

Endura AZ40

Sensor assembly



Orifice and seals kit
Kit reference: AZ400 752

Measurement made easy

Endura AZ40
sensor assembly

1 Introduction

This publication details replacement procedures for the following AZ40 orifice and seals kit (AZ400 752). Before carrying out any procedures, see Section 3. The following procedures must be carried out by a suitably-trained technician:

- Cleaning/Replacing CO and O₂ orifices: Sections 4, 5, 6 and 7 (pages 4, 4, 6 and 7)
- Replacing sensor assembly gaskets: Sections 4, 5, 6 and 8 (pages 4, 4, 6 and 8)
- Cleaning / Replacing sensor assembly aspirator: Sections 4, 5, 6 and 8.4 (pages 4, 4, 6 and 12)
- Replacing sensor assembly flow disk: Sections 4, 5, 6 and 8.5 (pages 4, 4, 6 and 14)

Kit contains:

- Orifices, gaskets, seals
- This publication

Tools required

- Transmitter door key (supplied with transmitter)
- Operating instruction [OI/AZ40-EN*](#)
- 3/16 in, 1/4 in, 5/32 in allen keys (wrenches)
- 7/8 in open-ended spanner (wrench)
- 10 in adjustable spanner (wrench)
- Medium flat-bladed screwdriver
- 2 Small screwdrivers (1 × flat-bladed, 1 × crosshead)
- Single-edged razor blade
- Anti-seize compound (suitable for temperatures up to 200 °C [392 °F])

*Operating instruction [OI/AZ40-EN](#) contains mandatory safety information and can be downloaded from the link (above) or by scanning this code:



2 For more information

Further information is available from:

www.abb.com/analytical

or by scanning these codes:



Sales



Service

3 Health & Safety

3.1 Safety precautions

Be sure to read, understand and follow the instructions contained within this document before and during use of the equipment. Failure to do so could result in bodily harm or damage to the equipment.



WARNING – Bodily injury Installation, operation, maintenance and servicing must be performed:

- by suitably trained personnel only
- in accordance with the information provided in this document
- in accordance with relevant local regulations

3.2 Potential safety hazards

3.2.1 Process conditions and requirements



WARNING – Bodily injury
Environmental conditions



– High air / equipment / structure temperatures, poor air quality and adverse environmental conditions may be present when the process is running.



– It is recommended that the process is shut down before performing these procedures.



– The process must be cool enough to enable shutdown, disconnection and removal of the sensor in a safe manner and in accordance with relevant local regulations.

– Appropriate PPE, including mask and goggles must be worn when preparing the process for these procedures.

3.2.2 Endura AZ40 sensor – fibrous material in probe assembly



WARNING – Serious damage to health

Fibrous material



– The sensor and probe assemblies (standard and high temperature versions) contain fibrous material that can be a health hazard if airborne.



– The material, predominantly – aluminosilicate refractory fibres, CAS 142844-00-6. Refractory ceramic fibres (RCF) are classified as:



– Category 1B carcinogen under regulation (EC) No 1272/2008 – the classification, labelling and packaging regulations.

– Category 2B carcinogen by inhalation by The International Agency for Research on Cancer (IARC).

– When removing the sensor cover and subsequent maintenance activities, exposure to the airborne fibres could occur. ABB have conducted air sampling assessments within the breathing zone of the operator and have identified that an exposure limit of 1 fibre / cubic centimetre is unlikely to occur.

– Exposure to any carcinogen must be kept as low as reasonably practicable.

– Appropriate PPE defined below, must be worn when working with probe assemblies (all installation, replacement, maintenance procedures):

– A face fit tested, half mask conforming to EN140 (or equivalent) with a level 3 particulate filter conforming to EN 143 (or equivalent).

– Disposable protective coveralls in accordance with Type 5 ISO 13982-1:2004 (or equivalent).

– Goggles and gloves.

3.2.3 Endura AZ40 sensor / probe – installation to pressurized process



DANGER – Serious damage to health / risk to life
Pressurized equipment – do not install / remove / the sensor / probe if the process is at positive pressure

Installation, operation, maintenance and servicing of pressurized equipment must be performed:

– by suitably trained personnel only

– in accordance with the information provided in this document

– in accordance with relevant local regulations

– when process conditions are suitable to allow enough to enable installation / maintenance

3.2.4 Endura AZ40 sensor – high operational temperature on exposed parts



WARNING – Bodily injury High temperature on exposed surfaces – see Fig. 3.1

- During operation, exposed sensor surfaces can reach 200 °C (392 °F).
- Ensure suitable PPE is available and is worn before handling the sensor.
- Do not touch exposed surfaces until the sensor / probe is cool enough to handle with PPE.

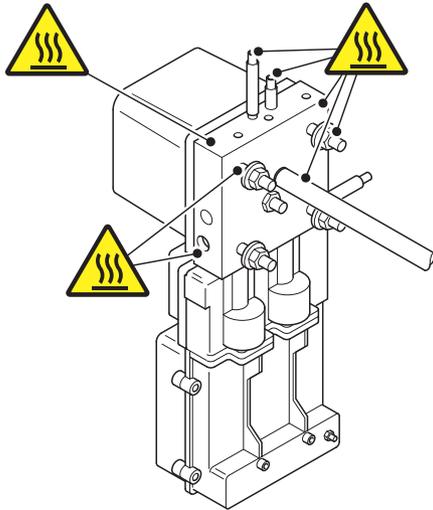


Fig. 3.1 High temperature points on exposed sensor surfaces during operation

3.2.5 Endura AZ40 sensor – weight



WARNING – Bodily injury

- The sensor weighs 9.0 kg (20 lb). When fitted with a probe / filter assembly, the combined sensor / probe weight is dependent on probe length / type plus filter option – refer to Operating instruction OI/AZ40-EN for weight details.
- The sensor / probe assembly must be mounted in accordance with the information supplied in Operating instruction OI/AZ40-EN.
- Suitable lifting equipment must be available when installing / removing the sensor / probe from the process.

