SAE Aerospace
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AEROSPACE STANDARD

SAE AS20708/94 | REV. B

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SupersedingAS20708/94A

(R) Synchro, 60 and 400 Hz, Size 23

FSC 5990

RATIONALE

This Revision consists of a 5 (five) year review, which provides updates to current format and references.

NOTICE

The complete requirements for procuring the Synchro described herein shall consist of this document and the issue in effect of SAE AS20708.

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 publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of the other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AS20708 Synchros, General Specification For

2.1.2 NAS Publications

Available from Aerospace Industries Association, 1000 Wilson Boulevard, Suite 1700, Arlington, VA 22209-3928, Tel: 703-358-1000, www.aia-aerospace.org.

NASM35275 Screw, Machine-Drilled Fillister Head, Slotted, Corrosion Resisting Steel, Passivated, UNC-2A

NASM35333 Washer, Lock, Flat-Internal Tooth

NASM35338 Washer, Lock-Spring, Helical, Regular (Medium) Series

2.1.3 U. S. Government Publications

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: http://www.sae.org

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AS20708/94B

Available from the Document Automation and Production Service (DAPS), Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-9495, https://assist.daps.dla.mil/quicksearch/.

COMMERCIAL ITEM DESCRIPTION

A-A-208 Ink, Marking, Stencil, Opaque (Porous and Non-porous Surfaces)

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-710 Synchros, 60 and 400 Hz, Selection and Application of

MIL-STD-202 Test Methods for Electronic and Electrical Component Parts

MS17186 Washer, Drive (Synchro)

MS17187 Nut, Plain, Hexagon

MS51972 Nut, Plain, Hexagon-steel, Corrosion Resisting, 300 Series, Passivated, UNF-2B

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 SAE AS20708, except as otherwise specified herein. In case of conflict between the requirements of SAE AS20708 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 ± 15 minutes without mechanical damage or loosening of parts, and without degradation in performance to the extent specified in SAE AS20708, 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 SAE AS20708 where applicable. After testing, there shall be no damage or loosening of parts and synchros shall meet the performance requirements specified in SAE AS20708, following low impact shock testing.

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 1 and 2 herein at the specified ambient temperatures of SAE AS20708, 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 SAE AS20708. The high ambient temperature shall be +85 °C in lieu of +125 °C.

TABLE 1 - 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
1/ Primary voltage	Volts	Nominal	115	90	115	115	90	115
Primary current	Milliamps	Maximum	231	420	231	1040	1210	1040
Primary power	Watts	Maximum	6	13.5	6	9.36	10.2	9.36
Transformation ratio		± 1%	0.783	1.154	0.783	0.783	1.154	0.783
Electrical error	Minutes	Maximum	8	8	8	8	8	8
Torque gradient	oz-in/deg	Minimum	0.12	0.03	0.12	0.12	0.16	0.12
Receiver error	Minutes	Maximum			60			60
Null voltage	Millivolts	Maximum						
Total			160		160	100		100
Fundamental			60		60	75		75
Friction torque @-55 °C	oz./in.	Maximum	0.2 0.5	0.2 0.5		0.2 0.5	0.2 0.5	
Temperature rise	°C	Maximum	65	65		65	65	65
Impedance	Ohms	R±15%+						
Zro		jx±10%						
Zso				100+j210			11+j94	
Zrs				170+j52			9+j10	
Zss		Nominal	121+j28.3		121+j28.3	7.3+j6.3		7.3+j6.3

1/ See SAE-AS20708, Standard test voltage and frequency.

TABLE 2 - 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
1/ Primary voltage	Volts	Nominal	115	90	90	115	90	90
Primary current	Milliamps	Maximum	83	112	22	264	297	7.7
Primary power	Watts	Nominal	1.6	2.2	0.5	2.5	2.8	0.08
Transformation ratio		± 1%	0.783	1.154	0.735	0.783	1.154	0.735
Electrical error	Minutes	Maximum	8	8	6	8	8	6
Null voltage	Millivolts	Maximum						
Total			100	100	75	100	100	60
Fundamental			75	75	60	75	50	30
Friction torque @-55°C	oz./in.	Maximum	0.2 0.5	0.2 0.5	0.2 0.5	0.2 0.5	0.2 0.5	0.2 0.5
Temperature rise	°C	Maximum	45	45	45	45	45	45
Impedance	Ohms	R±20%+						
Zro		jx±15%	256+j1510			50.1+j544		
Zso				211+j757	1200+j3920		41.4+j311	1495+j11870
Zrs				471+j127	1412+j389		36+j32.7	675+j741
Zss			285+j55.5			19.3+j16.4		

1/ See SAE-AS20708, Standard test voltage and frequency.

