Registration No. 1287

JAXA-QTS-2060F
22 March 2024

Superseding
JAXA-QTS-2060E
Cancelled
22 March 2024

CONNECTORS,
HIGH RELIABILITY, SPACE USE,
GENERAL SPECIFICATION FOR

Japan Aerospace Exploration Agency

This document is the English version of JAXA QTS/ADS which was originally written and authorized in Japanese and carefully translated into English for international users. If any question arises as to the context or detailed description, it is strongly recommended to verify against the latest official Japanese version.

The release date of the English version of this specification: 25 March 2026

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Revision History

Rev.	Date	Description
A	31 Mar. 2004	(1) Revised to reflect the organizational change from NASDA to JAXA. (2) Renumbered sections/paragraphs in accordance with Appendix A of JAXA-QTS-2000. (3) Replaced terminologies with those used in the generic specification.
B	31 Mar. 2006	(1) Changed the contact dimensions in Appendix C. (2) Clarified the reference contact dimensions in Appendixes C and D. (3) Reviewed duplicated test items in the qualification test, renumbered sections/paragraphs and made relevant corrections in Appendixes B, C, and D.
C	25 Jun. 2008	(1) Added Appendix F; Connectors, Rectangular, Microminiature. (2) Corrected as follows to ensure consistency. ・ Paragraph 2.2: Deleted NASDA-STD-7 (obsolete document). ・ Paragraph 2.2: Deleted referential MIL or ESA specifications for appendixes and specified in each appendix. ・ Paragraph 3.3.2: Specified calculation procedure for outgassing. ・ Paragraph 4.5.2.4: Corrected to ensure consistency between main body and appendices. ・ Paragraphs *.4.2.2, *.4.2.3: Deleted duplicative specification of main body. ・ Table B-28: Specified that the samples used to test plating porosity cannot be delivered as the test is a breakdown test. ・ Supplementary Figures C-23 and D-19: Corrected figures in accordance with actual test method.
D	27 Sep. 2010	(1) Added Appendix G; Connectors, Rectangular, Miniature, Composite. (2) Appendix C: ・ Added requirements for location plates (paragraph C.1.2.8). ・ Clarification of applicable requirements per connector type (Paragraphs C.3.3.4, C.3.3.7.2, C.3.7.1, C.3.7.2, Tables C-11, C-13). ・ Added figures of connector without location plate (Supplementary Figures C-6, C-7). ・ Added figures of grommet type connecter (shell material: brass) (Supplementary Figures C-12, C-13). ・ Added figures of solder contact (non-removable type) (Supplementary Figures C-18, C-19). ・ Added dimensions of mounting holes on printed wiring board (for ND301) (Supplementary Figure C-25). (3) Appendix D: ・ Added brass as a shell material (paragraphs D.1.2.2, D.3.2.11.2, Supplementary Figures D-2 through D-5). (4) Appendix E: ・ Changed the appendix title. ・ Added composite, miniature, rectangular connectors as applicable connectors (paragraph E.1.1). (5) Other Modifications for error correction and ensuring consistency.
E	19 Dec. 2012	(1) Added Appendix H; Connectors, Coaxial, Radio Frequency. (2) Added an applicable wire (Appendix F) ・ Added requirements for the connectors with wire sizes of AWG#24 and #28 (Tables F-5, F-6, F-9 and paragraph F.4.3.4.3). ・ Modified the identification number for wire type to 2-digit number in order to correspond to increased number of wire type (F.1.2.7). ・ Clarified the selection criteria for test sample (F. 4.1.1.2a)1) and Table F-15). (3) Other Modifications for error correction and ensuring consistency.

Rev.	Date	Description
F	22 Mar. 2024	Incorporated the result of the deliberation by the committee conducted in FY2023, and corrected typographical errors. (1) General ・ Replaced cancelled "MIL-STD-1344" with "EIA-364" (paragraph2.1).Based on the review of the differences between MIL-STD-1344 and EIA-364, incorporated the additional requirements applied to EIA-364 in the main body, appendixes B, C, D, F, G, and H of this specification. ・ (for Japanese version only) Clarified wording of the status of connecting position of the connectors and the contacts in the main body, appendixes B, C, D, E, F, G, and H of this specification. ・ (for Japanese version only) Clarified the wording of connection of the connectors and the contacts in the main body, appendixes B, C, D, E, F, G, and H. of this specification. (2) Main body ・ Replaced cancelled "MIL-W-22759" with "SAE-AS22759"(paragraph 2.1). ・ Added the following specifications specified in paragraph 2.1. ESCC Detail Specification No.3401/005 in item bc) JAXA-QTS-2120 in item be) ・ Replaced cancelled "MIL-I-81969" with "SAE-AS81969" (paragraph 2.1). ・ Clarified the wording of the shape of the connectors specified in paragraph 6.3.2. ・ Corrected editorial errors. ・ Replaced cancelled "MIL-STD-1344" with "EIA-364", with the comparison of each test method specified in both documents as follows. Salt splay (corrosion): MIL-STD-1344 method 1001.1 and EIA-364-26C Humidity: MIL-STD-1344 method 1002.2 and EIA-364-31F Temperature cycling: MIL-STD-1344 method 1003.1 and EIA-364-32G Altitude immersion: MIL-STD-1344 method 1004.1 and EIA-364-03C Temperature life: MIL-STD-1344 method 1005.1 and EIA-364-17C Hydrostatic pressure: MIL-STD-1344 method 1007.1 and EIA-364-14B Altitude-low temperature: MIL-STD-1344 method 1011 and EIA-364-105B Simulated life: MIL-STD-1344 method 1016 and EIA-364-10J Contact axial concentricity: MIL-STD-1344 method 2002.1 and EIA-364-24B Crimp tensile strength: MIL-STD-1344 method 2003.1 and EIA-364-08C Shock (specified pulse): MIL-STD-1344 method 2004.1 and EIA-364-27C Vibration: MIL-STD-1344 method 2005.1 and EIA-364-28F Probe damage (contacts): MIL-STD-1344 method 2006.2 and EIA-364-25E Contact retention: MIL-STD-1344 method 2007.1 and EIA-364-29D Insert retention: MIL-STD-1344 method 2010.1 and EIA-364-35C Contact insertion and removal force: MIL-STD-1344 method 2012.1 and EIA-364-05C Mating and unmating forces: MIL-STD-1344 method 2013.1 and EIA-364-13E Contact engagement and separation force: MIL-STD-1344 method 2014 and EIA-364-37C Durability: MIL-STD-1344 method 2016 and EIA-364-09D Dielectric withstanding voltage: MIL-STD-1344 method 3001.1 and EIA-364-20F Insulation resistance: MIL-STD-1344 method 3003.1 and EIA-364-21F Contact resistance: MIL-STD-1344 method 3004.1 and EIA-364-06C

Rev.	Date	Description
		Standing Wave Ratio (SWR): MIL-STD-1344 method 3005 and EIA-364-106 (3) Appendix C ・ Added the revision letter of referenced document specified in item a) of paragraph C.2.2. ・ Deleted the cancellation document "MIL-DTL-26074" referred to paragraph C.3.2.11.2. ・ Added wording that the requirement for fluid immersion applies when requested by the purchaser.(paragraph C.3.8.5 and Table C-13). ・ Added wording that the test data can be substituted when the insulating materials used in the connector was evaluated with the equivalent test conditions (paragraph C.3.8.8 and note 2 of Table C-14). ・ Changed the requirement of the content of nitric acid from "specific gravity of 1.425 at 15.6 ºC" to "concentration: 70^{+3}_{-1} %" to utilize a commonly available commercial chemical in paragraph C.4.3.4.1. ・ Added the repetition rate for both manual and automatic testers in paragraph C.4.3.6.6. ・ Corrected editorial errors. (4) Appendix F ・ Replaced cancelled "MIL-W-22759" with "SAE-AS22759” (paragraph F.2.1). ・ Added the revision letter and the issue number of the reference documents in items a), b), and c) of paragraph F.2.2. ・ Changed the requirement of the content of nitric acid from "specific gravity of 1.425 at 15.6 ºC" to "concentration: 70^{+3}_{-1} %" to utilize a commonly available commercial chemical in paragraph F.3.2.12.1.2. ・ Clarified the limit of insulation resistance other than moisture resistance as "5000 MΩ minimum" in Table F-4. ・ Replaced cancelled "MIL-W-M22759/33" with "SAE AS22759/33" (paragraph F.3.5.3). ・ Added wording that the requirement for fluid immersion applies when requested by the purchaser. (paragraph F.3.7.5 and Table F-12). ・ Added wording that the test data can be substituted when the insulating materials used in the connector was evaluated with the equivalent test conditions. (paragraph F.3.7.8 and note2 of Table F-13). ・ Added the repetition rate for both manual and automatic testers in paragraph F.4.3.5.4. ・ Corrected editorial errors. (5) Appendix H ・ Added the issue number of the reference document in items a) of paragraph H.2.2. ・ Clarified wording which limit to be applied in Table H-9 in the content of paragraph H.3.6.4 ・ Changed the title from "corona level" to "partial discharge" in paragraphs H.3.6.5, H.4.3.4.5, and Table H-13. ・ Changed the minimum contact removal force from "0.277N" to "0.28N" in item b) of paragraph H.3.7.3. ・ Clarified wording of intermittent contact in paragraphs H.3.8.1 and H.3.8.2 . ・ Changed the requirement of the content of nitric acid from "specific gravity of 1.425 at 15.6 ºC" to "concentration: 70^{+3}_{-1} %" to utilize a commonly available commercial chemical in paragraph H.4.3.2.2. ・ Added the condition of relative humidity under test in item b) of paragraph H.4.3.4.1. ・ Deleted the test condition of tightened coupling nuts during measurement in item b) of paragraph H.4.3.4.4 to align with MIL-DTL-39012.

