

SERVICE INSTRUCTION**Introduction of a new turbocharger assy. with new ECU software and exhaust requirements for ROTAX® Engine Type 915 i A (Series)**

ATA System: 78-20-00 Turbocharger

1) Planning information

To obtain satisfactory results, procedures specified in this publication must be accomplished with accepted methods in accordance with prevailing legal regulations.

BRP-Rotax GmbH & Co KG cannot accept any responsibility for the quality of work performed in accomplishing the requirements of this publication.

1.1) Applicability

All versions of ROTAX® engine types:

Engine type	Serial number
915 iS A	from S/N 9132575
915 iSc A	from S/N 9127353

NOTE: On engines with equal or higher S/N than those listed above, new style turbocharger, exhaust bracket, muffler and latest version of ECU software have already been fitted in serial production.

1.2) Concurrent ASB/SB/SI and SL

In addition to this Service Instruction the following Service Instructions must be observed and complied with:

- SB-915 i A-004/SI-912 i -018 - "List of approved Engine Control Unit (ECU) software and hardware configurations for ROTAX® Engine Type 912 i and 915 i (Series)", current issue
- SI-915 i-002, "B.U.D.S. Aircraft Installation Instruction", current issue

1.3) Reason

In the course of further development and standardization, a new turbocharger assy. has been introduced.

1.4) Subject

Introduction of a new turbocharger assy. with new ECU software and exhaust requirements for ROTAX® Engine Type 915 i A (Series).

1.5) Compliance

NONE - For Information Only.

1.6) Approval

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

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1.7) Labor time

Estimated labor hours:

Engine installed in the aircraft - - - labor time will depend on airframe installation and therefore no estimate is available from the engine manufacturer.

1.8) Mass data

Change of weight - - - insignificant.

Moment of inertia - - - unaffected.

1.9) Electrical load data

No change.

1.10) Software modifications

Yes. See section 1.2 and 2.6.

1.11) References

In addition to this technical information refer to current issue of

- Illustrated Parts Catalog (IPC)
- Installation Manual (IM)
- Maintenance Manual Line (MML)
- Maintenance Manual Heavy (MMH)

NOTE: The status of the Manuals can be determined by checking the table of amendments. The 1st column of this table shows the revision status. Compare this number to the one listed on the ROTAX website: www.flyrotax.com. Updates and current revisions can be downloaded for free.

1.12) Other Publications affected

None.

1.13) Interchangeability of parts

Old and new parts are NOT interchangeable as they have different fixation positions for the turbocharger assy.

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2) Material Information

2.1) Material

Price and availability will be provided on request by ROTAX® Authorized Distributors or their independent Service Centers.

2.2) Company support information

None.

2.3) Material requirement per engine

New p/n	Qty/ engine	Description	Old p/n
893108	1	Turbocharger	893105/893106
851299	1	Turbocharger bracket Metric	851296/851297
851283	1	Turbocharger bracket UNF	851296/851297
979479	1	Muffler	979475
626333	2	Washer	-

2.4) Material requirement per spare part

None.

2.5) Rework of parts

None.

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2.6) Special tooling/lubricants- /adhesives- /sealing compounds

Price and availability will be supplied on request by ROTAX® Authorized Distributors or their independent Service Centers:

Description	Qty/ engine	Part no.
B.U.D.S. set Level 3 - Maintenance (for OEM/Distributor)	1	864023
B.U.D.S. Aircraft Software (3.0.0. or higher)	1	864361
Service wiring harness assy. (Only required for the loading process, if the ECU has been removed from aircraft / disconnected from har- ness)	1	864280
Y-cable (Only required if the aircraft has two separate D-Sub DB 9 Maintenance ports. Specification according to the latest Maintenance Manual Heavy of the respec- tive engine type)	1	-
Software configuration ECU 915 i A Series (Program files to be loaded onto the relevant ECU)	1	864089

NOTICE

If using these special tools observe the manufacturers specifications.

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3) Accomplishment/Instructions

- ROTAX® reserves the right to make any amendments to existing documents, which might become necessary due to this standardization, at the time of next revision or issue.

NOTE: Before accomplishment, review the entire documentation to make sure you have a complete understanding of the procedure and requirements.

Accomplishment

All measures must be implemented and confirmed by at least one of the following persons or organizations:

- ROTAX® - Authorized Distributors or their independent Service Centers
- Persons with approved qualifications for the corresponding engine types. Only authorized persons (iRMT, Level Heavy Maintenance) are entitled to carry out this work

NOTE: All work has to be performed in accordance with the relevant Maintenance Manual.

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



WARNING

Danger of severe burns and scalds!

Allow the engine and exhaust system to cool to ambient temperature before starting work



All work has to be performed in accordance with the relevant Maintenance Manuals of the respective engine type.

General

All general inspection, maintenance and repair has to be carried out e.g. in accordance with relevant Advisory Circular AC 43.13 from FAA.

Advisory Circular

This Manual "Advisory Circular" AC describes maintenance methods, techniques and practice. These are recognized and authorized for inspection and repairs in non-pressurized areas for which there are no separate maintenance and repair instructions.

3.1) Spare Parts - related information



See current Illustrated Parts Catalog (IPC) for the respective engine type.

3.2) Installation - related information



See current Installation Manual (IM) for the respective engine type.

