with the gasket rings. See also section 61-20-00 Governor.

Fig. 29



- 1. Oil line
- 2. Cable clamp
- 3. M10 banjo bolt

INSPECTION

OIL LINE - INSPECTION

Preparation

- Clean all parts carefully. See also section 05-00-00 Procedures
- General visual inspection. See relevant Maintenance Manual Line for the 912 i Series engine type.

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INSTALLATION

OIL LINE - INSTALLATION

NOTICE	
Ensure that the lines are installed without tension and are not scuffed. Observe minimum distances, e.g. 2 mm (0.0787 in.) from the housing.	

Step	Procedure
1	Install the oil lines and clamps according to the instructions in the aircraft manufacturer's manual.
2	Use original lines with the corresponding certification for replacement.
3	Only use suitable screw hose clamps or crimp connections to fasten the lines.

OIL LINE (STEEL LINE) INSTALLATION

Step	Procedure
1	Install the M10 banjo bolt and gasket ring on the governor flange. See also section 61-20-00 Governor.
2	Install the banjo bolt on the oil pump housing with the gasket rings. See section 61-20-00 Governor.
3	Install the cable clamp for supporting the line on the side of the gearbox.

FINISHING WORK

- Check the oil level.
See relevant Maintenance Manual Line for the 912 i Series.
- Bleed the oil system.
See relevant Maintenance Manual Line for the 912 i Series.
- Carry out an engine test run and leakage check.

TEMPERATURE AND PRESSURE MEASUREMENT SYSTEM

TEMPERATURE SENSOR (OIL)

General note

The temperature sensor for measuring the oil temperature is screwed into the crankcase. The sensor is a NTC resistor and identical to the two sensors for the cylinder head temperature.

NOTICE	
The max. operating temperature must not be exceeded.	

If it rises above this,

- the lubrication system (See relevant Maintenance Manual Line for the 912 i Series engine type)
- the temperature sensor
- the indicating instrument
- the line connection
- the measurement line

must be checked.

NOTE: The ground connection of the temperature sensor is established directly via the housing.

REMOVAL

**TEMPERATURE SENSOR (OIL) -
 REMOVAL**

Step	Procedure
1	To do this, see section 76-70-00 Sensors and actuators.
2	Clean the thread of the oil temperature sensor.

INSPECTION

**TEMPERATURE SENSOR (OIL) -
 INSPECTION**

Step	Procedure
1	To do this, see section 76-70-00 Sensors and actuators.

INSTALLATION

**TEMPERATURE SENSOR (OIL) -
 INSTALLATION**

Step	Procedure
1	To do this, see section 76-70-00 Sensors and actuators.

PRESSURE SENSOR (OIL)

General note

The pressure sensor for measuring the oil pressure is screwed into the ignition housing.

NOTE: The pressure sensor has a range from 0 to 10 bar. This indicator can be seen on the circumference of the pressure sensor.

NOTICE	
The pressure range of the display device must match the pressure range of the pressure sensor. Otherwise the oil pressure will not be displayed correctly.	

NOTICE	
The temperature must be no more or less than the max. operating temperature.	

REMOVAL

**PRESSURE SENSOR (OIL) -
 REMOVAL**

Step	Procedure
1	To do this, see section 76-70-00 Sensors and actuators.
2	Clean the thread of the pressure sensor.

INSPECTION

**PRESSURE SENSOR (OIL) -
 INSPECTION**

Step	Procedure
1	To do this, see section 76-70-00 Sensors and actuators.

INSTALLATION

**PRESSURE SENSOR (OIL) -
 INSTALLATION**

Step	Procedure
1	To do this, see section 76-70-00 Sensors and actuators.

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COMPONENT REPAIR

THREAD

MAGNETIC DRAIN PLUG

See relevant Maintenance Manual Line for the 912 i Series engine type.

NOTE: It is possible to repair the thread of the magnetic plug in the crankcase with a HeliCoil.

DRAIN PLUG

See relevant Maintenance Manual Line for the 912 i Series engine type.

FLAT AREAS

NOTICE

The sealing surfaces on oil pump components must not be repaired!
If damage to these sealing surfaces is found, the corresponding component must be replaced with a new part.