3.2.6 Endura AZ40 analyzer – electrical



WARNING – Bodily injury

To ensure safe use when operating this equipment, the following points must be observed:

- up to 240 V AC may be present. Ensure the supply is isolated before removing the terminal cover
- normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and / or temperature

Safety advice concerning the use of the equipment described in this document or any relevant Material Safety Data Sheets (where applicable) can be obtained from the Company, together with servicing and spares information.

Endura AZ40 transmitter – weight



WARNING – Bodily injury

- The transmitter weighs 7.6 kg (17 lb) and must be mounted in accordance with the information supplied in Operating instruction OI/AZ40-EN.
- Suitable lifting equipment must be available when installing / removing the transmitter from the mounting.

4 Isolating the transmitter

Referring to Fig. 4.1.

1. Isolate transmitter (A) from incoming mains power supplies (B).



DANGER – Serious damage to health / risk to life

The transmitter must be isolated from mains power supplies before performing this procedure.

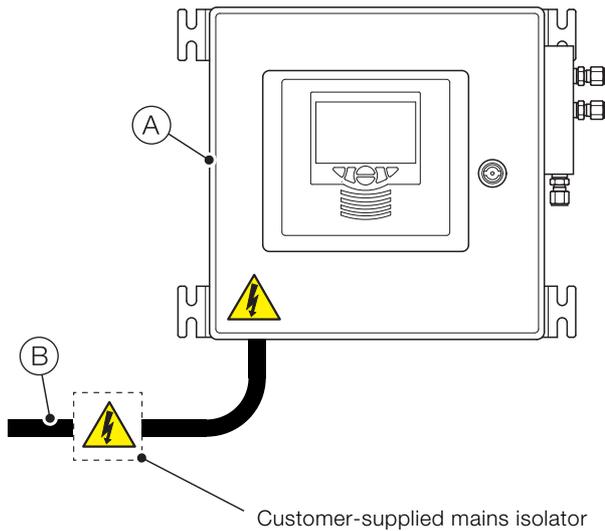


Fig. 4.1 Isolating the transmitter from incoming mains power supplies

5 Shutting down / removing the sensor assembly from the process



DANGER – Serious damage to health / risk to life

Allow sufficient time for the sensor assembly to cool before performing these procedures.

5.1 Shutting the sensor assembly down at the process

Referring to Fig. 5.1.

1. Close the air supply valve (A) and shut down the test gas line (B) at the supply.

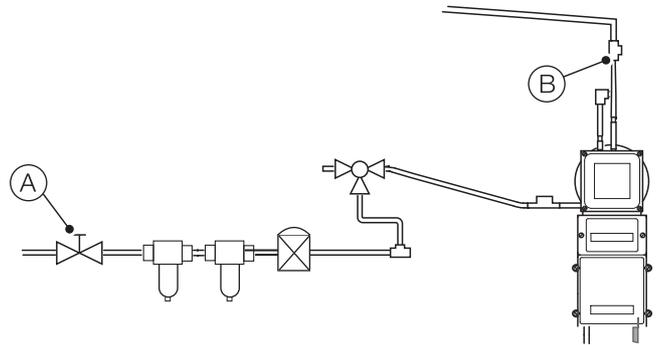


Fig. 5.1 Shutting down instrument air and test gas supplies

5.2 Disconnecting the sensor air and test gas supplies at the process

Referring to Fig. 5.2:

1. Disconnect air line (B) and test gas line (C) at sensor (D).

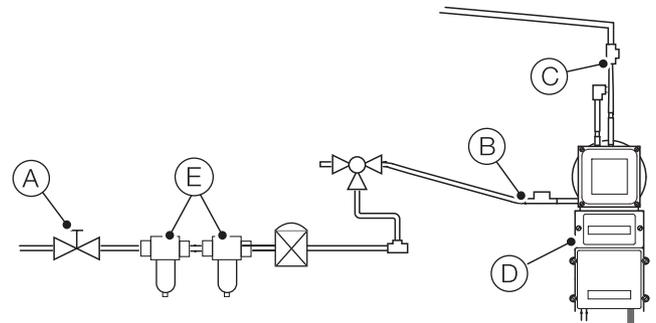


Fig. 5.2 Disconnecting instrument air and test gas supplies

5.3 Disconnecting the sensor electrical power and signal cables at the process



DANGER – Serious damage to health / risk to life

Allow sufficient time for the sensor assembly to cool before performing this procedure.



DANGER – Serious damage to health / risk to life

The transmitter must be isolated from mains power supplies before performing this procedure.

Referring to Fig. 5.3:

1. Use a medium flat-bladed screwdriver to unscrew 4 (captive) cover screws (A) and remove cover (B) from sensor assembly (C).
2. Disconnect mains cable (D) from terminal block (E).
3. Disconnect signal cable (F) from terminal block (G).
4. Disconnect thermocouple cables (H) from terminal block (I).
5. If optional blowback is fitted, disconnect cable (J) from terminal block (K).