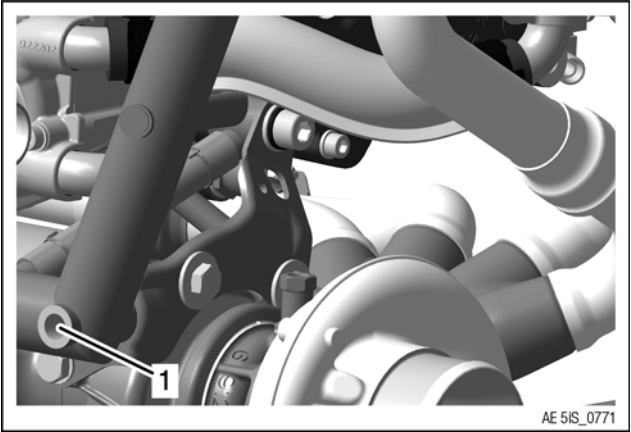
NOTICE

Connection turbocharger bracket with engine suspension frame requires a Metric or UNF fixed connection.

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1 Connection turbocharger bracket with engine suspension frame



3.3) Operation - related information



See current Operators Manual (OM) for the respective engine type.

3.4) Maintenance (Line) - related information



See current Maintenance Manual (Line) for the respective engine type and its periodical maintenance information

Points of inspection	Interval Operating hours	Chapter reference
	100 h	
Check the wastegate lever for free running and correct position.	x	12-20-00
Lubricate the wastegate lever.	x	12-20-00
Inspection of the GENUINE ROTAX® exhaust system included in the standard delivery.	x	05-20-00

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3.5) Maintenance (Heavy) - related information

3.5.1) Turbocharger assy. - removal

Preparation:

- Drain oil
- Remove the air filter
- Remove turbocharger / intercooler connection

Step	Procedure
1	Disconnect the turbo pressure oil line and the suction oil line.
2	Remove the cable clamp (Allen screw M5x20 and lock nut) for supporting the suction line on the turbocharger bracket.
3	Remove hose from wastegate regulator.

- 1 Turbo pressure oil line
 2 Suction oil line
 3 Wastegate regulator
 4 Hose (wastegate regulator)
 5 Cable clamp

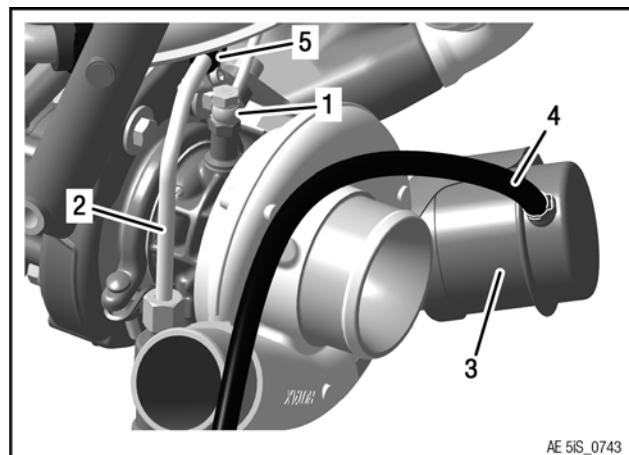


Fig. 1

Step	Procedure
4	Remove M8 hex. nuts and washers from turbocharger flange.
5	Remove M8x30 screws to disconnect turbocharger from exhaust manifold assy.

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- 1 Turbocharger flange
- 2 Exhaust manifold assy.
- 3 Hex. nut M8
- 4 Washer
- 5 Screw M8x30

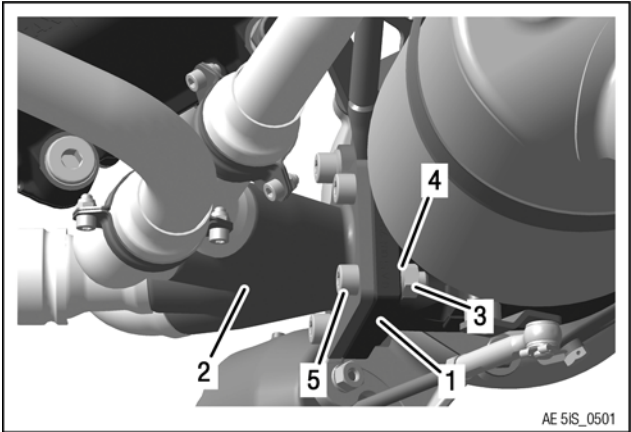


Fig. 2

Step	Procedure
6	Slacken tension clamp but do not detach or remove it from the muffler bracket.

- 1 Muffler
- 2 Tension clamp
- 3 Muffler bracket

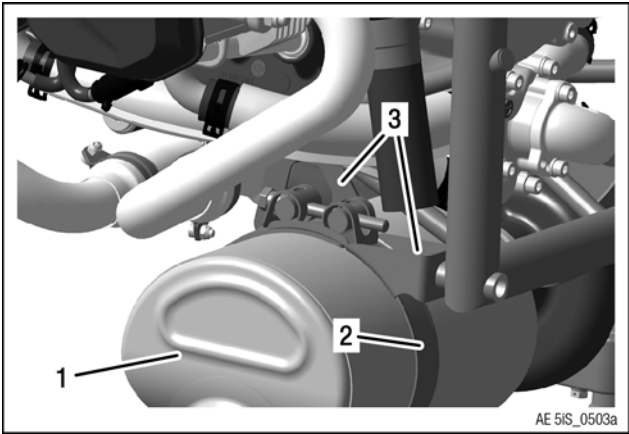


Fig. 3

Step	Procedure
7	Remove the Allen screw M10x50 (attachment of the turbocharger bracket) together with the lock washer and washer
8	Loosen the engine suspension frame / muffler bracket bolt (not supplied with the engine).

