CS-ETSO AMENDMENT 3 CHANGE INFORMATION

The Agency publishes amendments to Certification Specifications-European Technical Standard Orders (CS-ETSO) as consolidated text for each constituent European Technical Standard Order (ETSO) individually.

Consequently, except for the revision indication letter and revised issue date in the header of the ETSO, the consolidated text of each individual ETSO does not allow readers to see the detailed changes introduced by the amendment. To allow readers to also see these detailed changes this document has been created. The same format as for publication of Notices of Proposed Amendments has been used to show the changes:

1. text not affected by the amendment remains the same: unchanged
2. deleted text is shown with a strike through: ~~deleted~~
3. new text is highlighted with grey shading: new
4. ....

   Indicates that remaining text is unchanged in front of or following the reflected amendment.

....

SUBPART A - GENERAL

……..

3.2 The following addresses are provided below:

- EUROCAE documents may be purchased from:

European Organisation for Civil Aviation Equipment
102 rue Etienne Dolet – 92240 Malakoff - France.
~~17, rue Hamelin 75116 PARIS Cedex 16 - FRANCE~~
Telephone: +33 1 40 92 79 30 ; FAX +33 1 46 55 62 65
(web site: www.eurocae.eu).
……..

ETSO-C44c
~~**ETSO-C44b**~~
~~Date : 24.10.03~~

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: FUEL FLOWMETERS

1 - Applicability

This ETSO gives the requirements which fuel flowmeters that are manufactured on or after the date of this ETSO must meet in order to be identified with the applicable ETSO marking.

2 - Procedures

2.1. - General

Applicable procedures are detailed in CS-ETSO Subpart A.

2.2 - Specific

None

3 - Technical Conditions

3.1 - Basic

3.1.1 - Minimum Performance Standard

~~Standards set forth in the SAE Aeronautical Standard AS 407B „Fuel Flowmeters“, revisedMarch 1, 1960, and reconfirmed May 1991, as amended and supplemented by this ETSO:Exceptions:~~

~~(i) Correction to Section 1. of AS 407B: As referenced in this ETSO, AS 407B specifies minimum requirements for fuel flowmeters for use on reciprocating engines or turbinepowered civil aircraft. In addition, the following specifically numbered subparagraphs in AS 407B do not concern minimum performance and, therefore, it is not essential to show compliance with this paragraphs: 3.1, 3.2 and 4.2.1.~~

~~(ii) Thermal shock: This test shall apply to any hermetically sealed components. The components shall be subjected to four cycles of exposure to water at 85°±2° and 5°±2°C without evidence of moisture penetration or damage to coating or enclosure. Each cycle of the test shall consist of immersing the component in water at 85°±2°C for a period of 30 minutes and then within 5 seconds of removal from the bath, the component shall be immersed for a period of 30 minutes in the other bath maintained at 5°±2°C. This cycle shall be repeated continuously, one cycle following the other until four cycles have been completed. Following this test, the component shall be subjected to the Sealing test specified in (ii). No leakage shall occur as a result of the test.~~

~~(iii) Sealing: This performance test shall apply to any hermetically sealed components, The component shall be immersed in a suitable liquid, such as water. The absolute pressure of the air above the liquid shall then be reduced to approximately 34 hPa (1 inch of mercury (Hg)) and maintained for 1 minute, or until air bubbles cease to be given off by the liquid, whichever is longer. The absolute pressure shall then be increased by 85 hPa (2 1/2 inches Hg). Any~~

ETSO-C44c
~~**ETSO-C44b**~~

~~bubbles coming from within the indicator case shall be considered as leakage and shall be cause for rejection. Bubbles which are the result of entrapped air in the various exterior parts of the case shall not be considered as leakage. Other test methods which provide evidence equal to the immersion test of the integrity of the instrument's seals may be used. If the component incorporates non hermetically sealed appurtenances such as a case extension, these appurtenances may be removed prior to the Sealing test.~~

~~(iv) Correction to subparagraph 3.3.1: Under column A, the temperature values for unheated areas (Temperature Uncontrolled) shall be -55° to 70°C.~~

Standards set forth in **Appendix 1**

3.1.2 - Environmental Standard

~~The conditions and procedures prescribed in AS 407B are to be used.~~

The Fuel Flowmeter must be tested in accordance with SAE AS407C "*Fuel Flowmeters"* from July 1, 2001, unless otherwise specified by appendix 1 of this ETSO, SAE AS1055D "*Fire Testing of Flexible Hose, Tube Assemblies, Coils, Fittings, and Similar System Components"* (sections 4 and 5) from June 1997, and EUROCAE ED-14E (RTCA DO-160E) "*Environmental Conditions and Test Procedures for Airborne Equipment"* from March 2005 unless otherwise specified by appendix 1 of this ETSO.