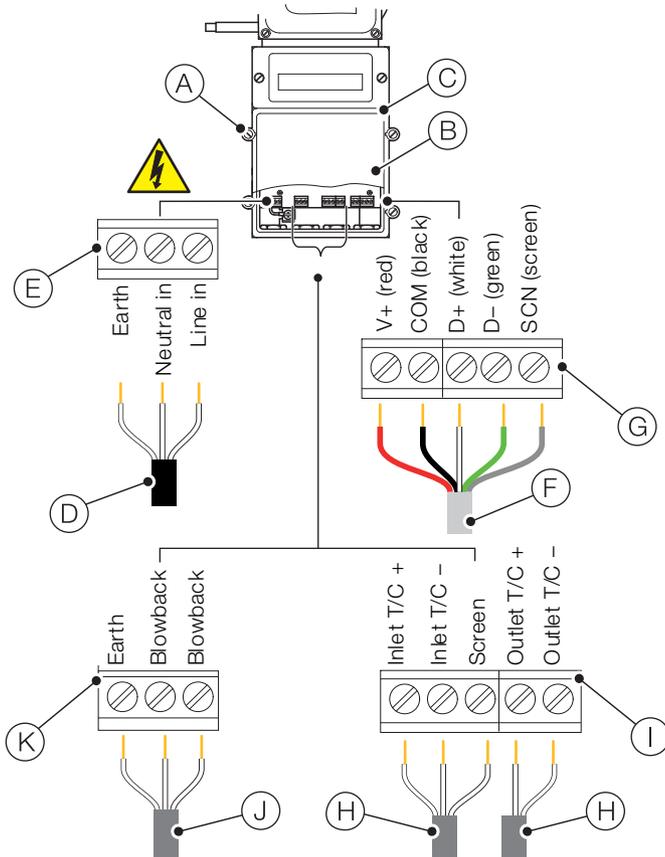


Fig. 5.3 Disconnecting sensor cables

5.4 Removing the sensor assembly from the process



DANGER – Serious damage to health / risk to life

Allow sufficient time for the sensor assembly to cool before performing this procedure.

Referring to Fig. 5.4:

1. Use a 10 in. adjustable spanner (wrench) to remove 4 nuts, washers and lockwashers (A) securing sensor assembly (B) to mounting flange (C). Set items aside for re-use.
2. Carefully remove the sensor assembly and the attached probe (including filter assembly) from the process.
3. Temporarily cover process opening until the sensor assembly is ready to be re-installed.

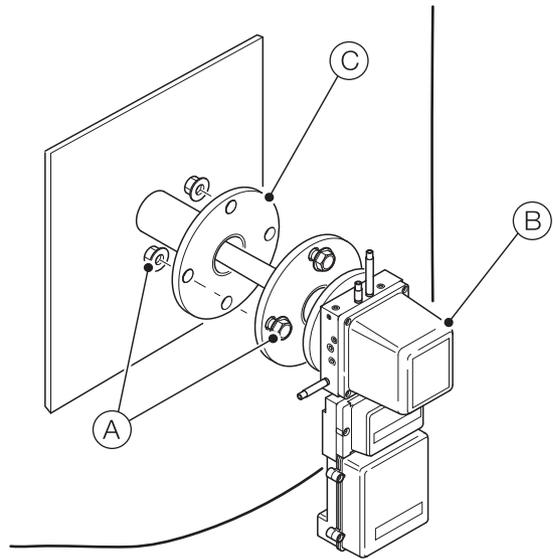
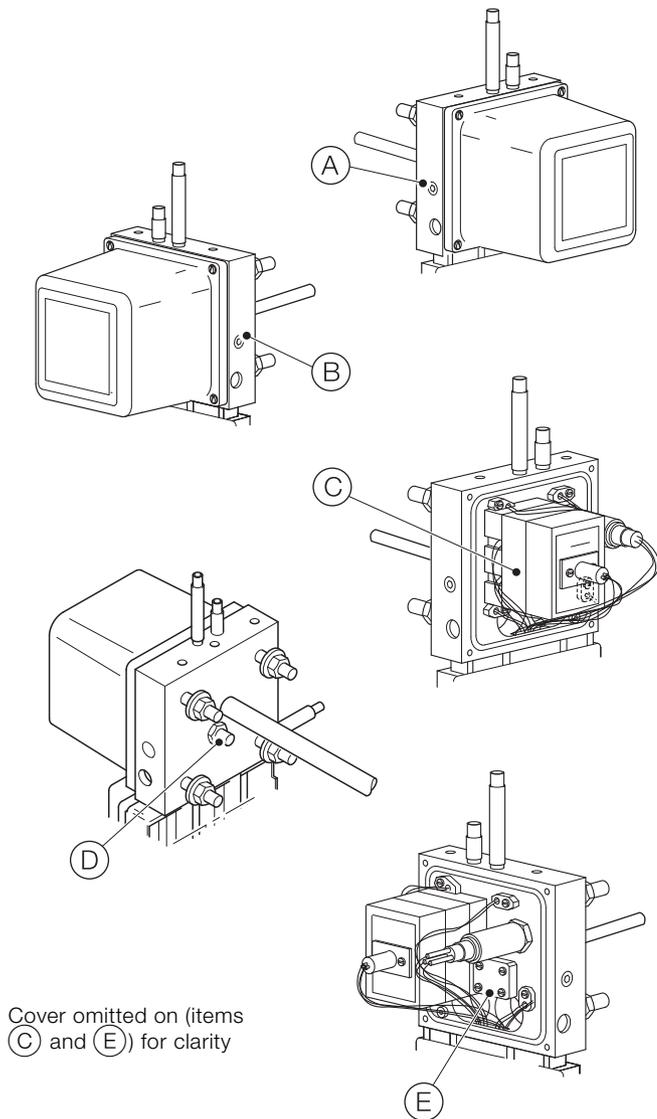


Fig. 5.4 Removing the sensor assembly from the process

6 Orifice and seals kit component locations on sensor assembly

Refer to Fig. 6.1 for orifice and seals kit component locations:



Key:

- (A) CO orifice – see Section 7, page 7
- (B) O₂ orifice – see Section 7, page 7
- (C) CO heater block gaskets – see Section 8.3, page 9
- (D) Aspirator (aspirator filter and probe omitted for clarity) – see Section 8.4, page 12
- (E) Flow disk – see Section 8.5, page 14

Fig. 6.1 Orifice and seals kit component locations on sensor assembly

7 Cleaning / Replacing CO and O₂ orifices

Referring to Fig. 7.1.

