

AEROSPACE STANDARD

SAE AS20708/94

REV.
A

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Superseding AS20708/94

Synchro, 60 and 400 Hz, Size 23

FSC 5990

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1. SCOPE:

1.1 This specification covers the detail requirements for 115 volt, 60 and 400 Hz, size 23 synchros (see 6.1).

2. APPLICABLE DOCUMENTS:

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

Federal

TT-I-558 Ink, Marking Stencil, Opaque, for Nonporous Surfaces (Metals, Glass, etc.)

Military

MIL-V-173 Varnish, Moisture-and-fungus resistant (For the Treatment of Communications, Electronic, and Associated Electrical Equipment)

MIL-S-20708 Synchros, General Specification for

STANDARDS

Military

MS 17186 Washer, Drive (Synchro)

MS 17187 Nut, Plain, Hexagon

MS 35275 Screw, Machine-drilled, Fillister Head, Slotted, Corrosion Resisting Steel, Passivated, UNC-2A

MS 35333 Washer, Lock, Flat-Internal Tooth

MS 35338 Washer, Lock-spring, Helical, Regular (Medium) Series (in./mm)

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2.1 (Continued):

MS 51972 Nut, Plain, Hexagon-steel, Corrosion Resisting, 300 Series,
Passivated, UNF-2B

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS:

3.1 First article:

Synchros furnished under this specification shall be a product which has been tested and has passed the first article inspection specified in accordance with 4.2.

3.2 Design and construction:

Synchros furnished under this specification shall conform with the design, construction, and physical dimensions specified in Figure 1.

3.2.1 Housings: Not applicable.

3.2.2 Slip rings: Not applicable.

3.3 General requirements:

All requirements shall be in accordance with MIL-S-20708 except as otherwise specified herein. In case of conflict between the requirements of MIL-S-20708 and this specification, the requirements of this specification shall govern.

3.3.1 Altitude: Not applicable.

3.3.2 Vibration: Synchros shall withstand mechanical vibrations of 0.10 ± 0.02 inch amplitude up to 60 Hz perpendicular and parallel to the shaft axis for a period of 8 hours \pm 15 minutes without mechanical damage or loosening of parts, and without degradation in performance to the extent specified in MIL-S-20708 following conformance to the vibration requirement.

3.3.3 Shock: Synchros shall be capable of withstanding shock blows of 100 G in accordance with the low impact shock requirement of MIL-S-20708 where applicable. After testing, there shall be no damage or loosening of parts and synchros shall meet the performance requirements specified in MIL-S-20708 following low impact shock testing.

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3.3.4 Ambient temperature: Synchros shall be capable of storage in ambients ranging from -62°C to 100°C. Synchros shall be capable of operation in ambient temperatures ranging from -55°C to 85°C. Synchros shall meet the applicable requirements in Tables I and II herein at the specified ambient temperatures of MIL-S-20708, except the high ambient temperature shall be 85°C in lieu of 125°C. Hereinafter throughout this specification all requirements specified at the high temperature, shall be made at 85°C.

3.3.5 Endurance: All synchros shall be capable of continuous operation for 1000 ± 10 hours without failure or undue wear. After testing, all synchros shall meet the applicable requirements of MIL-S-20708. The high ambient temperature shall be 85°C in lieu of 125°C.

3.4 Performance requirements:

The performance requirements shall be as specified in Tables I and II as applicable.

3.5 Part number identification:

Synchros listed in Tables I and II shall be identified by the following part numbers (see 6.2).

| <u>Part No.</u> | <u>Type</u> | <u>Item Name</u> |
|-----------------|-------------|-----------------------------------|
| 7674818 | 23TX4 | Synchro, Transmitter |
| 7674819 | 23TR4 | Synchro, Receiver |
| 7674820 | 23CDX4 | Synchro, Differential Transmitter |
| 7674821 | 23CT4 | Synchro, Control Transformer |
| 7676354 | 23TX6 | Synchro, Transmitter |
| 7676355 | 23TR6 | Synchro, Receiver |
| 7676356 | 23CDX6 | Synchro, Differential Transmitter |
| 7676357 | 23CT6 | Synchro, Control Transformer |
| 7676359 | 23CX6 | Synchro, Transmitter |
| 7676360 | 23TDX6 | Synchro, Differential Transmitter |
| 7676906 | 23CX4 | Synchro, Transmitter |
| 7676963 | 23TDX4 | Synchro, Differential Transmitter |
| 8212762 | 23TX4A | Synchro, Transmitter |
| 8212766 | 23TR4A | Synchro, Receiver |
| 8212772 | 23CDX4A | Synchro, Differential Transmitter |
| 8212775 | 23CT4A | Synchro, Control Transformer |
| 8212778 | 23TX6A | Synchro, Transmitter |
| 8212781 | 23TR6A | Synchro, Receiver |
| 8212786 | 23CDX6A | Synchro, Differential Transmitter |
| 8212789 | 23CT6A | Synchro, Control Transformer |
| 8212794 | 23CX6A | Synchro, Transmitter |
| 8212797 | 23TDX6A | Synchro, Differential Transmitter |
| 8212801 | 23CX4A | Synchro, Transmitter |
| 8212807 | 23TDX4A | Synchro, Differential Transmitter |

