

Endura AZ40

Sensor assembly



Heater and thermocouple kit
Kit reference: AZ400 753

Measurement made easy

Endura AZ40
sensor assembly

1 Introduction

This publication details replacement procedures for AZ40 cartridge heaters and thermocouples (AZ400 753) fitted to Endura AZ40 sensor assemblies. Before carrying out any procedures, read Section 3. These procedures must be carried out by a suitably-trained technician.

Kit contains:

- Heaters (4 x 100 W, 2 x 70 W), 2 x thermocouples
- This publication

Tools required

- Transmitter door key (supplied with transmitter)
- Operating instruction [OI/AZ40-EN](#)*
- Medium flat-bladed screwdriver
- Small flat-bladed screwdriver
- 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.

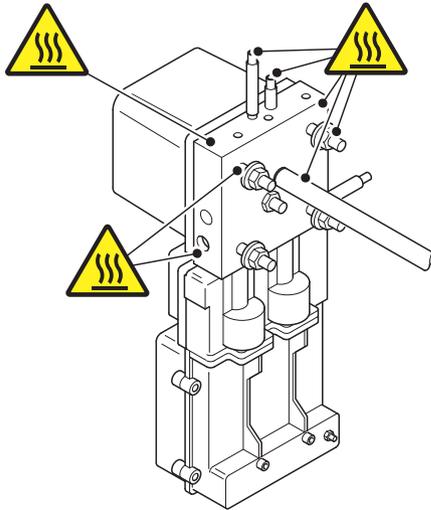


Fig. 3.1 High temperature points on exposed sensor surfaces during operation

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.

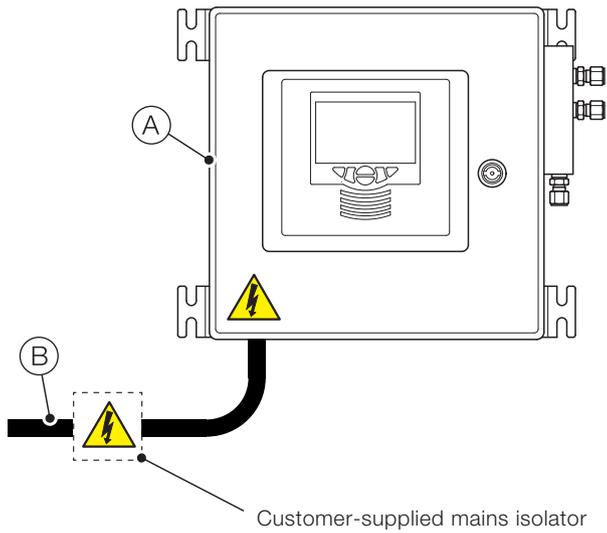


Fig. 4.1 Isolating the transmitter from incoming mains power supplies

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.

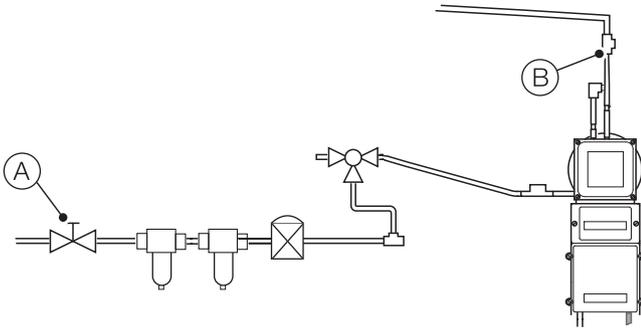


Fig. 5.1 Shutting down instrument air and test gas supplies

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).