3.1.3 - Computer Software

~~See CS-ETSO Subpart A paragraph 2.2~~

If the equipment design includes a digital computer, the software must be developed in accordance with EUROCAE ED-12B (RTCA DO-178B) "*Software Considerations in Airborne Systems and Equipment Certification*" from 1992.

3.2 - Specific

None

4 - Marking

4.1 - General

Marking is detailed in CS-ETSO Subpart A paragraph 1.2. ~~In addition, the range (transmitters only) and electrical rating shall be shown.~~

4.2 - Specific

None

5 - Availability of Referenced Document

See CS-ETSO Subpart A paragraph 3

APPENDIX 1.

MINIMUM PERFORMANCE STANDARD FOR FUEL FLOWMETERS

1. General Requirements.

The applicable standard is SAE AS407C, *Fuel Flowmeters*, dated July 1, 2001.

Paragraphs 3.1, 3.1.1, 3.1.2, 3.2.b, and 4.2.1 of the SAE AS407C do not apply to this ETSO.

SAE AS407C must be applied as follows (changed text shown framed):

a. Temperature. On Page 2 of SAE AS407C, replace Table 1 with the following table.

TABLE 1

INSTRUMENT LOCATION	A	B
Heated Areas (Temp. Controlled)	-30 to 50 ºC	-65 to 70 ºC
Unheated Areas (Temp. Controlled)	-55 to 70 ºC	-65 to 100 ºC
Power Plant Compartment	-55 to 70 ºC	-65 to 100 ºC
Power Plant Accessory Compartment	-55 to 70 ºC	-65 to 100 ºC

b. Altitude. In the first sentence of paragraph 3.3.4, Altitude, (page 3), replace “40.000 feet (12.192 m) standard altitude with 51.000 ft (15.545 m) standard altitude.

c. Leak Test. In the second sentence of paragraph 6.3, Leak Test, (page 6), replace “to an air pressure of 40 psi (275.8 kPa) ”with "to an air pressure in accordance with the manufacturer's recommendations."

2. Testing Your Fuel Flowmeter. In addition to the qualification test requirements described in SAE AS407C, perform the following tests:

a. Thermal Shock Test. This test applies to any hermetically sealed components. Subject the components to four cycles of exposure to water 85° ± 2° C and 5° ± 2° C. There should be no evidence of moisture damage to coating or enclosure. During each cycle of the test, immerse the component in water at 85° ± 2° C for 30 minutes. Within 5 seconds of removal from the bath, immerse the component for 30 minutes in the other bath maintained at 5° ± 2° C. Repeat this cycle continuously, one cycle following the other until four cycles are completed. After this test, subject the component to the sealing test in paragraph 2b (2) of this appendix. The component must have no leakage resulting from the test.

b. Sealing Test. Apply this performance test to any hermetically sealed components. Immerse the component in a suitable liquid such as water. Then reduce the absolute pressure of the air above the liquid to about 1 inch of mercury (Hg) (3.4

kPa) Maintain this absolute pressure for 1 minute, or until the liquid stops giving off air bubbles, whichever is longer. Increase the absolute pressure by 2½ inches Hg (8.5 kPa) . If any bubbles come from the component case, consider it Leakage and reject the component. Do not consider bubbles, resulting from entrapped air in the exterior parts of the case, as leakage. If other test methods provide evidence equal to the immersion test, they can be used to test the integrity of the instrument's seals. If the component includes nonhermetically sealed appurtenances such as a case extension, these appurtenances can be removed before the sealing test.

c. Other Tests. The following table lists where can be find other tests and conditions:

For:	Use the test conditions in:
Fire-resistant or fireproof test	SAE AS 1055, Rev. D, , dated June 1997, Sections 4 and 5
Explosion proofness test	EUROCAE ED-14E /RTCA/DO-160E Section 9
Power input test	EUROCAE ED-14E /RTCA/DO-160E Section 16
Voltage spike test	EUROCAE ED-14E /RTCA/DO-160E Section 17
Audio frequency conducted susceptibility test	EUROCAE ED-14E /RTCA/DO-160E Section 18
Induced signal susceptibility test	EUROCAE ED-14E /RTCA/DO-160E Section 19
Radio frequency susceptibility test	EUROCAE ED-14E /RTCA/DO-160E Section 20

