

NATIONAL AEROSPACE STANDARD

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC., 1725 DE SALES STREET, N. W., WASHINGTON 6, D. C.

FED SUP CLASS
5935

1. SCOPE

1.1 This specification covers crimp-type, electric contacts rated for continuous operation at 200°C (392°F), for use with electrical connectors. ①

1.1.1 NAS numbers as shown on the applicable NAS drawings may be assigned to parts qualified to this specification.

1.2 CLASSIFICATION

The contacts shall be of the following styles and sizes:

1.2.1 STYLES

P - Pin contacts

S - Socket contacts

1.2.2 SIZES

Number 20

Number 16

Number 12

1.2.3 TYPE DESIGNATION

The type designations shall indicate the size and style, such as 20S, 16P.

1.3 WIRE SIZE ACCOMMODATIONS - See Table I.

TABLE I

Wire Size Accommodations

Contact Size	Wire Size
20	24
20	22
20	20
16	20
16	18
16	16
12	14
12	12

② INACTIVE FOR DESIGN AFTER JUNE 1980. NO SUPERSADDING STANDARD. FOR DESCRIPTION OF STATUS NOTES SEE NAS380.

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PROCUREMENT
SPECIFICATION

TITLE

CONTACTS, CRIMP TYPE,
FOR ELECTRICAL CONNECTORSCLASSIFICATION
SPECIFICATION

NAS 1600

Sheet 1 of 16

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2.0 APPLICABLE DOCUMENTS

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

SPECIFICATIONS

Federal

Federal Test Method Standard No. 151 - Metals; Test Methods

QQ-N-290 Nickel Plating (Electrodeposited)
 QQ-S-365 Silver Plating, Electrodeposited, General Requirements for

Military

MIL-W-16878/4 Wire, Electrical, Type E, 200°C and 260°C, 600 Volt
 MIL-W-16878/5 Wire, Electrical, Type EE, 200°C and 260°C, 1000 Volt
 MIL-I-17214 Indicator, Permeability; Low-Mu (Go-No Go)
 MIL-G-45204 Gold Plating (Electrodeposited)

NAS

NAS1599 Connector, General Purpose, Electrical

STANDARDS

Military

MIL-STD-10 Surface Roughness, Waviness, and Lay
 MIL-STD-105 Sampling Procedures and Tables for Inspection by Attributes
 MIL-STD-202 Test Methods for Electronic and Electrical Component Parts
 MIL-STD-831 Test Reports, Preparation of
 MS3191 Tool, Crimp Type, for Contacts of Electric Connectors
 MS3197 Gage, Pin, Electric Connector - Contact Engagement Test
 MS21985 Wire, Electric, Fluorocarbon Insulated, Type I, Extruded TFE, Silver Coated Copper
 MS21986 Wire, Electric, Fluorocarbon Insulated, Type I, Extruded TFE, Nickel Coated Copper
 MS33586 Metals, Definition of Dissimilar

3. REQUIREMENTS

3.1 QUALIFICATION

The pin and socket contacts furnished under this specification shall be a product which has been tested, and passed the qualification tests specified herein. If after qualification the product is modified in any way, the modified form shall be subjected to and shall pass the qualification tests. Pin and socket contacts qualified under this specification shall be a product which has been qualified in conjunction with the qualification of any NAS connector using these contacts.

3.2 NAS DRAWINGS FOR INDIVIDUAL CONTACTS

The requirements herein apply to pin and socket contacts covered by the applicable NAS drawings. Detail requirements or exceptions applicable to individual types shall be as specified herein or as in the applicable NAS drawings. In the event of any conflict between the requirements of this specification and the requirements of the NAS drawings, the latter shall govern.

3.3 MATERIALS

Unless otherwise specified, pin and socket contact bodies shall be machined of solid rod stock using suitable conductive material. Springs and hoods when used, shall be made from non-corrosive materials or suitably protected from corrosion as defined in 3.3.3.

3.3.1 FINISH

The pin and socket contact bodies shall be plated as specified in applicable NAS drawings. When gold, silver or nickel plating is specified, it shall be in accordance with MIL-G-45204, QQ-S-365 or QQ-N-290 respectively.

3.3.1.1 PLATING THICKNESS

Plating material thickness shall be as specified in the applicable NAS drawing. The minimum thickness of plating specified in the applicable NAS drawing is applicable to and shall be measured on surfaces indicated in Figure 1. The plating thickness on surfaces and areas not specified above shall be sufficient to ensure plating continuity, uniform utility, appearance, and protection.

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APPROVAL DATE JULY 1963 REVISION ① 30 Dec. 1965 ② June 1980

AIA AND ITS COMMITTEES WILL NOT INVESTIGATE THE APPLICABILITY OF PATENTS TO THE SUBJECT MATTER OF NAS STANDARDS AND IN RESPECT THEREOF DO NOT ASSUME ANY LIABILITY TO PATENT OWNERS OR TO PROSPECTIVE USERS.