Rev.	Date	Description
		・ Deleted the test circuit and added the test equipment name in paragraph H.4.3.4.5, H.4.3.4.6, and H.4.3.4.8. ・ Added the wording "age-hardened (heat-treated)" previously "heat treatment" for clarification in paragraph H.4.3.5.1. ・ Changed the force from "266.74N {27.21kgf}" to "266.7N {27.20kgf}" in item b) of paragraph H.4.3.5.4. ・ Changed the force applied to the radial direction of receptacle plug or receptacle jack from "2.815N· cm {287.5gf· cm}" to "2.82N· cm {287.6gf· cm}" in Table H-22. ・ Clarified the mount condition for the connector in paragraphs H.4.3.6.1, and H.4.3.6.2 . ・ Added the test method number of MIL-STD-202 with the test condition letter in item a) of paragraphs H.4.3.6.3.1, and H.4.3.6.3.2 . ・ Clarified the mount condition for the connector with the cables in paragraph H.4.3.6.4. ・ Added the test method number of MIL-STD-202 with the test condition letter in item b) of paragraph H.4.3.6.5. ・ Corrected editorial errors. (6) Appendix B ・ Replaced cancelled "MIL-I-81969" with "SAE-AS81969" specified in paragraphs B.3.3.2.6, and B.3.3.3 . ・ Replaced cancelled "MIL-W-22759" with "SAE-AS22759" specified in Table B-19 and Table B-20 . ・ Changed the requirement of the content of nitric acid from "specific gravity of 1.425 at 15.6 ºC" to "concentration: 70^{+3}_{-1} %" to utilize a commonly available commercial chemical in paragraph B.4.3.4.1. ・ Added the repetition rate for both manual and automatic testers in paragraph B.4.3.6.5. ・ Corrected editorial errors. (7) Appendix D ・ Added the revision letter of the reference document in items a) of paragraph D.2.2. ・ Deleted cancelled document "MIL-DTL-26074" in paragraph D.3.2.11.2. ・ Added wording that the requirement for fluid immersion shall apply when the requirement is specified in the detail specification or the purchaser orders in accordance with paragraph 6.2.1 in paragraph D.3.8.5 and Table D-13. ・ Changed the requirement of the content of nitric acid from "specific gravity of 1.425 at 15.6 ºC" to "concentration: 70^{+3}_{-1} %" to utilize a commonly available commercial chemical in paragraph D.4.3.4.1. ・ Corrected editorial errors. ・ Added wording that the requirement for radiation hardness shall apply when the insulating materials was evaluated with the equivalent test conditions and the data is available to comply with the requirements in appendix C in paragraph D.3.8.8 and note 2 of Table D-14. (8) Appendix G ・ Added the issue number of the reference documents in items a), b) and c) of paragraph G.2.2. ・ Deleted cancelled document "MIL-DTL-26074" in paragraph G.3.2.7.2. ・ Added wording that the requirement for fluid immersion shall apply when the requirement is specified in the detail specification or the purchaser orders in accordance with paragraph 6.2.1 in paragraph G.3.8.5 and Table G-15. ・ Added wording that the test data can be substituted when the insulating materials was evaluated with the equivalent test conditions. (paragraph G.3.8.8 and Table G-16).

Rev.	Date	Description
		・ Changed the requirement of the content of nitric acid from "specific gravity of 1.425 at 15.6 ºC" to "concentration: 70^{+3}_{-1} %" to utilize a commonly available commercial chemical in paragraph G.4.3.4.1. ・ Corrected editorial errors.

Contents

CONNECTORS, HIGH RELIABILITY, SPACE USE, GENERAL SPECIFICATION FOR

1. GENERAL

1.1 Scope

This specification establishes the general requirements and quality assurance provisions for high reliability, connectors (hereinafter referred to as "connectors") used for electronic equipment installed on space systems.

This specification complies with JAXA-QTS-2000 (Common Parts/Materials, Space Use, General Specification for) which was recently established to transition to the qualified manufacturing line system and replaces the following specifications.

a) NASDA-QTS-1028A Connectors, Circular, Miniature, High Density, High Reliability, Space Use (NASDA NR 03)

b) NASDA-QTS-1029A Connectors, Circular, Miniature, High Reliability, Space Use (NASDA NR 04)

c) NASDA-QTS-24308A Connectors, Rectangular, Miniature, High Reliability, Space Use (NASDA ND 101)

d) NASDA-QTS-24308A/102A Accessories for Connectors, Rectangular, Miniature, High Reliability, Space Use (NASDA ND 102)

e) NASDA-QTS-39012A Connectors, Coaxial, Radio Frequency, High Reliability, Space Use, General Specification for, Notice of Change 1

1.2 Terms and Definitions

The definitions for terms used herein are as shown in paragraph 6.3 of this specification.

1.3 Classification

Connectors covered by this specification shall be classified as specified in Table 1.

Table 1. Classification

Classification	Appendix	Equivalent QPL specification
Connectors, Circular	B	NASDA-QTS-1028A NASDA-QTS-1029A
Connectors, Rectangular, Miniature	C	NASDA-QTS-24308A
Connectors, Rectangular, Miniature, High Density	D	None
Accessories for Connectors, Rectangular, Miniature and Connectors, Rectangular, Miniature, High Density	E	NASDA-QTS-24308A/102A
Connectors, Rectangular, Microminiature	F	None
Connectors, Rectangular, Miniature, Compound	G	None
Connectors, Coaxial, Radio Frequency	H	NASDA-QTS-39012

1.4 Part Number

The part number shall be as specified in each appendix.

2. APPLICABLE DOCUMENTS

2.1 Applicable Documents

The documents listed below form a part of this specification as specified herein. These documents are the latest issues available at the time of contract award or application. If it is necessary to designate an issue, the issue shall be specified in the detail specification.

a)	JAXA-QTS-2000	Common Parts/Materials, Space Use, General Specification for
b)	MIL-STD-202	Test Method Standard, Electronic and Electrical Component Parts
c)	MIL-HDBK-454	General Guidelines For Electronic Equipment
d)	Deleted	
e)	MIL-STD-1560	Insert Arrangements for MIL-DTL-38999, MIL-DTL-27599 and MIL-C-29600 Series A, Electrical Circular Connectors
f)	MIL-STD-1669	Insert Arrangements for MIL-DTL-26482 Environment Resisting, Circular, Electrical Connectors
g)	MIL-DTL-22520	Crimping Tools, Wire Termination, General Specification for
h)	Deleted	
i)	MIL-DTL-26482	Connectors, Electrical (Circular, Miniature, Quick Disconnect, Environment Resisting), Receptacles and Plugs, General Specification for
j)	MIL-C-39029	Contacts, Electrical Connector, General Specification for
k)	MIL-PRF-5606	Hydraulic Fluid, Petroleum Base, Aircraft, Missile, and Ordnance
l)	Deleted	
m)	MIL-PRF-23699	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base, NATO Code Number O-156
n)	MIL-DTL-16878	Wire, Electrical, Insulated, General Specification for
o)	MIL-DTL-81381	Wire, Electric Polyimide-Insulated, Copper or Copper Alloy
p)	MIL-DTL-38999	Connectors, Electrical, Circular, Miniature, High Density, Quick Disconnect (Bayonet, Threaded, and Breech Coupling), Environment Resistant, Removable Crimp and Hermetic Solder Contacts, General Specification for
q)	SAE-AMS2418	Copper Plating
r)	SAE-AMS2422	Plating, Gold
s)	SAE-AS31971	Pin, Gage, for Socket Contact Engagement Test
t)	SAE-AMS-C-26074	Coatings, Electroless Nickel, Requirements for
u)	ASTM B 488	Gold for Engineering Uses, Electrodeposited Coatings of
v)	ASTM B 733	Metal, Autocatalytic Electroless Nickel-Phosphorus Coatings on
w)	MS 3461	Test Gauge, MIL-C-26482 Series 2 or MIL-C-81703 Series 3 Contact Retention Feature
x)	MS 27488	Plug, End Seal, Electrical Connector
y)	GSFC S-311-P-13	Wire and Cable, Electrical, Insulated, for Space Flight Use, General Specification For

z) JIS B 7507	Vernier, Dial and Digital Calipers
aa) JIS Z 9015-1	Sampling Procedures for Inspection by Attributes Part 1: Sampling schemes Indexed by Acceptance Quality Limit (AQL) for Lot-by-Lot Inspection
ab) ASTM E595	Standard Test Method for Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment
ac) SAE-AS22759	Wire, Electrical, Fluoropolymer-Insulated, Copper or Copper Alloy
ad) EIA-364-03	Altitude Immersion Test Procedure for Electrical Connectors
ae) EIA-364-05	Contact Insertion, Release and Removal Force Test Procedure for Electrical Connectors
af) EIA-364-06	Contact Resistance Test Procedure for Electrical Connectors
ag) EIA-364-08	Crimp Tensile Strength Test Procedure for Electrical Connectors
ah) IA-364-09	Durability Test Procedure for Electrical Connectors and Contacts
ai) EIA-364-10	Fluid Immersion Test Procedure for Electrical Connectors
aj) EIA-364-13	Mating and Unmating Force Test Procedure for Electrical Connectors and sockets
ak) EIA-364-14	Ozone Exposure Test Procedure for Electrical Connectors
al) EIA-364-17	Temperature Life with or Without Electrical Load Test Procedure for Electrical Connectors and sockets
am) EIA-364-20	Dielectric Withstanding Voltage Test Procedure for Electrical Connectors, Sockets and Coaxial Contacts
an) EIA-364-21	Insulation Resistance Test Procedure for Electrical Connectors, Sockets and Coaxial Contacts
ao) EIA-364-23	Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets
ap) EIA-364-24	Maintenance Aging Test Procedure for Electrical Connectors
aq) EIA-364-25	Probe Damage Test Procedure for Electrical Connectors
ar) EIA-364-26	Salt Spray Test Procedure for Electrical Connectors, Contacts and Sockets
as) EIA-364-27	Mechanical shock (Specified Pulse) Test Procedure for Electrical Connectors and Sockets
at) EIA-364-28	Vibration Test Procedure for Electrical Connectors and Sockets
au) EIA-364-29	Contact Retention Test Procedure for Electrical Connectors
av) EIA-364-31	Humidity Test Procedure for Electrical Connectors and Sockets
aw) EIA-364-32	Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors and Sockets
ax) EIA-364-35	Insert Retention Test Procedure for Electrical Connectors
ay) EIA-364-37	Contact Engagement and Separation Test Procedure for Electrical Connectors

az) EIA-364-54 Magnetic Permeability Test Procedure for Electrical Connectors, Contacts, and Sockets

ba) EIA-364-105 Altitude-Low Temperature Test Procedure for Electrical Connectors and Sockets

bb) EIA-364-106 Standing wave ratio (SWR)

bc) ESCC Detail Specification No. 3401/005 Contacts, Electrical, Crimp, for 3401/002, 3401/097 Connectors

bd) ESCC Detail Specification No. 3401/022 Accessories for Rectangular Connectors 3401/001, 3401/002, 3401/098 and Connector Savers 3401/020, 3401/080

be) JAXA-QTS-2120 Electric Cable (Appendix B: Fluorinated Ethylene Propylene (FEP) Insulated, Polyimide Covering)

bf) SAE-AS81969 Installing and Removal Tools, Connector Electrical Contact, General Specification for

2.2 Reference Documents

The following documents are reference documents.

a) JERG-0-035 NASDA Parts Application Handbook

b) NASA-STD-8739.4 Crimping, Interconnecting Cables, Harnesses, and Wiring

2.3 Order of Precedence

In the event of a conflict between the text of this specification and the applicable documents, the following order of precedence shall apply.

a) Detail specification
b) This specification
c) JAXA-QTS-2000
d) Applicable documents of this specification (paragraph 2.1, except for JAXA-QTS-2000)

2.4 Detail Specification

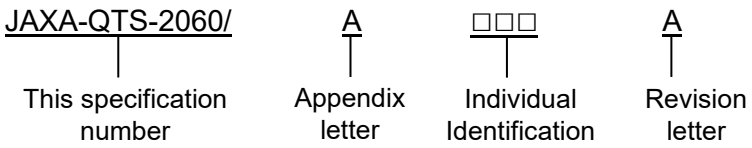
Detailed requirements for the type and performance of connectors are specified in each detail specification.