Synchro Type	Dim “A”	Shaft Nut	Shaft Washer	Shaft Extension
TR4, TX4, CX4, CT4, TR6, TX6, CX6, CT6	4.294 MAX	MS51972-1	NASM35333-74	KEYWAY
TR4A, TX4A, CX4A, CT4A, TR6A, TX6A, CX6A, CT6A		MS17187-3	MS17186-8	SPLINE
TDX4, CDX4, TDX6, CDX6	4.544 MAX	MS51972-1	NASM35333-74	KEYWAY
TDX4A, CDX4A, TDX6A, CDX6A		MS17187-3	MS17186-8	SPLINE

FIGURE 1 - SYNCHROS, 60 AND 400 HZ SIZE 23

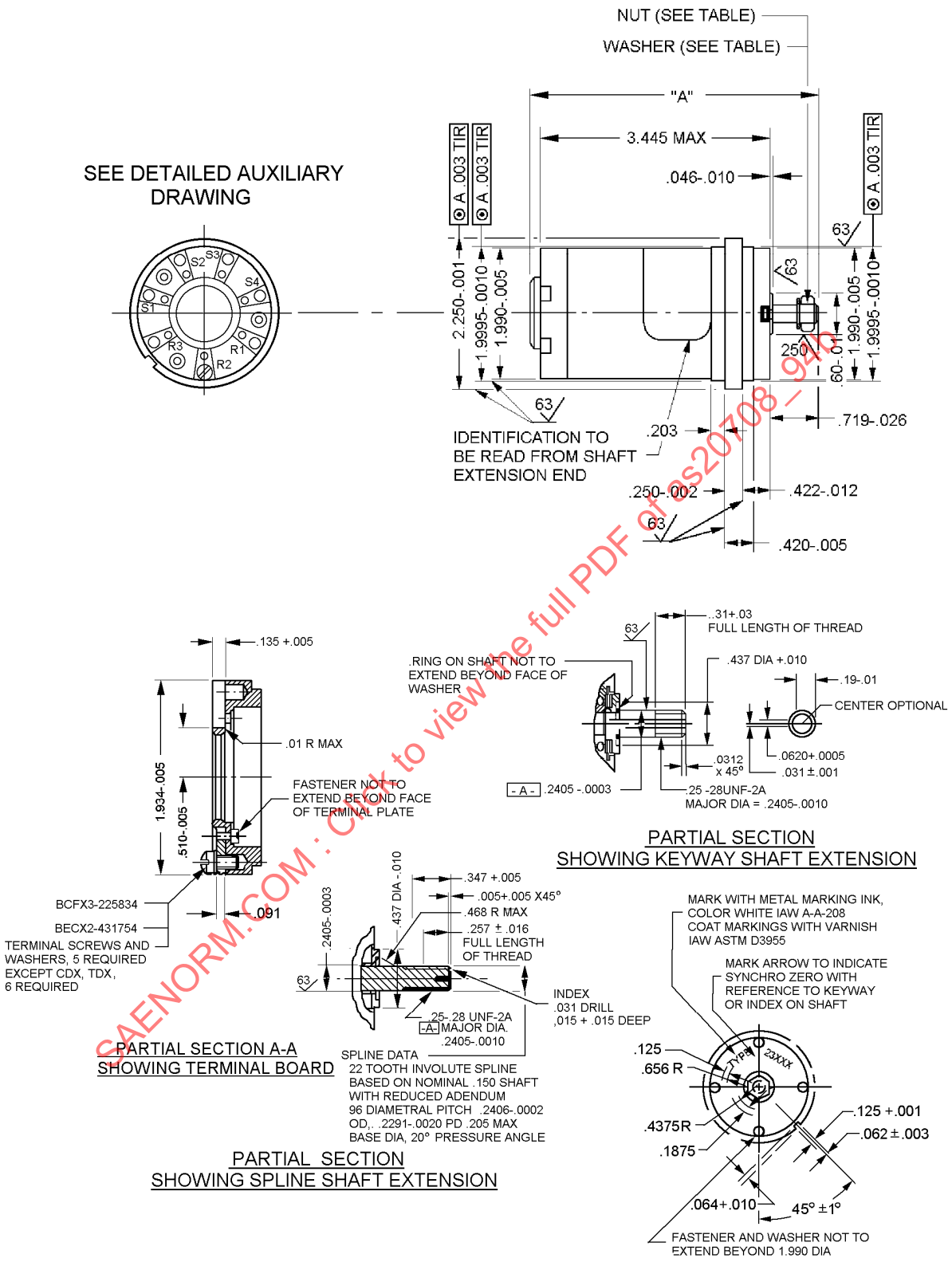
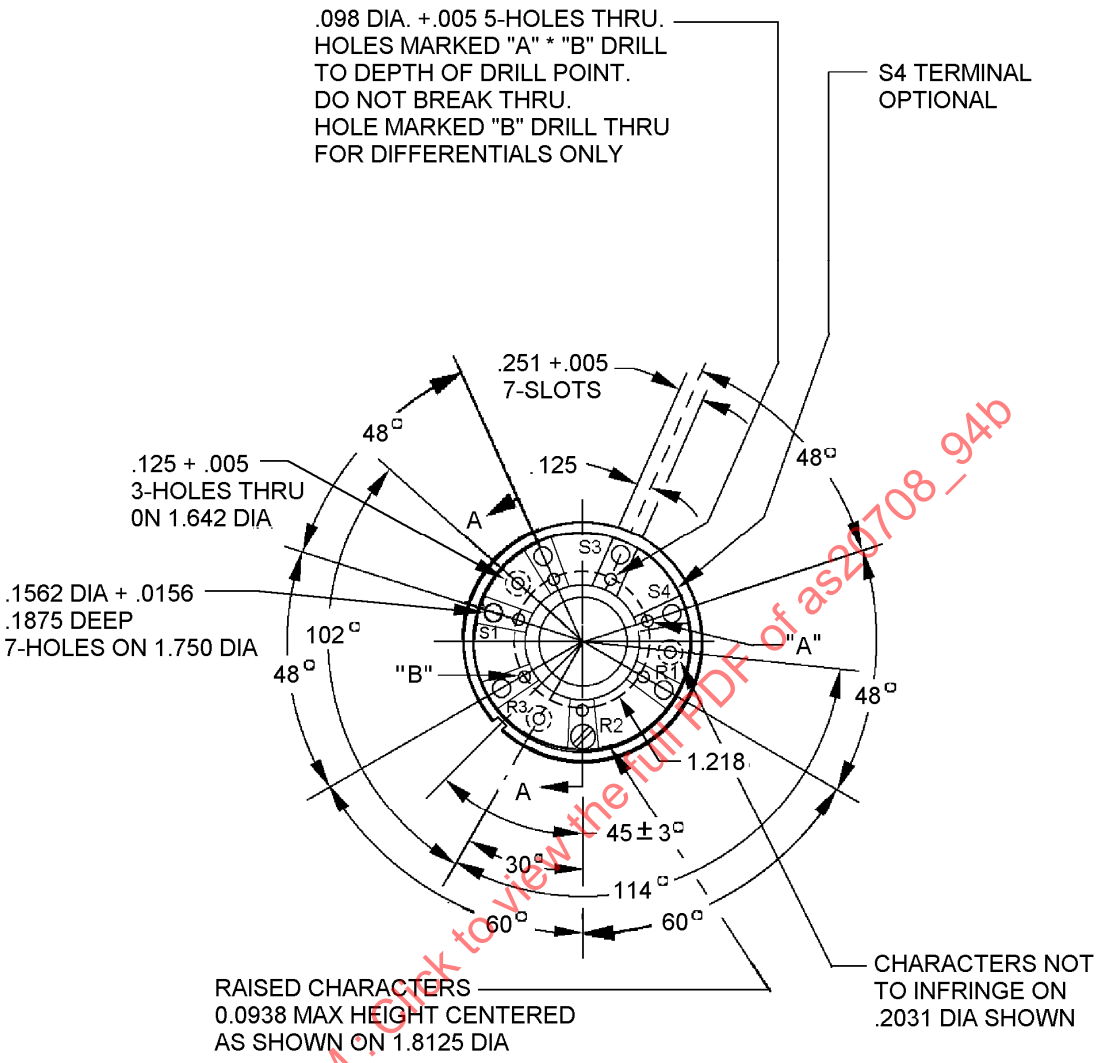