1. Use a 1/4 in. allen key (wrench) to loosen and remove CO orifice pipe plug (A). Retain for re-use.
2. Use a 5/32 in. allen key (wrench) to loosen and remove CO orifice (B). The CO orifice has 2 notches in the head.
3. Use a 1/4 in. allen key (wrench) to loosen and remove O₂ orifice pipe plug (C). Retain for re-use.
4. Use a 5/32 in. allen key (wrench) to loosen and remove O₂ orifice (D). The O₂ orifice has 1 notch in the head.
5. Carefully clean any blockages or debris from both orifice holes using a low pressure air hose.

WARNING – Bodily injury



- Do not use compressed air for any other purpose than that for which it is provided.
- Never direct a stream of compressed air towards your body or the body of any other person.
- When handling / connecting compressed air lines the correct safety procedures must be observed.

If the blockage cannot be cleared, renew both orifices.

CAUTION – Damage to equipment



Do not drill chamber out or scratch inner surfaces as damage to any of the internal faces affects aspirator performance.

6. Apply a small amount of anti-seize compound to the thread of each orifice (B and D) and each pipe plug (A and C).



CAUTION – Damage to equipment

Do not allow anti-seize compound to contaminate the manifold surfaces or enter orifice holes.

7. Use a 5/32 in. allen key (wrench) to secure CO orifice (B) (2 notches in head) in place in the CO orifice chamber.
8. Use a 1/4 in. allen key (wrench) to secure CO orifice pipe plug (A) in place in the CO orifice chamber.
9. Use a 5/32 in. allen key (wrench) to secure O₂ orifice (D) (1 notch in head) in place in the O₂ orifice chamber.
10. Use a 1/4 in. allen key (wrench) to secure O₂ orifice pipe plug (C) in place in the CO orifice chamber.
11. Prepare the sensor assembly for operation by reversing the shutdown / isolation procedure – refer to Section 4, page 4.
12. Refer to Operating instruction OI/AZ40-EN to restore the analyzer to full operational condition.

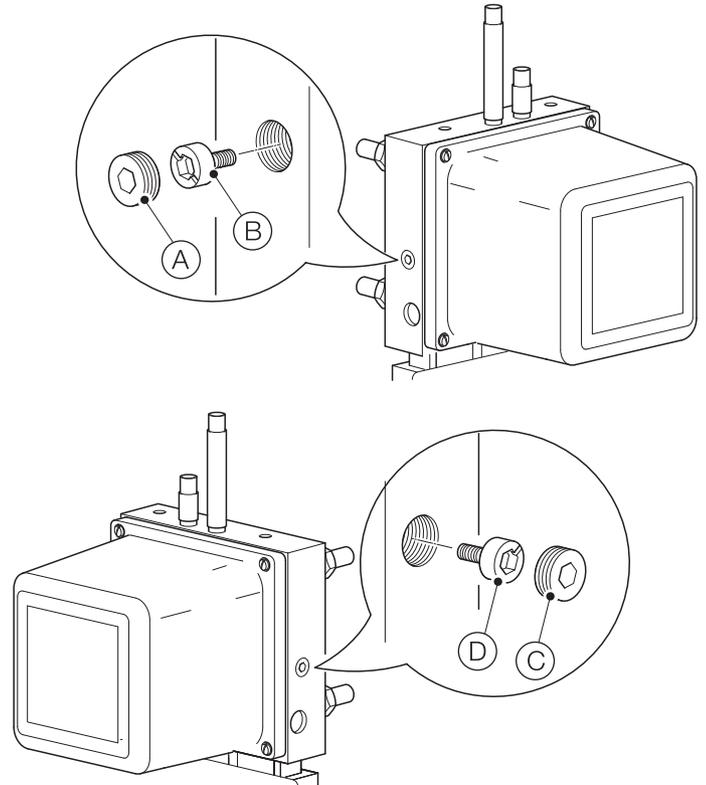


Fig. 7.1 Cleaning / Replacing the orifices

8 Replacing sensor assembly gaskets, flow disk and replacing / cleaning the aspirator

8.1 Removing the probe, exhaust filter, adaptor flange (if fitted) from the sensor

Referring to Fig. 8.1:

1. If a flange adaptor (A) is fitted, use a 10 in. adjustable spanner (wrench) to loosen and remove flange mounting nuts and washers (B) and remove flange.
2. Unscrew probe / filter (C) and remove from manifold (D).
3. Remove exhaust filter (E) from aspirator (F) using an open-ended $\frac{7}{8}$ in. spanner (wrench).

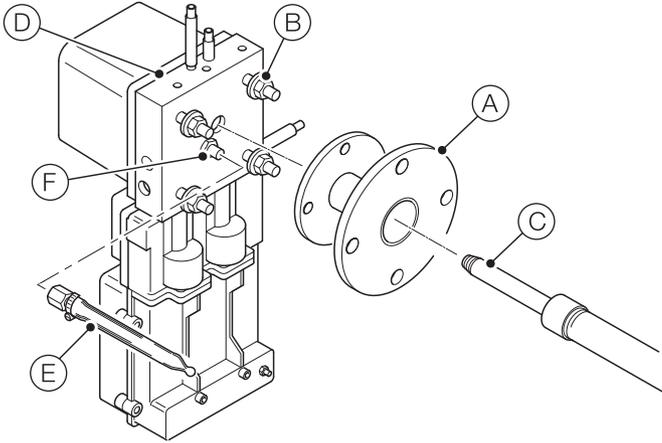


Fig. 8.1 Removing the probe, exhaust filter, adaptor flange from the sensor

4. Perform the required replacement / cleaning procedures by referring to the following sections:
 - Replacing sensor assembly gaskets: see section 8.2 to remove covers, then section 8.3, page 9
 - Replacing / cleaning sensor assembly aspirator: see section 8.4, page 12
 - Replacing sensor assembly flow disk: see section 8.2 to remove covers, then section 8.5, page 14

8.2 Removing / Replacing sensor covers

8.2.1 Removing the sensor covers

Referring to Fig. 8.2:

1. Use a medium flat-bladed screwdriver to unscrew 4 (captive) cover retaining screws (A) and remove cover (B). Retain cover for re-use.
2. Use a medium flat-bladed screwdriver to unscrew 2 (captive) cover retaining screws (C) and remove cover (D). Retain cover for re-use.

i IMPORTANT (NOTE)

Check the seals fitted to each cover. If they need replacing or seals have bonded to the mating surfaces of the sensor assembly, replace them. Refer to Instruction INS/ANAINST/010-EN for the sensor cover seals replacement procedure.