The detail specification shall be prepared and established by a manufacturer in accordance with paragraph A.4, Appendix A of JAXA-QTS-2000. The detailed specification shall also be registered with the Japan Aerospace Exploration Agency (hereinafter referred to as “JAXA”).

2.4.1 Detail Specification Number

The detail specification number shall be indicated in the following form in accordance with paragraph A.2.2.2 of JAXA-QTS-2000. The individual identification shall be identified by a three-digit number. The first digit shall indicate a certified manufacturer and the following two-digit shall indicate series number.

(Example)



2.4.2 Revision Letter of Detail Specification
A revision letter in the detail specification number shall be assigned in accordance with paragraph A.2.2.2.4 of JAXA-QTS-2000.

2.4.3 Independency of Detail Specification
The detail specification shall be a stand-alone document with a unique number defined in accordance with paragraph 2.4.1.

2.4.4 Format of Detail Specification
The detail specification format shall be in accordance with A.6 b) of JAXA-QTS-2000 and shall specify each requirement in accordance with A.4, Appendix A of JAXA-QTS-2000.

3. REQUIREMENTS

3.1 Certification

3.1.1 Qualification Coverage
Qualification coverage shall be as specified in each appendix and the detail specification in accordance with paragraph A.3.3.3.2.1 of JAXA-QTS-2000.

3.1.2 Initial Qualification
To acquire certification of the capacitors in compliance with this specification, a manufacturer shall establish a quality assurance program in accordance with paragraph 3.3.1 of JAXA-QTS-2000, perform the qualification tests specified in paragraph 4.4, and acquire a certification status from JAXA as specified in paragraph 3.4.1 of JAXA-QTS-2000. The manufacturer shall be listed on the Qualified Manufacturer List of the Japan Aerospace Exploration Agency (JAXA QML).

3.1.3 Retention of Qualification
To continue supplying capacitors in accordance with this specification, a manufacturer must apply for QML certification retention in accordance with paragraph 3.4.2.1 of JAXA-QTS-2000 commencing between 30 and 60 days prior to the expiration date of the certification period (paragraph 3.1.4).
If products were not shipped during the effective period of certification and a quality conformance inspection was not conducted, the manufacturer may apply for retention of certification without conducting the quality conformance inspection.

3.1.4 Effective Period of Certification
The effective period of certification granted in compliance with this specification shall be three years.

3.1.5 Change of Qualification Coverage
To change the qualification coverage, the manufacturer shall perform procedures for re-certification in accordance with paragraph 3.4.3 of JAXA-QTS-2000.

3.2 Quality Assurance Program

3.2.1 Establishment of a Quality Assurance Program
To acquire certification in compliance with this specification, the manufacturer shall be responsible for establishing a quality assurance program that satisfies the requirements specified in paragraph 3.3.1 of JAXA-QTS-2000 and this specification. The

manufacturer shall generate a Quality Assurance Program Plan in accordance with paragraph 3.3.2 of JAXA-QTS-2000 and provide the plan to JAXA for review in accordance with paragraph 3.3.6 of JAXA-QTS-2000.

3.2.2 TRB Formation

To acquire a certification status in compliance with this specification, the manufacturer shall form and operate the Technical Review Board (TRB) in accordance with paragraph 3.3.5 of JAXA-QTS-2000.

3.3 Materials

3.3.1 General

Materials used for manufacturing connectors shall be specified in this specification. If a specific material is not specified, a material which enables the connectors to satisfy the requirements of this specification shall be used and the material shall be specified in the document defining the manufacturing conditions of the quality assurance program. Detailed requirements for the materials shall be as specified in each appendix and as follows.

3.3.2 Outgassing

Unless otherwise specified, organic materials used for connectors shall satisfy the following requirements when tested in accordance with ASTM E 595. Outgassing from whole organic materials shall be evaluated using the outgassing measurements of each organic material in consideration of the weight allocation.

a) Total Mass Loss (TML) ([1]): 1.0% or less
b) Collected Volatile Condensable Material (CVCM) ([2]): 0.1% or less

Notes: ([1]) TML: Total Mass Loss
([2]) CVCM: Collected Volatile Condensable Materials

3.4 Design and Construction

Design and construction shall be in accordance with each appendix. Detailed requirements shall be specified in the detail specifications.

3.5 Externals, Dimensions, and Marking

The externals, constructions, dimensions, mass and markings of the connectors shall be as specified in each appendix.

3.6 Workmanship

The workmanship of the connectors shall be as specified in each appendix.

3.7 Rating

The ratings of the connectors shall be as specified in each appendix.

3.8 Electrical Performance

Requirements for the electrical performance of the connectors shall be in accordance with each appendix.

3.9 Mechanical Performance

Requirements for the mechanical performance of the connectors shall be in accordance with each appendix.

3.10 Environmental Performance
Requirements for the environmental performance of the connectors shall be in accordance with each appendix.

3.11 Durability Performance
Requirements for the durability performance of the connectors shall be in accordance with each appendix.

4. QUALITY ASSURANCE PROVISIONS

4.1 General Requirements
The manufacturer shall be responsible for implementing the quality assurance program as specified in paragraph 3.2 and operating the TRB.

4.2 Classification of Test and Inspection
The tests and inspections shall be classified into the following three categories in accordance with paragraph 4.3 of JAXA-QTS-2000.

a) In-process inspection
b) Qualification test
c) Quality conformance inspection

4.3 In-Process Inspection
The manufacturer shall perform the in-process inspections as specified below to detect any failure which could seriously affect the reliability and quality of the products, assure the workmanship and characterize properties which cannot be measured using the finished products. The manufacturing flowchart in the quality assurance program plan shall define the inspection process.

a) Internal visual inspection of semi-finished products (non-destructive, 100% or sample inspection)
b) Physical or chemical inspection of semi-finished products (destructive or non-destructive, 100% or sample inspection)
c) Characterization of semi-finished products (non-destructive, 100% or sample inspection)

4.4 Qualification Test

4.4.1 Sample
Samples shall be manufactured using the process and control as specified in the quality assurance programs and shall also typify the qualification coverage.

4.4.2 Manufacturing Records
The manufacturer, which intends to acquire certification status, shall archive material certification, receiving inspection data or test data of materials used, work records related to sample preparation, and in-process inspection data. These records shall be readily available upon request.

4.4.3 Test Items and Number of Samples
Test items, test sequence and sample size shall be in accordance with each appendix.

4.4.4 Determination of Pass or Fail

A failure of any test in qualification tests specified in each appendix shall constitute failure of the qualification test. If the failure mode of the defects is catastrophic such as an open- or short-circuiting where the function of the connectors might be lost, the connectors fail the qualification test.

4.4.5 Disposition after Test (Qualification Test)

When failed in the qualification test, the manufacturer shall review all the materials and manufacturing processes and take corrective actions to re-perform qualification test. JAXA has the right to determine the test items to be re-performed (all or some of test items).

The products in the same inspection lot that have passed qualification test may be delivered upon passing group A inspection of quality conformance inspection.

4.5 Quality Conformance Inspection

4.5.1 Quality Conformance Inspection (Group A)

Group A inspections shall be performed at the time of production for all products.

4.5.1.1 Sample

Selection of test samples for group A inspections lots shall be defined as a part of the manufacturing conditions in the quality assurance program.

4.5.1.2 Inspection Items and Sample Size

Inspection items, inspection order and samples size in group A inspection shall be as specified in each appendix.

4.5.1.3 Determination of Pass or Fail

A failure of any inspection specified in group A inspection shall constitute failure of the quality conformance inspection. If the failure mode of the defects is catastrophic such as an open- or short-circuiting where the function of the connectors might be lost, the connectors fail group A of quality conformance inspection.

4.5.1.4 Disposition after Inspection

The lots rejected in group A inspection shall not be delivered.
Details shall be specified in each appendix.

4.5.2 Quality Conformance Inspection (Group B and Group C)

Groups B and C inspections shall be performed in compliance with the following schedule.

a) Group B inspection shall be performed on the first lot manufactured within the certification period.
b) When retention of certification is granted, group C inspection shall be performed prior to the restart of production when no products were manufactured within the previous certification period and no quality conformance inspection was performed.

4.5.2.1 Sample

Inspection lots for groups B and C inspections shall consist of samples that have passed Group A inspections.

4.5.2.2 Inspection Items and Sample Size
Inspection items, inspection order and the sample size of group B or C inspection shall be as specified in each appendix.

4.5.2.3 Determination of Pass or Fail
A failure of any inspection specified in the group B or C inspection shall constitute failure of the quality conformance inspection of each group. If the failure mode of the defects is catastrophic such as an open- or short-circuiting where the function of the connectors might be lost, the capacitor fails group B or C inspection.

4.5.2.4 Disposition after Inspection
The samples used for group C inspection shall not be delivered. If the samples fail in group B or C inspection, the manufacturer shall conduct a failure analysis on the defects and take corrective action. Delivery of the products shall be suspended until JAXA approves the corrective actions.

4.6 Method for Test or Inspection
Procedures for tests or inspections shall be as specified in each appendix.

4.6.1 Materials
Test method for materials shall be as specified in each appendix.

4.6.2 Externals, Dimension, Mass, and Marking
Test methods for externals, dimensions, mass, and marking of the connectors shall be as specified in each appendix.

4.6.3 Workmanship
Test methods regarding workmanship of the connectors shall be as specified in each appendix.

4.6.4 Electrical Performance
Test methods regarding the electrical performance of the connectors shall be as specified in each appendix.

4.6.5 Mechanical Performance
Test methods regarding the mechanical performance of the connectors shall be as specified in each appendix.

4.6.6 Environmental Performance
Test methods regarding the environmental performance of the connectors shall be as specified in each appendix.

4.6.7 Durability Performance
Test methods regarding the durability performance of the connectors shall be as specified in each appendix.

4.7 Long-Term Storage

4.7.1 Disposition of Lots Stored for a Long-Term at the Manufacturer’s Site
When connectors have been stored at the manufacturer’s site for 24 months or longer after group A inspection of quality conformance inspection, the manufacturer shall perform 100% inspection for all test items of group A inspection other than dimensions

and mass prior to delivery. Only the connectors which have passed the inspections can be shipped as products.
See paragraph 4.3.4.1 of JAXA-QTS-2000 for other details.

4.7.2 Storage by Purchasers
Instructions for storage by purchasers shall be as follows.
The storage condition and storage time limit shall be specified in the detail specification, if required.

a) Connectors shall be stored at normal temperature and humidity.
b) Package bags shall be opened immediately before use. In the case of opened package, the package bag shall be hermetically heat sealed to store.
c) When storing unmated connectors, dust caps shall be attached.
d) Avoid subjecting to direct sunlight or placing directly on the floor.
e) Do not drop connectors during carriage.