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- 1 Turbocharger bracket
- 2 Allen screw M10x50
- 3 Lock washer
- 4 Washer
- 5 Distance sleeve
- 6 Connection turbocharger bracket with engine suspension frame

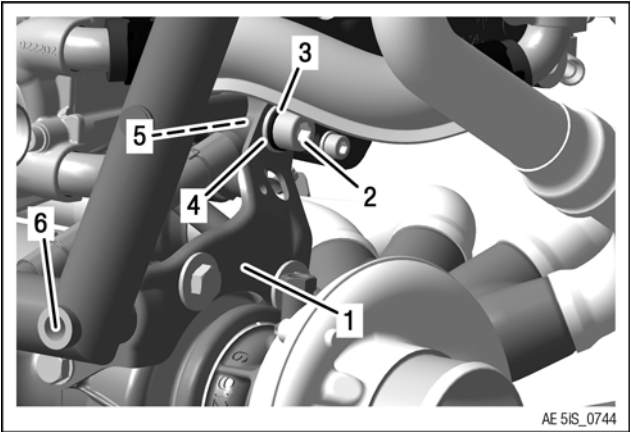


Fig. 4

Step	Procedure
9	Support the complete unit of muffler - turbocharger - bracket, remove the tension clamp and take off the complete unit.

- 1 Turbocharger
- 2 Muffler
- 3 Turbocharger bracket

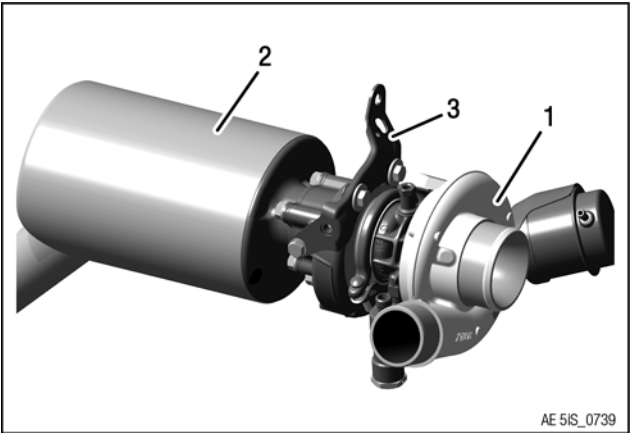


Fig. 5

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SERVICE INSTRUCTION

3.5.2) Turbocharger bracket - removal

Preparation:

- Remove turbocharger assy.

Step	Procedure
1	Remove 2 hex. screws M8x16 with washers B 8.4 (bigger outer diameter) from turbo-charger.
2	Remove hex. screw M8x16 with washer 8.4 and remove bracket.

- 1 Hex. screws M8x16
- 2 Washers B 8.4
- 3 Washer 8.4

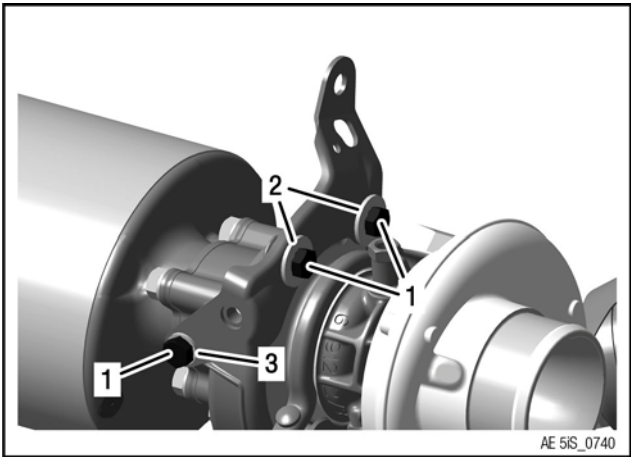


Fig. 6

3.5.3) Muffler - removal

Preparation:

- Remove turbocharger assy.

Step	Procedure
1	Remove hex. nuts with washers from the turbocharger studs.

- 1 Hex. nuts M8
- 2 Washers 8.4

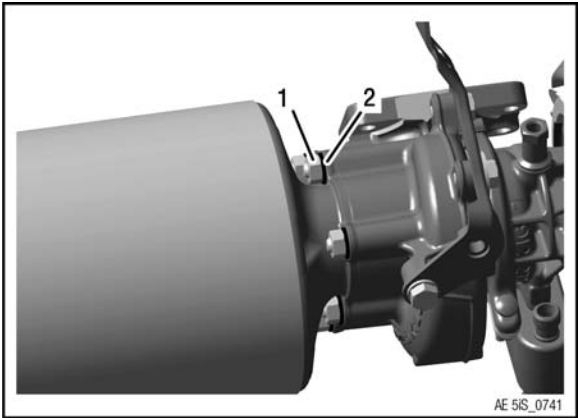


Fig. 7

SERVICE INSTRUCTION

3.5.4) Muffler - inspection

Step	Procedure
1	Check the muffler assy. and exhaust flange for cracks, damage and wear.