- Flat areas on lubricant supply components up to a maximum of 0.3 mm (0.0118 in.).
 - The indentations must not have sharp edges! Remove sharp edges carefully with a sharpening stone. Damage limits must not be exceeded!
-

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Chapter: 80-00-00
ELECTRIC STARTER

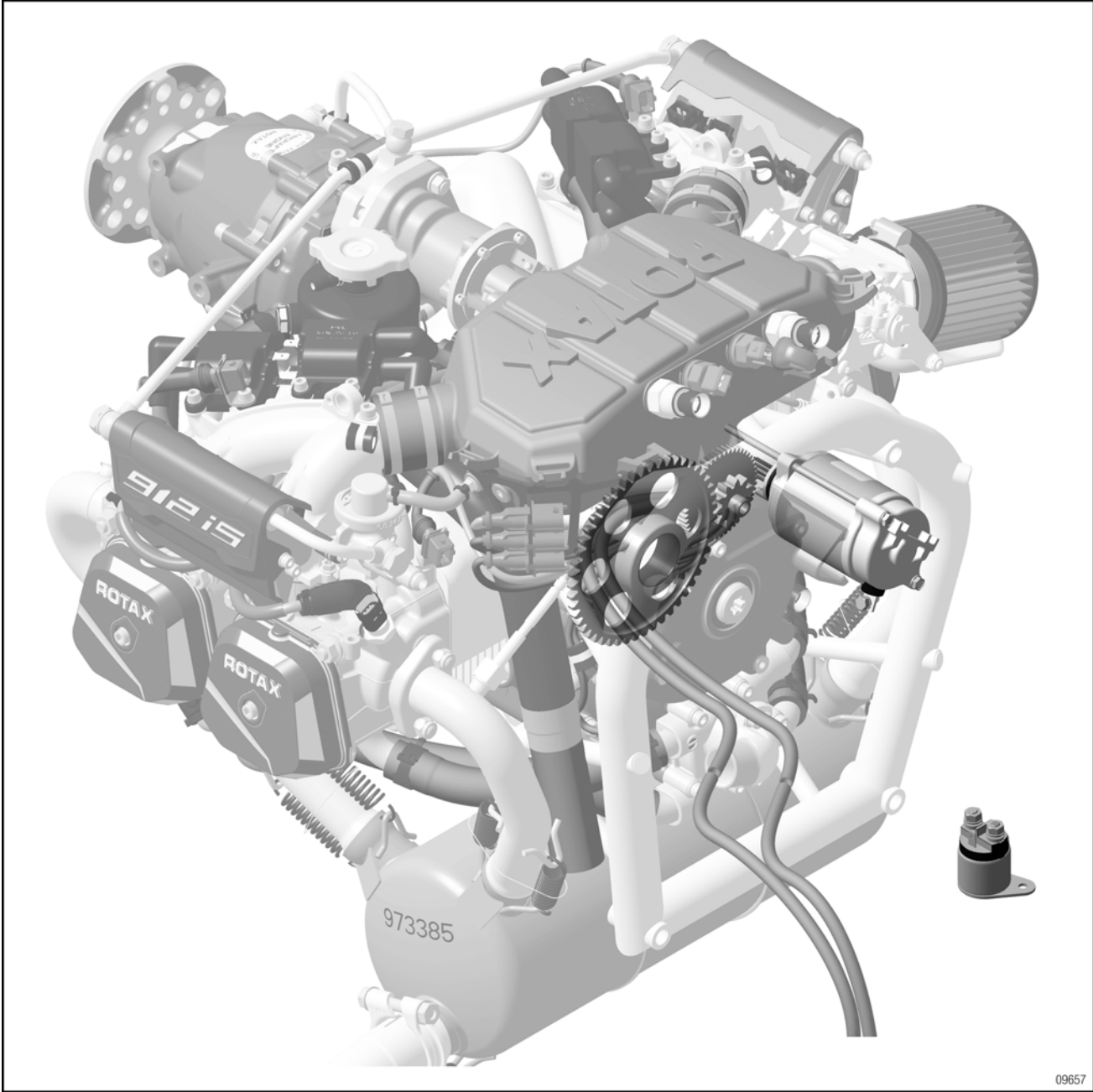
Introduction

This section describes the maintenance of the electric starter assembly of the ROTAX 912 i Series engine. The description is divided into sub-sections and explanations of system functions.