4.8 Change or Optimization of Tests and Inspections
Any change in the in-process inspection and quality conformance inspection specified in this specification shall be made in accordance with paragraphs 4.3.5 and 6 of JAXA-QTS-2000.

5. PREPARATION FOR DELIVERY
Preparation for delivery shall be as follows and as specified in paragraph 5 of JAXA-QTS-2000.

5.1 Packaging
The capacitors shall be appropriately packaged as follows not to adversely affect the products during handling or shipment. The package specifications shall be included in the quality assurance program.

a) A dust cap shall be attached to the mating area of connector. Contacts shall be placed in a case which will prevent damage during storage or carriage. Each product shall be placed in a transparent polyethylene bag and heat sealed.
b) Sealed packaged connectors shall be packaged with a tag indicating product name, required marking items and notes (example: Care shall be taken when handling as the product has been cleaned for space use.).

5.2 Marking on Package
Each shipping package shall have the following markings.

a) Part name
b) Part number
c) Applicable specification number
d) Lot identification code
e) Purchaser’s name
f) Manufacturer’s name
g) Quantity of packages
h) Date of inspection
i) Inspection result

6. NOTES

6.1 Notes for Manufacturer

6.1.1 Preparation and Registration of Application Data Sheet

The manufacturer shall prepare the Application Data Sheet in accordance with appendix G of JAXA-QTS-2000 and register it with JAXA.

6.2 Notes for Purchaser

Purchaser shall not open the sealed package until immediately before using the connectors purchased in accordance with this specification. Refer to the Application Data Sheet for the detailed data of the products and notes.

6.2.1 Items to be Specified for Procurement

To purchase connectors manufactured in compliance with this specification, the purchaser shall provide the following information.

a) Part number
b) This specification number.
c) Detail specification number.
d) Indication of test data or source inspection results to be submitted for delivery
e) Others

For item e), requirements other than those defined in this specification may be specified for special applications. However, if the requirements conflict with the existing requirements in this specification, the purchaser shall not request that the manufacturer indicate that the capacitors comply with this specification.

6.3 Terms and Definitions

The following terms are defined in this specification.

6.3.1 Common to All Connector Types

a) Insert
A part that holds the contacts in their proper positions and electrically insulates contacts from each other and from the shell.

b) Contact
A part that provides electrical connection when connectors are coupled. Contacts are constructed so that applicable wire can be terminated.

c) Contact retention clip
A part placed in a pre-defined position of the insert to hold the contacts.

d) Sealing plug
A plug that fills an unused contact hole at the wire end of resilient insulating material.

e) Shell
An outer case that securely houses and protects inserts. The shell has provisions for alignment required for mating with its counterpart connector for mounting to a panel.

f) Sleeve
A tubular covering placed over a socket mating end which holds the contact spring in the correct position within the socket contact.

g) Probe damage
Damage of a socket contact caused by screwing a pin contact into the socket contact.

h) Wire barrel
A portion of a contact termination end which accommodates a conductor of applicable gauge wire.

6.3.2 Specific to Circular Connectors

a) Polarization
The physical structure that determines the mating position of connectors and avoids erroneous mating by changing the key position.

b) Coupling pin
A pin that is fixed to the outer perimeter of the receptacle and mates with a coupling nut of the plug to insert and lock, or unmate connectors.

c) Spring finger
Springs installed around the shell periphery to improve electrical contact between the mated shells.

d) Plug
A connector with a terminal, attached to one end of a wire or cable. The side with needle-shaped contacts, usually the male side. Can be coupled with a receptacle.

e) Receptacle
A connector on the side that has an opening and is attached to a device or panel. The side with a lattice-shaped contact insertion opening, generally the female side. Can be coupled with a plug.

6.3.3 Specific to Miniature Rectangular Connectors, and High Density Miniature Rectangular Connectors

a) Oversize pin
A pin which has a diameter larger than the specified size for the pin contact.

b) Mated Screw lock
A metal part that keeps mated connectors together using screws or springs under conditions where shock or vibration is applied.

c) Closed entry
A design feature provided at a socket mating end or socket contact cavity to prevent possible damage to the socket contact spring due to insertion of an oversize pin contact, or application of excessive force.

d) Maintenance aging
A test that determines if crimp contacts can withstand repetitions of inserting into and removing from an insert.

6.3.4 Specific to Accessories for Miniature Rectangular Connectors and High Density Miniature Rectangular Connectors

a) Screw lock
A metal part that keeps mated connectors together using screws or springs under conditions where shock or vibration is applied.

APPENDIX B

CONNECTORS, CIRCULAR

This document is the English version of JAXA QTS/ADS which was originally written and authorized in Japanese and carefully translated into English for international users. If any question arises as to the context or detailed description, it is strongly recommended to verify against the latest official Japanese version.

The release date of the English version of this specification: 25 March 2026

APPENDIX B

CONNECTORS, CIRCULAR

B.1 General

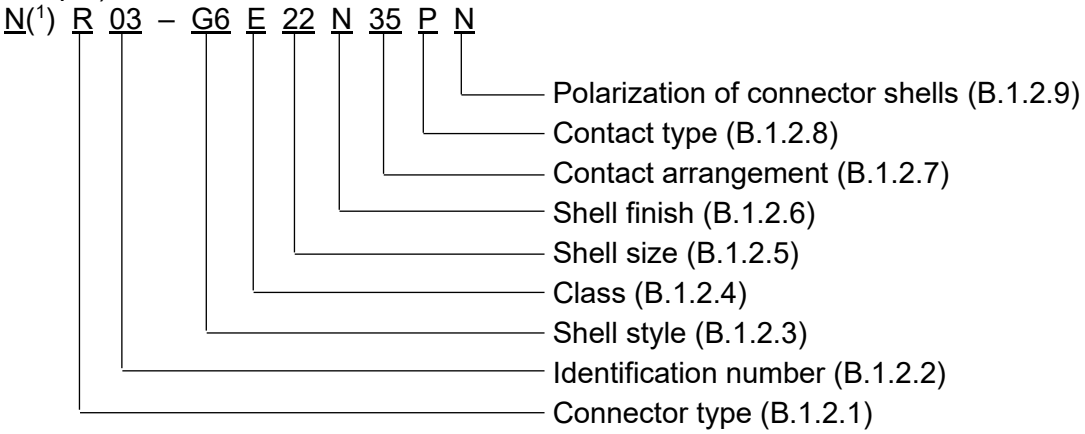
B.1.1 Scope

This appendix establishes the general requirements and quality assurance provisions for the circular connectors (hereinafter referred to as "connectors").

B.1.2 Part Number

The part number identifies the connector type, identification number, shell style, class, shell size, shell finish, contact arrangement, contact type, and polarization of connector shells, as given below. The details shall be as specified in the detail specification.

(Example)



Note: (1) "N" indicates the part is for space use and may be abbreviated “N”.

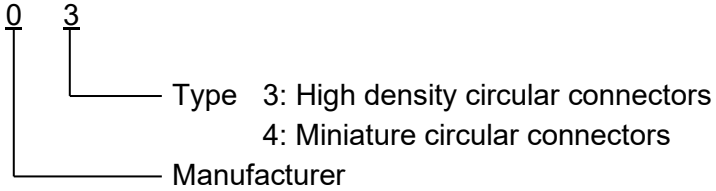
B.1.2.1 Connector Type

The connector type is identified by a single capital letter “R”, indicating a round (circular) connector.

B.1.2.2 Identification Number

The identification number is identified by a two-digit number and indicated as follows.

(Example)



B.1.2.3 Shell Style

The shell style is identified by a single-digit number, or by a single capital letter followed by a single-digit number in accordance with Tables B-1 and B-2.

Table B-1. Shell Style of High Density, Miniature Circular Connectors

Symbol	Shell style
3	Back panel mounting flange receptacle
6	Straight plug
G6	Grounding straight plug
7	Jam-nut receptacle

Table B-2. Shell Style of Miniature Circular Connectors

Symbol	Shell style
0	Mounting flange receptacle
4	Jam-nut receptacle
6	Straight plug

B.1.2.4 Class

The class is identified by a single capital letter as shown in Table B-3.

Table B-3. Class

Type	Symbol	Class
High density miniature circular connectors	E	With rear accessories of environment resisting (without strain relief)
	T	Without rear accessories of environment resisting
Miniature circular connectors	F	With rear accessories of environment resisting (with strain relief)
	T	Without rear accessories of environment resisting

B.1.2.5 Shell Size

The shell size is identified by a one- or two-digit number as shown in Table B-4.

Table B-4. Shell Size

Type	Shell Size
High density miniature circular connectors	8, 10, 12, 14, 16, 18, 20, 22, 24
Miniature circular connectors	10, 12, 14, 16, 18, 20, 22, 24

B.1.2.6 Shell Finish

The shell finish is identified by a single capital letter. ”N” denotes electroless nickel plating (-65°C to +200°C).

B.1.2.7 Contact Arrangement

The contact arrangement is identified by a two-digit number denoting contact size, the number of contacts, and dielectric withstanding voltage standard (see Supplementary Figure B-1). Details shall be as specified in MIL-STD-1560 for high density miniature circular connectors and MIL-STD-1669 for miniature circular connectors.

B.1.2.8 Contact Type

The contact type is identified by a single capital letter. “P” indicates a pin (male) contact and “S” indicates a socket (female) contact.

B.1.2.9 Polarization of Connector Shells

The polarization of connector shells is identified by a single capital letter. “N” denotes the normal position and other letters denote alternate positions. See Supplementary Figures B-2 and B-3 for details.

B.2 Applicable Documents

Applicable documents in this appendix shall be as specified in paragraph 2.1.

B.3 Requirements

B.3.1 Certification

B.3.1.1 Qualification Coverage

The qualification coverage shall be limited to connectors that are produced by the manufacturing line that conforms to materials, designs, constructions, ratings, and performance specified in paragraphs B.3.2 to B.3.8. The qualification coverage shall be fully represented by samples that have passed the qualification test. Within this coverage, the manufacturer is allowed to supply qualified products in accordance with the detail specification.
If necessary, additional definitions of qualification coverage shall be specified in the detail specification.

B.3.2 Materials

The material shall be as specified in the following paragraphs and in paragraph 3.3.

B.3.2.1 Dissimilar Metals

When dissimilar metals are used in direct contact and produce an electric potential difference, protection against galvanic corrosion shall be provided in accordance with Guideline 16 of MIL-HDBK-454.

B.3.2.2 Nonmagnetic Materials

When tested as specified in paragraph B.4.3.2.1, magnetic permeability of all materials and surface treatments used for connectors shall be 2.0 or less.

B.3.2.3 Contact Materials

Contact shall be made of suitably conductive copper based alloys. Sleeves, if required on socket contacts, shall be made of corrosion-resistant steels.