THIS DRAWING SUPERSEDES ALL ANTECEDENT STANDARD DRAWINGS OF THE SAME TITLE AND NUMBER AND SHALL BE EFFECTIVE NO LATER THAN SIX MONTHS FROM THE LAST DATE OF APPROVAL SHOWN HEREON.

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3.3.1.2 GOLD PLATING POROSITY

Gold plated contacts shall show no visible reaction in the form of bubbles when tested in accordance with 4.6.1.3.4.

3.3.1.3 ADHESION

The adhesion of the plating and any undercoat shall be such that when examined at a magnification of four diameters neither the plating, nor any undercoat, shall show separation from the basis metal or from each other at their common interface when subjected to the test specified in 4.6.1.3.3. The interface between a plating and the basis metal is the surface of the basis metal before plating. The formation of cracks in the basis metal or plate which result in flaking, peeling, or blistering of the plate shall be considered as failing to meet this requirement.

3.3.1.4 PLATING DURABILITY

There shall be no exposure of basis metal on contacting surfaces of pin and socket contacts as a result of the durability conditioning test when examined in accordance with 4.6.1.3.5.

3.3.1.5 DUCTILITY OF MATERIALS

There shall be no cracks in the plating or basis metal of the pin or socket contact following crimping the wire to the contacts with the MS3191 crimp tool and applicable locator.

3.3.2 NONMAGNETIC MATERIALS

All contact component parts shall be constructed of nonmagnetic material. The relative permeability of the contact shall be less than 2 when tested with an instrument in accordance with MIL-I-17214.

3.3.3 DISSIMILAR METALS

Unless suitably protected against electrolytic corrosion, dissimilar metals shall not be employed in intimate contact with each other. Dissimilar metals are defined in MS33586.

3.4 DESIGN AND CONSTRUCTION

Contacts shall be so designed that neither the pin nor the socket will be damaged by twisting or forcing during mating or unmating of the connectors or by insertion of contacts into or removal of contacts from the connector with the tool required for insertion or removal.

3.4.1 DIMENSIONS AND WEIGHT

The contact shall conform to the applicable NAS drawings.

3.4.2 CONTACT ENGAGING END

3.4.2.1 SOCKET ENGAGING END

The engaging end of the socket contact shall be of the closed-entry type designed to exclude entrance of a pin 0.005 inch larger than the allowable maximum diameter. The entrance shall be chamfered or as specified on applicable NAS drawings to allow for directing and centering of the entering pin. The socket contact shall provide spring action for maintaining contact pressure between mated pin and socket contacts. The pressure spring shall be designed and located so that it will engage a flat faced test pin (diameter in accordance with MS3197 "Minimum Diameter Test Pin") when the test pin is inserted a maximum of .045 inch for size 20 contacts and .050 for size 12 and 16 contacts measured from the front end of the socket contact. The socket contact pressure spring need not be a current - carrying member of the contact. The socket contacts shall be designed to protect the mechanical pressure member. The mechanical pressure member shall not be exposed. A continuous smooth exterior encompassing the pressure member shall be used for protection from handling damage during contact assembly procedures. The socket contact shall be designed to prevent damage to the integral sealing surfaces and integral insert retention member of the connector during connector assembly or maintenance.

3.4.2.2 PIN ENGAGING END

The engaging end of pins shall be rounded or of a suitable configuration to allow for directing and centering of the pin in a mating socket contact and shall conform to the applicable NAS drawings.

3.4.3 CONTACT TERMINATIONS

Pin and socket contact terminations shall be designed for crimp-type connections and shall conform to the applicable NAS drawings. The pin and socket contact crimp barrel shall be provided with an inspection hole. When crimped to the wire sizes listed in Table I, using a tool in accordance with MS3191 with correct contact position locator, the crimp barrels shall meet the performance requirements specified herein.

3.4.4 SURFACE ROUGHNESS

The roughness height rating (defined in MIL-STD-10) of all contact mating surfaces, indicated in Figure 1, shall be less than the value specified on the applicable NAS drawing.

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		NAS 1600 Sheet 3

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3.4.5 INSERTION AND REMOVAL TOOLS

Tools required for assembly or disassembly of pin and socket contacts into their connector inserts shall be in accordance with the applicable NAS drawings.

3.5 PERFORMANCE

Pin and socket contacts shall perform as follows when tested as specified in section 4.

3.5.1 CONTACT ENGAGING AND SEPARATING FORCES

Socket contacts, when tested in accordance with the Contact Engaging and Separating Forces test of 4.6.2 shall comply with requirements of Table II.

TABLE II
Contact Engaging and Separating Forces

Contact Size	Force in Ounces		Depth of Insertion Inches ± 0.01
	Min	Max	
20	.75	7.0	0.25
16	2.0	13.5	0.25
12	3.0	20.0	0.25

3.5.2 SIZE 20 PIN CONTACT STRENGTH

The pin contact strength shall be such that a force of 2 pounds ± 1 ounce will not produce a permanent set in excess of 0.005 inch when tested in accordance with 4.6.3.