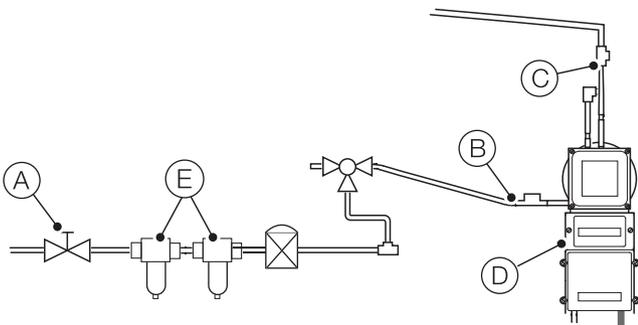


Fig. 5.2 Disconnecting instrument air and test gas supplies

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).

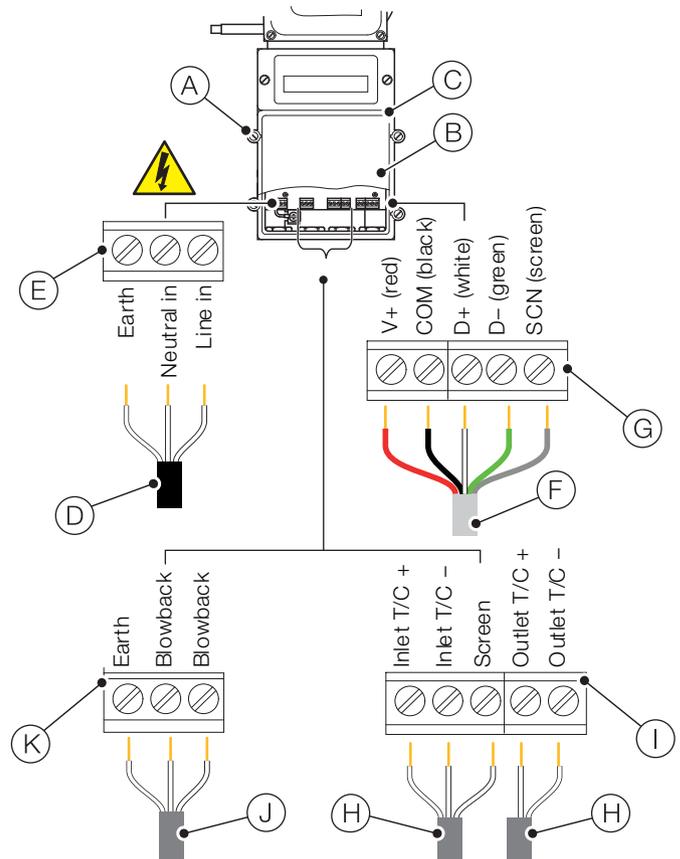


Fig. 5.3 Disconnecting sensor cables

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.

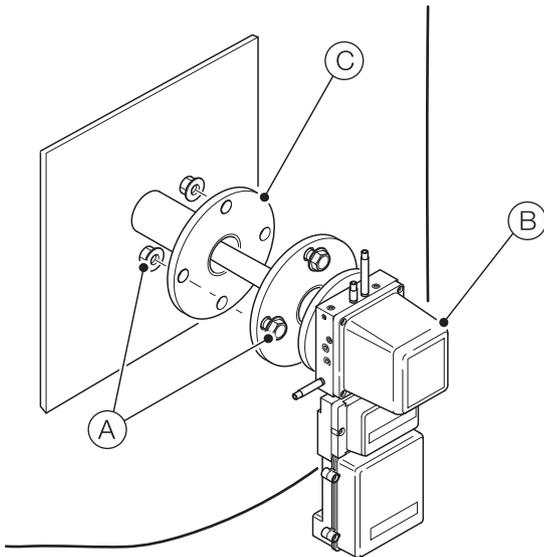
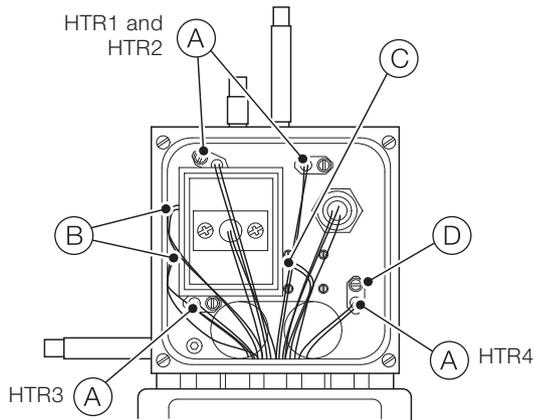