B.3.2.4 Insulation Materials

B.3.2.4.1 Rigid Dielectric Materials

Rigid dielectric materials shall be mechanically and electrically high-grade reinforced epoxy resins or equivalents.

B.3.2.4.2 Resilient Dielectric Materials

Resilient dielectric materials shall be environmental preferable silicones or equivalents.

B.3.2.5 Contact Retention Clips

Contact retention clips shall be made of mechanically high-grade copper-beryllium alloys or equivalents.

B.3.2.6 Hardware

Hardware such as shells and barrels shall be made of mechanically high-quality aluminum alloys or corrosion resistant steels.

B.3.2.7 Coupling Pins

Coupling pins shall be made of environmentally preferable and mechanically high-quality corrosion resistant steels.

B.3.2.8 Spring Fingers

Spring fingers shall be made of mechanically and electrically high-grade beryllium copper alloys or corrosion-resistant steels.

B.3.2.9 Filler Compounds

Filler compound shall be made of environmentally preferable RTV silicones or equivalents. This provision shall apply to the high density miniature circular connectors exclusively.

B.3.2.10 Surface Finish

B.3.2.10.1 Contacts

Contacts shall be hard-gold plated to a thickness of 1.27μm as a minimum in accordance with ASTM B488 or SAE-AMS 2422, over a soft-gold underplate whose thickness shall be1.27μm as a minimum per ASTM B488 or SAE-AMS 2422. Unless otherwise specified, copper flash may be applied over base material. Contact sleeves shall be passivated. Applicable plating standards shall be specified in the detail specification.

B.3.2.10.2 Hardware

a) Aluminum alloys
Aluminum alloys shall be electrically conductive, electroless nickel plated in accordance with ASTM B 733 or SAE-AMS-C-26074. Unless otherwise

specified, chrome plating may be provided over a suitable underplate and nickel plating. Applicable plating standards shall be specified in the detail specification.

b) Corrosion resistant steel shell
Passivation treatment shall be provided to meet the requirements of this appendix.

B.3.3 Externals, Physical Dimensions and Marking

B.3.3.1 General

Connectors and accessories shall have externals, constructions, physical dimensions, mass, and workmanship to withstand normal handling. See Supplementary Figures B-4 and B-5 for details. Recommended panel cutout dimensions are shown in Supplementary Figure B-11.

B.3.3.2 Contacts

Contacts shall be designed to be crimped to applicable wires, and shall have the physical dimensions shown in Supplementary Figures B-6 and B-7. Unless otherwise specified, extra contact(s) shall be attached to connector unit packages, one for 26 or less contact arrangements unit, and two for 27 or more contact arrangements unit.

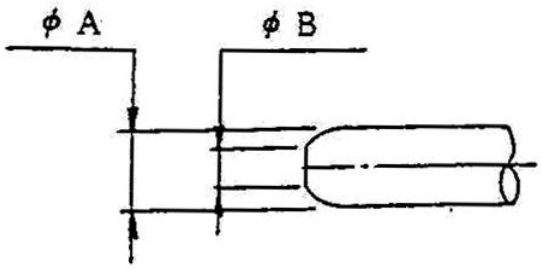
B.3.3.2.1 Pin Engagement End

The mating end of pin contacts engagement shall be formed with a spherical shape that is approximately half the pin diameter. The flat diameter on the engaging end of the pin contacts shall be as specified in Table B-5.

Table B-5. Pin Dimensions at Mating End

Unit: mm

Contact Size	Engagement end diameter (ΦA)	Engagement tip, flat diameter (ΦB)
22D	0.762±0.012	0.381 maximum
20	1.016±0.025	0.508 maximum
16	1.588±0.025	0.813 maximum
12	2.388±0.025	1.575 maximum



B.3.3.2.2 Socket Mating End

The mating end of socket contacts shall be rounded or chamfered to direct and center pin contact. Socket contacts shall have mechanical pressure members to maintain contact pressures between mated pins and sockets. Socket contacts shall have a closed entry design to exclude mating of pins whose diameters exceed the maximum allowable pin diameter by 0.127mm or larger.

B.3.3.2.3 Roughness of Surface

The surface shall be smooth without any tool mark.

B.3.3.2.4 Wire Barrel Sizes

Wire barrel sizes and wire sizes shall be as shown in Table B-6.

Table B-6. Wire Barrel Size

Contact Size	Wire Gauge (AWG)
22D	28, 26, 24, 22
20	24, 22, 20
16	20, 18, 16
12	14, 12

B.3.3.2.5 Contact Arrangement

Contact arrangement shall be as specified in Supplementary Figure B-1, or equivalent.

B.3.3.2.6 Insertion and Removal Tools

The individual pin contacts and socket contacts shall be installed and removed with the insertion and removal tools in accordance with SAE-AS81969/8 or SAE-AS81969/14.

B.3.3.3 Inserts

A rigid dielectric and a resilient dielectric with wire sealing and wire supporting elements shall be bonded together to form an integral part which shall sufficiently seal and support around the wires.
The contact retention clip shall be contained in the rigid dielectric insert and provide the required contact retention.
The construction shall enable contact insertion and removal using insertion/removal tools which are specified in the detail specification, SAE-AS81969/8 or SAE-AS81969/14.
The front face of pin inserts shall be made from a resilient dielectric material and shall have sealing projections. The front face of socket inserts shall be made of rigid dielectric materials and shall have a construction to accept the sealing projections of pin inserts. Details shall be as specified in Supplementary Figure B-8 (a) and (b).

B.3.3.4 Sealing

B.3.3.4.1 Wire Sealing

Connectors shall be designed to meet the wire sealing requirements of this appendix for any combination of wires specified in Table B-7.

Table B-7. Wire Sizes and Diameters

Unit: mm

Connector type	Contact size	Wire size (AWG)	External diameter of finished wire	
			Minimum	Maximum
High density miniature circular	22D	28, 26, 24, 22	0.76	1.37
Miniature circular	20	24, 22, 20	1.02	2.11
	16	20, 18, 16	1.35	2.62
	12	14, 12	2.46	4.01

B.3.3.4.2 Grommet Sealing Plugs

Grommets shall be designed to accept sealing plugs specified in MS27488 in lieu of wires where contacts are not wired. Unless otherwise specified, the quantity of sealing plugs to be enclosed in the unit package shall be equal to 10 percent of the number of contacts, or one if the 10 percent is less than one.

B.3.3.4.3 Insertion Seal

Connectors shall be constructed to seal in mating between each contact and between the contact and the shell. The interfacial sealing between plugs and receptacles shall be provided by a resilient front seal attached to the receptacles.

B.3.3.5 Shell

Shells shall have a one-piece construction that enables to retain inserts in intended positions.
Adhesive may be used to retain inserts.
A blue color band shall be marked in a readily visible location to indicate that the connector is of a rear release type.

B.3.3.5.1 Spring Fingers

Spring fingers shall be designed to make electrical contact with the mating shell without interfering with proper engagement. The spring fingers shall be retained around the shell periphery. This provision shall exclusively apply to high density miniature circular connectors.

B.3.3.6 Coupling

Connectors shall be coupled to counterpart connectors by means of a bayonet mechanism. The mechanism shall include a means of maintaining the coupled connector in full engagement.
The coupling nuts shall be knurled or fluted to facilitate coupling and uncoupling and shall be identified with a blue color band in a readily visible location to indicate that the connector is of a rear release type.
Coupling pins shall be caulked and their surfaces shall be colored with a contrasting color to the shell finish.

B.3.3.6.1 Ease of Coupling

Counterpart connectors of any arrangement shall be capable of being fully coupled and uncoupled by hand without using any tool.

B.3.3.6.2 Locking

A detent shall be provided in the coupling mechanism so that an audible click is evident when proper coupling is accomplished.
Proper coupling shall be also visually verifiable.

B.3.3.6.3 Polarization of Connector Shells

Polarization of connector shells shall be accomplished by means of integral keys and suitable matching keyways on the counterpart.
Polarization shall be accomplished before the initial engagement of the coupling ring. Pins shall not touch sockets or the insert face until the keys start moving in the axial direction.

B.3.3.6.3.1 Alternate keing /rotation shells

High density miniature circular connectors shall have a construction capable to change polarization positions by rotating the keys (or keyways) from the normal position (N) as shown in Supplementary Figure B-2.
Miniature circular connectors shall be capable to change polarization positions as shown in Supplementary Figure B-3.

B.3.3.6.4 Interchangeability

All connectors and contacts having the same part number shall be completely interchangeable with each other with respect to physical layout and mechanical performance.

B.3.3.6.5 Cavity Fill

Any cavity between the insert and the shell or the barrel at the rear side of the connector shall be filled with RTV silicone or an equivalent. This provision shall exclusively apply to high density miniature circular connectors.

B.3.3.7 Marking

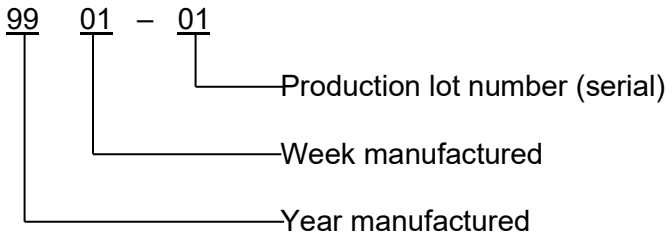
B.3.3.7.1 Connectors and Accessories

The following items shall be marked on the locations shown in Supplementary Figure B-4 for high-density miniature circular connectors and their accessories,

and Supplementary Figure B-5 for miniature circular connectors and their accessories.
The marking shall remain legible after completion of any test or inspection specified in this appendix.

a) Manufacturer's name and its trademark
b) Part number (paragraph B.1.2)
c) Identification code (production year and week and production lot number) (paragraph B.3.3.8)

(Example)



B.3.3.7.2 Contact Location Identification

Contact locations shall be indicated as shown in Supplementary Figure B-1.
All positions shall be marked on the front and rear faces of the insert if space is available. The contact location number shall be marked as closely to the holes as possible.

B.3.3.7.3 Contact Designations

Trademark and Basic Identification Number (BIN) code color bands shall be visibly marked on contacts as follows. The marking shall remain legible after completion of any tests and inspections specified in this appendix.
If the marking in crimped area is peeled off and still remains legible, the marking shall not be rejected.

a) Trademark
The manufacturer's trademark shall be marked on the location specified in Figure B-1 or on the shoulder of wire barrel.
b) BIN code color band
The BIN code color band shall be marked on the wire barrel end as shown in Figure B-1, Supplementary Figure B-6 for high density miniature circular connectors, and Supplementary Figure B-7 for miniature circular connectors.