3.5.3 CONTACT POTENTIAL DROP

3.5.3.1 CONTACT RESISTANCE

Resistance of mated pairs of pin and socket contacts shall be such that the potential drop measured with the specified test current will not be greater than the potential drop listed in Table III for 25°C when tested in accordance with 4.6.4.1.

3.5.3.2 CONTACT RESISTANCE - LOW LEVEL

The resistance of mated pairs of pin and socket contacts shall be less than one-tenth ohm when tested in accordance with 4.6.4.2.

3.5.3.3 CONTACT RESISTANCE - HIGH TEMPERATURE

Resistance of mated pairs of pin and socket contacts shall be such that the potential drop measured with the specified test current will not be greater than the potential drop listed in Table III for 200°C when tested in accordance with 4.6.4.3.

TABLE III - CONTACT RESISTANCE
(Maximum Potential Drop in Millivolts)

CONTACT	WIRE SIZE	TEST CURRENT (AMPERES)	POTENTIAL DROP ACROSS Y-Y ∇	
			25°C	200°C
20	24	3.0	12	25
20	22	5.0	13.5	26
20	20	7.5	15	26
16	20	7.5	12	26
16	18	15	20	36
16	16	20	21	36
12	14	25	21	33
12	12	35	22	36

∇ for Y-Y refer to Figure 2.

3.5.4 CRIMP POTENTIAL DROP

Potential drop through crimped terminations of pin and socket contacts, when measured as specified in 4.6.5 with test currents indicated in Table IV for applicable sizes of wire and contacts, shall not be greater than values specified in Table IV.

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3.5.4 (Continued)

TABLE IV - CRIMP TEST REQUIREMENTS

CONTACT SIZE	WIRE SIZE	TEST CURRENT AMPERES	MILLIVOLT DROP ACROSS X-X MAX 	TENSILE (LBS) (MIN)
20	24	3	4.5	6
20	22	5	4.5	8
20	20	7.5	4.5	12
16	20	7.5	5.5	12
16	18	15.	7.0	31
16	16	20.	7.0	45
12	14	25.	6.0	60
12	12	35.	6.0	100

 for X-X refer to Figure 2.

3.5.5 DURABILITY CONDITIONING

Mating pin and socket contacts shall withstand the durability conditioning procedure outlined in 4.6.6 as a conditioning prior to succeeding tests.

3.5.6 TEMPERATURE DURABILITY

Contacts shall withstand a temperature of $200^{\circ} +5^{\circ}\text{C}$ ($392^{\circ} +9^{\circ}\text{F}$) for $1000 +24_{-0}$ continuous hours as specified in 4.6.7 as a conditioning prior to succeeding tests.

3.5.7 CURRENT CYCLING

Contacts shall withstand the Current Cycling test as specified in 4.6.8 as a conditioning prior to succeeding tests.

3.5.8 THERMAL SHOCK

Pin and socket contacts shall withstand the Thermal Shock test as specified in 4.6.9 as a conditioning prior to succeeding tests.

3.5.9 RESISTANCE TO PROBE DAMAGE

Socket contacts shall withstand the probe damage test outlined in 4.6.10 and then meet the requirements of Contact Engaging and Separating Force in 3.5.1.

3.5.10 CORROSION

Pin and socket contacts shall show no exposure or indication of exposure of basis metal after subjection to corrosion test of 4.6.11.

3.5.11 CRIMP TENSILE STRENGTH

The tensile strength of the pin and socket contact crimp joint shall meet the tensile force requirements of Table IV when tested in accordance to 4.6.12. The wire shall not pull out of the contact, or break within the contact, nor shall the contact break or become distorted to the extent it is unfit for further use before the minimum tensile strength, as specified in Table IV, is reached.

3.6 IDENTIFICATION OF PRODUCT

3.6.1 MANUFACTURER'S IDENTIFICATION - Each pin and socket contact shall be marked to indicate the manufacturer in the location indicated on the applicable NAS drawing.

3.6.2 CONTACT TRACEABILITY IDENTIFICATION

Each contact unit package shall be marked with an identification code (purge capability symbol) in the location specified in 5.1.1. The identification code shall provide the means for data linkage between the contacts in supplier or user stock and the fabrication processes and materials used to manufacture the complete contact. The manufacturer shall maintain records of the identification code applied to the contacts from which positive information concerning the processes and materials used to manufacture the individual contact can be obtained. The identification code records shall be retained by the manufacturer for a minimum period of two (2) years. The traceability system employed may be lot control or a similar method which controls and identifies the following critical processes and materials:

1. Contact components (body, pressure mechanism, and hood).
 - a. materials
 - b. heat treat
 - c. plating
2. Serial number and refurbishment period of special tools such as progressive dies used to form spring members or hoods.

3.7 WORKMANSHIP

The pin and socket contacts shall be free from burrs or sharp corners that might damage inserts or wire seals of connector or damage plating of mating contacts.

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