FIGURE 1 - SYNCHROS, 60 AND 400 HZ SIZE 23 – CONTINUED



NOTES:

1. End play shall not exceed 0.003, shaft horizontal, upon reversal of a 1 (one) pound load.
2. Radial play shall not exceed 0.001, upon reversal of a 0.5 (1/2) pound load.
3. Brush pressure shall be adjusted to permit attainment of performance requirements.
4. Dimensions are in inches.
5. Tolerances, when not specified, are ± 0.005 on decimals, ± 0º 30’ on angles.
6. The design of this unit shall provide for the terminal block to remain fixed, when terminal screws and terminal lugs are removed.
7. Break all sharp edges 0.010 x 45º.
8. 125 (micro-inch finish) all over, except as noted.

FIGURE 1 - SYNCHROS, 60 AND 400 HZ SIZE 23 – CONTINUED

3.4 Performance Requirements

The performance requirements shall be as specified in Tables 1 and 2 as applicable.

3.5 Part Number Identification

Synchros listed in Tables 1 and 2 shall be identified by the following part numbers (see 6.2).

Part No.	Type	Item Name
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

4. VERIFICATION

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 purchase 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 SAE AS20708, 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 ± 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 degrees to the horizontal and vibrate in the vertical direction with resultant amplitudes yielding 0.10 ± 0.02 inch components parallel and perpendicular to the shaft axis.