Subject	Page
1. Introduction	Page 1
2. Service products	Page 3
3. System description	Page 3
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Chapter: 80-00-00
ELECTRIC STARTER

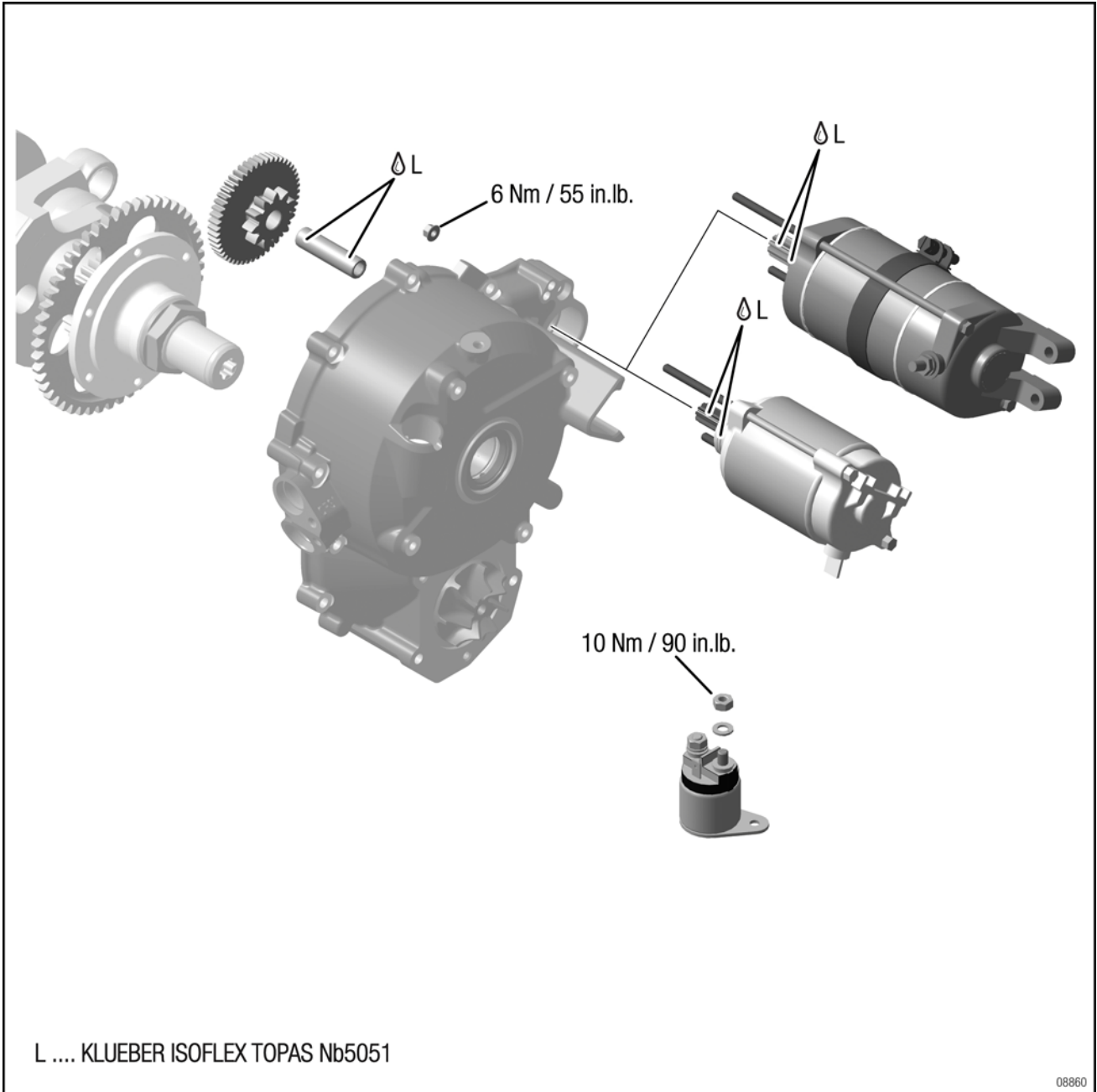
SERVICE PRODUCTS

Description	Part no.
KLUEBER ISOFLEX TOPAS Nb5051	898351

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Electric starter



SYSTEM DESCRIPTION

The electric starter is a DC motor with a permanent magnet and carbon brushes. The gear-tooth system of the armature shaft is permanently engaged in the idler gear. During the starting process the sprag clutch forms a connection to the crankshaft via the idler gear and free wheel gear. As soon as the engine speed is higher than the speed generated by the electric starter, the sprag clutch breaks the connection.

