SAE Aerospace
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AEROSPACE STANDARD

SAE AS81659 | REV. A

Issued 2004-06
Revised 2012-01

Superseding AS81659

(R) Connectors, Electrical, Rectangular Crimp Contacts General Specification For

RATIONALE

The document was totally revised to include Engineering Position Letter amendments, remove government jargon, update specification references, align specification with SAE guidelines as needed, and review for minor technical problems.

1. SCOPE

1.1 Scope

This specification covers two series of electrical, rectangular connectors with crimp type removable contacts. These connectors are provided with single, dual, triple, and quadruple insert shell configurations.

1.2 Classification

Connectors covered by this specification shall be of the following types, classes, series and shell designators.

1.2.1 Type Description

The connector type shall be identified as follows:

Type I - Short grommet seal (series 1 only).
Type II - Standard grommet seal.
Type III - Without grommet seal.
Type IV - Without interfacial and grommet seals.

1.2.2 Class Description

The connector class shall be identified as follows:

Class 1: -65 to +125 °C.
Class 2: -65 to +200 °C.

1.3 Part Number

The part number shall consist of the letter "M", the basic number of the specification sheet, and coded numbers or letters as shown in the following example:

M81659/29	A	2	0002
Basic part number (1.3.1)	Shell designator (1.3.2)	Series designator (1.3.3)	Insert designator (1.3.4)

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1.3.1 Basic Part Number

The basic part number shall be as shown on the applicable specification sheet. Revision letters shall not be included.

1.3.2 Shell Designator

The shell designator shall consist of a letter in accordance with the following:

A - A connector having a shell configuration to accommodate a keystone insert.
B - A connector having a shell configuration to accommodate a rectangular insert.

1.3.3 Series Designator

The series designator shall consist of a one digit number in accordance with the following:

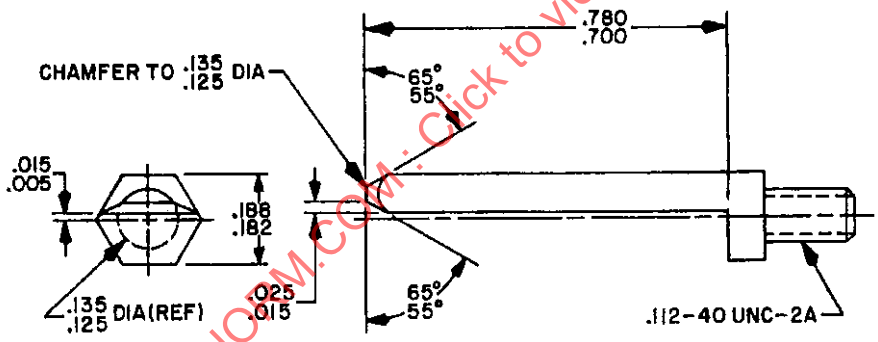
Series 1 - Front release contacts.
Series 2 - Rear release contacts.

1.3.4 Insert Designator

The insert designator shall consist of a four digit number as shown on MS3157.

1.4 Polarization Position

The polarization position of the connector shall be in accordance with Table 1. Polarizing hardware is depicted in Figure 1A and 1B. All connectors shall be supplied with the polarizing hardware shipped loose. Polarization shall be accomplished by the user and the position number marked on the connector shell following the part number (see 1.3).



INCHES	MM
.005	.13
.015	.38
.025	.64
.098	2.49
.108	2.74
.110	2.79
.112	2.84
.125	3.18
.130	3.30
.135	3.43
.182	4.62
.188	4.78
.220	5.59
.250	6.35
.700	17.78
.780	19.81

FIGURE 1A - POLARIZING POST

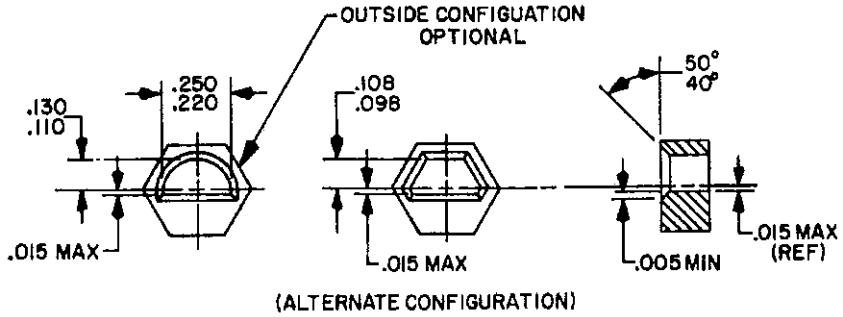


FIGURE 1B - POLARIZING INSERT

TABLE 1 - POLARIZATION POSITIONS

PLUG				RECEPTACLE			
POSITION	LEFT POST	CENTER POST	RIGHT POST	POSITION	LEFT KEY	CENTER KEY	RIGHT KEY
00	--	--	--	00	--	--	--
01	1	1	1	01	4	4	4
02	2	1	1	02	4	4	3
03	3	1	1	03	4	4	2
04	4	1	1	04	4	4	1
05	5	1	1	05	4	4	6
06	6	1	1	06	4	4	5
07	1	1	6	07	5	4	4
08	2	1	6	08	5	4	3
09	3	1	6	09	5	4	2
10	4	1	6	10	5	4	1
11	5	1	6	11	5	4	6
12	6	1	6	12	5	4	5
13	1	1	5	13	6	4	4
14	2	1	5	14	6	4	3
15	3	1	5	15	6	4	2
16	4	1	5	16	6	4	1
17	5	1	5	17	6	4	6
18	6	1	5	18	6	4	5
19	1	1	4	19	1	4	4
20	2	1	4	20	1	4	3
21	3	1	4	21	1	4	2
22	4	1	4	22	1	4	1
23	5	1	4	23	1	4	6
24	6	1	4	24	1	4	5
25	1	1	3	25	2	4	4
26	2	1	3	26	2	4	3
27	3	1	3	27	2	4	2
28	4	1	3	28	2	4	1
29	5	1	3	29	2	4	6
30	6	1	3	30	2	4	5
31	1	1	2	31	3	4	4
32	2	1	2	32	3	4	3
33	3	1	2	33	3	4	2
34	4	1	2	34	3	4	1
35	5	1	2	35	3	4	6
36	6	1	2	36	3	4	5
37	1	2	1	37	4	3	4
38	2	2	1	38	4	3	3
39	3	2	1	39	4	3	2
40	4	2	1	40	4	3	1
41	5	2	1	41	4	3	6
42	6	2	1	42	4	3	5
43	1	2	6	43	5	3	4
44	2	2	6	44	5	3	3
45	3	2	6	45	5	3	2
46	4	2	6	46	5	3	1
47	5	2	6	47	5	3	6
48	6	2	6	48	5	3	5
49	1	2	5	49	6	3	4

TABLE 1 - POLARIZATION POSITIONS (CONTINUED)

PLUG				RECEPTACLE			
POSITION	LEFT POST	CENTER POST	RIGHT POST	POSITION	LEFT KEY	CENTER KEY	RIGHT KEY
50	2	2	5	50	6	3	3
51	3	2	5	51	6	3	2
52	4	2	5	52	6	3	1
53	5	2	5	53	6	3	6
54	6	2	5	54	6	3	5
55	1	2	4	55	1	3	4
56	2	2	4	56	1	3	3
57	3	2	4	57	1	3	2
58	4	2	4	58	1	3	1
59	5	2	4	59	1	3	6
60	6	2	4	60	1	3	5
61	1	2	3	61	2	3	4
62	2	2	3	62	2	3	3
63	3	2	3	63	2	3	2
64	4	2	3	64	2	3	1
65	5	2	3	65	2	3	6
66	6	2	3	66	2	3	5
67	1	2	2	67	3	3	4
68	2	2	2	68	3	3	3
69	3	2	2	69	3	3	2
70	4	2	2	70	3	3	1
71	5	2	2	71	3	3	6
72	6	2	2	72	3	3	5
73	1	3	1	73	4	2	4
74	2	3	1	74	4	2	3
75	3	3	1	75	4	2	2
76	4	3	1	76	4	2	1
77	5	3	1	77	4	2	6
78	6	3	1	78	4	2	5
79	1	3	6	79	5	2	4
80	2	3	6	80	5	2	3
81	3	3	6	81	5	2	2
82	4	3	6	82	5	2	1
83	5	3	6	83	5	2	6
84	6	3	6	84	5	2	5
85	1	3	5	85	6	2	4
86	2	3	5	86	6	2	3
87	3	3	5	87	6	2	2
88	4	3	5	88	6	2	1
89	5	3	5	89	6	2	6
90	6	3	5	90	6	2	5
91	1	3	4	91	1	2	4
92	2	3	4	92	1	2	3
93	3	3	4	93	1	2	2
94	4	3	4	94	1	2	1
95	5	3	4	95	1	2	6
96	6	3	4	96	1	2	5
97	1	3	3	97	2	2	4
98	2	3	3	98	2	2	3
99	3	3	3	99	2	2	2

Notes:

1. Darkened portion indicates extended part of post in plug. Light portion indicates key hole in receptacle.
2. Mating faces shown with top up.

1.5 Wire Range Accommodations

Wire range accommodations of the contacts shall be as shown in Table 2.

TABLE 2 – WIRE RANGE ACCOMMODATIONS

Wire Barrel Sizes	Wire Size	Insulation Diameter Range (inches)
22	26, 24, 22	.030 to .054
20	24, 22, 20	.040 to .071
16	20, 18, 16	.068 to .103
12	14, 12	.097 to .135

2. APPLICABLE DOCUMENTS

2.1 Issues of Documents

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.

AMS2404 Plating, Electroless Nickel

AMS-C-26074 Coatings, Electroless Nickel, Requirements for

AMS-QQ-A-250 Aluminum and Aluminum Alloy Plate and Sheet, General Specification for

AMS-QQ-P-416 Plating, Cadmium (Electrodeposited)

AMS-QQ-A-367 Aluminum Alloy Forgings

AS22759/9 Wire, Electrical, Fluoropolymer-Insulated, Extruded TFE, Silver-Coated Copper Conductor, 1000-Volt

AS22759/10 Wire, Electrical, Fluoropolymer-Insulated, Extruded TFE, Nickel-Coated Copper Conductor, 1000-Volt

AS22759/11 Wire, Electrical, Fluoropolymer-Insulated, Extruded TFE, Silver-Coated Copper Conductor, 600-Volt

AS22759/12 Wire, Electrical, Fluoropolymer-Insulated, Extruded TFE, Nickel-Coated Copper Conductor, 600-Volt

AS39029 Contacts, Electrical Connector, General Specification for.

AS81659/9 Connectors, Electrical, Rectangular, Receptacle, Environment Resistant, Crimp Contacts, Double Insert, Type II, Class 1(65 °C to +125 °C), Series 1, Shell Designator A

AS81659/29 Connectors, Electrical, Rectangular, Plug, Crimp Contacts, (Single Insert, Type II, Class 1 (-65 °C to +125 °C), Series 2, shell Designator A)

AS81659/31 Connectors, Electrical, Rectangular, Receptacle, Crimp Contacts, (Single Insert, Type II, Class 1 (-65 °C to +125 °C), Series 2 Shell Designator A)

AS81659/33	Connectors, electrical, Rectangular, Plug, Crimp Contacts, (Dual Insert, Type II, Class 1 (-65 °C to +125 °C), Series 2, Shell Designator A)
AS81659/35	Connectors, Electrical, Rectangular, Receptacle, Crimp Contacts, (Dual Insert, Type II, Class 1 (-65 °C to +125 °C), Series 2, shell Designator A)
AS81659/37	Connectors, Electrical, Rectangular, Plug, Crimp Contacts, (Triple Insert, Type II, Class 1 (-65 °C to +125 °C), Series 2, Shell Designator A
AS81659/39	Connectors, Electrical, Rectangular, Receptacle, Crimp Contacts, (Triple Insert, Type II, Class 1 (-65 °C to 125 °C), Series 2, Shell Designator A)
AS81659/41	Connectors, Electrical, Rectangular, Plug, Crimp Contacts, (Quadruple Insert, Type II, Class 1 (-65 °C to +125 °C), Series 2, Shell Designator A
AS81659/43	Connectors, Electrical, Rectangular, Receptacle, Crimp Contacts, (Quadruple Insert, Type II, Class 1 (-65 °C to +125 °C), Series 2, Shell Designator A
AS81659/53	Connectors, Electrical, Rectangular, Plug, Environment Resistant, Crimp Contacts, Triple Insert, Type II, Class 1 (-65 °C to +125 °C), Series 2, Shell Designator B
AS81659/56	Connectors, Electrical, Rectangular, Receptacle, Environment Resistant, Crimp Contacts, Triple Insert, Type II, Class 2 (-65 °C to +200 °C), Series 2, Shell Designator B
AS81659/57	Connectors, Electrical, Rectangular, Plug, Environment Resistant, Crimp Contacts, Quadruple Insert, Type II, Class 1 (-65 °C to +125 °C)
AS81659/58	Connectors, Electrical, Rectangular, Plug, Environment Resistant, Crimp contacts, Quadruple Insert, Type II, Class 2 (-65 °C to +200 °C), Series 2, Shell Designator B
AS81659/61	Connectors, Electrical, Rectangular, Receptacle, Crimp Contacts, (Single Insert, Type III, Class 1 (-65 °C to +125 °C), Series 2, Shell Designator A)
AS81659/62	Connectors, Electrical, Rectangular, Receptacle, Crimp Contacts, (Dual Insert, Type III, Class 1 (-65 °C to +125 °C), Series 2, Shell Designator A)
AS81659/63	Connectors, Electrical, Rectangular, Receptacle, Crimp Contacts, (Triple Insert, Type III, Class 1 (-65 °C to +125 °C), Series 2, Shell Designator A)
AS81659/64	Connectors, Electrical Rectangular, Receptacle, Crimp Contacts, (Quadruple Insert, Type III, Class 1 (-65 °C to +125 °C), Series 2, Shell Designator A)
AS81659/65	Connectors, Electrical, Rectangular, Plug, Crimp Contacts, (Single Insert, Type IV, Class 1, (-65 °C to +125 °C) Series 2, Shell Designator A)
AS81659/66	Connectors, Electrical, Rectangular, Receptacle, Crimp Contacts, (Single Insert, Type IV, Class 1 (-65 °C to +125 °C), Series 2, Shell Designator A)
AS81659/67	Connectors, Electrical, Rectangular, Receptacle, Crimp Contacts, (Single Insert, Type IV, Class 1, (-65 °C to +125 °C), Series 2, Shell Designator A, Clinch Nut Mounting)
AS81659/68	Connectors, Electrical, Rectangular, Receptacle, Crimp Contacts, (Single Insert, Type IV, Class 1, (-65 °C to +125 °C), Series 2, Shell Designator A, Float Mounting)
AS81659/69	Connectors, Electrical, Rectangular, Plug, Crimp Contacts, (Dual Insert, Type IV, Class 1 (-65 °C to +125 °C), Series 2, Shell Designator A)