- 1 Muffler assy.
2 Exhaust flange

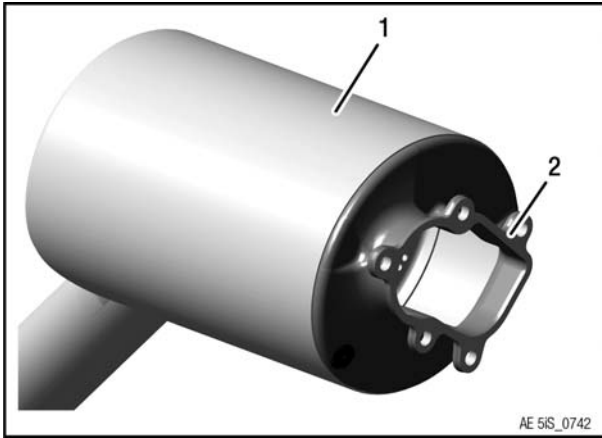


Fig. 8

3.5.5) Turbocharger - inspection

Preparation:

- Clean all parts carefully
- Record the readings in the Appendix



General visual inspection.
See Maintenance Manual Line (MML) for the engine type 915 i A Series Chapter 12-20-00

NOTE: The turbocharger is handled as a complete unit, i.e. no spare parts are available from BRP-Rotax. In the event of damage, the complete unit must be replaced.

Step	Procedure
1	Use a straight edge to test for distortion (see also section 4, Appendix). A distortion of max. 0.1 mm (0.004 inch) is permissible. If the maximal allowed distortion is exceeded, then it is possible to rework the surface up to 0.5 mm (0.02 inch). The amount of the rework must be recorded in the Appendix.

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SERVICE INSTRUCTION



Fig. 9

Step	Procedure
2	Check the threaded holes for damage and wear.
3	Apply slightly a radial pressure onto the turbine shaft to minimize the gap between the turbine casing and the turbine wheel. The gap must never be less than 0.1 mm (0.004 in.) (see also section 4, Appendix). Check the complete circumference of 360°.

NOTICE

It is not allowed to repair any of the threads inside of the turbine housing with thread inserts.

- 1 Threaded hole
- 2 Gap

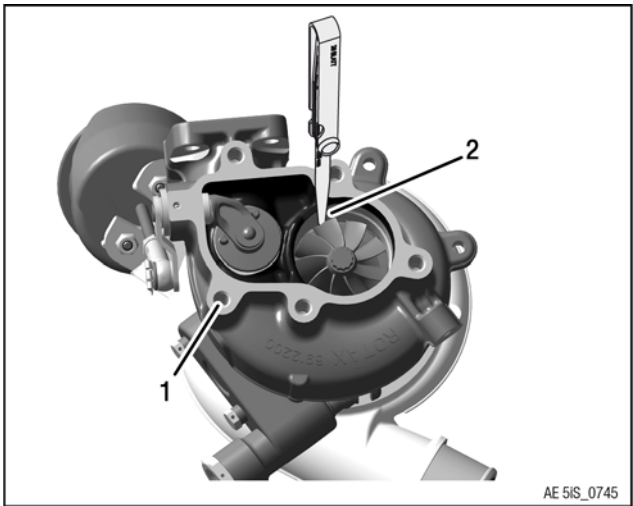


Fig. 10

SERVICE INSTRUCTION

Step	Procedure
4	Apply slightly a radial pressure onto the compressor shaft whereby it must not contact the compressor housing. Check the complete circumference of 360°.

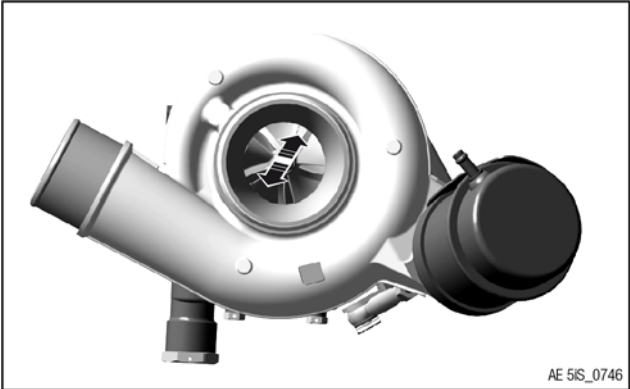


Fig. 11

Step	Procedure
5	Check the wastegate lever for free movement. If it does not move freely, lubricate the axle of the wastegate with LOCTITE ANTI SEIZE 8151.

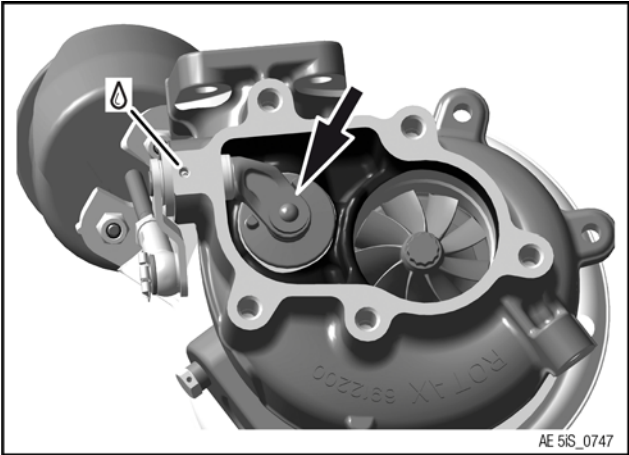


Fig. 12

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Step	Procedure
6	Apply slight in and out axial pressure onto the turbocharger shaft and check axial clearance TC01 (see also section 4, Appendix). The gap must exceed 0.084 mm (0.0033 in.)
7	Check the turbocharger shaft for radial clearance TC02 (see also section 4, Appendix). The gap must exceed 0.127 mm (0.0050 in.).