ETSO-C45b
~~**ETSO-C45a**~~
~~Date : 24.10.03~~

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: MANIFOLD PRESSURE INSTRUMENTS

1 - Applicability

This ETSO gives the requirements which manifold pressure instruments that are manufactured on or after the date of this ETSO must meet in order to be identified with the applicable ETSO marking.

2 - Procedures

2.1. - General

Applicable procedures are detailed in CS-ETSO Subpart A.

2.2 - Specific

None

3 - Technical Conditions

3.1 - Basic

3.1.1 - Minimum Performance Standard

~~Standards set forth in the SAE Aerospace Standard (AS) document : AS 4 l l „Manifold Pressure Instruments“, dated November 1, 1948~~

Standard set forth in the SAE Aerospace Standard (AS) document: SAE AS 8042 from December 1, 1985, unless otherwise specified by **Appendix 1** of this ETSO.

3.1.2 - Environmental Standard

~~As indicated in AS 4 l 1~~

The Manifold Pressure Instruments must be tested according to Section 7 of SAE AS 8042 and EUROCAE ED-14E (RTCA DO-160E) "*Environmental Conditions and Test Procedures for Airborne Equipment*" from March 2005.

3.1.3 - Computer Software

~~None~~

If the Manifold Pressure Instruments includes a digital computer, the software must be developed according to EUROCAE ED-12B (RTCA DO-178B), "*Software Considerations in Airborne Systems and Equipment Certification*", dated December 1992.

3.2 - Specific

None

4 - Marking

4.1 - General

Marking is detailed in CS-ETSO Subpart A, paragraph 1.2. ~~in lieu of the weight, the range shall be shown.~~

4.2 - Specific

None

5 - Availability of Referenced Document

See CS-ETSO Subpart A paragraph 3.

APPENDIX 1.

MINIMUM PERFORMANCE STANDARD FOR MANIFOLD PRESSURE INSTRUMENTS

This appendix lists EASA modifications to the MPS for Manifold Pressure Instruments.

The applicable standard is SAE AS 8042, Manifold Pressure Instruments, dated December 1, 1985.

1. Manifold Pressure Instruments are not required to meet the requirements in SAE AS 8042 paragraphs 3.1, 3.2, and 3.3.

2. Replacement of SAE AS 8042 paragraph 3.24.2 (Fire Hazards) by:

"Except for small parts (such as fasteners, grommets, knobs, seals, and small electrical parts) that would not contribute significantly to the propagation of a fire, all material used must be self-extinguishing when tested in accordance with the requirements of CS 25.869(a)(4) and the applicable portions of Part I, Appendix F."

ETSO-C47a
~~**ETSO-C47**~~
~~Date: 24.10.03~~

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: PRESSURE INSTRUMENTS – FUEL, OIL AND HYDRAULIC

1 - Applicability

This ETSO gives the requirements which fuel, oil, and hydraulic pressure instruments that are manufactured on or after the date of this ETSO must meet in order to be identified with the applicable ETSO marking.

2 - Procedures

2.1. - General

Applicable procedures are detailed in CS-ETSO Subpart A.

2.2 - Specific

None

3 - Technical Conditions

3.1 - Basic

3.1.1 - Minimum Performance Standard

~~Standards set forth in the SAE Aerospace Standard (AS) document: AS 408A „Pressure Instruments Fuel, Oil and Hydraulic, dated December 15, 1954.“~~

Standards set forth in the SAE Aerospace Standard (AS) document: SAE AS 408C "*Pressure Instruments - Fuel, Oil and Hydraulic"* from July 1, 2001 unless otherwise specified by **Appendix 1** of this ETSO.

3.1.2 - Environmental Standard

Testing fuel, oil, and hydraulic pressure instruments must be in accordance with SAE AS408C section 7 and EUROCAE ED-14E (RTCA DO-160E) "*Environmental Conditions and Test Procedures for Airborne Equipment*" from March 2005.