AS81659/71 Connectors, Electrical, Rectangular, Receptacle, Crimp Contacts, (Dual Insert, Type IV, Class 1, (-65 °C to +125 °C), Series 2, Shell Designator A, Clinch Nut Mounting)

AS81659/72 Connectors, Electrical Rectangular, Receptacle, Crimp Contacts, (Dual Insert, Type IV, Class 1, (-65 °C to +125 °C), Series 2, Shell Designator A, Float Mounting)

AS81659/72 Connectors, Electrical Rectangular, Receptacle, Crimp Contacts, (Dual Insert, Type IV, Class 1, (-65 °C to +125 °C), Series 2, Shell Designator A, Float Mounting)

2.1.2 ANSI Publications

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ANSI/ISO 10012-1 Quality Assurance Requirements for Measuring Equipment

2.1.3 ASQ Publications

Available from American Society for Quality, 600 North Plankinton Avenue, Milwaukee, WI 53203, Tel: 800-248-1946 (United States or Canada)) or +1-414-272-8575 (International), www.asq.org.

ASQC Z1.4 Sampling Procedures and Tables for Inspection by Attributes

2.1.4 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM A 342/A342M Test Method for Permeability of Feebly Magnetic Materials

ASTM B 85 Standard Specification for Aluminum-Alloy Die Castings

ASTM D 5948 Molding Compounds, Thermosetting, Standard Specification For

ASTM B 733-90 Nickel-Phosphorous Coatings on Metals

2.1.5 EIA Publications

Available from Electronic Industries Alliance, 2500 Wilson Boulevard, Arlington, VA 22201-3834, Tel: 703-907-7500, www.eia.org.

EIA-364 Electrical Connector/Socket Test Procedures Including Environmental Classifications

EIA-364.09 Durability Test Procedure for Electrical Connectors and Contacts

EIA-364.13 Mating and Unmating Forces Test Procedure for Electrical Connectors

EIA-364.17 Temperature Life with or without Electrical Load, Test Procedure for Electrical Connector and Sockets

EIA-364.20 Withstanding Voltage Test Procedure for Electrical Connectors, Sockets and Coaxial Contacts

EIA-364.21 Insulation Resistance Test Procedure for Electrical Connectors, Sockets, and Coaxial Contacts

EIA-364.26 Salt Spray Test Procedure for Electrical Connectors, Contacts and Sockets

EIA-364.27 Mechanical Shock (Specified Pulse) Test Procedure for Electrical Connectors

EIA-364.28 Vibration Test Procedure for Electrical Connectors and Sockets

EIA-364.31 Humidity Test Procedure for Electrical Connectors and Sockets

EIA-364.32 Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors and Sockets

2.1.6 NATIONAL CONFERENCE OF STANDARDS LABORATORIES (NCSL)

National Conference of Standards Laboratories, 2995 Wilderness Place, Suite 107, Boulder, CO 80301-5404, Tel: 303-440-3339, www.ncsli.org.

NCSL Z540-1 General Requirements for Calibration Laboratories and Measuring and Test Equipment

2.1.7 U. S. Government Publications

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/.

MIL-DTL-16878 Wire, Electrical, Insulated, General Specification for

MIL-DTL-22520 Crimping Tools, Terminal, Hand or power Actuated, Wire Termination and Tool Kits, General Specification for

MIL-DTL-55330 Electrical and Fiber Optic, Packaging of

MIL-I-81969 Installing and Removal Tools, Connector Electrical Contact, General Specification for

MIL-I-81969/1 Installing and Removal Tools Connector Electrical Contact, Type III, Class 2, Comp C

MIL-I-81969/14 Installing and Removal Tools Connector Electrical Contact, Type III, Class 2, Comp B

MIL-I-81969/17 Installing and Removal Tools Connector Electrical Contact, Type I, Class I, Comp C

MIL-I-81969/19 Installing and Removal Tools Connector Electrical Contact, Type II, Class 1, Comp C

MIL-PRF-5606 Hydraulic Fluid, Petroleum Base, Aircraft, Missile, and Ordnance

MIL-PRF-23699 Lubricating Oil, Aircraft Turbine Engines, Synthetic Base, NATO Code Number 0-156

MIL-STD-1285 Marking of Electrical and Electronic Parts

MIL-HDBK-454 General Requirements for Electronic Equipment

MS3157 Insert Arrangements, MIL-C-81659 electric Connector, Series 1 and 2

MS27488 Plug, End Seal, Electric Connector

SD-6 Provisions Governing Qualification

3. REQUIREMENTS

3.1 Specification Sheets

The individual item requirements shall be as specified herein and in accordance with the applicable specification sheets. In the event of any conflict between requirements of this specification and the specification sheets, the latter shall govern.

3.2 Qualification

Connectors furnished under this specification and the applicable specification sheet shall be products which are qualified for listing on the applicable qualified products list (QPL) at the time set for the opening of bids (see 4.4 and 6.3).

3.3 Materials

Materials shall be as specified herein. When a definite material is not specified, a material shall be used which will enable the connectors to meet the performance requirements of this specification. Acceptance of approval of any constituent material shall not be construed as an assurance of the acceptance of the finished product.

3.3.1 Dissimilar Metals

When dissimilar metals are employed in intimate contact with each other, suitable protection against electrolytic corrosion shall be provided as specified in requirement 16 of MIL-HDBK-454.

3.3.2 Nonmagnetic Materials

All parts shall be made from materials which pass the magnetic permeability test (see 3.5.1).

3.3.3 Shells

Shells shall be made from a high grade aluminum alloy. Die casting materials shall conform to composition number 413, A413, 380, A380 or 384 of ASTM B 85, or aluminum forging alloy conforming to AMS-QQ-A-367 or AMS-QQ-A-250.

3.3.4 Finish

The connector finish on all exposed metal parts, other than electrical contacts, insert retention plates, and corrosion resistant steel parts, shall be protected as shown in 3.3.4.1 and 3.3.4.2.

3.3.4.1 Class 1

Finish for class 1 connectors shall be cadmium plated per type II of AMS-QQ-P-416.

3.3.4.2 Class 2

Finish for class 2 connectors shall be electroless nickel per ASTM B 733-90, AMS-C-26074 or AMS2404.

3.3.4.3 Insert Retaining Plate

The insert retaining plate shall be black to indicate series I and a contrasting blue color to indicate series II.

3.3.4.4 Shell Front Face (series 2 only)

The top edges of the plug shell and the area around the polarizing keys of the receptacle shell shall be provided with a 0.031 inch minimum wide blue stripe to indicate rear release contact retention system.

3.3.5 Inserts

3.3.5.1 Rigid Insert Material

Rigid insert material shall conform to ASTM D 5498 type GDI-30F, SDG-F or reinforced epoxy resin (Allied Chemical 1288 BX or equivalent), or reinforced phenolic resin per ASTM D 5498.

3.3.5.2 Resilient Insert Material

Resilient insert material shall be a high grade elastomer having a shore “A” hardness between 35 and 65.

3.4 Design and Construction

Connectors shall be of the design and construction specified (see 3.1). Bosses and barriers shall be used as necessary to meet electrical requirements.

3.4.1 Contacts

Unless otherwise specified, contacts shall conform to AS39029/2 or AS39029/11 for pins and AS39029/3 or AS39029/12 for sockets. A quantity of contacts consisting of the normal complement, plus one spare contact for connector arrangements having 26 contacts or less and two spares for arrangements over 26 contacts shall be included in the unit package. For indirect shipments, connectors may be ordered without contacts (see 6.1).

3.4.2 Coaxial Contacts

Users shall obtain coaxial contacts separately from the manufacturer of the connector being employed, except coaxial contacts for the “C2” and “C3” insert arrangements shall be supplied with the connector.

3.4.3 Grommet Sealing Plugs (Type II)

The grommet sealing plugs shall be in accordance with MS27488. Fifteen percent of the number of contacts, but not less than 1, shall be included in the unit package. Sealing plugs shall not be supplied for coaxial contact cavities. They must be obtained separately. For indirect shipments, connectors may be ordered without grommet sealing plugs (see 6.1).

3.4.4 Installing and Removal Tools

Individual contacts shall be installed with the applicable installing tool as specified in MIL-I-81969/17 and capable of being removed with the applicable removal tool conforming to MIL-I-81969/19 for series 1 connectors. For series 2 connectors, the applicable installing and removal tool conforming to MIL-I-81969/1 or MIL-I-81969/14 shall be used.

3.4.5 Contact Crimping

A crimping tool conforming to MIL-DTL-22520 shall be used as applicable.

3.4.6 Insert

Inserts shall be designed and constructed with proper sections and radii in order that they will not crack, chip, or break in assembly or in normal service. Depressions used to achieve longer creepage paths shall not cause structural weakness, hollow or split inserts shall not be used, inserts shall be so designed that all air paths between adjacent contacts and contacts to shell are eliminated. The insert and wire sealing member shall be either one integral part or a bonded laminate construction. The wire sealing portion shall provide suitable sealing around the wire on the wire ranges and insulation diameter ranges shown on Table 2. The insert shall be positioned in the shell as specified (see 3.1).

3.4.6.1 Interfacial Seal (Types I, II, and III)

Inserts with size 20, 16, 12, or coaxial pin contacts, or size 22 socket contacts, shall have a resilient face seal permanently bonded in place to provide an interfacial seal with the hard face of the mating insert in the mated condition (see 4.6.9).

3.4.7 Contact Retention

The inserts shall be designed so that positive locking action of the contacts in the insert is provided. The contact retaining system shall be free of foreign material, adhesive, or any obstruction that would prevent smooth contact insertion and positive retention.

3.4.8 Insert Arrangement

The number and arrangement of contacts shall be in accordance with MS3157.

3.4.9 Contact Alignment and Stability

With all contacts in place, the alignment of pin and socket contacts shall permit engagement irrespective of buildup of allowable tolerances on hole locations, distortion of contacts due to crimping and insert location in the shell.

3.4.10 Contact Cavity Identification

Designation of contacts shall be as specified in the applicable detail specification. Numerals shall be clearly legible. Marking shall be arranged to avoid confusion between contacts. All markings shall appear on the front and rear face of each insert. Insert marking on the front face of connectors with projecting contacts (including the 106 arrangement) is optional. Identification of the socket insert shall correspond with that of the mating pin insert. Ink marking is preferred but molded, raised, or recessed insert identification is permissible if located so as not to interface with sealing surfaces.

3.4.11 Shell

The shell shall be designed to positively retain the insert.

3.4.12 Polarization

Polarization of the mating plug and receptacle shall be accomplished by means of mating keys on the plug shell and keyways on the receptacle shell (see Table 1). Polarization shall be accomplished prior to contact engagement.

3.4.13 Interchangeability

Receptacles of a given size and design manufactured by one qualified source to the requirements of this specification, shall be capable of mating with associated plugs manufactured to the requirements of this specification by other qualified sources. The connector assemblies having the same part number shall be directly and completely interchangeable with each other with respect to installation and performance as specified herein.

3.4.14 Intermateability

Applicable Figures 3 through 19 depict shell, interface, and contact location dimensions establishing intermateability control.

3.5 Performance

Connectors and accessories shall be designed to meet the performance requirements stated herein when tested in accordance with the specified method of Section 4. All requirements and tests on mated connectors shall be performed with the mounting flanges at 0.297 +.001/-.000. Spacers may be used between the flanges to hold the position. A mated connector is defined as shown in Figure 2.

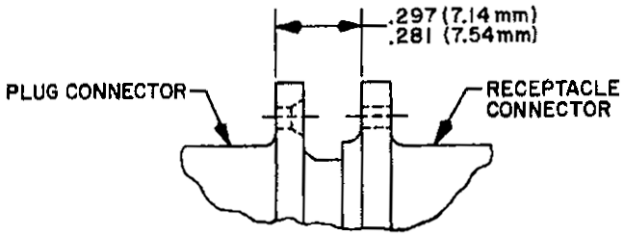


FIGURE 2 - DEFINITION OF A MATED CONNECTOR

3.5.1 Magnetic Permeability

When tested in accordance with 4.6.2, the permeability of the basic connector assembly shall be less than 2.