3.5.6) Pressure drop measuring method

Testing device consisting of:

- 2x pressure gauge
- 1x orifice jet (inner diameter = 1 mm (0.039 in.) / length = 3 mm (0.12 in.))
- 1x connecting nipple M12x1.5 for the thread in the middle section of the turbocharger
- 1x cover plate for the oil outlet connecting hoses (as required)

Step	Procedure
1	Screw in the connecting nipple and close the oil outlet with the cover plate.
2	Connect the pressure gauge together with the regulating valves.
3	Apply a constant pressure of 2 bar (29 psi) to the connection cable. The pressure drop must not exceed 50%. (From 2 bar (29 psi) to max. 1 bar (14.5 psi)). NOTE: For optimum results, the position of the shaft should always be changed slightly during the check, i.e. the shaft should be moved backwards and forwards in axial and radial directions

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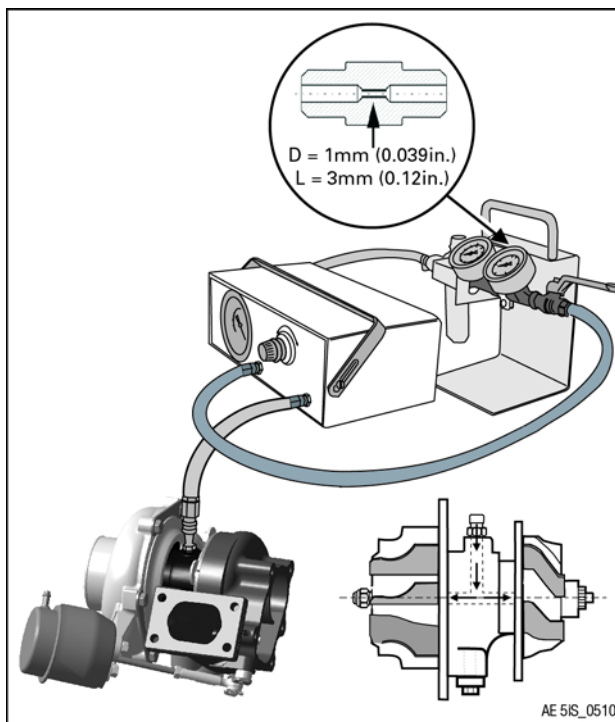


Fig. 13

SERVICE INSTRUCTION

3.5.7) Muffler - installation

Step	Procedure
1	Apply LOCTITE ANTI SEIZE to the studs of the turbocharger. Tighten muffler with washers and nuts M8 to the turbocharger housing. Tightening torque 25 Nm (18 ft. lb.).

- 1 Hex. nuts M8
- 2 Washers 8.4

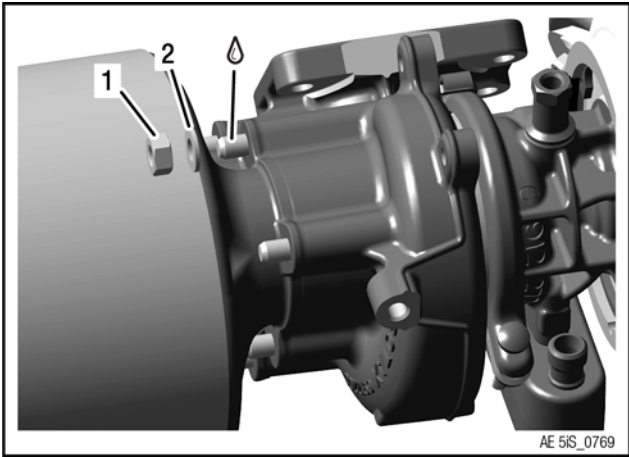


Fig. 14

3.5.8) Turbocharger bracket - installation

Turbocharger bracket integrates a captive nut used for engine ring mount and aircraft suspension frame attachment. It is available in Metric (M10) part no. 851298 or UNF (3/8-24) (AN6) part no. 851282.

Step	Procedure
1	Apply LOCTITE ANTI SEIZE to the hex. screws M8x16. Tighten the bracket to the turbocharger using 3 hex. screws M8x16 with 1x washer 8.4 and 2x washers B 8.4 (bigger outer diameter). Tightening torque 25 Nm (18 ft. lb.).