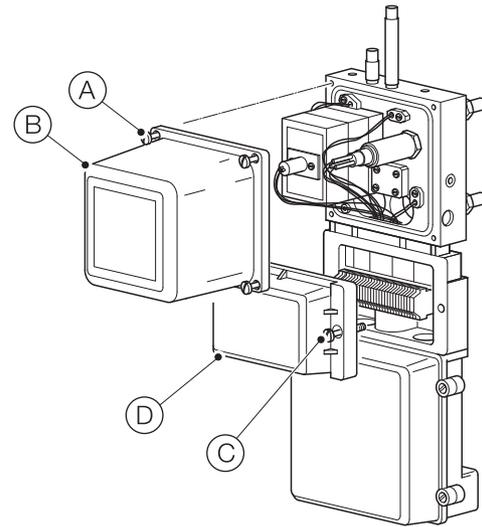


Fig. 8.2 Removing the sensor covers

8.2.2 Refitting the sensor covers

Referring to Fig. 8.2:

1. Apply a light coating of anti-seize compound (suitable for temperatures up to 200 °C [392 °F]) to the threads of sensor cover mounting screws (A) and (C).
2. Refit covers in the reverse order of removal – refer to Section 8.2.1 (above).
3. Refit the probe / filter assembly in the reverse order of removal – refer to Section 8.1 (above).
4. Prepare the sensor assembly for operation by reversing the sensor shutdown / removal procedure at the process – refer to Section 4, page 7.
5. Refer to Operating instruction OI/AZ40-EN to restore the analyzer to full operational condition.

8.3 Sensor assembly gaskets

8.3.1 Removing the O₂ sensor



IMPORTANT NOTE

The O₂ sensor must be removed to enable access to the COe block thermocouple – see Fig. 8.4, page 11, item (L).

Referring to Fig. 8.3:

1. Place the sensor assembly on a clean flat surface with the flange studs pointing down.
2. Disconnect O₂ sensor wiring at upper terminals 8, 9, 10 using a small flat-bladed screwdriver to depress the spring connector in each terminal and withdraw the wires from the terminal housing.
3. Unscrew O₂ sensor (A) from manifold block (B) using a 7/8 in. spanner (wrench) and withdraw the sensor.



CAUTION – Minor injuries

Do not overtighten when refitting the O₂ sensor.

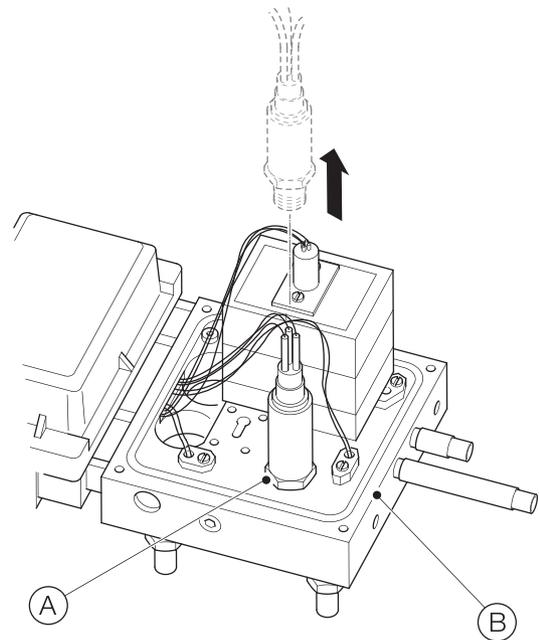
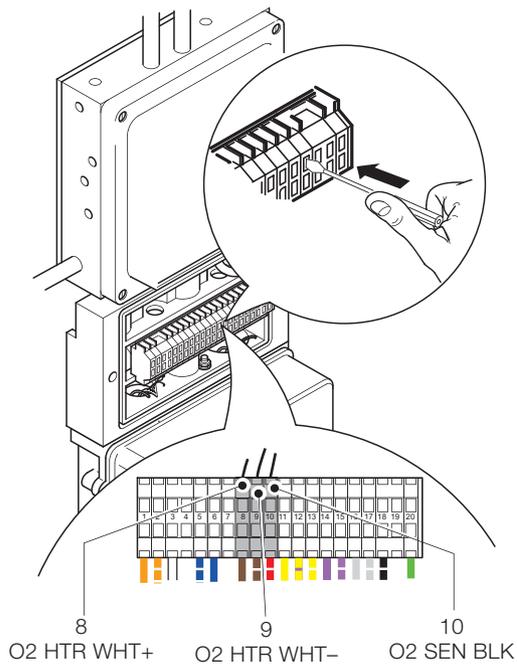


Fig. 8.3 Removing the O₂ sensor

8.3.2 Replacing CO sensor assembly gaskets

Referring to Fig. 8.4, page 11:

1. Remove insulation (A) surrounding COe block (B) by loosening insulation retainers (C) and sliding the insulation up off the block over COe sensor wires (D) or, optionally, remove insulation retainers (C) and unwrap the insulation from around COe block assembly (B).



CAUTION – Damage to equipment

Appropriate PPE (gloves / goggles) must be worn when performing this step. The heater block insulation material is fragile and becomes brittle after continuous operation. When sliding insulation away from the CO block or removing it, handle carefully.

2. Use a small crosshead screwdriver to remove 2 sensor clamp plate retaining screws / washers (E) and lift CO block insulator (F) and sensor clamp plate (G) up with CO sensor (H) in place.