3.5.2 Maintenance Aging (releasable contacts only)

When pin and socket contacts are tested in accordance with 4.6.3, the individual contact installing and removal forces shall meet the requirements of 3.5.3.

3.5.2.1 Contact Installing and Removal Forces

The installing force for any individual contact, using the applicable installing tool, shall not exceed 15 pounds. The removal force for any individual contact, using the applicable removal tool, shall not exceed 10 pounds.

3.5.3 Contact Retention

When tested in accordance with 4.6.4, the contacts in wired (or unwired) unmated connectors shall withstand the axial load specified in Table 3 without dislodging or damaging the contact, the connector insert or the contact retention mechanism. The axial displacement of the contact shall not exceed 0.012 inch.

TABLE 3 - CONTACT AXIAL LOAD

Contact size	Axial load, pounds, minimum	
	Series 1	Series 2
22	15	15
20	20	20
16	25	25
12	30	30

3.5.4 Insulation Resistance

When tested in accordance with 4.6.5, the insulation resistance at 25 °C (77 °F) shall be greater than 5000 megohms.

3.5.5 Thermal Shock

When tested in accordance with 4.6.6, the temperature limits shall be -65 °C +3 °C -0 °C to +125 °C +3 °C -0 °C for class 1 connectors and +200 °C +3 °C -0 °C for class 2 connectors. The connectors shall meet the subsequent test requirements listed in the applicable test sequence table.

3.5.6 Insulation Resistance at Elevated Temperature

When tested in accordance with 4.6.7, the connectors shall show no evidence of physical damage and shall exhibit an insulation resistance greater than 1000 megohms at 125 °C and 200 megohms at 200 °C.

3.5.7 Dielectric-Withstanding Voltage

When tested in accordance with 4.6.8, the connectors shall be capable of withstanding the applicable voltage shown in Table 4 without flashover unless otherwise specified (see 3.1). The maximum leakage current shall be 1 milliampere.

TABLE 4 - DIELECTRIC WITHSTANDING VOLTAGE

Altitude	Voltages, rms					
	Service rating A*			Service rating B*		
	Unmated	Mated		Unmated	Mated	
		Type I, II and III	Type IV		Type I, II and III	Type IV
Sea level 50 000 ft.	1000 650	1500 1000	1000 650	1500 1000	1800 1200	1500 1000

*Service ratings shown in MS3157.

3.5.8 Mating and Unmating Forces (connector assembly)

When tested in accordance with 4.6.9, the mating and unmating forces shall not exceed 45 pounds per insert except insert 106 (see 3.5). For position insert 106, the engagement force prior to test conditioning shall not exceed 65 pounds and after test conditioning shall not exceed 75 pounds (see 4.6).

3.5.9 Humidity (Type I, Type III and Type IV)

When tested in accordance with 4.6.10, the mated connectors shall meet the dielectric withstanding voltage at sea level as specified in 3.5.7 and 100 megohms (minimum) insulation resistance.

3.5.10 Vibration

When tested in accordance with 4.6.11, the connectors shall show no evidence of cracking, breaking, loosening of parts, or loss of continuity of any contact circuit greater than 1 microsecond.

3.5.11 Shock (specified pulse)

When tested in accordance with 4.6.12, the connectors shall show no evidence of cracking, breaking, loosening of parts, nor loss of continuity of any contact circuit greater than 1 microsecond.

3.5.12 Durability

When subjected to 500 cycles of mating and unmating in accordance with 4.6.13, the connectors shall show no evidence of damage detrimental to the operation of the connector and shall meet the mating and unmating forces as specified in 3.5.8.

3.5.13 Salt Spray (corrosion)

When tested in accordance with 4.6.14, exposure to a salt-laden atmosphere shall not cause sufficient corrosion to interfere with the mating and unmating force of the connectors.

3.5.14 Temperature Life

When tested in accordance with 4.6.15, connectors shall withstand without evidence of damage 1000 hours at an ambient temperature of 125 °C ± 3 °C for class 1 and 200 °C ± 3 °C for class 2.

3.5.15 Fluid Immersion

When tested in accordance with 4.6.16, unmated connectors shall mate within the forces specified in 3.5.8.

3.5.16 Altitude-Moisture Injection (Type II)

When tested in accordance with 4.6.17, connectors shall have an insulation resistance of at least 100 megohms and shall maintain a dielectric withstanding voltage per Table 4.

3.5.17 Insert Retention

When tested in accordance with 4.6.18, unless otherwise specified (see 3.1), the connector-insert assembly shall retain its normal position in the connector shell for the specified load and shall show no signs of physical damage.

3.6 Marking

Each connector shall be legibly and permanently marked as specified (see 3.1) in accordance with MIL-STD-1285.

3.7 Workmanship

Connectors shall be processed in such a manner as to be uniform in quality and shall be free from pits, corrosion, cracks, rough edges, chips, and other defects that will affect life or serviceability.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

Unless otherwise specified, the supplier is responsible for the performance of all contract inspection requirements as specified herein. Except as otherwise specified in the contact, purchase order or qualification authorization letter, the supplier may use any facilities suitable for the performance of the inspection requirements specified herein. The purchaser or qualifying activity has the right to perform any of the inspections set forth in the standard where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Test Equipment and Inspection Facilities

Test and measuring equipment and inspection facilities of sufficient accuracy, quality and quantity to permit performance of the required inspection shall be established and maintained by the contractor. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with NCSL Z540-1 or ANSI/ISO 10012-1.

4.2 Classification of Inspections

The inspections specified herein are classified as follows:

a. Qualification inspection (see 4.4).

b. Quality conformance inspection (see 4.5).

4.3 Inspection Conditions

Unless otherwise specified herein, all inspections shall be performed with the test conditions specified in the "General Requirements" of EIA-364.

4.3.1 Preparation of Crimp Contact Samples

The wire to be used shall be in accordance with AS22759/9-12. The connector shall be fully wired with 3 feet minimum length of wire. Approximately half of the samples shall be wired with wire of the largest size applicable to the wire barrels and with a finished outside diameter approaching the upper limit of the applicable wire range as specified in Table 2. The other samples shall be wired with wire to the smallest size for which contacts are rated: i.e., for size 20 contacts use size 24 wire conforming to AS22759/11 or /12.

4.3.2 Depth of Engagement

Mated connectors shall be engaged as specified in 3.5.

4.4 Initial Qualification Inspection

Initial qualification inspection shall be performed by the Qualifying Activity test laboratory (see 6.4) and the supplier in accordance with Table 5. Test sample units shall be produced with equipment and procedures normally used in production. Inspection shall be performed on each connector type the supplier seeks to qualify, unless qualification by similarity is approved. The extent of qualification by similarity shall be determined by the Qualifying Activity. The Qualifying Activity will perform the multiple insert test group (last group in Table 5) and the supplier is responsible for performing all other test groups in the applicable test tables.

4.4.1 Sample Size

Six each completely assembled plugs or receptacles with single inserts of the greatest complement of contacts and one each completely assembled plug or receptacle with multiple inserts, for all other connector sizes for which qualification is desired, shall be submitted. The samples subjected to qualification testing shall be provided with counterpart connectors for those tests requiring mating assemblies. The counterpart connectors provided for this purpose shall be new previously qualified connectors or new connectors submitted for qualification testing. Suppliers not producing mating connectors shall submit substantiating certification data that tests were performed with qualified counter part connectors.

4.4.2 Inspection Routine

The sample shall be subjected to the inspection specified in Table 5, in the order shown.

TABLE 5 - QUALIFICATION INSPECTION

Inspection	Requirement paragraph	Test method paragraph	Sample numbers						
			1	2	3	4	5	6	⚠
Examination of product	3.1, 3.3 through 3.4.12, 3.6 and 3.7	4.6.1	X	X	X	X	X	X	X
Magnetic permeability	3.5.1	4.6.2	X	X					
Maintenance aging	3.5.2	4.6.3	X	X	X	X	X	X	X
Contact insertion and removal forces	3.5.2.1	4.6.3	X	X	X	X	X	X	X
Contact retention	3.5.3	4.6.4	X	X	X	X	X	X	X
Contact insertion and removal forces	3.5.2.1	4.6.3	X	X	X	X	X	X	X
Insulation resistance	3.5.4	4.6.5	X	X	X	X	X	X	X
Thermal shock	3.5.5	4.6.6	X	X	X	X	X	X	X
Insulation resistance (elevated temperature)	3.5.6	4.6.7			X	X			
Dielectric withstanding voltage (sea level)	3.5.7	4.6.8	X	X	X	X	X	X	X
Mating and unmating force	3.5.8	4.6.9	X	X	X	X	X	X	X
Humidity (type I, type III, and type IV)	3.5.9	4.6.10					X	X	X
Vibration (mated)	3.5.10	4.6.11	X	X	X	X			
Shock (specified pulse)	3.5.11	4.6.12	X	X					
Durability	3.5.12	4.6.13	X	X					
Salt Spray (corrosion)	3.5.13	4.6.14	X	X					
Temperature Life	3.5.14	4.6.15			X	X			
Fluid Immersion	3.5.15	4.6.16					X	X	
Mating and unmating force	3.5.8	4.6.9	X	X	X	X	X	X	X
Altitude-moisture injection (type II)	3.5.16	4.6.17	X	X					X
Insert retention	3.5.17	4.6.18	X	X					
Dielectric withstanding voltage (altitude)	3.5.7	4.6.8			X	X			
Examination of product	3.1, 3.3 through 3.4.12, 3.6 and 3.7	4.6.1	X	X	X	X	X	X	X

⚠ Additional samples of multiple insert connectors (see 4.4.1). This test group is performed by the Qualifying Activity.

4.4.3 Failures

One or more failures shall be cause for refusal to grant qualification approval.

4.4.4 Retention of Qualification

Retention of qualification inspection (Group C, Table 8) shall be performed by the Qualifying Activity on sample units produced with equipment and procedures normally used in production. To retain qualification, the supplier shall forward their periodic qualification submittal every 36 months to the Qualifying Activity. The Qualifying Activity shall establish the initial reporting date. Failure to submit test samples/data within 30 days after the end of the sampling interval may result in loss of qualification for the products. Except where the results of these inspections show non-compliance with the applicable requirements, delivery of products which have passed group A/B inspection shall not be delayed pending the results of retention of qualification inspections.

4.4.4.1 Summary of Group A/B Results

The report shall consist of a summary of the results of the tests performed for the inspection of product, group A, indicating as a minimum the number of lots that have passed and the number of lots that have failed. The results of the tests of all re-worked lots shall be identified and accounted for. Detailed test data shall be submitted for the group B inspection.

4.4.4.2 Retention of Qualification Test Results

Where test measurements are required, the values shall be reported. The Qualifying Activity laboratory shall submit the required test results in a data package to the supplier. The supplier will maintain the data for two retention periods. The supplier test report shall be a summary of the Group A tests performed and completed during the retention qualification interval, detailed test data for group B inspection, material certifications, and other details required by the Qualifying Activity. If the retention of qualification test results indicate non-conformance with specification requirements, and corrective action acceptable to the Qualifying Activity has not been taken, action may be taken to remove the failing products from the qualified products list (QPL).

4.4.4.3 Retention of Qualification Certification of No Production

In the event that no production occurred during the 36 month reporting period, a certification report shall be submitted certifying that the supplier still has the capabilities and facilities necessary to produce the item. The form of the report shall be in accordance with the Qualifying Activity requirements. No more than one reporting period may be certified.

4.5 Quality Conformance Inspection

4.5.1 Inspection of Product for Delivery

Inspection of product for delivery shall consist of group A inspection.

4.5.1.1 Group A Inspection

Group A inspection shall consist of the examinations and test specified in Table 6, in the order shown.

TABLE 6 - GROUP A INSPECTION

Inspection	Requirement paragraph	Test Method Paragraph	AQL (percent defective)	
			Major	Minor
Visual and mechanical inspection	3.1, 3.3 through 3.4.12, 3.6 and 3.7	4.6.1	1.0	4.0
Dielectric withstanding voltage (sea level)	3.5.7	4.6.8.1	100% test	

4.5.1.1.1 Inspection Lot

An inspection lot shall consist of all connectors covered by the same specification sheet produced under essentially the same conditions, and offered for inspection at one time.

4.5.1.1.2 Sampling Plan

A random sample shall be selected from each inspection lot in accordance with Level II of ANSI/ASQC Z1.4 for inspection based on the specified AQL in Table 2. Classification of defects shall be as specified in Table 2 and definitions in therein (see Section 6). A supplier's normal quality control tests and production tests may be used to fulfill Group A inspection, provided they are at least equal to the quality required by Table 2.

4.5.1.1.3 Rejected Lots

If an inspection lot is rejected, the supplier may rework it to correct the defects, or screen out the defective units, and resubmit for re-inspection. Resubmitted lots shall be inspected using tightened inspection, and shall not thereafter be tendered for acceptance unless the former rejection or requirement of correction is disclosed. Such lots shall be separate from new lots, and shall be clearly identified as re-inspected lots.

