



Number: CTSO-C95a  
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Approved by: Yang Zhenmei

## China Civil Aviation Technical Standard Order

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This China Civil Aviation Technical Standard Order (CTSO) is issued according to Part 37 of the China Civil Aviation Regulations (CCAR-37). Each CTSO is a criterion which the concerned aeronautical materials, parts or appliances used on civil aircraft must comply with when it is presented for airworthiness certification.

### Mach Meters

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#### **1. Purpose.**

This China Civil Aviation Technical Standard Order (CTSO) is for manufacturers of mach meter applying for a CTSO authorization (CTSOA). This CTSO prescribes the minimum performance standards(MPS) that mach meter must first meet for approval and identification with the applicable CTSO marking.

#### **2. Applicability.**

This CTSO affects new applications submitted after its effective date. Major design changes to article approved under this CTSO will require a new authorization in accordance with section 21.310 of CCAR-21R3.

#### **3. Requirements.**

New models of mach meters identified and manufactured on or after the effective date of this CTSO must meet the MPS qualification and documentation requirements in SAE International's Aerospace Standard

(AS) 8018, “ Minimum Performance Standard for Mach Meters” ,  
Revision A, (September 1, 1996).

**a. Functionality.**

This CTSO’s standards apply to equipment intended to indicate the mach number, when connected to sources of static (Ps), and total (Pt), or impact (Pt-Ps) pressure. This CTSO also includes MPS for equipment intended to perform the same function when connected to electrical outputs of the same sources.

**b. Failure Condition Classification.**

Failure of the function defined in paragraph 3.a of this CTSO is a major failure condition. Develop the system to, at least, the design assurance level equal to this failure condition classification.

**c. Functional Qualification.**

Demonstrate the required performance under test conditions in SAE AS8018, Revision A.

**d. Environmental Qualification.**

Test the equipment according to RTCA/DO-160E, “Environmental Conditions and Test Procedures for Airborne Equipment”, dated December 9, 2004.

**e. Software Qualification.**

If the article includes software, develop the software according to RTCA/DO-178B, “Software Considerations in Airborne Systems and

Equipment Certification”, dated December 1, 1992.

**f. Electronic Hardware Qualification.**

If the article includes a complex custom micro-coded component, develop the component to RTCA/DO-254, “Design Assurance Guidance for Airborne Electronic Hardware”, dated April 19, 2000. The hardware design assurance level should be consistent with the failure condition classification defined in paragraph 3.b of this CTSO.

**g. Deviations.**

For using alternative or equivalent means of compliance to the criteria in the MPS of this CTSO, the applicant must show that the equipment maintains an equivalent level of safety. The applicant must apply for a deviation in accordance with section 21.310(b) of CCAR-21R3.

**4. Marking.**

a. Mark at least one major component permanently and legibly with all the information in 21.312(d) of CCAR-21R3, except for the following:

(1) For 21.312(d)(2) of CCAR-21R3, use the name, type, and part number. Do not use the optional model number;

(2) For 21.312(d)(3) of CCAR-21R3, use the date of manufacture. Do not use the optional serial number.

b. Also, mark the following permanently and legibly, with at least the manufacturer’s name, subassembly part number, and the CTSO

number:

- (1) Each component that is easily removable (without hand tools),
- (2) Each interchangeable element, and
- (3) Each subassembly of the article that the applicant determined may be interchangeable.

c. If the component includes software then the part number must include hardware and software identification. Or, the part numbering scheme can use a separate part number for hardware and software. Either way, it must include a means to show the modification status.

NOTE: Similar software versions, approved to different software levels, must be differentiated by part number.

d. Identify deviations granted to the article by marking “Deviation. See installation/instruction manual (IM)” after the CTSO number. The marking can be abbreviated to “Dev. See IM.”

e. When applicable, identify the equipment as an incomplete system or state that the article performs functions beyond those described in paragraph 3.a of this CTSO.