Fig. 5.4 Removing the sensor assembly from the process

6 Heater and thermocouple locations on sensor flange block and CO heater block

Refer to Fig. 6.1 for cartridge heater and thermocouple locations on the sensor flange block and CO heater block:



Sensor shown with top cover removed

Key:

- (A) Flange block cartridge heaters: 100 W – Section 8.1, page 9
- (B) CO heater block cartridge heaters: 70 W – Section 8.2, page 10
- (C) CO heater block thermocouple: T/C 1 – see Section 8.3, page 11
- (D) Flange block thermocouple: T/C 2 – see Section 8.4, page 14

Fig. 6.1 Heater and thermocouple locations on sensor flange block and CO heater block

7 Removing / Refitting sensor covers

7.1 Removing sensor covers

Referring to Fig. 7.1:

1. Unscrew 4 (captive) cover retaining screws (A) using a medium flat-bladed screwdriver, and remove sensor cover (B).
2. Unscrew 2 (captive) cover retaining screws (C) using a medium flat-bladed screwdriver and remove sensor terminal cover (D).

Retain covers (B) and (D) 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 – see Instruction INS/ANAINST/10-EN.

7.2 Refitting sensor covers

Referring to Fig. 7.1:

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 the sensor cover (B) and sensor terminal cover (D) in the reverse order of removal – refer to Section 7.1.
3. Prepare the sensor assembly for operation by reversing the procedures in Sections 5 and 4 (pages 5 and 4).
4. Refer to Operating instruction OI/AZ40-EN to restore the analyzer to full operational condition.

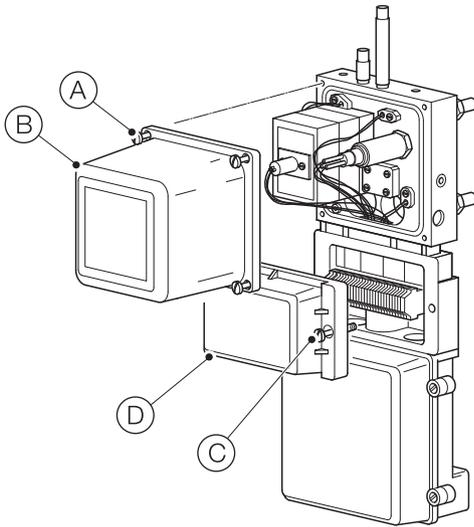


Fig. 7.1 Removing sensor covers

8 Replacement procedures

8.1 Flange block cartridge heaters (100 W)

Referring to Fig. 8.1:

1. Use a small flat-bladed screwdriver to depress the spring connectors at terminal numbers 1, 2 and 3 and disconnect 100 W flange block cartridge heater wires from top terminal block connectors (A).
2. Pull cartridge heater wires up through (left) opening (B) in flange block (C).
3. Use a small flat-headed screwdriver to unscrew cartridge heater retaining screws (D) and remove cartridge heater retainers (E) in 4 positions (F) HTR1, (G) HTR2, (H) HTR3 and (I) HTR4). Retain items for re-use.

i IMPORTANT (NOTE)

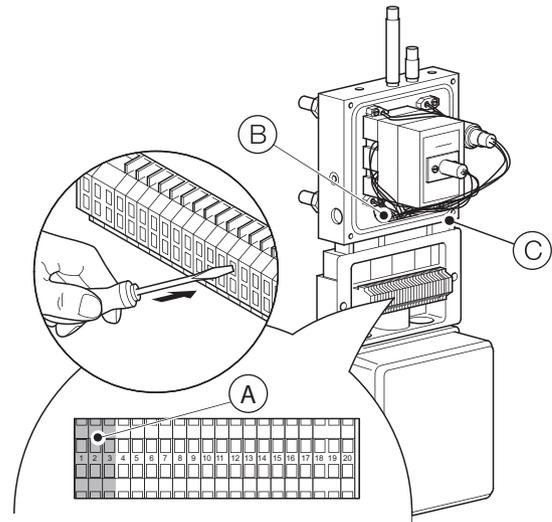
When refitting cartridge heater retainers, refit them ONLY in their original fitted position.