4.5.2 Periodic Inspection

Periodic inspection shall consist of groups B and C. Except where the results of these inspections show noncompliance with the applicable requirements (see 6.5) delivery of products which have passed groups B and C shall not be delayed pending the results of these periodic inspections.

4.5.2.1 Group B Inspection

Group B inspection shall consist of the inspections specified in Table 7, in the order shown, and shall be made on sample units which have been subjected to and have passed the group A inspection.

TABLE 7 - GROUP B INSPECTION

Inspection	Requirement paragraph	Test method paragraph	Number of sample units to be tested	Number of defectives permitted
Maintenance aging	3.5.2	4.6.3	6	0
Insulation resistance	3.5.4	4.6.5	6	0
Insert retention	3.5.17	4.6.18	6	0

4.5.2.1.1 Sampling Plan

Six mating inserts with the greatest complement of contacts being produced, assembled in mating connector shells, shall be inspected. Inspection shall be performed every 9 months.

4.5.2.1.2 Disposition of Sample Units

Sample units which have been subjected to group B inspection shall not be delivered on a contract or purchase order.

4.5.2.2 Group C Inspection

Group C inspection shall consist of the inspections specified in Table 8, in the order shown. Group C inspection shall be made on sample units selected from inspection lots which have passed the group A inspection.

TABLE 8 – GROUP C INSPECTION

Inspection	Requirement paragraph	Test method paragraph	Number of sample units to be inspected	Number of defectives permitted
Examination of Product	3.1, 3.3 through 3.4.12, 3.6 and 3.7	4.6.1	0	0
Maintenance aging	3.5.2	4.6.3	6	0
Insulation resistance at elevated temperature	3.5.6	4.6.7	6	0
Thermal shock	3.5.5	4.6.6	6	0
Humidity	3.5.9	4.6.10	6	0
Durability	3.5.12	4.6.13	6	0
Salt spray (corrosion)	3.5.13	4.6.14	6	0
Mating and unmating forces	3.5.8	4.6.9	6	0
Fluid immersion	3.5.15	4.6.16	6	0

4.5.2.2.1 Sampling Plan

Every 36 months, six mating inserts with the greatest complement of contacts being produced, assembled in mating connector shells, shall be inspected.

4.5.2.2.2 Failures

If one or more sample units fail to pass group C inspection, the sample shall be considered to have failed. The Qualifying Activity laboratory shall notify the supplier immediately of the failure.

4.5.2.2.3 Disposition of Sample Units

Sample units which have been subjected to group C inspection shall not be delivered on the contract or purchase order.

4.5.3 Packaging Inspection

The sampling and inspection of the preservation-packaging, packing and container marking shall be in accordance with the requirements of MIL-DTL-55330.

4.6 Methods of Examination and Tests

4.6.1 Visual and Mechanical Examination

Connectors shall be examined to verify that the material, design and construction, marking and workmanship are in accordance with the applicable requirements (see 3.1, 3.3 through 3.4.12, 3.6 and 3.7).

4.6.2 Magnetic Permeability (see 3.5.1)

Permeability shall be checked with an instrument conforming to ASTM A 342. The connectors shall be wired or unwired as convenient but shall not be carrying current.

4.6.3 Maintenance Aging (see 3.5.2)

Each wired contact shall be installed, removed and reinstalled using the applicable installing and removal tools. The connector shall then be mated and unmated 10 times. Twenty percent of the contacts, but not less than 4 contacts, in each plug and receptacle shall be subjected to nine additional cycles of removal-installation. The force to fully seat (and remove, where required) the cycled contacts in each plug and receptacle shall be measured during the third and ninth installation and removal (see 3.5.2.1).

4.6.4 Contact Retention (see 3.5.3)

The axial load as specified in Table 3 shall be applied to the engaging end for series 2 and in either direction for series 1 of 20 percent of the contacts in wired or unwired unmated connectors. The axial rate of application shall be approximately one pound per second. Contact movement shall be measured after the contact is firmly seated on the retention member.

4.6.5 Insulation Resistance (see 3.5.4)

Unmated connectors shall be tested in accordance with method TP 021 of EIA 364.

4.6.6 Thermal Shock (see 3.5.5)

Wired, mated, connectors shall be tested in accordance with TP 032 of EIA 364. Test condition III (-65 °C/+125 °C) for class 1 connectors and test condition VI (-65 °C/+200 °C) for class 2 connectors shall be used. Upon completion of the last cycle, the connectors shall be returned to room ambient conditions for inspection.

4.6.7 Insulation Resistance at Elevated Temperature (see 3.5.6)

The insulation resistance of wired, assembled, mated connectors shall be measured in accordance with 4.6.5 except the connectors shall have been exposed to a temperature of +125 °C +3 °C -0 °C for class 1 connectors or +200 °C +3 °C -0 °C for class 2 connectors for a minimum of 30 minutes. After the test the resistance shall be measured while the connector is at the elevated temperature.

4.6.8 Dielectric-Withstanding Voltage (see 3.5.7)

The connectors shall be tested in accordance with method TP 020 of EIA 364. The connectors shall show no evidence of flashover when the applicable voltage at the simulated altitudes, are applied between all adjacent contacts and between shell and closest contacts. The voltage shall be applied at a rate not to exceed 500 volts per second until the applicable voltage of Table 4 is reached.

4.6.8.1 Dielectric-Withstanding Voltage - Group A Inspection

Unmated connectors shall be tested in accordance with 4.6.8, except that simulated contacts may be used and the period of application of voltage shall be 1 second minimum.

4.6.9 Mating and Unmating Force (see 3.5.8)

The connectors shall be mated and unmated three times. During the third cycle, the force to mate and unmate the connector shall be measured.

4.6.10 Humidity (Type I, Type III and Type IV) (see 3.5.9)

The mated connectors shall be tested in accordance with method TP 031, procedure IV of EIA 364 except that steps 7a and 7b are not required. During the entire final cycle, a 200 dc voltage potential shall be applied between the 3 closest pairs of contacts and between the shell and the 3 contacts closest to the shell. After the recovery period specified in EIA 364, the dielectric withstanding voltage at sea level and insulation resistance shall be tested in accordance with 4.6.8 and 4.6.5, respectively.

4.6.11 Vibration (see 3.5.10)

The mated connectors shall be vibrated in accordance with method TP 028, test condition IV of EIA 364. All contacts shall be series wired and connected to a suitable testing circuit with 0.1 ampere flowing through the contacts.

4.6.12 Shock (specified pulse) (see 3.5.11)

The mated connectors shall be subjected to a shock test in accordance with method TP 027 of EIA 364. Test condition letter will be A. All contacts shall be series wired and connected to a suitable testing circuit with 0.1 ampere flowing through the contacts. The shock test shall be repeated 3 times in both directions of the referenced 90 axis planes (a total of 18 drops).

4.6.13 Durability (see 3.5.12)

The wired, assembled plugs and receptacles shall be subjected to 500 cycles of mating and unmating at a rate not to exceed 100 cycles per hour. The plug and receptacle shall be completely separated during each cycle. Connectors may be mated and unmated by machine.

4.6.14 Salt Spray (corrosion) (see 3.5.13)

The mated plugs and receptacles shall be subjected to a salt spray test in accordance with method TP 026, test condition B, of EIA 364. Salt concentration shall be 5 percent.

4.6.15 Temperature Life (see 3.5.14)

The wired, assembled, and mated connectors shall be placed in a circulating air oven. The temperature limits and the time duration shall be as specified in 3.5.14. The sensing device used to monitor the temperature shall be placed on the shell of the connector.

4.6.16 Fluid Immersion (see 3.5.15)

Unmated counterpart connectors shall be immersed fully in the fluids specified in a. and b. for the required periods. At least one pair of mating counterpart connectors shall be immersed in each fluid. After removal from the fluid, each pair of connectors shall remain for 1 hour in free air at room conditions in a position to allow the fluid to drain from the insert faces. Subsequent testing shall be performed on connectors mated with the same mating connectors used in previous testing.

a. Hydraulic fluid conforming to MIL-PRF-5606 - 20 hours.

b. Lubricating oil conforming to MIL-PRF-23699 - 20 hours.

4.6.17 Altitude - Moisture Injection (Type II only) (see 3.5.16)

Wired and mated connectors shall be subjected to 50 000 feet equivalent altitude. After 5 minutes stabilization at this altitude, the pressure shall be increased to sea level at the rate of 10 000 feet per minute. This procedure constitutes one cycle. The air admitted into the test chamber shall be at least 99 percent humidity. This test shall consist of five cycles. The dielectric withstanding voltage test shall be performed as specified in 4.6.8 on the mated connector at the end of the first and fifth cycle. An acceptable method for humidifying the admitted air is as follows:

a. Partially fill a laboratory flask with water. Close with a two hole stopper fitted with an air intake tube extending well below the water level and an outlet tube which is located in the top of the flask well above the water level.

b. Place the flask in an oven, having a volume which exceeds the volume of the altitude chamber, and at a temperature of 190 °F ± 5 °F (88 °C ± 3 °C). Connect a tube between the outlet side of the flask and the altitude chamber providing a shut-off valve to control the flow as desired. CAUTION: Appropriate traps should be located between the altitude chamber and any instrumentation and the vacuum pump to prevent free moisture and/or water vapor from entering the low pressure monitoring or pumping system.

4.6.18 Insert Retention (see 3.5.17)

Unless otherwise specified (see 3.1), connector inserts shall withstand a uniformly distributed axial load of 120 pounds in either direction without being dislocated from their normal position in the connector shell. The load shall be increased gradually at a rate not to exceed 20 pounds per second until the specified load is reached.

5. PACKAGING

5.1 Packaging Requirements

The requirements for packaging shall be in accordance with MIL-DTL-55330.

6. NOTES:

6.1 Ordering Data

Procurement documents should specify the following:

a. Title, number, and date of this specification.

b. Title, number, and date of the applicable specification sheet and the complete part number.

c. For indirect shipments, these connectors may be furnished without contacts or grommet sealing plus (see 3.4.1, 3.4.1.1, and 3.4.2).

6.2 Definitions

The following definitions shall apply:

a. PLUG CONNECTOR - An electrical fitting with male shell with contacts, constructed to be electrically connected to a cable, conduit, coaxial line, cord, or wire to join with another electrical connector(s), and is designed to be mounted on a bulkhead, chassis or panel.

b. RECEPTACLE CONNECTOR - An electrical fitting with female shell with contacts, constructed to be electrically connected to a cable, coaxial line, cord, or wire to join with another electrical connector(s), and is designed to be mounted on a bulkhead, wall, chassis, or panel.

c. CRITICAL DEFECTS – A critical defect is a defect that judgment and experience indicate would result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the product, or a defect that judgment and experience indicate is likely to prevent performance of the actual function of a major end item such as a ship, aircraft, tank, missile, or space vehicle.

d. DEFECT – A defect is any nonconformance of the unit or product with specified requirements.

e. MAJOR DEFECT – A major defect is a defect, other than critical, that is likely to result in failure, or to reduce the usability of the unit of product for its intended purpose.

f. MINOR DEFECT – A minor defect is a defect that is not likely to reduce materially the usability of the unit of product for its intended purpose, or is a departure from established standards having little bearing on the effective use or operation of the unit.

6.3 Polarizing Keys

Connectors covered by this specification are designed to be used with polarizing keys which polarize and insure contact alignment. Use of these connectors without polarizing keys is not recommended.

6.4 Qualification

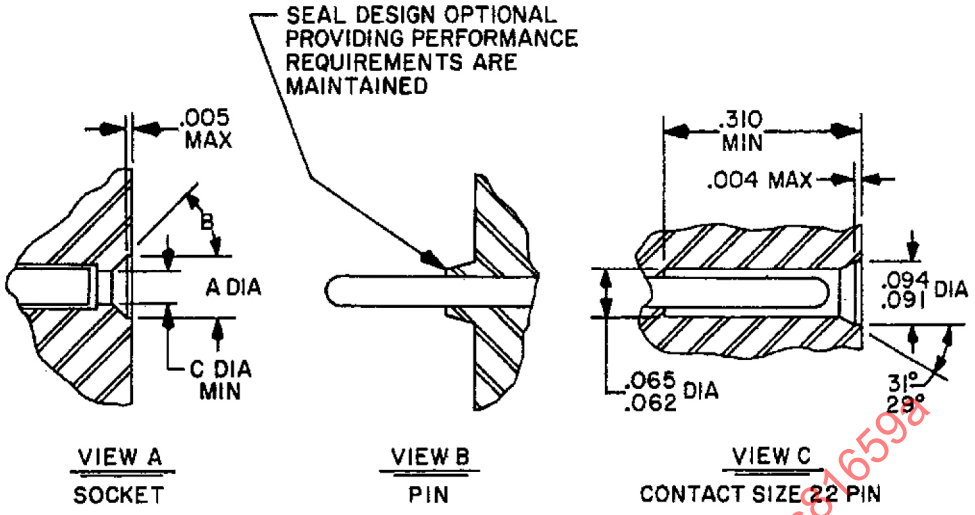
With respect to products requiring qualification by the government, awards will be made only for products, which are at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List (QPL), whether or not such products have actually been so listed by that date. The attention of the contractors (purchasers) is called to these requirements, and manufacturers (suppliers) are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts for the products delineated in this specification. Qualification is required for U.S. Government procurement. The QPL Evaluating Activity (qualifying activity), for U.S. Department of Defense procurement purposes, is the Naval Air Systems Command (Code 4.4.5.3), 22229 Elmer Road, Building 2360, Room 107, Patuxent River, MD 20670. Application for qualification tests shall be made in accordance with SD-6, Provisions Governing Qualification (see 2.2).