TABLE I. Synchros, Torque System Types

| Requirement | Unit | Tolerance | Types | | | | | | | |
|----------------------|------------|-----------------|-------------|---------------|-------------|-------------|---------------|-------------|----------|----------|
| | | | TX6 TX6A | TDX6 TDX6A | TR6 TR6A | TX4 TX4A | TDX4 TDX4A | TR4 TR4A | | |
| 1/ Frequency | Hz | Nominal | 60 | 60 | 60 | 400 | 400 | 400 | 400 | 400 |
| 1/ Primary voltage | Volts | Nominal | 115 | 90 | 115 | 115 | 115 | 90 | 115 | 115 |
| Primary current | Milliamps | Maximum | 231 | 420 | 231 | 1040 | 1040 | 1210 | 1040 | 1040 |
| Primary power | Watts | Maximum | 6 | 13.5 | 6 | 9.36 | 9.36 | 10.2 | 9.36 | 9.36 |
| Transformation ratio | | ± 1% | 0.783 | 1.154 | 0.783 | 0.783 | 0.783 | 1.154 | 0.783 | 0.783 |
| Electrical error | Minutes | Maximum | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Torque gradient | oz-in/deg | Minimum | 0.12 | 0.03 | 0.12 | 0.12 | 0.12 | 0.16 | 0.12 | 0.12 |
| Receiver error | Minutes | Maximum | | | 60 | | | | 60 | 60 |
| Null voltage | Millivolts | Maximum | 160 | | 160 | 100 | 100 | | 100 | 100 |
| Total | | | 60 | | 60 | 75 | 75 | | 75 | 75 |
| Fundamental | | | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| Friction torque | oz./in. | Maximum | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Temperature rise | °C | Maximum | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 |
| Impedance | Ohms | R±15%+ j±10% | | | | | | | | |
| Z _{ro} | | | | 100+j210 | | | | | | |
| Z _{so} | | | | 170+j52 | | | | | | |
| Z _{rs} | | | | | | | | | | |
| Z _{ss} | | | | | | | | | | |
| | | Nominal | 121+j28.3 | | 121+j28.3 | 121+j28.3 | 7.3+j6.3 | | 7.3+j6.3 | 7.3+j6.3 |

1/ See MIL-S-20708, Standard test voltage and frequency.

TABLE II. Synchros, Control System Types

| Requirement | Unit | Tolerance | Types | | | | | | | |
|----------------------|--------------|-----------|-------------|---------------|-------------|-------------|---------------|-------------|-------|--|
| | | | CX6 CX6A | CDX6 CDX6A | CT6 CT6A | CX4 CX4A | CDX4 CDX4A | CT4 CT4A | | |
| 1/ Frequency | Hz | Nominal | 60 | 60 | 60 | 400 | 400 | 400 | 400 | |
| 1/ Primary voltage | Volts | Nominal | 115 | 90 | 90 | 115 | 90 | 90 | 90 | |
| Primary current | Milliamperes | Maximum | 83 | 112 | 22 | 264 | 297 | 297 | 7.7 | |
| Primary power | Watts | Nominal | 1.6 | 2.2 | 0.5 | 2.5 | 2.8 | 2.8 | 0.08 | |
| Transformation ratio | | ± 1% | 0.783 | 1.154 | 0.735 | 0.783 | 1.154 | 1.154 | 0.735 | |
| Electrical error | Minutes | Maximum | 8 | 8 | 6 | 8 | 8 | 8 | 6 | |
| Null voltage | Millivolts | Maximum | | | | | | | | |
| Total | | | 100 | 100 | 75 | 100 | 100 | 100 | 60 | |
| Fundamental | | | 75 | 75 | 60 | 75 | 50 | 50 | 30 | |
| Friction torque | oz/in. | Maximum | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | |
| (@-55°C) | | | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | |
| Temperature rise | °C | Maximum | 45 | 45 | 45 | 45 | 45 | 45 | 45 | |
| Impedance | Ohms | R ± 20% | | | | | | | | |
| Z _{ro} | | j* ± 15% | 256+j1510 | 211+j757 | 1200+j3920 | 50.1+j544 | 41.4+j311 | 1495+j11870 | | |
| Z _{so} | | | | 471+j127 | 1412+j389 | 19.3+j16.4 | 36+j32.7 | 675+j741 | | |
| Z _{rs} | | | | | | | | | | |
| Z _{ss} | | | 285+j55.5 | | | | | | | |

1/ See MIL-S-20708, Standard test voltage and frequency.

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4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for inspection:

Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 First article:

When specified in the contract or purchase order, the first article sample shall be subjected to first article inspection provisions of MIL-S-20708 as applicable.

4.3 Test methods and procedures:

4.3.1 Vibration: Synchros shall be mounted rigidly to a vibration stand, shaft axis vertical and shaft extension downward, and shall be vibrated simultaneously in the vertical and horizontal directions for 8 hours \pm 15 minutes, at 0.10 ± 0.02 inch amplitude and at a frequency varying linearly from 10 Hz to 60 Hz over a period of one minute. An acceptable test method is as follows: Mount the synchro with the shaft extension downward and shaft axis at 45° to the horizontal and vibrate in the vertical direction with a resultant amplitude yielding 0.10 ± 0.02 inch components parallel and perpendicular to the shaft axis.

4.3.2 Shock: The low impact shock test of MIL-S-20708 shall apply except that the shock blow and its application shall be in accordance with Method 202 of MIL-STD-202.

4.3.3 Ambient temperatures: The ambient temperature tests of MIL-S-20708 shall apply except that all synchros covered herein shall be subjected to a high temperature test of 85°C in lieu of 125°C .

4.3.4 Endurance: The endurance test of MIL-S-20708 shall apply except that the total time of test shall be 1000 ± 10 hours and the time of test at $23 \pm 5^\circ\text{C}$ shall be 840 ± 4 hours.

5. PREPARATION FOR DELIVERY:

5.1 Preparation for delivery shall be in accordance with MIL-S-20708.