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- 1 Hex. screws M8x16
- 2 Washers B 8.4
- 3 Washer 8.4

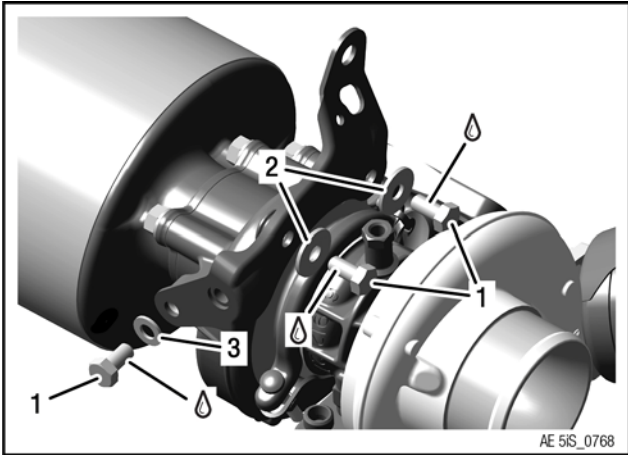


Fig. 15

3.5.9) Turbocharger assy. - installation

Step	Procedure
1	Place distance spacer 10.5/17/15 into the engine suspension frame.
2	Screw turbocharger assembly to the engine housing, complete with muffler and turbocharger bracket with washer, lock washer and Allen screw M10x50. Tightening torque 60 Nm (44 ft. lb).

- 1 Turbocharger bracket
- 2 Allen screw M10x50
- 3 Lock washer
- 4 Washer
- 5 Distance sleeve
- 6 Connection turbocharger bracket with engine suspension frame

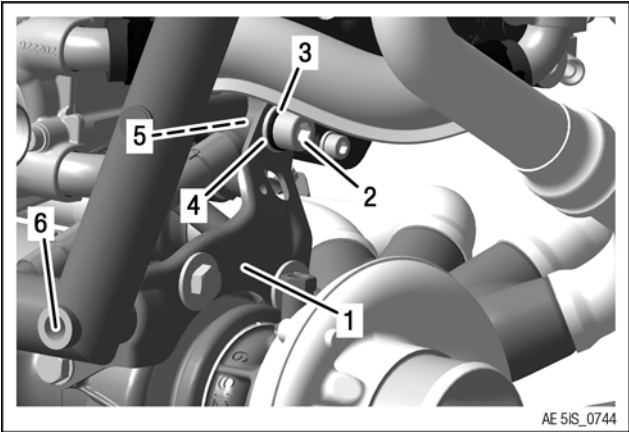


Fig. 16

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Step	Procedure
3	The muffler is attached to the muffler bracket with a tension clamp. Tightening torque 20 Nm (15 ft. lb).

- 1 Muffler
- 2 Tension clamp
- 3 Muffler bracket

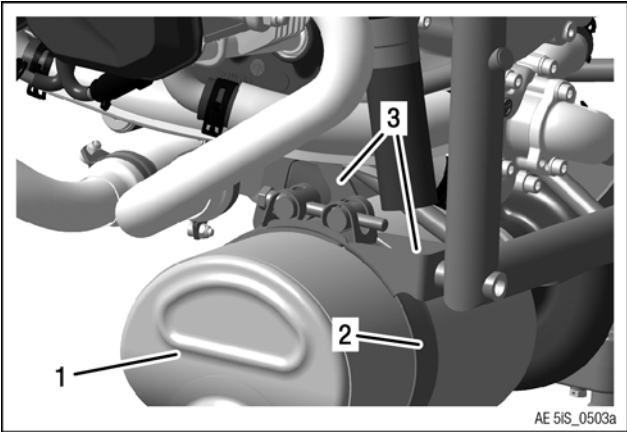


Fig. 17

Step	Procedure
4	Install turbo on exhaust manifold using Allen screws M8x30 with hex. nuts M8 and washers. Apply LOCTITE ANTI SEIZE to the screws. Tightening torque 25 Nm (18 ft. lb).

- 1 Allen screw M8x30
- 2 Washer 8.4
- 3 Hex. nut M8

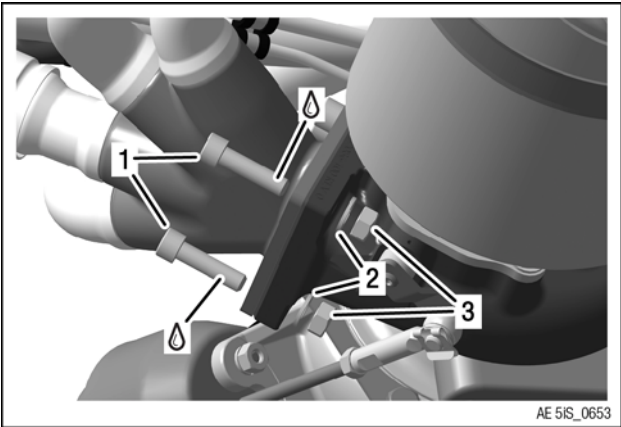


Fig. 18

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Step	Procedure
5	Re-establish attachment (turbocharger bracket engine suspension frame (not supplied with engine). Tightening torque as specified by the aircraft manufacturer. NOTE: Ensure correct attachment bolt is used for the turbocharger bracket.

NOTICE

Total blockage of oil supply may occur!
Do not install ball and spring for check valve in wrong order. Ball must be on the upper side, over the spring!

Step	Procedure
6	Install spring and ball of turbo pressure oil line, see applicable Maintenance Manual Heavy (MMH), Chapter 79-00-00 Oil line (steel line) installation. NOTE: Ball must be on the upper side, over the spring! NOTE: Valve housing part no. 956482 must be used in conjunction with turbocharger part no. 893107.
7	Connect the turbo pressure oil line with new sealing rings, see applicable Maintenance Manual Heavy (MMH), Chapter 79-00-00 Oil line (steel line) installation.. Tightening torque 17 Nm (150 in. lb).
8	Install turbo suction oil line with clamp, M5x20 screw and new M5 lock nut on turbocharger bracket, see Chapter 79-00-00 Oil line (steel line) installation.
9	Install hose on wastegate regulator assy.