6.5 Noncompliance

If a sample fails to pass group B or C inspections, the manufacturer shall notify the qualifying activity and the cognizant inspection activity of such failure and take corrective action on the materials or processes, or both, as warranted, and on all units of product which can be corrected and which were manufactured under essentially the same conditions with essentially the same materials, processes, etc., and which are considered subject to the same failure. Acceptance and shipment of the product shall be discontinued until corrective action, acceptable to the qualifying activity has been taken. After the corrective action has been taken, groups B and C inspections shall be repeated on additional sample units (all inspection, or the inspection which the original sample failed, at the option of the qualifying activity). Group A inspection may be reinstituted; however, final acceptance and shipment shall be withheld until the groups B and C inspections have shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure shall be furnished to the cognizant inspection activity and the qualifying activity.

6.6 Specification notes

A change bar (l) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. Change bars and (R) are not used in original publications, nor in documents that contain editorial changes only.



CONTACT SIZE	A	B	C – MIN.
20	.110/.090	50°/40°	.050
16	.135/.125		.068
12	.180/.170		.099

Note: Size 22 socket contacts are exposed similar to view B; size 22 pin contacts are recessed as shown in view C.

FIGURE 3 - CONNECTOR INTERFACE CONTROL DIMENSIONS

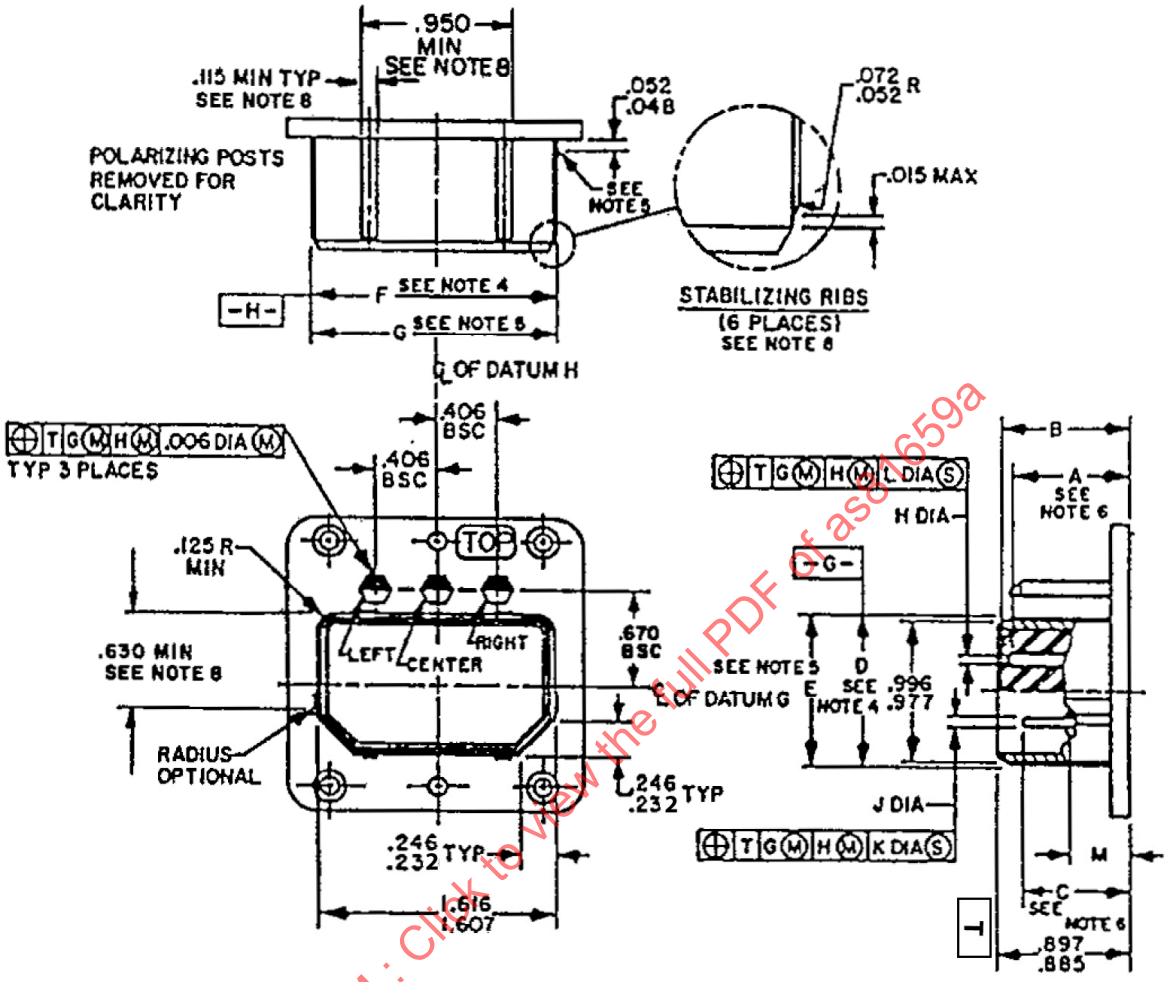


FIGURE 4 - SINGLE PLUG CONNECTOR INTERMATEABILITY CONTROL DIMENSIONS (SHELL DESIGNATOR A)

CONNECTOR	A				B				C			
	22	20	16	12	22	20	16	12	22	20	16	12
SERIES 1	.882 (22.40) .802 (20.37)	.882 (22.40) .802 (20.37)	.882 (22.40) .802 (20.37)	N/A	.942 (23.93) .902 (22.91)	.942 (23.93) .902 (22.91)	.942 (23.93) .902 (22.91)	N/A	.836 (21.23) .777 (19.74)	.703 (17.86) .642 (16.31)	.881 (22.38) .820 (20.83)	N/A
SERIES 2	.736 (18.69) .688 (17.48)	.827 (21.00) .769 (19.53)	.782 (19.86) .735 (18.67)	.793 (20.14) .746 (18.95)	.797 (20.24) .769 (19.53)	.893 (22.68) .865 (21.97)	.893 (22.68) .865 (21.97)	.893 (22.68) .865 (21.97)	.737 (18.72) .688 (17.48)	.700 (17.78) .585 (14.86)	.824 (20.93) .746 (18.95)	.824 (20.93) .746 (18.95)

CONNECTOR	D MIN.	E MAX.	F MIN.	G MAX.	H DIAMETER (M)				J DIAMETER (M)			
					22	20	16	12	22	20	16	12
SERIES 1	.992 (25.20)	.999 (25.37)	1.612 (40.94)	1.619 (41.12)	N/A	.068 (1.73)	.122 (3.10)	N/A	N/A	.041 (1.04)	.0635 (1.61)	.095 (2.41)
SERIES 2					.063 (1.60)	.050 (1.27)	.068 (1.73)	.099 (2.51)	.061 (1.55)			
ALL TYPE IV	N/A	N/A	N/A	N/A								

CONNECTOR	K DIAMETER (S)				L DIAMETER (S)				M			
	22	20	16	12	22	20	16	12	22	20	16	12
SERIES 1	N/A	.032 (.81)	.032 (.81)	N/A	N/A	.032 (.81)	.032 (.81)	N/A	N/A	N/A	N/A	N/A
SERIES 2	.0095 (.24)	.040 (1.02)	.045 (1.14)	.061 (1.55)	.0075 (.19)	.010 (.25)	.015 (.38)	.020 (.51)				
ALL TYPE IV									.429 (10.90) .377 (9.58)	.343 (8.71) .291 (7.39)	.343 (8.71) .291 (7.39)	.343 (8.71) .291 (7.39)

Notes:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only and are based on 1 inch = 25.4mm.
3. Metric equivalents are in parentheses.
4. Dimension D and F are taken at .654 from flange.
5. Dimension E and G are taken at .052 from flange.
6. For contact size 22, dimension A represents pin contacts and dimension C represents socket contacts.
7. The K diameter (S) includes the positional tolerance of the contact cavity plus the maximum amount of contact diametral splay.
8. It is not necessary for the shell to have stabilizing ribs provided D and F dimensions are maintained.

FIGURE 4 - SINGLE PLUG CONNECTOR INTERMATEABILITY CONTROL DIMENSIONS (CONTINUED)
(SHELL DESIGNATOR A)

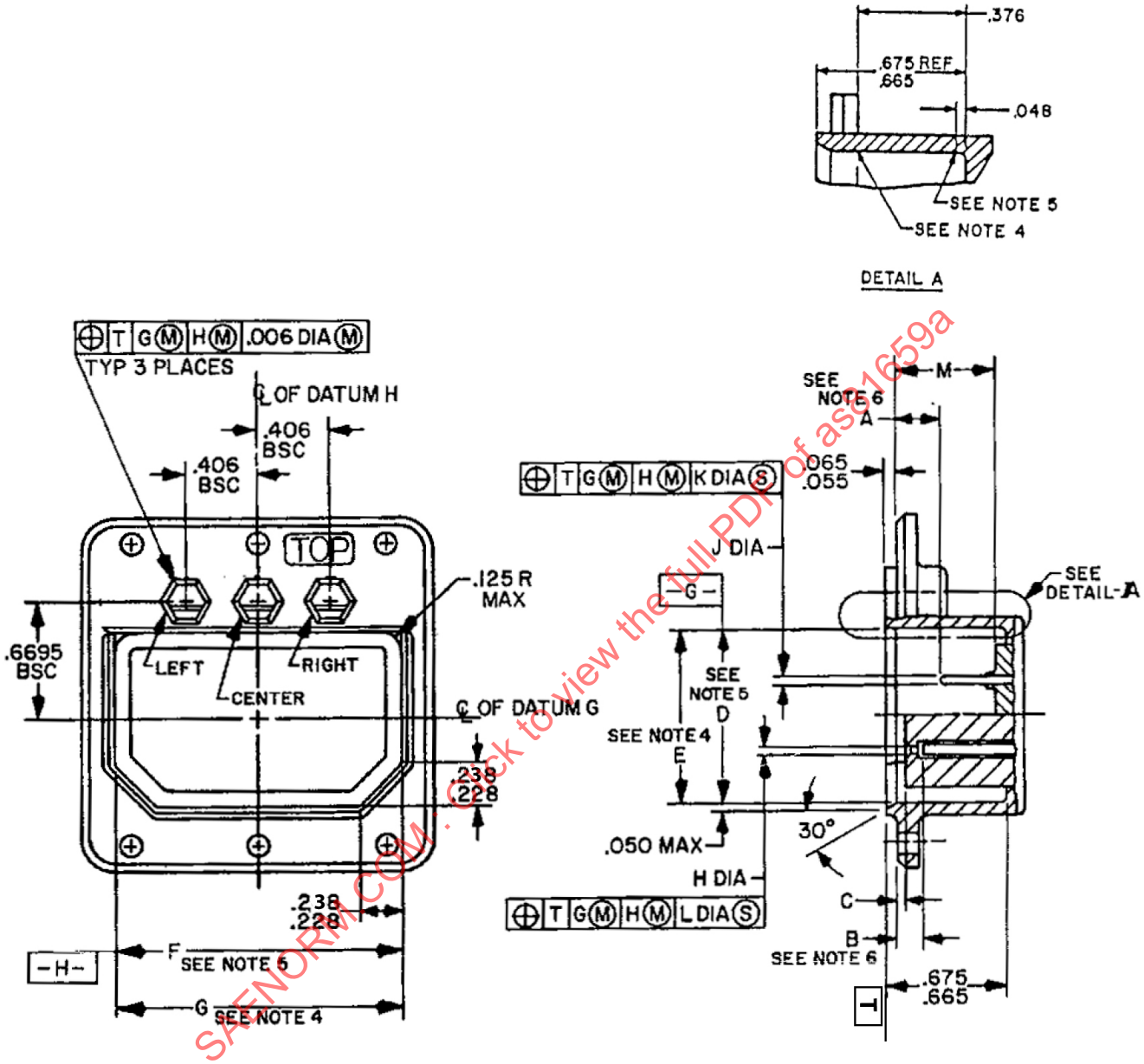


FIGURE 5 - SINGLE RECEPTACLE CONNECTOR INTERMATEABILITY CONTROL DIMENSIONS (SHELL DESIGNATOR A)

CONNECTOR	A				B				C			
	22	20	16	12	22	20	16	12	22	20	16	12
SERIES 1	.222 (5.64) .155 (3.94)	.355 (9.02) .288 (7.32)	.177 (4.50) .110 (2.79)	N/A	.193 (4.90) .113 (2.87)	.193 (4.90) .113 (2.87)	.193 (4.90) .113 (2.87)	N/A	.093 (2.36) .053 (1.35)	.093 (2.36) .053 (1.35)	.093 (2.36) .053 (1.35)	N/A
SERIES 2	.250 (6.35) .205 (5.21)	.346 (8.79) .241 (6.12)	.165 (4.19) .104 (2.64)	.165 (4.19) .104 (2.64)	.238 (6.04) .192 (4.88)	.170 (4.32) .115 (2.92)	.205 (5.21) .146 (3.71)	.205 (5.21) .146 (3.71)	.175 (4.44) .137 (3.48)	.081 (2.06) .048 (1.22)	.081 (2.06) .048 (1.22)	.081 (2.06) .048 (1.22)

CONNECTOR	D MIN.	E MAX.	F MIN.	G MAX.	H DIAMETER (M)				J DIAMETER (M)			
					22	20	16	12	22	20	16	12
SERIES 1	1.000 (25.40)	1.007 (25.58)	1.620 (41.15)	1.632 (41.45)	N/A	.068 (1.73)	.122 (3.10)	N/A	N/A	.041 (1.04)	.0635 (1.61)	.095 (2.41)
SERIES 2					.063 (1.60)	.050 (1.27)	.068 (1.73)	.099 (2.51)	.061 (1.55)			
ALL TYPE IV	N/A	N/A	N/A	N/A								

CONNECTOR	K DIAMETER (S)				L DIAMETER (S)				M			
	22	20	16	12	22	20	16	12	22	20	16	12
SERIES 1	N/A	.032 (.81)	.032 (.81)	N/A	N/A	.032 (.81)	.032 (.81)	N/A	N/A	N/A	N/A	N/A
SERIES 2	.0095 (.24)	.040 (1.02)	.045 (1.14)	.061 (1.55)	.0075 (.19)	.010 (.25)	.015 (.38)	.020 (.51)				
ALL TYPE IV									.561 (14.25) .511 (12.98)	.647 (16.43) .597 (15.16)	.647 (16.43) .597 (15.16)	.647 (16.43) .597 (15.16)

Notes:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only and are based on 1 inch = 25.4mm.
3. Metric equivalents are in parentheses.
4. Dimension E and G are taken at .376 from bottom of cavity.
5. Dimension D and F are taken at .048 from bottom of cavity.
6. For contact size 22, dimension A represents pin contacts and dimension B represents socket contacts.
7. The K diameter (S) includes the positional tolerance of the contact cavity plus the maximum amount of contact diametral splay.