4. Withdraw each cartridge heater (J) from its chamber in flange block (C). If seized, rotate the cartridge heaters to loosen them.
5. Slide one new cartridge heater into each cartridge heater chamber at positions (F) HTR1, (G) HTR2, (H) HTR3 and (I) HTR4).

i IMPORTANT (NOTE)

The cartridge heater retainer at position (I) also retains flange block thermocouple T/C 2. Use only the cartridge heater retainer previously fitted at this position.

6. Apply a small amount of anti-seize compound (suitable for temperatures up to 200 °C [392 °F]) to the thread of each cartridge heater retainer screw (D) and use a small flat-headed screwdriver to secure each cartridge heater retainer (E) to its original position on flange block (C).
7. Feed all flange block heater wires down through left opening (B) in flange block (C) and make terminal block connections at the top terminal connectors (A) as follows:
 - connect one wire from each cartridge heater to terminal 1.
 - connect the free wire from cartridge heaters (F) (HTR1) and (G) (HTR2) to terminal 2.
 - Connect the free wire from cartridge heater (H) (HTR3) and (I) (HTR4) to terminal 3.
8. To replace 70 W CO heater block cartridge heaters, refer to Section 8.2, page 10.
9. Refit sensor covers – refer to Section 7.2, page 8.



Wire color	Terminal no.	Cable type	Connection
Orange	1	Power	FLBK HTR 1-4
White / Orange	2		FLBK HTR 1-2
White	3		FLBK HTR 3-4

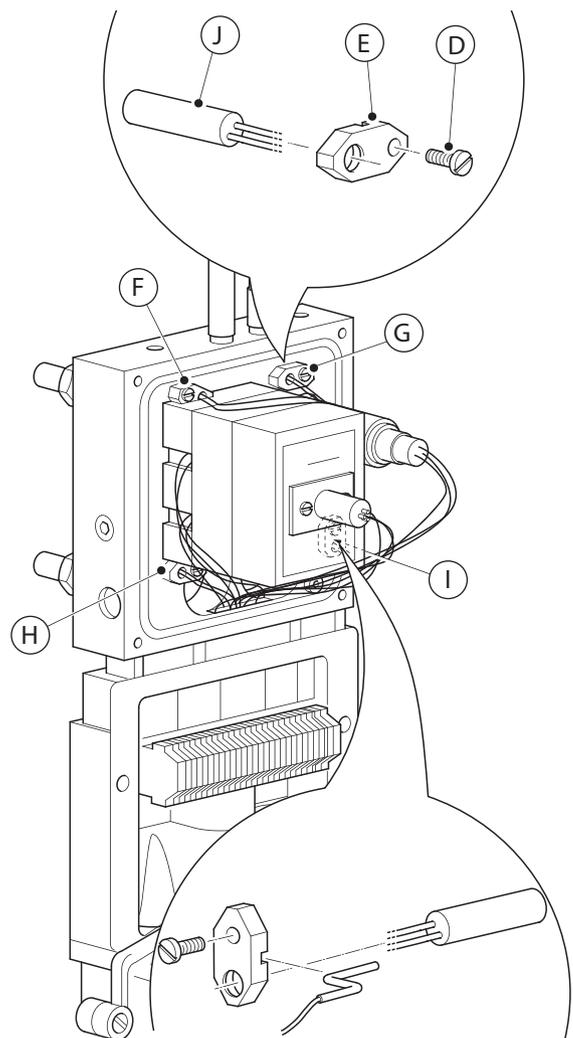


Fig. 8.1 Replacing flange block cartridge heaters (100 W)