- 1 Turbo pressure oil line
- 2 Suction oil line
- 3 Wastegate regulator
- 4 Hose (wastegate regulator)
- 5 Cable clamp

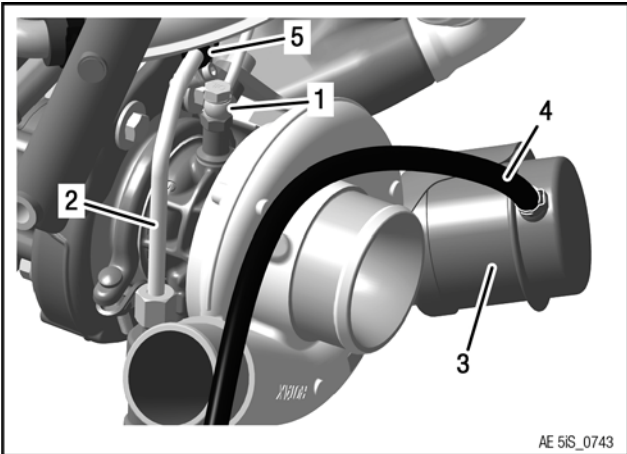


Fig. 19

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If the location of the oil line connection does not correspond with oil pump housing, correction can be achieved by slightly turning the turbocharger center section. After completion of installation as described, all the screw connections on the turbocharger bracket, exhaust manifold, exhaust bends and the tension clamp must be tightened to the specified torques:

Description	Application	Tightening torque
Allen screw	Turbo flange	25 Nm / 18 ft. lb
Allen screw	Turbocharger bracket	60 Nm / 44 ft. lb
Allen screw	Exhaust bracket	60 Nm / 44 ft. lb
Hex. screw	Tension clamp	20 Nm / 15 ft. lb

NOTICE

In the high temperature zone of the turbocharger and exhaust system, use exclusively high grade, stainless steel screws

3.6) ECU software check/update

Engines equipped with following ECU part numbers are already programmed with the latest version of ECU software.

Engine type	ECU part no.
915 iSc A	864357

3.6.1) Identify current ECU configuration

Connect ECU to computer by using the Service Wiring Harness or, in case the ECU is installed in an aircraft, by connecting the ECU directly via the aircraft wiring harness. Refer to the instructions of the latest Maintenance Manual Heavy Chapter 76-10-00.

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 – All Programs - B.U.D.S. - run B.U.D.S.).

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SERVICE INSTRUCTION

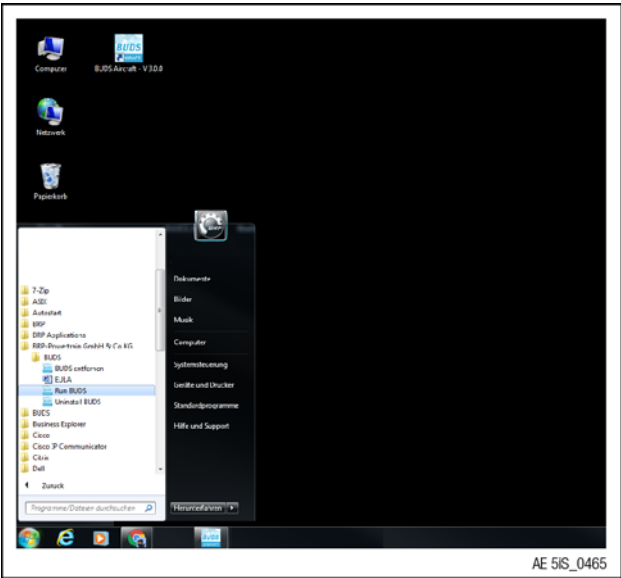


Fig. 20

Step	Procedure
2	Wait until the program has been started completely.
3	Check if both Lane Health Indicators (top left corner) turn green . If they are gray check connections and power supply and/or restart B.U.D.S. Aircraft.
4	Change to “ECU configuration” tab.