FIGURE 5 - SINGLE RECEPTACLE CONNECTOR INTERMATEABILITY CONTROL DIMENSIONS (CONTINUED)
(SHELL DESIGNATOR A)

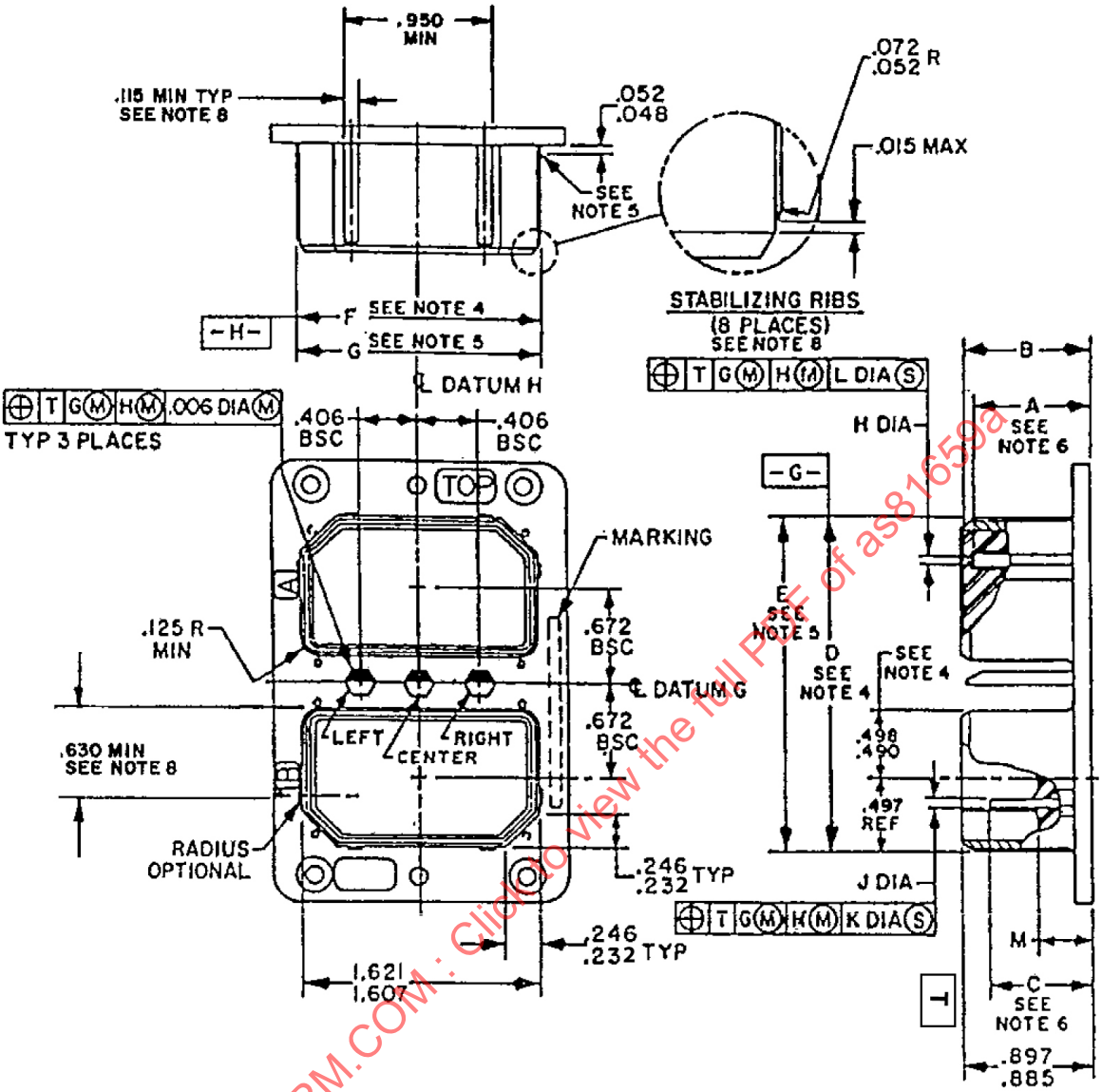


FIGURE 6 - DUAL PLUG CONNECTOR INTERMATEABILITY CONTROL DIMENSIONS (SHELL DESIGNATOR A)

CONNECTOR	A				B				C			
	22	20	16	12	22	20	16	12	22	20	16	12
SERIES 1	.882 (22.40) .802 (20.37)	.882 (22.40) .802 (20.37)	.882 (22.40) .802 (20.37)	N/A	.942 (23.93) .902 (22.91)	.942 (23.93) .902 (22.91)	.942 (23.93) .902 (22.91)	N/A	.836 (21.23) .777 (19.74)	.703 (17.86) .642 (16.31)	.881 (22.38) .820 (20.83)	N/A
SERIES 2	.736 (18.69) .688 (17.48)	.827 (21.00) .769 (19.53)	.782 (19.86) .735 (18.67)	.793 (20.14) .746 (18.95)	.797 (20.24) .769 (19.53)	.893 (22.68) .865 (21.97)	.893 (22.68) .865 (21.97)	.893 (22.68) .865 (21.97)	.737 (18.72) .688 (17.48)	.700 (17.78) .585 (14.86)	.824 (20.93) .746 (18.95)	.824 (20.93) .746 (18.95)

CONNECTOR	D MIN.	E MAX.	F MIN.	G MAX.	H DIAMETER (M)				J DIAMETER (M)			
					22	20	16	12	22	20	16	12
SERIES 1	2.335 (59.31)	2.342 (59.49)	1.617 (41.07)	1.624 (41.25)	N/A	.068 (1.73)	.122 (3.10)	N/A	N/A	.041 (1.04)	.0635 (1.61)	.095 (2.41)
SERIES 2					.063 (1.60)	.050 (1.27)	.068 (1.73)	.099 (2.51)	.061 (1.55)			
ALL TYPE IV	N/A	N/A	N/A	N/A								

CONNECTOR	K DIAMETER (S)				L DIAMETER (S)				M			
	22	20	16	12	22	20	16	12	22	20	16	12
SERIES 1	N/A	.032 (.81)	.032 (.81)	N/A	N/A	.032 (.81)	.032 (.81)	N/A	N/A	N/A	N/A	N/A
SERIES 2	.0095 (.24)	.040 (1.02)	.045 (1.14)	.061 (1.55)	.0075 (.19)	.010 (.25)	.015 (.38)	.020 (.51)				
ALL TYPE IV									.429 (10.90) .377 (9.58)	.343 (8.71) .291 (7.39)	.343 (8.71) .291 (7.39)	.343 (8.71) .291 (7.39)

Notes:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only and are based on 1 inch = 25.4mm.
3. Metric equivalents are in parentheses.
4. Dimension D, F, .497 (Ref) and .498/.490 are taken at .654 from flange.
5. Dimension E and G are taken at .052 from flange.
6. For contact size 22, dimension A represents pin contacts and dimension C represents socket contacts.
7. The K diameter (S) includes the positional tolerance of the contact cavity plus the maximum amount of contact diametral splay.
8. It is not necessary for the shell to have stabilizing ribs provided D and F dimensions are maintained.

FIGURE 6 - DUAL PLUG CONNECTOR INTERMATEABILITY CONTROL DIMENSIONS (CONTINUED)
(SHELL DESIGNATOR A)

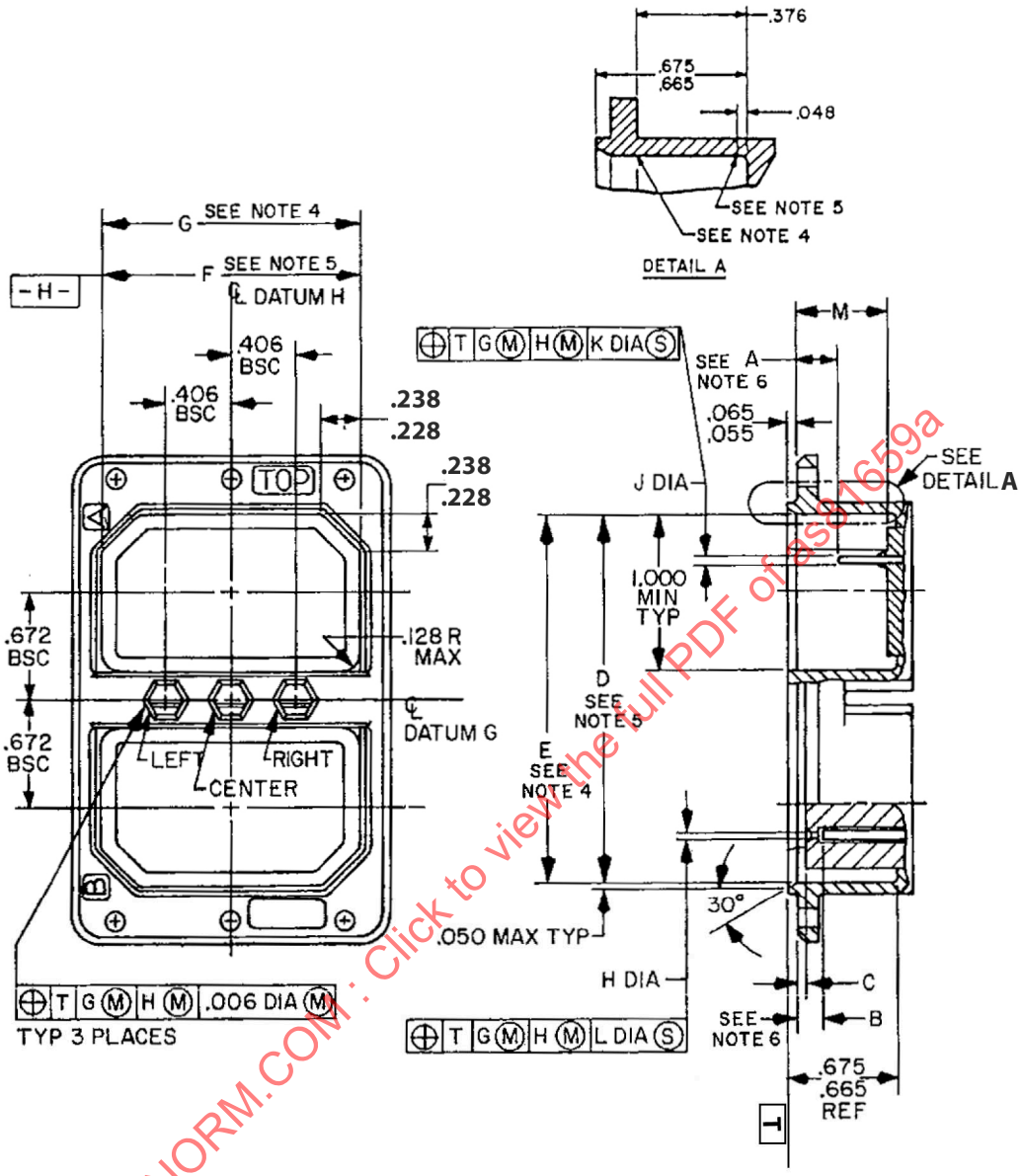


FIGURE 7 - DUAL RECEPTACLE CONNECTOR INTERMATEABILITY CONTROL DIMENSIONS (SHELL DESIGNATOR A)