8.2 CO heater block cartridge heaters (70 W)

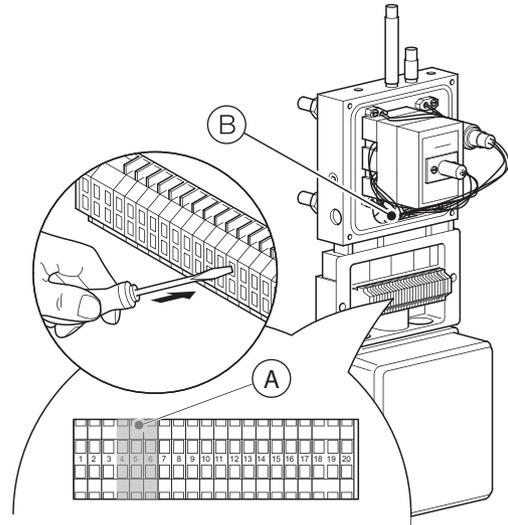
Referring to Fig. 8.2:

1. Use a small flat-bladed screwdriver to depress the spring connectors at terminal numbers 4, 5 and 6 and disconnect 70 W CO heater block cartridge heater wires from top terminal block connectors (A).
2. Pull CO heater block cartridge heater wires up through (left) opening (B) in the flange block.
3. Carefully slide CO heater block heater insulation (C) forward / up to expose the 2 x 60W cartridge heaters (D) (HTR1) and (E) (HTR2).



CAUTION – Minor injuries

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 manifold, handle with care.



4. Undo and remove screw (F) and large washer (G) that retains the heaters.
5. Slide each CO heater block cartridge heater out of the CO heater block (H). If CO cartridge heaters are stuck, rotate them or use a suitably sized rod to push them out from the other side.
6. Slide each new CO heater block cartridge heater into the CO heater block (H).
7. Take one wire from each new CO heater block cartridge heater and twist both wires together to form a twisted pair.
8. Apply a small amount of anti-seize compound (suitable for temperatures up to 200 °C [392 °F]) to the thread of screw (F) and secure large washer (G) to retain the CO heater block cartridge heaters in CO heater block (H).
9. Feed the 3 x CO heater block cartridge heater wires down through left opening (B) in the flange block and make top terminal block connections at connectors (A) as follows:
 - connect the twisted pair to terminal 6.
 - connect the free wire from cartridge heater (D) (HTR1) to terminal 4.
 - connect the free wire from cartridge heater (E) (HTR2) to terminal 5.
10. To replace CO heater block thermocouple (T/C 1), refer to Section 8.3, page 11. To refit sensor covers refer to Section 7.2, page 8.
11. Refit sensor covers – refer to Section 7.2, page 8.

Wire color	Terminal no.	Cable type	Connection
Empty	4	Power	COBK HTR 1
White / Blue	5		COBK HTR 2
Blue	6		COBK HTR 1-2

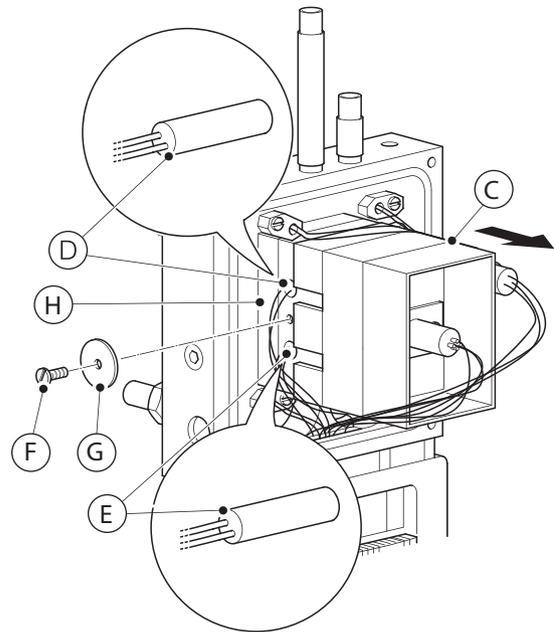


Fig. 8.2 Replacing CO heater block cartridge heaters (70 W)

8.3 CO heater block thermocouple (T/C 1)



CAUTION – Minor injuries

The O₂ sensor must be removed to enable access to COe heater block thermocouple T/C 1 (steps 1 to 3).