SAFETY INFORMATION

⚠ WARNING

Danger of severe burns and scalds!
Always allow the engine to cool down to ambient temperature before starting any work.

NOTICE

Danger of damage to engine! There is a risk of short circuits and cable fires during work on the electric starter!

- All installation work on the electric starter must be carried out with the engine switched off and the battery (negative pole) disconnected!
- Ignition, main and LANE selector switches must be "OFF"!

MAINTENANCE

As well as the maintenance and special checks, see the relevant Maintenance Manual Line for the respective 912 i Series engine type.

REMOVAL

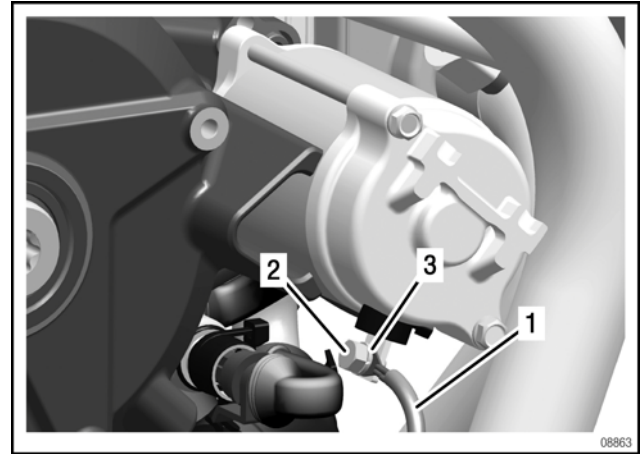
Preparation

- Switch the ignition key OFF
- Disconnect the battery (negative pole)

ELECTRIC STARTER REMOVAL

Step	Procedure
1	Disconnect the positive pole on the electric starter.

Fig. 1



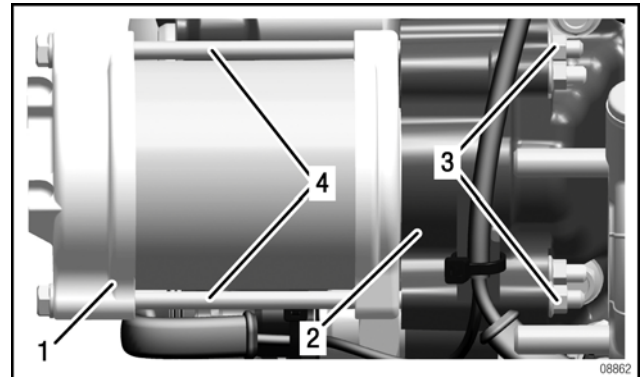
- 1. Positive (+) cable
- 2. Hex. screw
- 3. Washer

NOTICE

Hold the M5x145 hex. screw still with a suitable tool. If the hex. screw is turned, then the electric starter itself is unscrewed!

Step	Procedure
2	Loosen the 2 M5 hex. nuts on the rear of the crankshaft housing.

Fig. 2



- 1. Electric starter
- 2. Crankshaft housing
- 3. M5 hex. nuts
- 4. M5 hex. screw

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NOTICE

Do not tap the electric starter with a hammer, the adhering magnets can come off.

NOTE: If the o-ring (fig. 3) sticks, first press the electric starter gently down with a screwdriver and then pull off the starter by hand.