3.1.3 - Computer Software

If fuel, oil, and hydraulic pressure instrument includes a digital computer, the software must be developed according to EUROCAE ED-12B (RTCA DO-178B) "*Software Considerations in Airborne Systems and Equipment Certification"* from 1992 .

ETSO-C47a
~~**ETSO-C47**~~

3.1.4 Electronic Hardware Qualification.

If the fuel, oil, and hydraulic pressure instrument includes a complex custom micro-coded component, this must be developed according to EUROCAE ED-80 (RTCA DO-254), "*Design Assurance Guidance for Airborne Electronic Hardware"* from April 2000.

3.2 - Specific

None

4 - Marking

4.1 - General

Marking is detailed in CS-ETSO Subpart A paragraph 1.2~~; in lieu of the weight, the range shall be shown~~.

4.2 - Specific

~~None~~

a) At least one major component of the fuel, oil, and hydraulic pressure instrument shall be marked permanently and legibly with all the information as provided in SAE AS408C, Section 3.2 (except paragraph 3.2.b).

b) Mark "Fire resistant" or "Fireproof" information legibly and permanently

5 - Availability of Referenced Document

See CS-ETSO Subpart A paragraph 3

APPENDIX 1.

MINIMUM PERFORMANCE STANDARDS (MPS) FOR PRESSURE INSTRUMENTS - FUEL, OIL, AND HYDRAULIC

1. The MPS applying to this ETSO are provided in SAE AS408C, Pressure Instruments - Fuel, Oil, and Hydraulic, dated July 1, 2001, except for paragraphs 3.1, 3.1.1, 3.1.2, and3.2.b.

Here are provided the modifications to be applied to the referenced SAE document:

AS408C	***modification:***
Title	Replace "Pressure Instruments – Fuel, Oil, and Hydraulic (Reciprocating Engine Powered Aircraft)" Substitute: "Pressure Instruments – Fuel, Oil, and Hydraulic"
Section 1.1	Replace "…primarily for use with reciprocating engine powered transport aircraft, …" Substitute: "…for use with civil aircraft,..."
AS408C section 7	***modification:***
Para 7.13	Use test conditions in SAE AS1055 Rev D, "*Fire Testing of Flexible Hose, Tube Assemblies, Coils, Fittings, and Similar System Components"*, dated June 1, 1997, Sections 4 and 5.
Para 7.14	Add test conditions in EUROCAE ED-14E / RTCA DO-160E, Section 16, Power Input.
Para 7.15	Add test conditions in EUROCAE ED-14E / RTCA DO-160E Section 17, Voltage Spike.
Para 7.16	Add test conditions in EUROCAE ED-14E / RTCA DO-160E Section 18, Audio Frequency Conducted Susceptibility – Power Inputs.
Para 7.17	Add test conditions in EUROCAE ED-14E / RTCA DO-160E Section 19, Induced Signal Susceptibility
Para 7.18	Add test conditions in EUROCAE ED-14E / RTCA DO-160E Section 20, Radio Frequency Susceptibility.

2. The performance of fuel, oil and hydraulic pressure instruments can be enhanced or made superior to this specification, depending on intended application and configuration.

ETSO-C56b
~~**ETSO-C56a**~~
~~Date : 24.10.03~~

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: ENGINE DRIVEN DIRECT CURRENT GENERATORS / STARTER GENERATORS

1 - Applicability

This ETSO gives the requirements which Engine-driven ~~D.C.~~ Direct Current generators/starter generators that are manufactured on or after the date of this ETSO must meet in order to be identified with the applicable ETSO marking.

2 - Procedures

2.1. - General

Applicable procedures are detailed in CS-ETSO Subpart A.

2.2 - Specific

None

3 - Technical Conditions

3.1 - Basic

3.1.1 - Minimum Performance Standard

~~Standards set forth in the Society of Automotive Engineers, Inc., (SAE) Aerospace Standard (AS) 8020 „Engine Driven D.C. Generators/Starter Generators and Associated Voltage Regulators“, dated January 1980.~~

Standards set forth in the SAE Aerospace Standard (AS) document: AS8020, *"Engine Driven D.C. Generators/Starter-Generators and Associated Voltage Regulators"*, dated January 1980 (and reaffirmed by SAE in August 1991).

3.1.2 - Environmental Standard

~~See CS-ETSO Subpart A paragraph 2.1.~~
EUROCAE ED-14E (RTCA DO160E) *"Environmental Conditions and Test Procedures for Airborne Equipment"* from March 2005.