CAUTION – Damage to equipment

The CO sensor is fragile. The sensor elements should be protected to ensure no damage or contamination occurs during this procedure.

3. Take care not to disturb COe heater wires (I) and use a small flat-bladed screwdriver to remove thermocouple retaining screw (J) (complete with attached washer (K)) and carefully remove COe block thermocouple (L). Retain thermocouple for re-use.



CAUTION – Damage to equipment

The thermocouple is fragile and brittle. Handle with care.

4. Use a $\frac{3}{16}$ in. allen key (wrench) to loosen and remove 2 COe block retaining screws / washers (M).
5. Remove COe block (N), preheater (O), isolator (P), block gasket (Q) and isolator gaskets (R) from flange manifold (S).
6. Remove dilution air restrictor (T) from isolator (P).
7. Carefully remove any gasket material from all surfaces – a single-edged razor blade can be used.



CAUTION – Damage to equipment

When removing gasket material do not scratch the surfaces as damage to any internal / mating face may affect sensor performance.

8. Fit dilution air restrictor (T) to isolator (P).
9. Assemble items (N), (Q), (O), (R) and (P) in the correct order, ensuring the new gaskets (Q) and (R) are aligned correctly.



CAUTION – Damage to equipment

Alignment of the gaskets is critical to ensure a leak-free assembly. Double-check gaskets / blocks alignment before securing the COe block to the manifold.

10. Apply a light coating of an anti-seize compound (suitable for temperatures up to 200 °C [392 °F]) to the threaded portions of COe block retaining screws (M).
11. Position the COe block assembly on manifold (S) and use a $\frac{3}{16}$ in. allen key (wrench) to fit and tighten 2 COe block retaining screws / washers (M). Tighten the screws alternately, checking gasket / block alignment during tightening.
12. Apply a light coating of an anti-seize compound (suitable for temperatures up to 200 °C [392 °F]) to the threaded portion of thermocouple retaining screw (J).



CAUTION – Damage to equipment

Do not allow anti-seize compound to contaminate any part of the CO sensor or other local component(s).

13. Locate COe block thermocouple (L) ensuring it passes all the way into the thermocouple hole and use a small flat-bladed screwdriver to fit thermocouple retaining screw (J) (complete with attached washer (K)).



CAUTION – Damage to equipment

- The thermocouple is fragile and brittle. Do not bend or break the thermocouple tip.
- When refitting the thermocouple, ensure the thermocouple wiring is clear of screw (J) / attached washer (K) while tightening to prevent fraying / nicking of wires.

14. Re-fit COe block insulation (A) in the reverse order of removal.
15. Apply a light coating of an anti-seize compound (suitable for temperatures up to 200 °C [392 °F]) to sensor clamp plate retaining screws (E).
16. Position CO block insulator (F) with sensor clamp plate (G) and CO sensor (H) in place over COe block (N) and use a small crosshead screwdriver to secure 2 sensor clamp plate retaining screws (E) to COe block (N).
17. Refit the O₂ sensor by reversing the removal procedure – refer to Section 8.3.1, page 9.
18. Refit the sensor cover – refer to Section 8.2.2, page 8.
19. Refit the probe, exhaust filter, adaptor flange (if fitted) by reversing the removal procedure – refer to Section 8.1, page 8.
20. Prepare the sensor for operation by reversing the shutdown / removal / isolation procedures – refer to Sections 5 and 4 (pages 4, 4).



CAUTION – Damage to equipment

When re-commissioning the sensor, check the temperature of the CO block to ensure it is reading correctly. Perform a manual calibration.