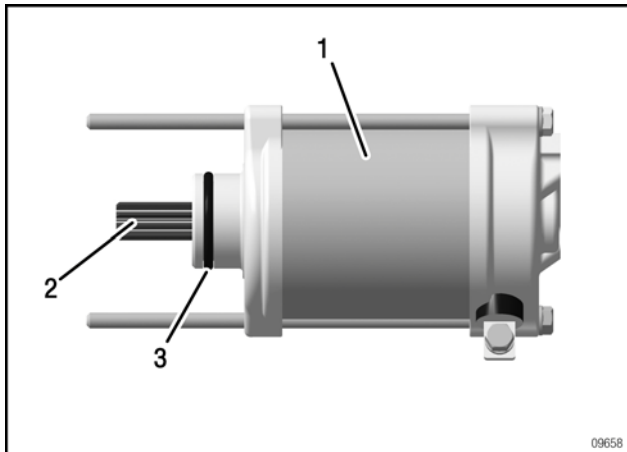
INSPECTION

ELECTRIC STARTER DISASSEMBLY, INSPECTION, ASSEMBLY

NOTICE

Only allowed for HD starters!

Fig. 3



1. Electric starter 2. Rotor
3. O-Ring

INSTALLATION

ELECTRIC STARTER - INSTALLATION

Preparation

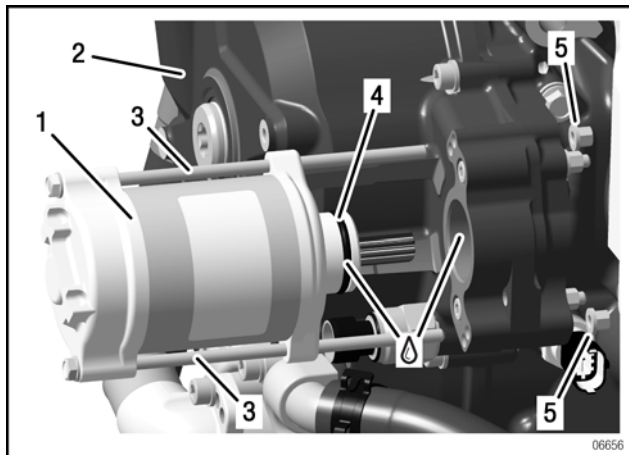
- Check that the o-rings are securely fitted on the bearing flange.
- Lightly grease the o-ring on the bearing flange and the centring bore in the ignition housing with KLUEBER ISOFLEX TOPAS Nb5051.

NOTICE

Ensure that the electric starter is in the correct installation position. See Fig. 4.

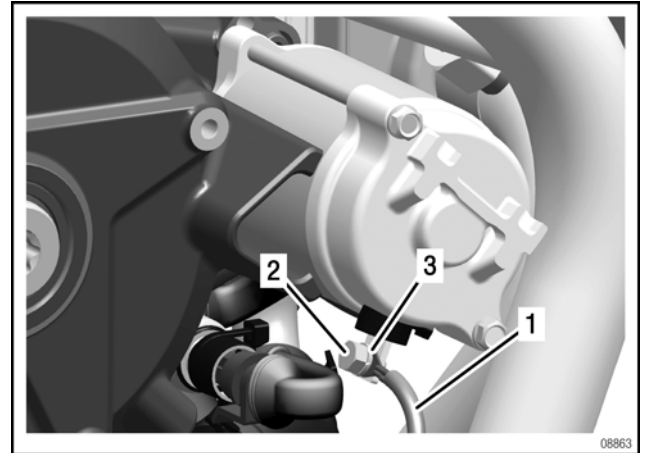
Step	Procedure
1	Push the whole electric starter into the ignition housing.
2	Tighten the M5 hex. nuts equally. Tightening torque 6 Nm (53.09 in. lb.).
3	Connect the positive pole on the electric starter.

Fig. 4



- 1. Electric starter
- 2. Ignition housing
- 3. M5 hex. screw
- 4. O-Ring
- 5. M5 hex. nut

Fig. 5



- 1. Positive (+) cable
- 2. Hex. screw
- 3. Washer

FINISHING WORK

- Connect the negative terminal of the on-board battery.
- Carry out an engine test run. See relevant Maintenance Manual Line for the 912 i Series engine type.

BRP-Powertrain
MAINTENANCE MANUAL

NOTES



Motornummer / Engine serial no.

Flugzeugtype / Type of aircraft

Flugzeugkennzeichen / Aircraft registration no.

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