Referring to Fig. 8.3:

1. Place the sensor assembly on a clean flat surface with the flange studs pointing down.
2. Use a small flat-bladed screwdriver to depress the spring connectors at terminal numbers 8, 9 and 10 and disconnect CO heater block thermocouple T/C 1 wires from top terminal block connectors (A).
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.

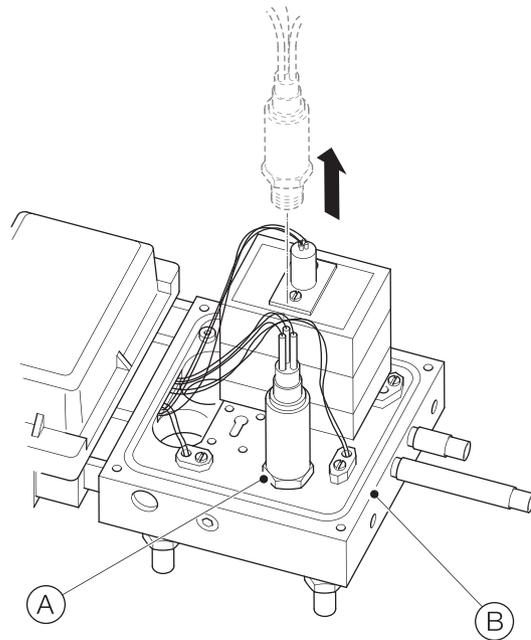
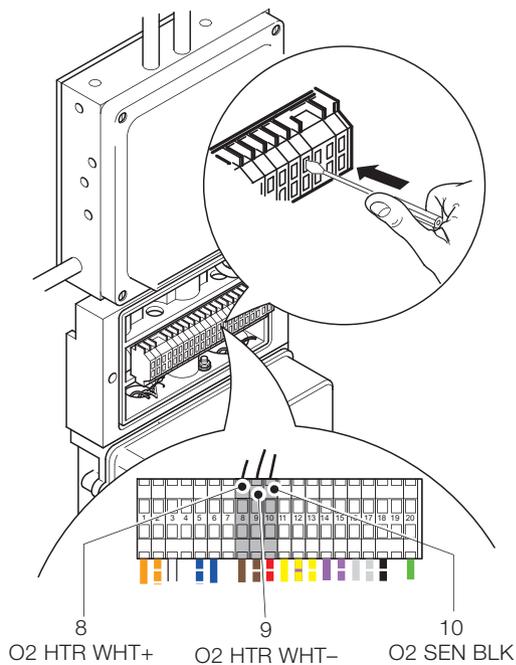


Fig. 8.3 Removing the O₂ sensor

Referring to Fig. 8.4:

4. Use a small flat-bladed screwdriver to depress the spring connectors at terminal numbers 17 and 19 and disconnect CO heater block thermocouple T/C 1 wires from top terminal block connectors (A).
5. Pull thermocouple (T/C 1) wires up through (right) opening (B) in flange block (C).
6. Carefully slide CO heater block insulation (D) away from flange block (C).