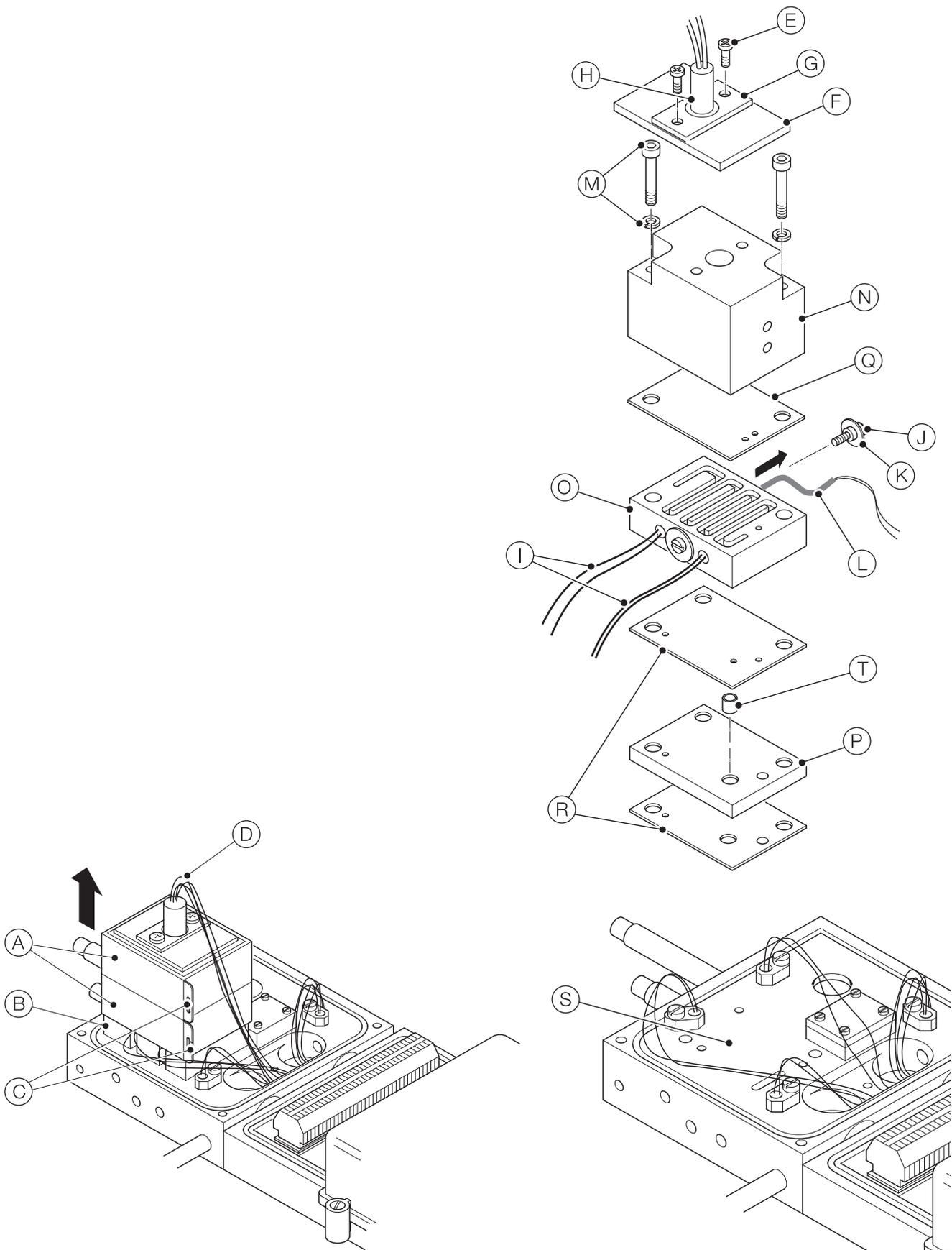


Fig. 8.4 Replacing sensor assembly gaskets

8.4 Cleaning / Replacing sensor assembly aspirator

Referring to Fig. 8.5:

1. Place the sensor assembly on a clean flat surface with the flange studs pointing up.
2. Use an open-ended $\frac{7}{8}$ in. spanner (wrench) to unscrew and remove aspirator (A). Withdraw the aspirator, nozzle (B) and gasket (C) from flange block (D).
3. Examine the aspirator and nozzle for blockages. Remove any gasket material from the aspirator assembly. Remove any contamination with an air hose.

WARNING – Bodily injury



- Do not use compressed air for any other purpose than that for which it is provided
- Never direct a stream of compressed air towards your body or the body of any other person
- When handling / connecting compressed air lines:
 - The correct safety procedures must be observed
 - Suitable PPE (goggles / gloves / overalls) must be worn



CAUTION – Damage to equipment

Do not drill chamber out or scratch inner surfaces as damage to any of the internal faces will affect aspirator performance.

-
4. If aspirator (A) and nozzle (B) cannot be cleaned discard them and fit a new aspirator and nozzle at step 7 onwards.



IMPORTANT (NOTE)

Dispose of the old aspirator / nozzle / gasket in accordance with the guidelines contained in Operating instruction OI/AZ40-EN.

-
5. Clean the aspirator flange counter-bore and flange local surfaces thoroughly. Ensure no gasket particles fall into the passage ways.
 6. Fit a new gasket (C) in the aspirator flange counter-bore, centre it and ensure it is seated correctly.

7. Fit the nozzle (B) into the aspirator (A), ensuring it is seated correctly.
8. Apply a light coating of an anti-seize compound (suitable for temperatures up to 200 °C [392 °F]) to the threaded portion (E) of the aspirator.
9. Insert the new or cleaned aspirator /nozzle assembly into the aspirator chamber and tighten to a torque of 28 ± 2 in.-lbs (3.16 Nm) using a $\frac{7}{8}$ in. spanner (wrench).



CAUTION – Damage to equipment

Do not overtighten.

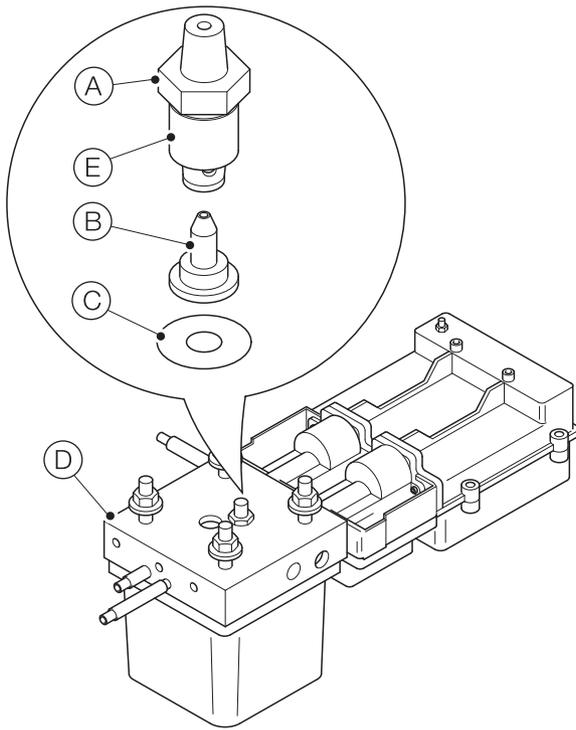


Fig. 8.5 Replacing / Cleaning sensor assembly aspirator

10. Prepare the sensor for operation by reversing the shutdown / removal / isolation procedures – refer to Sections 5 and 4 (pages 4, 4).

i IMPORTANT (NOTE)
 If a 2-stage filtration system is fitted in the instrument air line, refer to Section 8.4.1 to check / replace filters before returning the sensor to operation.

8.4.1 Replacing filters in 2-stage filtration system

Referring to Fig. 8.6:

If a (recommended) 2-stage filtration system (A) is fitted in the instrument air line, replace the filters in accordance with manufacturers' instructions.