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SERVICE INSTRUCTION

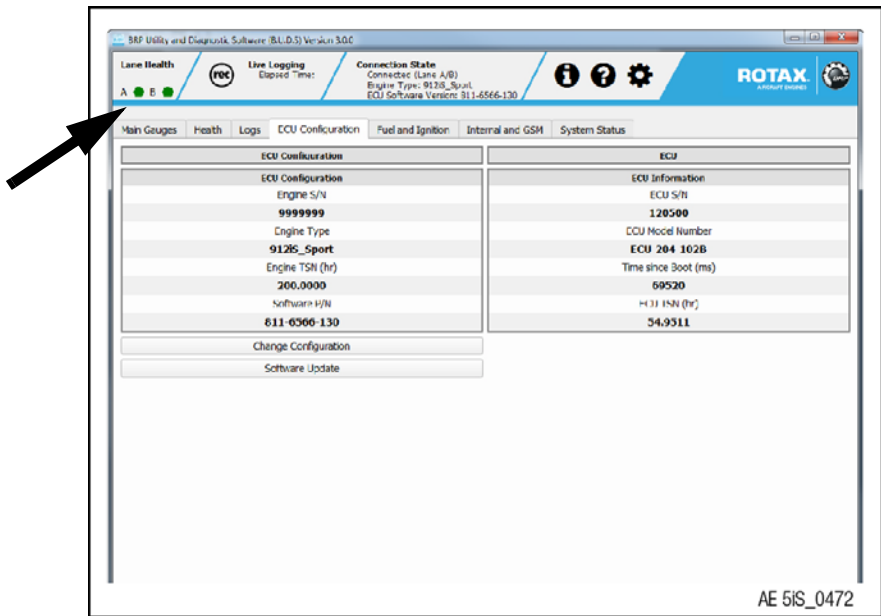


Fig. 21

Step	Procedure
5	<p>Read and note the values of following field:</p> <ul style="list-style-type: none"> - Software P/N: This value indicates the current software installed on the ECU. <p>NOTE: Knowing the current “Software Config. Part Number” and “ECU part number” is crucial, when loading ECU software or verifying if ECU has the latest software installed.</p>

3.6.2) Verify ECU Software

Verify if the installed ECU software version is up to date. If the software is not up to date continue with chapter 3.6.3. See also SI-915 i-004 - List of approved Engine Control Unit (ECU) software and hardware configurations for ROTAX® Engine Type 915 i (Series).

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3.6.3) Update of ECU software

If there is a newer ECU software for the relevant engine configuration available perform software loading according to SB-915 i-002 - Software Update for Engine Control Unit (ECU) on ROTAX® Engine Type 915 i (Series).

3.7) Test run

In case of uninstalled engines test run can be skipped as this is covered by the mandatory test run after installation.



Conduct test run. See Chapter 12-20-00 of the latest Maintenance Manual Line for the respective engine type.

3.8) Summary

These instructions (section 3) have to be followed in accordance with the deadlines specified in section 1.5.

The execution of the Service Instruction must be confirmed in the logbook.

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

Translation into other languages might be performed in the course of language localization but does not lie within ROTAX® scope of responsibility.

In any case the original text in English language and the metric units are authoritative.

3.9) Inquiries

Inquiries regarding this Service Instruction should be sent to the ROTAX® Authorized Distributor of your area.

A list of all ROTAX® Authorized Distributors or their independent Service Centers is provided on www.flyrotax.com.

SERVICE INSTRUCTION

4) Appendix

WEAR LIMITS

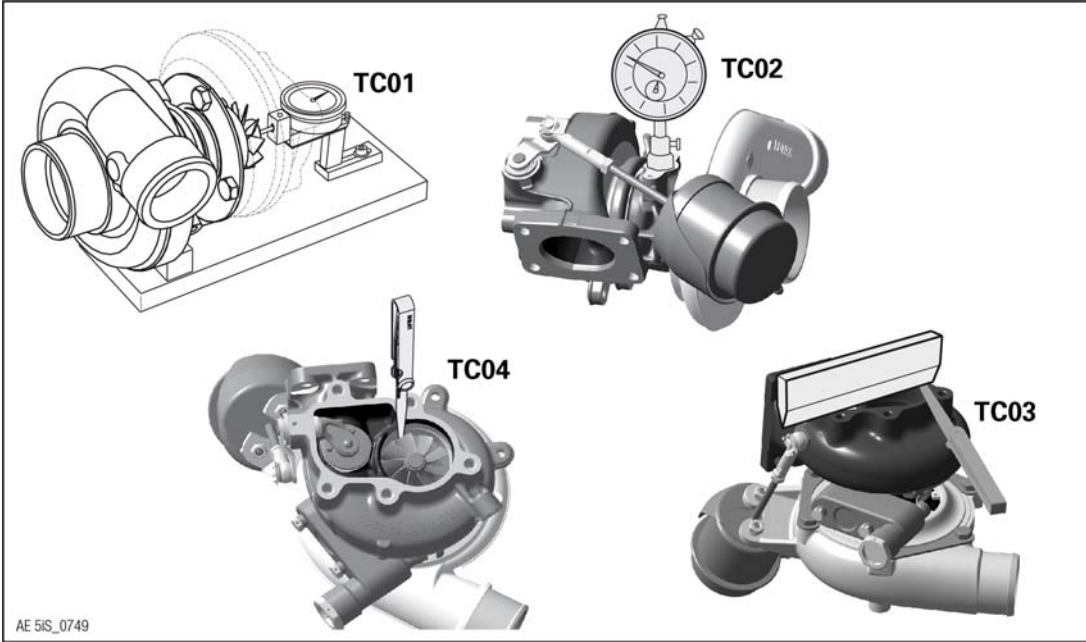


Fig. 22

Description	Code	Current measurement value		Tolerance limit	
		min	max	100%	50%
Turbocharger					
Axial clearance	TC01			0.025 mm (0.0010 in.) to 0.084 mm (0.0033 in.)	0.040 mm (0.0016 in.) to 0.070 mm (0.0028 in.)
Radial clearance	TC02			0.056 mm (0.0022 in.) to 0.127 mm (0.0050 in.)	0.074 mm (0.0029 in.) to 0.109 mm (0.0043 in.)
Rework turbine housing flange	TC03			0.5 mm (0.02 in.)	
Rotor turbine	TC04			0.1 mm (0.004 in.)	

NOTE: The illustrations in this document show the typical construction. They may not represent full detail or the exact shape of the parts which have the same or similar function.

Exploded views are **not technical drawings** and are for reference only. For specific detail, refer to the current documents of the respective engine type.