CONNECTOR	A				B				C			
	22	20	16	12	22	20	16	12	22	20	16	12
SERIES 1	.222 (5.64) .155 (3.94)	.355 (9.02) .288 (7.32)	.177 (4.50) .110 (2.79)	N/A	.193 (4.90) .113 (2.87)	.193 (4.90) .113 (2.87)	.193 (4.90) .113 (2.87)	N/A	.093 (2.36) .053 (1.35)	.093 (2.36) .053 (1.35)	.093 (2.36) .053 (1.35)	N/A
SERIES 2	.250 (6.35) .205 (5.21)	.346 (8.79) .241 (6.12)	.165 (4.19) .104 (2.64)	.165 (4.19) .104 (2.64)	.238 (6.04) .192 (4.88)	.170 (4.32) .115 (2.92)	.205 (5.21) .146 (3.71)	.205 (5.21) .146 (3.71)	.175 (4.44) .137 (3.48)	.081 (2.06) .048 (1.22)	.081 (2.06) .048 (1.22)	.081 (2.06) .048 (1.22)

CONNECTOR	D MIN.	E MAX.	F MIN.	G MAX.	H DIAMETER (M)				J DIAMETER (M)			
					22	20	16	12	22	20	16	12
SERIES 1	2.343 (59.51)	2.350 (59.60)	1.625 (41.28)	1.637 (41.58)	N/A	.063 (1.60)	.122 (3.10)	N/A	N/A	.041 (1.04)	.0635 (1.61)	.095 (2.41)
SERIES 2					.063 (1.60)	.050 (1.27)	.068 (1.73)	.099 (2.51)	.061 (1.55)			
ALL TYPE IV	N/A	N/A	N/A	N/A								

CONNECTOR	K DIAMETER (S)				L DIAMETER (S)				M			
	22	20	16	12	22	20	16	12	22	20	16	12
SERIES 1	N/A	.032 (.81)	.032 (.81)	N/A	N/A	.032 (.81)	.032 (.81)	N/A	N/A	N/A	N/A	N/A
SERIES 2	.0095 (.24)	.040 (1.02)	.045 (1.14)	.061 (1.55)	.0075 (.19)	.010 (.25)	.015 (.38)	.020 (.51)				
ALL TYPE IV									.561 (14.25) .511 (12.98)	.647 (16.43) .597 (15.16)	.647 (16.43) .597 (15.16)	.647 (16.43) .597 (15.16)

Notes:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only and are based on 1 inch = 25.4mm.
3. Metric equivalents are in parentheses.
4. Dimension E and G are taken at .376 from bottom of cavity.
5. Dimension D and F are taken at .048 from bottom of cavity.
6. For contact size 22, dimension A represents socket contacts and dimension B represents pin contacts.
7. The K diameter (S) includes the positional tolerance of the contact cavity plus the maximum amount of contact diametral splay.

FIGURE 7 - DUAL RECEPTACLE CONNECTOR INTERMATEABILITY CONTROL DIMENSIONS (CONTINUED)
(SHELL DESIGNATOR A)

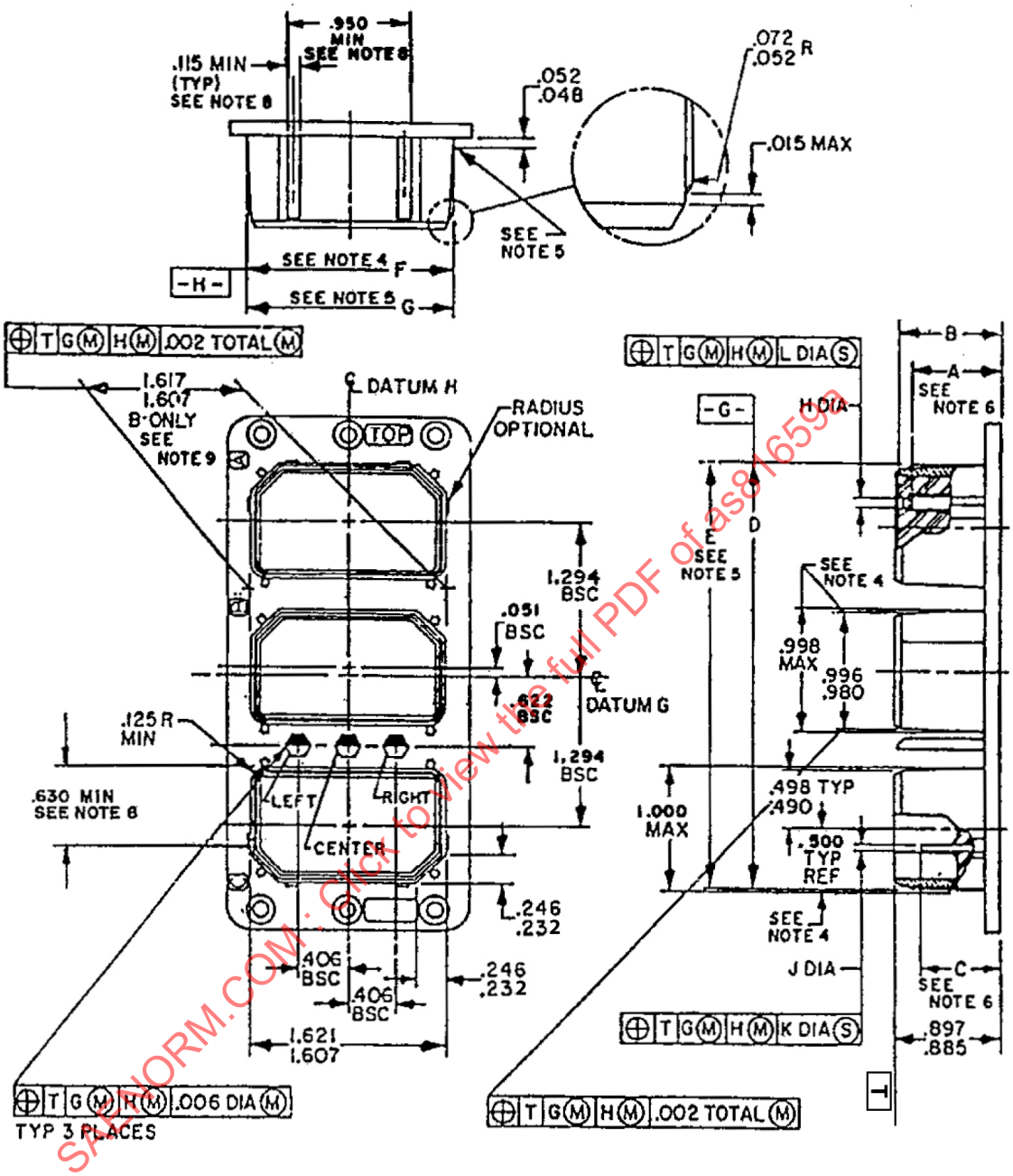


FIGURE 8 - TRIPLE PLUG CONNECTOR INTERMATEABILITY CONTROL DIMENSIONS (SHELL DESIGNATOR A)

CONNECTOR	A				B				C			
	22	20	16	12	22	20	16	12	22	20	16	12
SERIES 1	.882 (22.40) .802 (20.37)	.882 (22.40) .802 (20.37)	.882 (22.40) .802 (20.37)	N/A	.942 (23.93) .902 (22.91)	.942 (23.93) .902 (22.91)	.942 (23.93) .902 (22.91)	N/A	.836 (21.23) .777 (19.74)	.703 (17.86) .642 (16.31)	.881 (22.38) .820 (20.83)	N/A
SERIES 2	.736 (18.69) .688 (17.48)	.827 (21.00) .769 (19.53)	.782 (19.86) .735 (18.67)	.793 (20.14) .746 (18.95)	.797 (20.24) .769 (19.53)	.893 (22.68) .865 (21.97)	.893 (22.68) .865 (21.97)	.893 (22.68) .865 (21.97)	.737 (18.72) .688 (17.48)	.700 (17.78) .585 (14.86)	.824 (20.93) .746 (18.95)	.824 (20.93) .746 (18.95)

CONNECTOR	D MIN.	E MAX.	F MIN.	G MAX.	H DIAMETER (M)				J DIAMETER (M)			
					22	20	16	12	22	20	16	12
SERIES 1	3.583 (91.01)	3.592 (91.24)	1.617 (41.07)	1.624 (41.25)	N/A	.068 (1.73)	.122 (3.10)	N/A	N/A	.041 (1.04)	.0635 (1.61)	.095 (2.41)
SERIES 2					.063 (1.60)	.050 (1.27)	.068 (1.73)	.099 (2.51)	.061 (1.55)			

CONNECTOR	K DIAMETER (S)				L DIAMETER (S)			
	22	20	16	12	22	20	16	12
SERIES 1	N/A	.032 (.81)	.032 (.81)	N/A	N/A	.032 (.81)	.032 (.81)	N/A
SERIES 2	.0095 (.24)	.040 (1.02)	.045 (1.14)	.061 (1.55)	.0075 (.19)	.010 (.25)	.015 (.38)	.020 (.51)

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only and are based on 1 inch = 25.4mm.
3. Metric equivalents are in parentheses.
4. Dimension D, F, .500 (Typ-Ref) and .996/.980 are taken at .654 from flange.
5. Dimension E and G are taken at .052 from flange.
6. For contact size 22, dimension A represents pin contacts and dimension C represents socket contacts.
7. The K diameter (S) includes the positional tolerance of the contact cavity plus the maximum amount of contact diametral splay.
8. It is not necessary for the shell to have stabilizing ribs provided D and F dimensions are maintained.
9. Dimension 1.617/1.607 for "B" insert location is taken at .102/.098 from top edge. It shall be 1.617 maximum at .052/.048 from the flange.

FIGURE 8 - TRIPLE PLUG CONNECTOR INTERMATEABILITY CONTROL DIMENSIONS (CONTINUED)
(SHELL DESIGNATOR A)

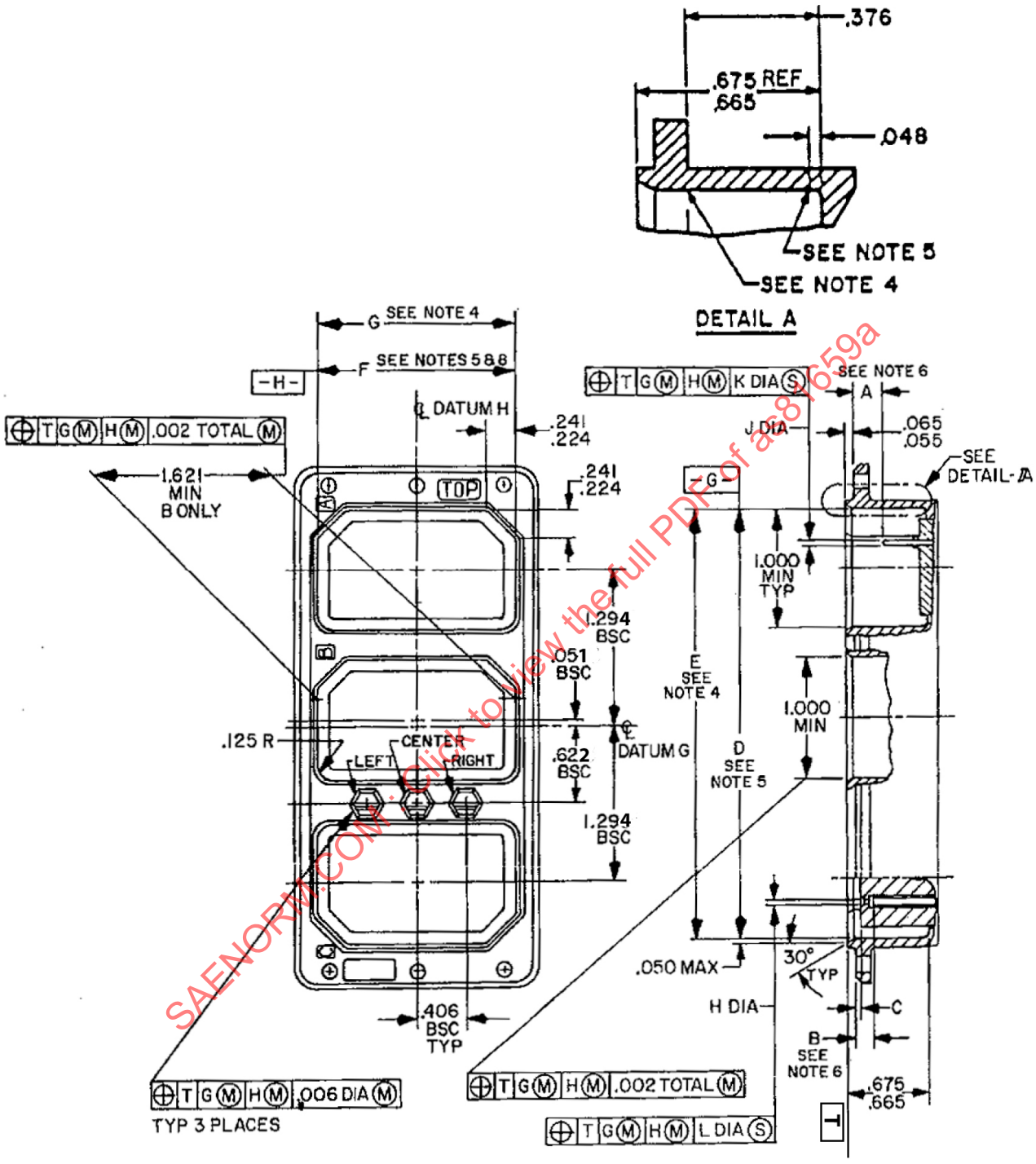


FIGURE 9 - TRIPLE RECEPTACLE CONNECTOR INTERMATEABILITY CONTROL DIMENSIONS (SHELL DESIGNATOR A)