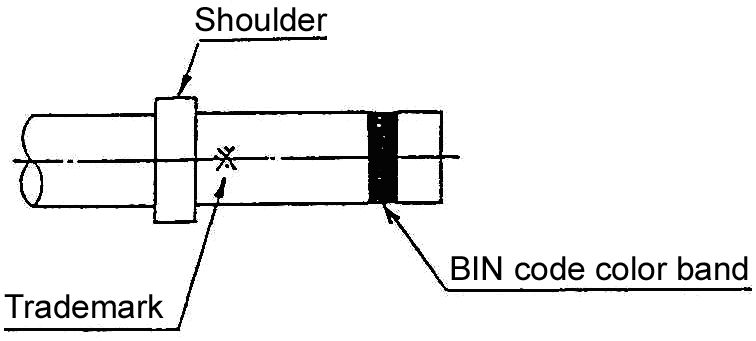


Figure B-1. Contact Marking

B.3.3.8 Traceability

The connectors shall be marked with an identification code (year and week manufactured and lot number) in accordance with paragraph B.3.3.7.1.
The identification code shall be used to trace the complete manufacturing process up to the final assembly even after the connectors are installed in electronic equipment including inventories.
Manufacturer shall retain identification code records for at least 8 years.

B.3.3.9 Workmanship

Connectors shall be manufactured and processed based on a good design in a manner to maintain uniform quality as specified in the quality assurance program defined in paragraph 3.2. In addition, connectors shall be free of crazing, holes, chips, sharp cutting edges, burrs, or other defects that will degrade electrical, mechanical, or physical performance that will adversely affect life and serviceability, and have no sharp cutting edges, burrs or other defects that will degrade electrical, mechanical, or physical performance.

B.3.4 Plating

B.3.4.1 Plating Porosity

When tested as specified in paragraph B.4.3.4.1, connectors of gold-finished contacts shall exhibit no bubbling during 30-second observation period.

B.3.4.2 Plating Thickness

When contact bodies are tested as specified in paragraph B.4.3.4.2, the minimum thickness of hard-gold plating and soft-gold underplate shall be 1.27μm each (2.54μm in total), except for corners.

B.3.5 Electrical Performance

Connectors shall meet the following requirements.

B.3.5.1 Dielectric Withstanding Voltage

When tested as specified in paragraphs B.4.3.5.1.1 and B.4.3.5.1.2, connectors shall exhibit no evidence of electrical shorting or electrical breakdown.

B.3.5.2 Insulation Resistance

B.3.5.2.1 At Ambient Temperature

When tested as specified in paragraph B.4.3.5.2.1, insulation resistance between contacts, and between any contact and the shell shall be 5,000MΩ or greater.
Insulation resistance after altitude immersion shall be 1,000 MΩ or greater.
Insulation resistance after humidity shall be 100 MΩ or greater.

B.3.5.2.2 At Elevated Temperature

When tested as specified in paragraph B.4.3.5.2.2, insulation resistance between contacts, and between any contact and the shell shall meet the following requirements.

a) High density miniature circular connectors: 1,000MΩ or greater
b) Miniature circular connectors: 500MΩ or greater

B.3.5.3 Shell-to-Shell Conductivity

When tested as specified in paragraph B.4.3.5.3, the maximum measured potential drop across assemblies shall be the following requirements.

a) High density miniature circular connectors with spring fingers: 2.5mV or less
b) High density miniature circular connectors without spring fingers and miniature circular connectors: 200mV or less

B.3.5.4 EMI Shielding

When tested as specified in paragraph B.4.3.5.4, EMI shielding capabilities of mated connectors with spring fingers shall meet the values specified in Table B-8. This provision shall apply to the high density miniature circular connectors exclusively.

Table B-8. EMI Shielding Effectiveness

Frequency (MHz)	Leakage attenuation (dB) minimum
100	65
200	60
300	55
400	55
800	45
1,000	45

B.3.5.5 Contact Resistance

When tested as specified in B.4.3.5.6, contacts in the inserted condition shall meet the contact resistance requirements of Table B-9.

Table B-9. Contact Resistance (Voltage Drop Measurement)

Unit: mV

Contact size	Wire size (AWG)	Test current (A)	Silver-finish wire		Nickel-finish wire	
			Initial	After test	Initial	After test
			Maximum	Maximum	Maximum	Maximum
22D	28	1.5	54	65	81	98
	26	2.0	53	64	80	96
	24	3.0	45	54	68	81
	22	5.0	73	88	110	132
20	24	3.0	45	54	68	81
	20	7.5	55	66	83	99
16	20	7.5	46	56	69	84
	16	13	49	59	74	89
12	14	17	40	48	60	72
	12	23	42	51	63	77

B.3.5.6 Low-Signal Level Contact Resistance

When tested as specified in paragraph B.4.3.5.5, low-signal level contact resistance for inserted contacts shall meet the requirements specified in Table B-10.

Table B-10. Low-Signal Level Contact Resistance

Unit: mΩ

Contact size	Wire size (AWG)	Initial (maximum)	After test (maximum)
22D	28	50	60
	26	34	38
	24	20	23
	22	15	17
20	24	20	23
	20	9	11
16	20	9	10
	16	5	6

B.3.6 Mechanical Performance

Connectors shall meet the following requirements.

B.3.6.1 Contact Insertion and Removal Force

When tested as specified in paragraph B.4.3.6.1, contact insertion and removal forces shall meet the requirements specified in Table B-11.

Table B-11. Contact Insertion and Removal Forces

Unit: N {kgf}

Contact Size	Insertion force (maximum)	Removal force (maximum)
22D	66.7 {6.8}	44.1 {4.5}
20		
16		
12		

B.3.6.2 Gauge Retention

When tested as specified in paragraph B.4.3.6.2, the test gauges conforming to Supplementary Figures B-12 and B-13 shall be retained in the contact cavities, and the axial displacement of the test gauges shall not exceed the following limit while the test gauges are loaded.

a) High density miniature circular connectors: 0.30mm
b) Miniature circular connectors: 0.38mm

B.3.6.3 Contact Retention

When tested as specified in paragraph B.4.3.6.3, axial displacement of contacts shall not exceed the following limit. The contacts or inserts shall not be damaged.

a) High density miniature circular connectors: 0.30mm
b) Miniature circular connectors: 0.38mm

B.3.6.4 Mating and Unmating force

When tested as specified in paragraph B.4.3.6.4, mating force and the unmating force of counterpart plugs and receptacles mating of connectors shall meet the requirements specified in Table B-12 for high density miniature circular connectors, or Table B-13 for miniature circular connectors.

Table B-12. Mating and Unmating Force (High Density Miniature Circular Connectors)

Unit: N·cm {kgf·cm}

Shell size		8	10	12	14	16	18	20	22	24
Mating and Unmating Force	Maximum	90.2 {9.2}	135.3 {13.8}	180.4 {18.4}	225.6 {23.0}	270.7 {27.6}	315.8 {32.2}	360.9 {36.8}	406.0 {41.4}	406.0 {41.4}
Unmating Force	Minimum	10.8 {1.1}	10.8 {1.1}	22.6 {2.3}	45.1 {4.6}	45.1 {4.6}	55.9 {5.7}	67.7 {6.9}	78.5 {8.0}	78.5 {8.0}

Table B-13. Mating and Unmating Force (Miniature, Circular Connectors)

Unit: N·cm {kgf·cm}

Shell size		10	12	14	16	18	20	22	24
Mating and Unmating Force	Maximum	135.3 {13.8}	180.4 {18.4}	225.6 {23.0}	270.7 {27.6}	315.8 {32.2}	360.9 {36.8}	406.0 {41.4}	496.2 {50.6}
Unmating Force	Minimum	10.8 {1.1}	22.6 {2.3}	45.1 {4.6}	45.1 {4.6}	55.9 {5.7}	67.7 {6.9}	78.5 {8.0}	78.5 {8.0}

B.3.6.5 Durability

When tested as specified in paragraph B.4.3.6.5, connectors shall exhibit no defects detrimental to the usage.

B.3.6.6 Accessory Thread Strength

When tested as specified in paragraph B.4.3.6.6, the accessory threads and portion of the connector that accepts cable clamps and end bells shall be capable of withstanding the torque listed in Table B-14.

Table B-14. Accessory Thread Strength

Unit: N·cm {kgf·cm}

Shell size	8	10	12	14	16	18	20	22	24
Accessory thread torque	563.9±56.9 {57.5±5.8}						1127.8±112.8 {115±11.5}		

B.3.6.7 External Bending Moment

When tested as specified in paragraph B.4.3.6.7, connectors shall exhibit no evidence of defects detrimental to mate and no interruption of electrical continuity in excess of 1μs.

B.3.6.8 Coupling Pin Strength

When tested as specified in paragraph B.4.3.6.8, coupling pins shall withstand a load of $222.6^{+22.6}_{0}$N {$22.7^{+2.3}_{0}$kgf} without displacement or loosening of coupling pins.

B.3.6.9 Pin Contact Stability

When tested as specified in paragraph B.4.3.6.9, the total displacement (amount of slant) of a reference point on the contact tip end shall not exceed the value shown in Table B-15.

Table B-15. Pin Contact Stability

Contact size	Total displacement (mm) (maximum)	Force (N {kgf})
22D	0.76	1.245 {0.127}
22	0.97	13.34 {1.36}
16	1.32	
12	1.57	

B.3.6.10 Contact Walkout

When tested as specified in paragraph B.4.3.6.10, contacts shall not become dislodged from their normal position.

B.3.6.11 Insertion and Removal Tool Abuse

When tested as specified in paragraph B.4.3.6.11, there shall be no evidence of damages to contacts, contact inserts or contact retaining mechanisms.

B.3.6.12 Insert Retention

When tested as specified in paragraph B.4.3.6.12, inserts shall be retained in proper locations in shells. There shall be no evidence of cracks, breakages, separations from the shell, or loosening of parts.

B.3.6.13 Shell Spring Finger Forces

When tested as specified in paragraph B.4.3.6.13, forces necessary to engage and separate plugs with spring fingers and receptacle shall be within the values specified in Table B-16. This provision shall apply to the high density miniature circular connectors exclusively.

Table B-16. Shell Spring Finger Forces

Unit: N {kgf}

Shell size	8	10	12	14	16	18	20	22	24
Maximum	111.2 {11.34}		133.5 {13.61}		155.7 {15.88}				
Minimum	2.3 {0.23}								

B.3.6.14 Contact Axial Concentricity

When tested as specified in paragraph B.4.3.6.14, contact axial concentricity shall be as specified in paragraphs B.3.6.14.1 and B.3.6.14.2.

B.3.6.14.1 Unwired Contacts

The total indicator reading (T.I.R. (1)) shall be 0.13mm or less for sizes 22D and 22, and 0.15mm or less for sizes 16 and 12.
Note: (1) T.I.R.: Total Indicator Reading

B.3.6.14.2 Wired Contacts

The total indicator reading (T.I.R. (1)) shall be 0.28mm or less for sizes 22D and 22, and 0.31mm or less for sizes 16 and 12.
Note: (1) T.I.R.: Total Indicator Reading

B.3.6.15 Contact Engagement and Separation Forces

When tested as specified in paragraph B.4.3.6.15, contact engagement and separation forces shall meet the requirements specified in Table B-17.