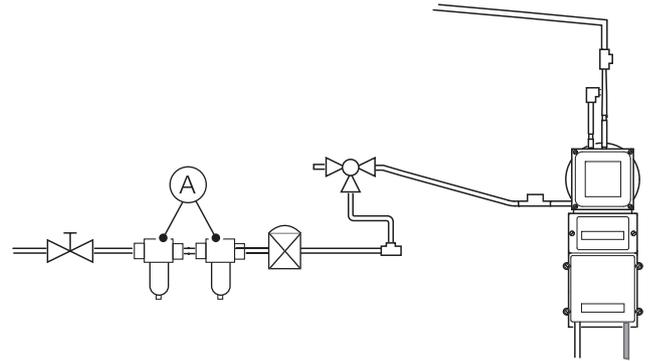


Fig. 8.6 Replacing filter elements in 2-stage filtration system

8.5 Replacing sensor assembly flow disk



WARNING – Bodily injury



- Probe assemblies (standard and high temperature versions) contain fibrous material that can be a health hazard if airborne.
- Appropriate PPE, including mask, goggles and gloves must be worn when performing this procedure.

Referring to Fig. 8.7:

1. Place the sensor assembly on a clean flat surface with the flange studs pointing down.
2. Remove 2 long screws (B) using a small flat-headed screwdriver.
3. Remove the flow disk assembly from flange manifold (C).
4. Remove 2 (short) screws (A) using a small crosshead screwdriver.
5. Separate flow disk cover plate (D), flow disk top cover gasket (E), flow disk (F), flow disk plate (G) and flow disk lower cover gasket (H). Discard gaskets (E) and (H).
6. Fit a new flow disk into flow disk plate (G), aligning the center of the curved flow disk face (I) against the small hole in the middle of the plate and in the orientation shown (concave face uppermost).



CAUTION – Damage to equipment

Do not manually snap the flow disk.
This will cause it to malfunction.

7. Place a new flow disk top gasket over flow disk plate (G).
8. Apply a light coating of anti-seize compound (suitable for temperatures up to 200 °C [392 °F]) to the threads of 2 (short) screws (A) and secure items (D), (E), (F) and (G) using 2 (short) screws (A). Tighten the screws firmly.
9. Place a new flow disk lower cover gasket in position on the flange manifold (C), ensuring screw holes are aligned correctly.
10. Position the flow disk assembly over the new flow disk lower gasket aligning the notched corner of the flow disk assembly (J) with the upper right-hand corner. Ensure screw holes are aligned correctly.
11. Apply a light coating of anti-seize compound (suitable for temperatures up to 200 °C [392 °F]) to the threads of 2 (long) screws (B) and secure the flow disk assembly to the flange manifold. Tighten the screw to a torque of 10 ±1 in.-lbs (1.1 Nm).

12. Apply 207 kPa (30 psig) air to air supply port (K) and check for leaks around the gasket and for no flow through aspirator (L). If leaks are detected, tighten the screws until all leaks are corrected. If flow is detected through the aspirator at room temperature, rebuild the flow disk assembly.



WARNING – Bodily injury

- Do not use compressed air for any other purpose than that for which it is provided.
- Never direct a stream of compressed air towards your body or the body of any other person.
- When handling / connecting compressed air lines the correct safety procedures must be observed.

13. Refer to Section 8.2.2, page 8 to refit the sensor cover.
14. Prepare the sensor for operation by reversing the shutdown / removal / isolation procedures – refer to Sections 5 and 4 (pages 4, 4).

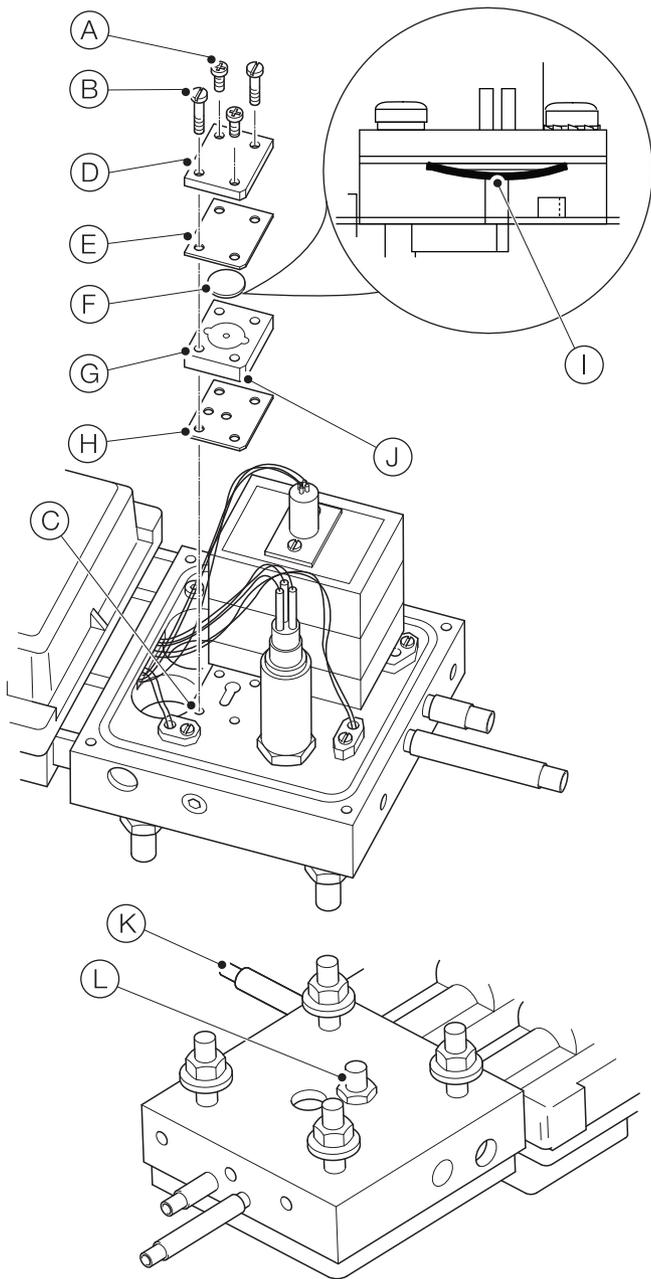


Fig. 8.7 Replacing sensor assembly flow disk

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