3.1.3 - Computer Software

~~None~~
If the Engine Driven Direct Current Generator / Starter Generator and the associated voltage regulators include a digital computer, the software must be

developed according to EUROCAE ED-12B (RTCA DO-178B) "*Software Considerations in Airborne Systems and Equipment Certification"* from 1992.

3.2 - Specific

None

4 - Marking

4.1 - General

Marking is detailed in CS-ETSO Subpart A paragraph 1.2; ~~In addition to this marking, the following information shall be legibly and permanently marked on the equipment:~~

~~(1) The environmental categories in which it has been qualified to operate in accordance with the applicable SAE document; however this marking is not necessary when the alternative is used as described in EUROCAE/RTCA document ED-14D/DO-160D.~~

~~(2) The digital computer software version (if applicable) and the environmental categories over which it has been tested.~~

~~(3) Indicate D.C. generator or starter generator.~~

~~(4) Nominal power output (electrical voltage and watts).~~

~~(5) Mechanical power input requirements (pad requirements).~~

4.2 – Specific

~~None~~

In addition to the information specified in §4.1, the following information is required:

(1) Means of indicating if the article is a D.C. generator or a D.C. starter-generator;

(2) Nominal power output (electrical voltage and watts);

(3) Mechanical power input requirements (pad requirements).

5 - Availability of Referenced Document

See CS-ETSO Subpart A paragraph 3

ETSO-C121a
~~**ETSO-C121**~~
~~Date : 24.10.03~~

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: UNDERWATER LOCATING DEVICES (ACOUSTIC) (SELF-POWERED)

1 - Applicability

This ETSO gives the requirements that new models of underwater locating devices (acoustic) (self powered) that are manufactured on or after the date of this ETSO must meet in order to be identified with the applicable ETSO marking.

2 - Procedures

2.1. - General

Applicable procedures are detailed in CS-ETSO Subpart A.

2.2 - Specific

None

3 - Technical Conditions

3.1 - Basic

3.1.1 - Minimum Performance Standard

~~Standards set forth in SAE document AS 8045 dated May 16, 1988, Sections 4 through 7, as amended and supplemented by this ETSO~~
Standards set forth in the SAE Aerospace Standard (AS) document: AS8045 "*Minimum Performance Standard for Underwater Locating Devices (Acoustic) (Self-Powered)"*, dated May 16, 1988, and from the American Society Testing Materials (ASTM) document D.1141-98 "*Standard Practice for the Preparation of Substitute Ocean Water"*, dated September 2003.

3.1.2 - Environmental Standards

~~(i) See CS-ETSO Subpart A paragraph 2.1 and in addition~~
~~(ii) Salt Water Immersion American Society Testing Materials (ASTM)Document D. 1141-75 „Standard Specification for Substitute Ocean Water", dated 1980.~~

The equipment must be tested according to EUROCAE ED-14E (RTCA DO-160E) "*Environmental Conditions and Test Procedures for Airborne Equipment*" from March 2005.

3.1.3 - Computer Software

~~None~~

If the article includes a digital computer, the software must be developed according to EUROCAE ED-12B (RTCA DO-178B), *Software Considerations in Airborne Systems and Equipment Certification*, dated December 1, 1992.

3.1.4 - Electronic Hardware Qualification

If the article includes a complex custom micro-coded component, the component must be developed according to EUROCAE ED-80 (RTCA DO-254), *Design Assurance Guidance for Airborne Electronic Hardware*, from April 2000.

3.2 - Specific

~~None~~

The battery used in the underwater locating device authorized under this ETSO must be appropriate for the intended operational environment, not pose a hazard to the aircraft and meet the requirements of acceptable battery standards. If non rechargeable lithium batteries are used to power the underwater locating device, ETSO-C142a "*Lithium Batteries*" provides MPS for such lithium batteries.

4 - Marking

4.1 - General

Marking is detailed in CS-ETSO Subpart A paragraph 1.2. ~~In addition, the following information shall be legibly and permanently marked on the major equipment components:~~
~~Each separate component of equipment that is manufactured under this ETSO (antenna, receiver, sensors, display panels, etc.) must be legibly and permanently marked with at least the name of the manufacturer, the ETSO number and part number.~~

4.2 - Specific

None

5 - Availability of Referenced Document

See CS-ETSO Subpart A paragraph 3