Table B-17. Contact Engagement and Separation Forces

Unit: mN {gf}

Contact size	Initial		After test	
	SAE-AS31971 test pin		SAE-AS31971 test pin	
	Minimum diameter	Maximum diameter	Minimum diameter	Maximum diameter
	Minimum separation force	Maximum engagement force	Minimum separation force	Maximum engagement force
22D	194.2 {19.8}	3336.2 {340.2}	166.7 {17.0}	3892.3 {396.9}
20	194.2 {19.8}	5004.3 {510.3}	166.7 {17.0}	6116.4 {623.7}
16	556.0 {56.7}	8340.6 {850.5}	416.8 {42.5}	10008.7 {1020.6}
12	833.6 {85.0}	8340.6 {850.5}	695.3 {70.9}	10008.7 {1020.6}

B.3.6.16 Probe Damage

When tested as specified in paragraph B.4.3.6.17, socket contacts shall withstand the bending moment at a depth of test probe insertion. There shall be no evidence of defects that will adversary affect the mechanical or electrical performance.

B.3.6.17 Crimp Tensile Strength

When tested as specified in paragraph B.4.3.6.16, crimp tensile strength shall meet the requirements specified in Table B-18.

Table B-18. Crimp Tensile Strength

Unit: N {kgf}

Contact size	AWG wire size (AWG)	Tensile strength (minimum)	
		Silver-finish wire	Nickel-finish wire
22D	28	13.8 {1.41}	8.92 {0.91}
	26	23.1 {2.36}	13.34 {1.36}
	24	36 {3.67}	26.67 {2.72}
	22	57 {5.81}	35.60 {3.63}
20	24	36 {3.67}	26.67 {2.72}
	20	92 {9.38}	84.53 {8.62}
16	20	92 {9.38}	84.53 {8.62}
	16	222.41 {22.68}	164.56 {16.78}
12	14	311.36 {31.75}	266.94 {27.22}
	12	489.35 {49.90}	444.83 {45.36}

B.3.7 Environmental Performance

Connectors shall meet the following requirements.

B.3.7.1 Random Vibration

When tested as specified in paragraph B.4.3.7.1, there shall be no electrical discontinuity in excess of 1μs, disengagement of the mated connectors, crack, breakage, or loosening of parts.

B.3.7.2 Shock

When tested as specified in paragraph B.4.3.7.2, there shall be no electrical discontinuity in excess of 1μs, disengagement of the mated connectors, crack, breakage, or loosening of parts.

B.3.7.3 Industrial Gas

When tested as specified in paragraph B.4.3.7.3, uninserted contacts shall withstand exposure to industrial gases for 100 hours without any damage detrimental to the mechanical or electrical performance.

B.3.7.4 Ozone Exposure

When tested as specified in paragraph B.4.3.7.4, the connectors shall exhibit no evidence of cracks, breakages, or separations of dielectric material that will adversely affect connector performance.

B.3.7.5 Altitude-Low Temperature

When tested as specified in paragraph B.4.3.7.5, connectors shall meet the requirements of dielectric withstanding voltage specified in paragraph B.3.5.1 and insulation resistance specified in paragraph B.3.5.2. This provision shall apply to high density miniature circular connectors exclusively.

B.3.7.6 Temperature Cycling

When tested as specified in paragraph B.4.3.7.6, connectors shall exhibit no defects which will adversely affect connector performance. Also, there shall be no failure modes identified in FMAT of the Quality Assurance Program Plan.

B.3.7.7 Fluid Immersion

When tested as specified in paragraph B.4.3.7.7, connectors shall meet the requirements for mating and unmating force specified in paragraph B.3.6.4 and dielectric withstanding voltage specified in paragraph B.3.5.1.

B.3.7.8 Altitude Immersion

When tested as specified in paragraph B.4.3.7.8, mated connectors shall meet the requirements for dielectric withstanding voltage specified in paragraph B.3.5.1 and insulation resistance (1,000MΩ or greater) specified in paragraph B.3.5.2.

B.3.7.9 Humidity

When tested as specified in B.4.3.7.9, connectors shall exhibit no deterioration which will adversely affect connector performance. Connectors shall meet the requirements for dielectric withstanding voltage specified in paragraph B.3.5.1 and insulation resistance (100MΩ or greater) specified in paragraph B.3.5.2.

B.3.7.10 Salt Spray (Corrosion)

When tested in paragraph B.4.3.7.10, connectors shall not expose the base material due to corrosion which will adversely affect connector performance.

B.3.8 Durability

Connectors shall meet the following requirements.

B.3.8.1 High Temperature Exposure with Contact Loading

When tested as specified in paragraph B.4.3.8.1, contacts shall be maintained at the specified locations as shown in Supplementary Figure B-9. During the test, there shall be no electrical discontinuity in excess of 1μs. In addition, connectors shall meet the requirements for contact resistance specified in paragraph B.3.5.5.

B.4 Quality Assurance Provisions

B.4.1 Qualification Test

B.4.1.1 Samples

Qualification test samples shall meet the requirements for materials specified in paragraph B.3.2. Unless otherwise specified, connectors with the maximum number of contacts shall be selected.

B.4.1.1.1 Sample Size

The number of samples shall be as specified below.

a) Unless otherwise specified, connectors with the maximum number of minimum size contacts shall constitute a sample unit. However, JAXA shall assume the rights to select samples.
b) 22 mating plugs and receptacles shall be prepared. Contacts for these connectors shall also be provided.
c) 3 plugs without inserts and contacts and 3 counterpart receptacles without inserts and contacts shall be prepared.
d) 50 pin and socket contacts that are the same as those specified in item b) of paragraph B.4.1.1.1 shall be prepared.

B.4.1.1.2 Preparation of Samples

Wiring of contacts shall be accomplished using crimping tools conforming to MIL-DTL-22520, class I.

a) Samples specified in item b) of paragraph B.4.1.1.1 except two inserting pairs shall be wired with the wires specified in Table B-19. Wires shown in column A shall be used as a half of the samples, and B as the other half.

Table B-19. Test Wire (Part number based on SAE AS22759) (1) (2)

Contact size	A	B
22D	SAE AS22759/9-24, /10-24	M81381/7-26, /8-26, /9-26, /10-26
20	SAE AS22759/7,/ 8-20, /9, /10	M81381/7, /8-22, /9, /10, /11, /12-24, /13, /14
16	SAE AS22759/3, /4-16, /7, /8	M81381/7, /8-16, /11, /12
12	SAE AS22759/7-12, /8-12	M81381/7, /8-12, /11, /12

Notes:(1) The wires shall meet or exceed those specified in Table B-19.

(2) One of wires specified in Table B-19 shall be selected.

b) 40 contacts from those specified in item d) of paragraph B.4.1.1.1 shall be wired with wires shown in Table B-20. A half of the samples shall have wires of the maximum diameter and the other half shall have wires of the minimum diameter.

Table B-20. Test Wire Size (1)

Contact size	Maximum diameter (AWG)	Minimum diameter (AWG)
22D	22	28
20	20	24
16	16	20
12	12	14

Note: (1) The wires shall meet or exceed MIL-W-16878/4, MIL-W-16878/5, or the specifications of SAE AS22759/1 through SAE AS22759/12.

B.4.1.1.3 Sample Grouping

a) Samples provided under item b) of paragraph B.4.1.1.1 shall be divided into 2 groups of 4 pairs (sample groups 1 and 2), 1 group of 2 pairs (sample group 3), and 1 group of 12 pairs (sample group 4). Approximate equal numbers of contacts for plug and receptacle shall be wired with wires from column A wires and column B wires as shown in Table B-19. One inserting pair of contacts for the test group 3 shall be wired with stranded steel wires. The samples shall be subjected to the following tests.
   1) Sample group 1: Test group 1 of Table B-21.
   2) Sample group 2: Test group 2 of Table B-21.
   3) Sample group 3: Test group 3 of Table B-22.
   4) Sample group 4: Test group 5 of Table B-24.

b) Samples provided under item c) of paragraph B.4.1.1.1 shall be subjected to the test group 4 specified in Table B-23. For high density miniature circular connectors, receptacles without coupling pins and contacts shall be used as counterparts for measuring spring finger strength.

c) Samples provided under item d) of paragraph B.4.1.1.1 shall be divided into four groups. Each group shall consist of five wired contacts with the maximum diameter wires and five wired contacts with the minimum diameter wires. Each group shall be subjected to the following tests.
   1) One group shall be subjected to test group 6 in Table B-25.
   2) One group shall be subjected to test group 7 in Table B-25.
   3) One group shall be subjected to test group 8 in Table B-25.
   4) One group shall be subjected to test group 9 in Table B-25.

d) Samples provided under item d) of paragraph B.4.1.1.1 shall be divided into two groups. Each group shall consist of five unwired contacts. Each group shall be subjected to the following tests.
   1) One group shall be subjected to test group 10 in Table B-26.
   2) One group shall be subjected to test group 11 in Table B-26.

B.4.1.2 Test Items

Test items shall be as specified in Tables B-21 through B-26. Each test shall be performed in the order shown in Tables B-21 through B-26.

B.4.1.3 Determination of Pass or Fail

A failure of any test specified in Tables B-21 through B-26 shall constitute failure of the qualification test.

B.4.1.4 Desposition after Test

If failed to pass qualification test, the manufacturer shall take corrective action to assure quality of the materials, manufacturing processes and processing methods. Corrective action shall also be taken on other manufacturing lines of products using the same materials and processes that may have similar defects.
After the corrective action has been taken, qualification test in Tables B-21 through B-26 shall be repeated on additional sample units. In this case, JAXA shall have the rights to determine whether all test items or only failed test items shall be performed. The additional samples shall be submitted for the qualification tests after completion of group A of the quality conformance inspection shown in Table B-27.