## **5. Application Data Requirements.**

The applicant must furnish the responsible certification personnel with technical data to support design and production approval. The data include a statement of conformance as specified in section 21.310(c)(3) of CCAR-21R3 and one copy each of the following:

a. Operating instructions and equipment limitations in an IM, sufficient to describe the equipment's operational capability. Describe any deviations in detail. If needed, identify equipment by part number, version, revision, and criticality level of software/hardware, classification for use, and environmental categories.

b. Installation procedures and limitations in an IM, sufficient to ensure that the mach meters, when installed according to the installation procedures, still meets this CTSO's requirements. Limitations must identify any unique aspects of the installation. Finally, the limitations must include a note with the following statement:

**“This article meets the minimum performance and quality control standards required by a CTSO. Installation of this article requires separate approval.”**

c. Schematic drawings of the installation procedures.

d. Wiring diagrams of the installation procedures.

e. List of components, by part number, that make up the mach meters complying with the standards prescribed under this CTSO. Include vendor part number cross-references, when applicable.

f. A component maintenance manual (CMM), covering periodic maintenance, calibration, and repair, for the continued airworthiness of installed mach meters. Include recommended inspection intervals and service life. Describe the details of deviations granted, as noted in

paragraph 5.a of this CTSO.

g. Material and process specifications list.

h. The quality system description required by section 21.143 and 21.310(c)(2) of CCAR-21R3, including functional test specifications. The quality system should ensure that it will detect any change to the approved design that could adversely affect compliance with the CTSO MPS, and reject the article accordingly.

i. Manufacturer's CTSO qualification test report.

j. Nameplate drawing with the information required by paragraph 4 of this CTSO.

k. List of all drawings and processes (including revision level), that define the article's design. For a minor change, follow the directions in 21.313 of CCAR-21R3. Show any revisions to the drawing list only on authorities' request.

l. An environmental qualifications form as described in the environmental qualifications document referenced in paragraph 3.d of this CTSO for each component of the system.

m. If the article includes software: a plan for software aspects of certification (PSAC), software configuration index, and software accomplishment summary. It is recommended that the applicant submit the PSAC early in the software development process. Early submittal allows the authorities to quickly resolve issues, such as partitioning and

determining software levels.

n. If the article includes a complex custom micro-coded component: a plan for hardware aspects of certification (PHAC), hardware verification plan, top-level drawing, and hardware accomplishment summary. It is recommended that the applicant submit the PHAC early in the software development process. Early submittal allows the authorities to quickly resolve issues.

## **6. Manufacturer Data Requirements.**

Besides the data given directly to the authorities, have the following technical data available for review by the authorities:

a. Functional qualification specifications for qualifying each production article to ensure compliance with this CTSO.

b. Equipment calibration procedures.

c. Corrective maintenance procedures within 12 months after CTSOA.

d. Schematic drawings.

e. Wiring diagrams.

f. Material and process specifications.

g. Results of the environmental qualification tests conducted per paragraph 3.d of this CTSO.

h. If the article includes software, the appropriate documentation defined in RTCA/DO-178B including all data supporting the applicable

objectives in RTCA/DO-178B Annex A, Process Objectives and Outputs by Software Level.

i. If the article includes a complex micro-coded component, the appropriate hardware life cycle data in combination with design assurance level, as defined in RTCA/DO-254, Appendix A, Table A-1.

## **7. Furnished Data Requirements.**

If furnishing one or more articles manufactured under this CTSO to one entity (such as an operator or repair station), provide the following:

a. One copy of the data in paragraphs 5.a through 5.f of this CTSO. Add any other data needed for the proper installation, certification, and use, or for continued airworthiness, of the mach meter.

b. If the article performs functions beyond those described in paragraph 3.a of this CTSO, send one copy of the data in paragraphs 5.1 through 5.n.

## **8. Availability of Referenced Documents.**

a. Order SAE documents from:

Society of Automotive Engineers, Inc.

400 Commonwealth Drive, WARRENDALE, PA 15096-001, USA

You may also order them online from [www.sae.org](http://www.sae.org).

b. Order RTCA documents from:

Radio Technical Commission for Aeronautics, Inc.

1150 18th Street NW, Suite 910, Washington D.C. 20036

You may also order them online from [www.rtca.org](http://www.rtca.org).