CONNECTOR	A				B				C			
	22	20	16	12	22	20	16	12	22	20	16	12
SERIES 1	.222 (5.64) .155 (3.94)	.355 (9.02) .288 (7.32)	.177 (4.50) .110 (2.79)	N/A	.193 (4.90) .113 (2.87)	.193 (4.90) .113 (2.87)	.193 (4.90) .113 (2.87)	N/A	.093 (2.36) .053 (1.35)	.093 (2.36) .053 (1.35)	.093 (2.36) .053 (1.35)	N/A
SERIES 2	.250 (6.35) .205 (5.21)	.346 (8.79) .241 (6.12)	.165 (4.19) .104 (2.64)	.165 (4.19) .104 (2.64)	.238 (6.04) .192 (4.88)	.170 (4.32) .115 (2.92)	.205 (5.21) .146 (3.71)	.205 (5.21) .146 (3.71)	.175 (4.44) .137 (3.48)	.081 (2.06) .048 (1.22)	.081 (2.06) .048 (1.22)	.081 (2.06) .048 (1.22)

CONNECTOR	D MIN	E MAX.	F MIN.	G MAX.	H DIAMETER (M)				J DIAMETER (M)			
					22	20	16	12	22	20	16	12
SERIES 1	3.589 (91.16)	3.598 (91.39)	1.621 (41.17)	1.637 (41.58)	N/A	.068 (1.73)	.122 (3.10)	N/A	N/A	.041 (1.04)	.0635 (1.61)	.095 (2.41)
SERIES 2					.063 (1.60)	.050 (1.27)	.068 (1.73)	.099 (2.51)	.061 (1.55)			

CONNECTOR	K DIAMETER (S)				L DIAMETER (S)			
	22	20	16	12	22	20	16	12
SERIES 1	N/A	.032 (.81)	.032 (.81)	N/A	N/A	.032 (.81)	.032 (.81)	N/A
SERIES 2	.0095 (.24)	.040 (1.02)	.045 (1.14)	.061 (1.55)	.0075 (.19)	.010 (.25)	.015 (.38)	.020 (.51)

Notes:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only and are based on 1 inch = 25.4mm.
3. Metric equivalents are in parentheses.
4. Dimension E and G are taken at .376 from bottom of cavity.
5. Dimension D and F are taken at .048 from bottom of cavity.
6. For contact size 22, dimension A represents socket contacts and dimension B represents pin contacts.
7. The K diameter (S) includes the positional tolerance of the contact cavity plus the maximum amount of contact diametral splay.
8. Dimension F applies to cavities A and C only.

FIGURE 9 - TRIPLE RECEPTACLE CONNECTOR INTERMATEABILITY CONTROL DIMENSIONS (CONTINUED)
(SHELL DESIGNATOR A)

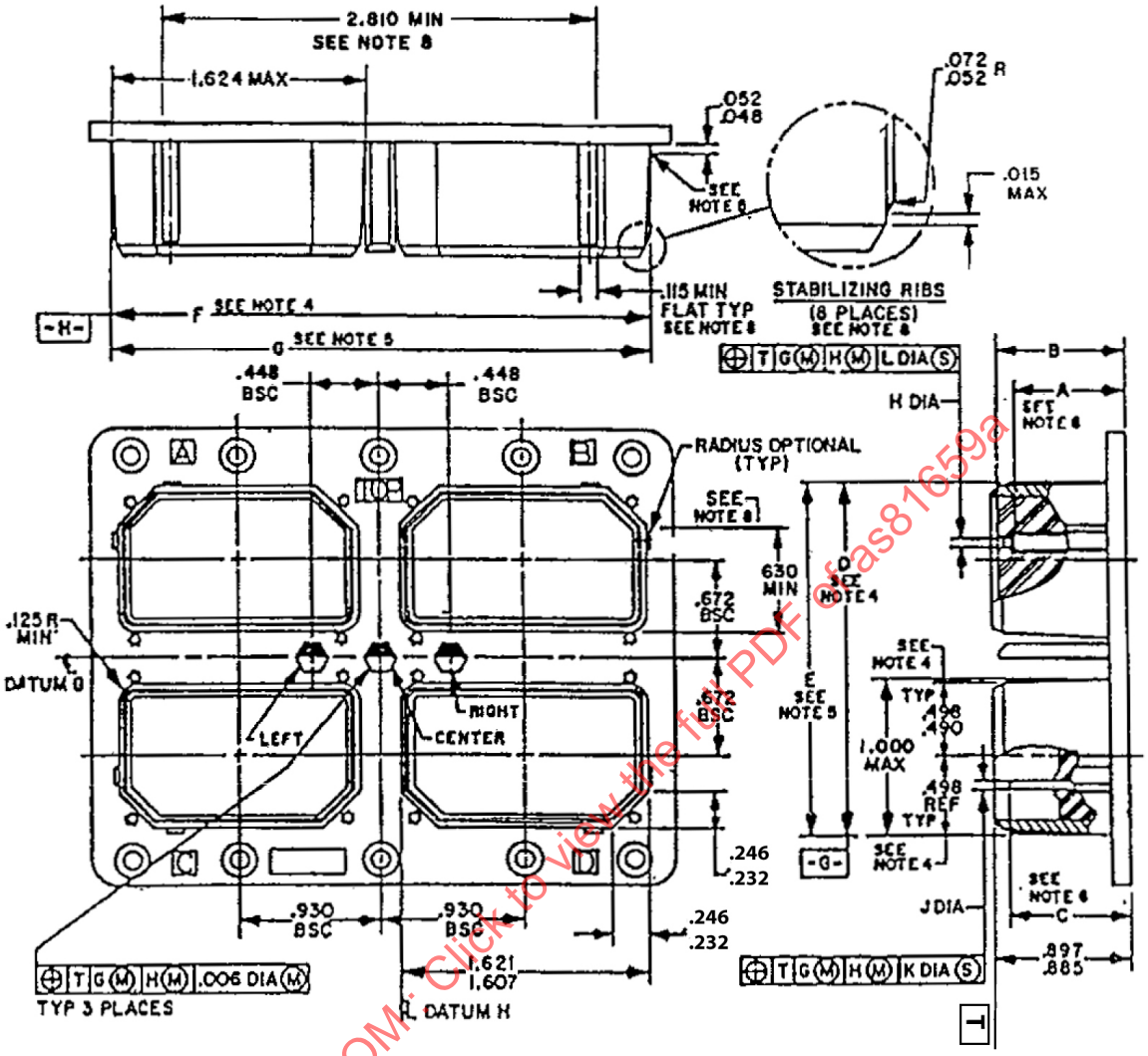


FIGURE 10 - QUADRUPLE PLUG CONNECTOR INTERMATEABILITY CONTROL DIMENSIONS (SHELL DESIGNATOR A)

CONNECTOR	A				B				C			
	22	20	16	12	22	20	16	12	22	20	16	12
SERIES 1	.882 (22.40) .802 (20.37)	.882 (22.40) .802 (20.37)	.882 (22.40) .802 (20.37)	N/A	.942 (23.93) .902 (22.91)	.942 (23.93) .902 (22.91)	.942 (23.93) .902 (22.91)	N/A	.836 (21.23) .777 (19.74)	.703 (17.86) .642 (16.31)	.881 (22.38) .820 (20.83)	N/A
SERIES 2	.736 (18.69) .688 (17.48)	.827 (21.00) .769 (19.53)	.782 (19.86) .735 (18.67)	.793 (20.14) .746 (18.95)	.797 (20.24) .769 (19.53)	.893 (22.68) .865 (21.97)	.893 (22.68) .865 (21.97)	.893 (22.68) .865 (21.97)	.737 (18.72) .688 (17.48)	.700 (17.78) .585 (14.86)	.824 (20.93) .746 (18.95)	.824 (20.93) .746 (18.95)

CONNECTOR	D MIN.	E MAX.	F MIN.	G MAX.	H DIAMETER (M)				J DIAMETER (M)			
					22	20	16	12	22	20	16	12
SERIES 1	2.339 (59.41)	2.348 (59.64)	3.486 (88.54)	3.495 (88.77)	N/A	.068 (1.73)	.122 (3.10)	N/A	N/A	.041 (1.04)	.0635 (1.61)	.095 (2.41)
SERIES 2					.063 (1.60)	.050 (1.27)	.068 (1.73)	.099 (2.51)	.061 (1.55)			

CONNECTOR	K DIAMETER (S)				L DIAMETER (S)			
	22	20	16	12	22	20	16	12
SERIES 1	N/A	.032 (.81)	.032 (.81)	N/A	N/A	.032 (.81)	.032 (.81)	N/A
SERIES 2	.0095 (.24)	.040 (1.02)	.045 (1.14)	.061 (1.55)	.0075 (.19)	.010 (.25)	.015 (.38)	.020 (.51)

Notes:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only and are based on 1 inch = 25.4mm.
3. Metric equivalents are in parentheses.
4. Dimension D, F, .498/.490 and .498 Ref. are taken at .654 from flange.
5. Dimension E and G are taken at .052 from flange.
6. For contact size 22, dimension A represents pin contacts and dimension C represents socket contacts.
7. The K diameter (S) includes the positional tolerance of the contact cavity plus the maximum amount of contact diametral splay.
8. It is not necessary for the shell to have stabilizing ribs provided D and F dimensions are maintained.

FIGURE 10 - QUADRUPLE PLUG CONNECTOR INTERMATEABILITY CONTROL DIMENSIONS (CONTINUED)
(SHELL DESIGNATOR A)

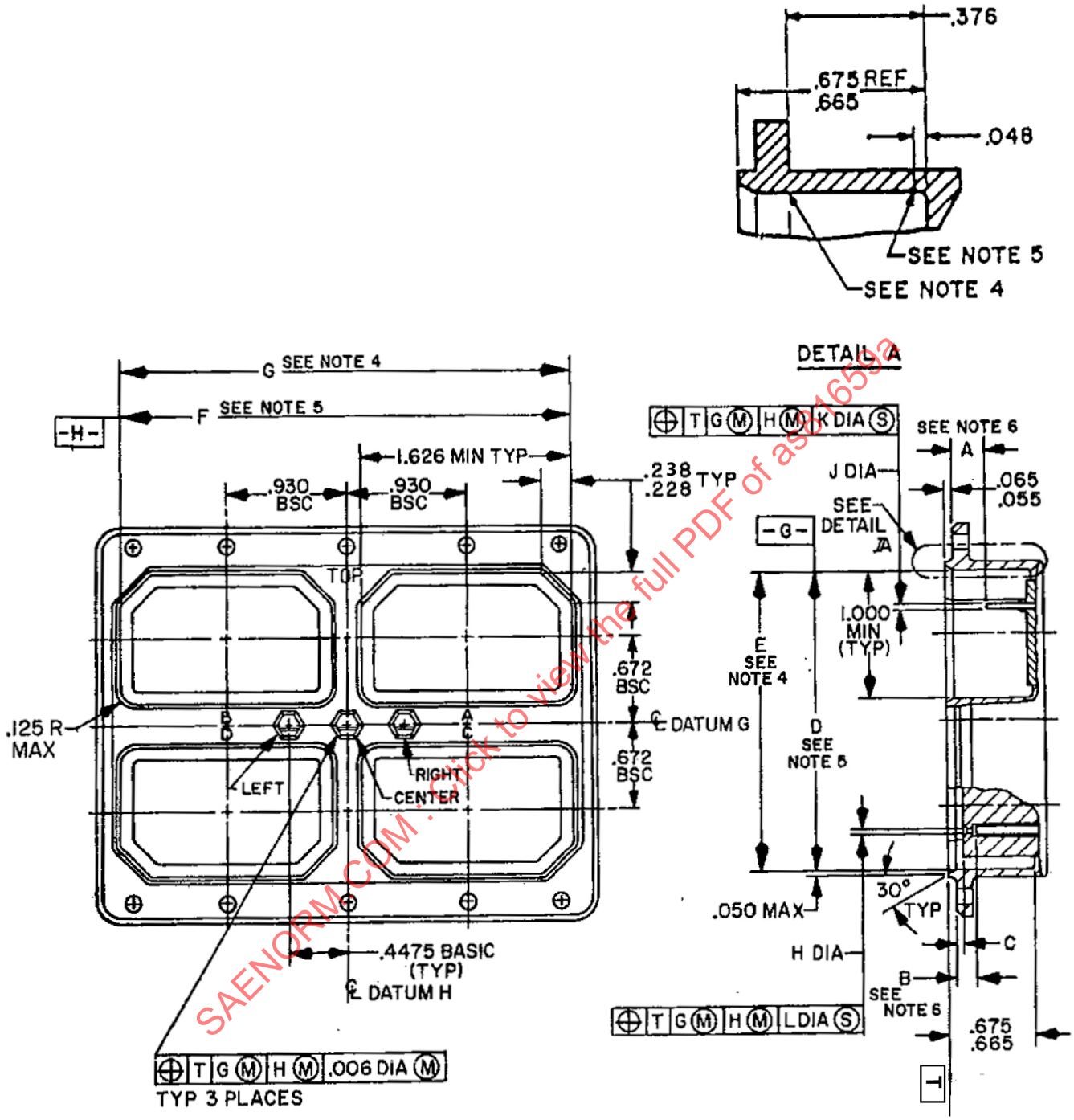


FIGURE 11 - QUADRUPLE RECEPTACLE CONNECTOR INTERMATEABILITY CONTROL DIMENSIONS (SHELL DESIGNATOR A)