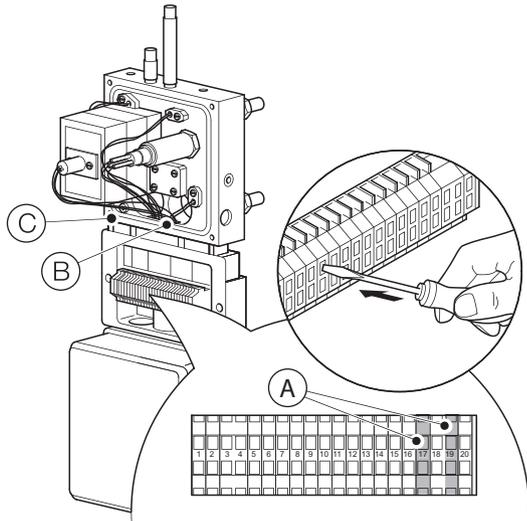


CAUTION – Minor injuries

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 manifold, handle with care.

7. Use a small flat-headed screwdriver to remove screw (E) with attached thermocouple retaining washer (F) from CO heater block (G). Retain screw / washer assembly for re-use.
8. Withdraw thermocouple (T/C1) (H) from CO heater block (G) and discard thermocouple.
9. Slide the new thermocouple (T/C1) into its chamber in CO heater block (G).
10. Apply a small amount of anti-seize compound (suitable for temperatures up to 200 °C [392 °F]) to the thread of screw (E) and use a small flat-headed screwdriver to secure screw (E) with attached thermocouple retaining washer (F) to CO heater block (G).

11. Feed thermocouple (T/C1) wires down through right opening (B) in flange block (C) and make terminal block connections at the top connectors A as follows:
 - connect one wire from thermocouple (H) (T/C1) to terminal 18.
 - connect one wire from thermocouple (H) (T/C1) to terminal 19.
12. Refit the O₂ sensor in the reverse order of removal – refer to steps 1 to 3 page 11.
13. To replace flange block thermocouple (T/C 2), refer to Section 8.4, page 14.
14. Refit sensor covers – refer to Section 7.2, page 8.



Wire color	Terminal no.	Cable type	Connection
White / Grey	17	Signal	COBK T/C WHT+
Empty	19		COBK T/C BLK-

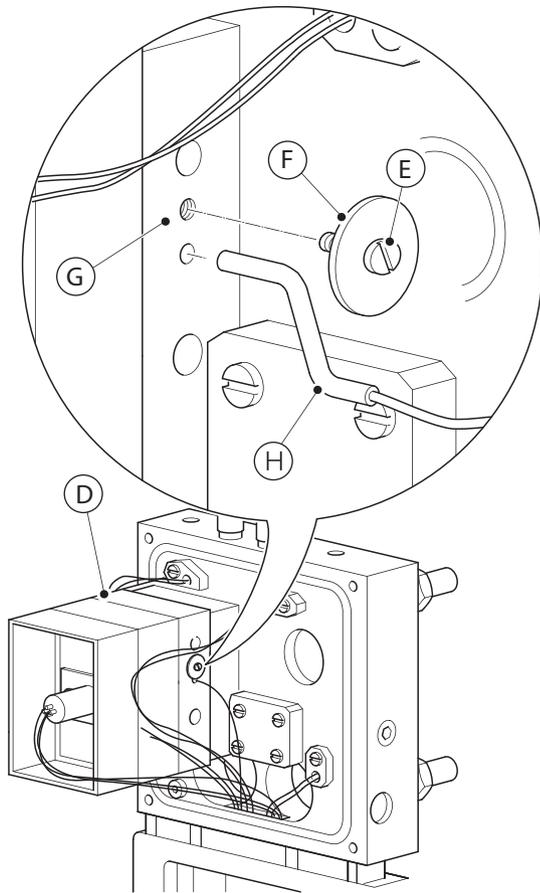


Fig. 8.4 Replacing CO heater block thermocouple (T/C 1)

8.4 Flange block thermocouple – T/C 2

Referring to Fig. 8.5:

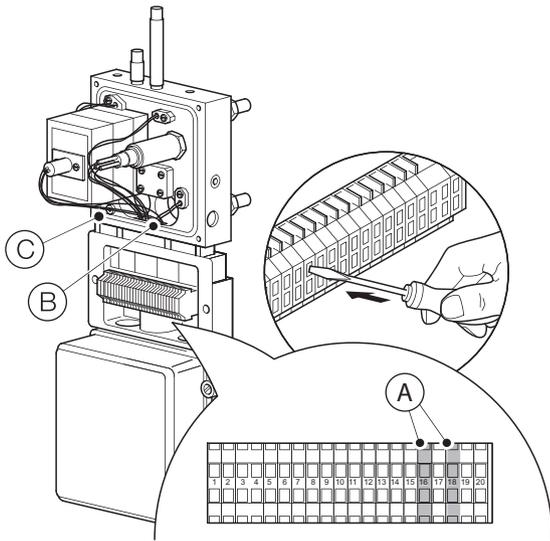
1. Use a small flat-bladed screwdriver to depress the spring connectors at terminal numbers 16 and 18 and disconnect flange block thermocouple T/C 2 wires from top terminal block connectors (A).
2. Pull thermocouple (T/C2) wires up through (right) opening (B) in flange block (C).
3. Use a small flat-headed screwdriver to unscrew cartridge heater / thermocouple retainer screw (D) and remove cartridge heater / thermocouple retainer (E). Retain items for re-use.
Do not disturb cartridge heater (F).
4. Withdraw thermocouple (G) (T/C 2) from flange block (C) and discard the thermocouple.
5. Slide the new thermocouple (T/C 2) into its chamber in flange block (C).
6. Carefully form the thermocouple through 90 ° so it fits into the groove in retainer (E).

i IMPORTANT (NOTE)

The retainer (E) at this position has a notch used to guide / restrain the thermocouple. Only use the retainer from this position when fitting / replacing thermocouple T/C 2.

7. Apply a small amount of anti-seize compound (suitable for temperatures up to 200 °C [392 °F]) to the thread of cartridge heater / thermocouple retainer screw (D) and use a small flat-headed screwdriver to secure cartridge heater / thermocouple retainer (E) to flange block (C).

8. Feed both thermocouple (T/C2) wires down through right opening (B) in flange block (C) and make terminal block connections at the top connectors (A) as follows:
 - connect one wire from thermocouple T/C2 to terminal 16.
 - connect one wire from thermocouple T/C2 to terminal 18.
9. Refit sensor covers – refer to Section 7.2, page 8.



Wire color	Terminal no.	Cable type	Connection
Grey	16	Signal	FLBK T/C WHT+
White / Black	18		FLBK T/C BLK-

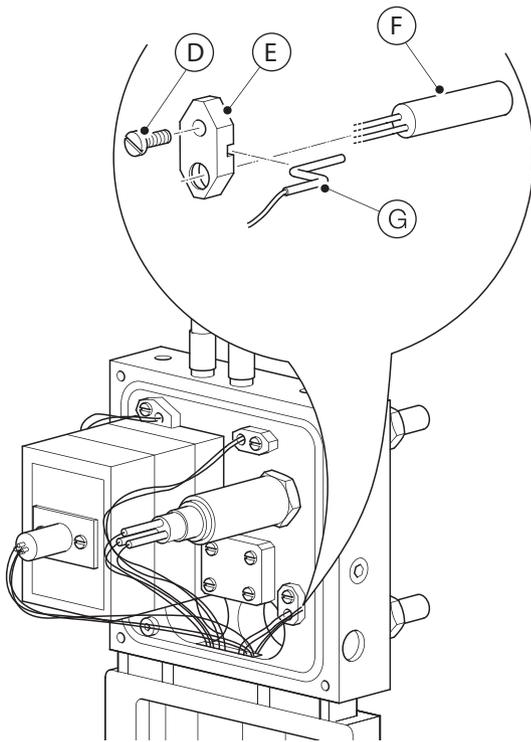


Fig. 8.5 Replacing flange block thermocouple (T/C 2)

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