Table B-21. Qualification Test and Quality Conformance Inspection (Group C) (Connectors)

Test item	Requirement paragraph	Test method paragraph	Test group (1)	
			1	2
Externals, physical dimensions and marking	B.3.3	B.4.3.3	×	×
Magnetic permeability	B.3.2.2	B.4.3.2.1	×	×
Contact insertion and removal forces	B.3.6.1	B.4.3.6.1	×	
Gauge retention	B.3.6.2	B.4.3.6.2		×
Contact retention	B.3.6.3	B.4.3.6.3	×	
Low-signal level contact resistance	B.3.5.6	B.4.3.5.5	×	
Contact resistance	B.3.5.5	B.4.3.5.6	×	×
Contact engagement and separation forces	B.3.6.15	B.4.3.6.15	×	
Mating and Unmating Force	B.3.6.4	B.4.3.6.4	×	×
Dielectric withstanding voltage (barometric pressure)	B.3.5.1	B.4.3.5.1.1	×	×
Dielectric withstanding voltage (reduced pressure)	B.3.5.1	B.4.3.5.1.2	×	
Insulation resistance	B.3.5.2.1	B.4.3.5.2.1	×	×
Altitude-low temperature	B.3.7.5	B.4.3.7.5		×(2)
Insulation resistance	B.3.5.2.1	B.4.3.5.2.1		×(2)
Dielectric withstanding voltage (barometric pressure)	B.3.5.1	B.4.3.5.1.1		×(2)
Temperature cycling	B.3.7.6	B.4.3.7.6	×	×
Altitude immersion	B.3.7.8	B.4.3.7.8	×	
Insulation resistance	B.3.5.2.1	B.4.3.5.2.1	×	
Dielectric withstanding voltage (barometric pressure)	B.3.5.1	B.4.3.5.1.1	×	
Humidity	B.3.7.9	B.4.3.7.9		×
Insulation resistance	B.3.5.2.1	B.4.3.5.2.1		×
Dielectric withstanding voltage (barometric pressure)	B.3.5.1	B.4.3.5.1.1		×
Contact resistance	B.3.5.5	B.4.3.5.6	×	×
Mating and Unmating force	B.3.6.4	B.4.3.6.4		×
Insulation resistance	B.3.5.2.2	B.4.3.5.2.2	×	
Shock	B.3.7.2	B.4.3.7.2		×
Random vibration	B.3.7.1	B.4.3.7.1		×
Durability	B.3.6.5	B.4.3.6.5		×
Accessory thread strength	B.3.6.6	B.4.3.6.6		×
Salt spray (corrosion)	B.3.7.10	B.4.3.7.10	×	×
Dielectric withstanding voltage (barometric pressure)	B.3.5.1	B.4.3.5.1.1	×	×
Insulation resistance	B.3.5.2.1	B.4.3.5.2.1	×	×

Table B-21. Qualification Test and Quality Conformance Inspection (Group C) (Connectors) (continued)

Test item	Requirement paragraph	Test method paragraph	Test group (1)	
			1	2
Low-signal level contact resistance	B.3.5.6	B.4.3.5.5	×	
Contact resistance	B.3.5.5	B.4.3.5.6	×	×
Mating and Unmating force	B.3.6.4	B.4.3.6.4	×	×
External bending moment	B.3.6.7	B.4.3.6.7	×	
Coupling pin strength	B.3.6.8	B.4.3.6.8		×
Externals, physical dimensions and marking	B.3.3	B.4.3.3	×	×

Notes:
(1) The tests identified with the symbol “x” shall be performed.
(2) Applicable to the high density miniature circular connectors.

Table B-22. Qualification Test and Quality Conformance Inspection (Group C) (Connectors)

Test item	Requirement paragraph	Test method paragraph	Test group
			3
Externals, physical dimensions and marking	B.3.3	B.4.3.3	×
Pin contact stability	B.3.6.9	B.4.3.6.9	×
Contact walkout	B.3.6.10	B.4.3.6.10	×
Installing/removal tool abuse	B.3.6.11	B.4.3.6.11	×
High temperature exposure with contact loading	B.3.8.1	B.4.3.8.1	×
Insert retention	B.3.6.12	B.4.3.6.12	×
Externals, physical dimensions and marking	B.3.3	B.4.3.3	×

Table B-23. Qualification Test and Quality Conformance Inspection (Group C) (Connectors)

Test item	Requirement paragraph	Test method paragraph	Test group
			4
Externals, physical dimensions and marking	B.3.3	B.4.3.3	×
Shell spring finger forces	B.3.6.13	B.4.3.6.13	× (1)
Shell-to-shell conductivity	B.3.5.3	B.4.3.5.3	×
EMI shielding	B.3.5.4	B.4.3.5.4	× (1)
Externals, physical dimensions and marking	B.3.3	B.4.3.3	×

Note: (1) Applicable to the high density miniature circular connectors.

Table B-24. Qualification Test and Quality Conformance Inspection (Group C) (Connectors)

Test item	Requirement paragraph	Test method paragraph	Test group
			5
Externals, physical dimensions and marking	B.3.3	B.4.3.3	×
Ozone exposure	B.3.7.4	B.4.3.7.4	×
Insulation resistance	B.3.5.2.1	B.4.3.5.2.1	×
Dielectric withstanding voltage (barometric pressure)	B.3.5.1	B.4.3.5.1.1	×
Fluid immersion	B.3.7.7	B.4.3.7.7	×
Mating and Unmating force	B.3.6.4	B.4.3.6.4	×
Dielectric withstanding voltage (barometric pressure)	B.3.5.1	B.4.3.5.1.1	×
Externals, physical dimensions and marking	B.3.3	B.4.3.3	×

Table B-25. Qualification Test and Quality Conformance Inspection (Group C) (Contacts)

Test item	Requirement paragraph	Test method paragraph	Test group (1)			
			6	7	8	9
Externals, physical dimensions and marking	B.3.3	B.4.3.3	×	×	×	×
Magnetic permeability	B.3.2.2	B.4.3.2.1	×			
Contact axial concentricity (unwired contacts)	B.3.6.14.1	B.4.3.6.14.1	×	×		
Contact axial concentricity (wired contacts)	B.3.6.14.2	B.4.3.6.14.2	×	×		
Contact resistance	B.3.5.5	B.4.3.5.6	×	×		
Contact engagement and separation forces	B.3.6.15	B.4.3.6.15	×			
Temperature cycling	B.3.7.6	B.4.3.7.6	×			
Contact engagement and separation forces	B.3.6.15	B.4.3.6.15	×			
Salt spray (corrosion)	B.3.7.10	B.4.3.7.10		×		
Probe damage	B.3.6.16	B.4.3.6.17	×			
Contact resistance	B.3.5.5	B.4.3.5.6	×	×		
Contact engagement and separation forces	B.3.6.15	B.4.3.6.15	×			
Crimp tensile strength	B.3.6.17	B.4.3.6.16	×		×	
Low-signal level contact resistance	B.3.5.6	B.4.3.5.5				×
Industrial gas	B.3.7.3	B.4.3.7.3				×
Low-signal level contact resistance	B.3.5.6	B.4.3.5.5				×

Note: (1) The tests identified with the symbol “x” shall be performed.

Table B-26. Qualification Test and Quality Conformance Inspection (Group C) (Contacts)

Test item	Requirement paragraph	Test method paragraph	Test group (1)	
			10	11
Externals, physical dimensions and marking	B.3.3	B.4.3.3	×	×
Plating porosity	B.3.4.1	B.4.3.4.1	×	
Plating thickness	B.3.4.2	B.4.3.4.2		×

Note: (1) The tests identified with the symbol “x” shall be performed.

B.4.2 Quality Conformance Inspection

Quality conformance inspection shall be as specified in Table B-27 for group A inspection, Table B-28 for group B inspection and Tables B-21 through B-26 for group C inspection.

B.4.2.1 Inspection Items and Sample Size

Inspections in each group shall be performed in the order listed in Tables B-27, B-28, and B-21 through B-26. Groups B or C inspection shall be conducted for products that have passed group A inspection.

B.4.2.2 Determination of Pass or Fail

Determination of pass or fail shall be in accordance with paragraphs 4.5.1.3 and 4.5.2.3.

B.4.2.3 Disposition after Inspection

Disposition after inspection shall be in accordance with paragraphs 4.5.1.4 and 4.5.2.4, and as follows.

a) Samples rejected in Groups A and B inspections shall not be delivered.

Table B-27. Quality Conformance Inspection (Group A)

Inspection item	Requirement paragraph	Test method paragraph	Pass/fail (2)	
			Quantity of samples	Quantity of allowable defectives
Externals, physical dimensions and marking (1)	B.3.3	B.4.3.3	100%	Less than 10%
Dielectric withstanding voltage (barometric pressure)	B.3.5.1	B.4.3.5.1.1		
Insulation resistance	B.3.5.2.1	B.4.3.5.2.1		
Insert retention	B.3.6.12	B.4.3.6.12		
Contact separation forces	B.3.6.15	B.4.3.6.15.2		

Notes:

(1) Visual inspection

(2) It is permissible to enter pass/fail determinations such as “pass” or “good” in the test data form.

Table B-28. Quality Conformance Inspection (Group B)

Inspection item	Requirement paragraph	Test method paragraph	Pass/fail (3)	
			Quantity of samples	Quantity of allowable defectives
Plating porosity (1)	B.3.4.1	B.4.3.4.1	4	0
Plating thickness (1)	B.3.4.2	B.4.3.4.2	4	0
Shell-to-shell conductivity (2)	B.3.5.3	B.4.3.5.3	4	0

Notes:

(1) Samples shall be randomly selected from the same production lot to test plating porosity and plating thickness. Samples used to test plating porosity shall not be delivered.

(2) Applicable to grounding straight plugs (G6) of high concentration miniature circular connectors.

(3) It is permissible to enter pass/fail determinations such as “pass” or “good” in the test data form.

B.4.3 Methods of Test and Inspection

B.4.3.1 Test Conditions

The inspections and tests shall be performed under the following environmental conditions.

a) Temperature: 15 to 35°C.
b) Relative humidity: 25 to 75%.
c) Atmospheric pressure: 73.3 to 106.7kPa {550 to 800mmHg}.

B.4.3.2 Material

Materials used for connectors shall be tested as specified in following paragraphs.

B.4.3.2.1 Magnetic Permeability

The magnetic permeability shall be tested in accordance with test procedure EIA-364-54.

B.4.3.3 Externals, Physical Dimensions and Marking

Externals, dimensions, marking, and workmanship shall be examined as specified in following paragraphs.

B.4.3.3.1 Connectors

External conditions and marking of the connector and its accessories shall be visually examined. A proper instrument such as vernier calipers specified in JIS B 7507 shall be used to measure dimensions and a weight scale shall be used for measuring mass.

B.4.3.3.2 Contacts

Contacts shall be visually examined with a 3x magnifier. A proper instrument such as vernier calipers specified in JIS B 7507 shall be used to measure dimensions and a weight scale shall be used for measuring mass.

B.4.3.4 Plating

B.4.3.4.1 Plating Porosity

Five each of unwired pin and socket contacts shall be completely immersed in nitric acid (concentration: 70^{+3}_{-1} %) at 25±3°C and observed for 30 seconds. Any contact shall be observable during the test.

B.4.3.4.2 Plating Thickness

Five of each of unwired pin and socket contacts shall be tested. Gold-plating thickness shall be measured by a proper method such as microscopic test, beta backscatter radiation, or X-ray fluorescence. The measuring point shall be in the range specified below.

a) Pin contact: 2.54 to 3.81mm from insertion end.
b) Socket contact: 2.54 to 3.81mm on outside diameter from wire barrel end.

B.4.3.5 Electrical Performacne

Electrical performance tests shall be performed as follows.

B.4.3.5.1 Dielectric Withstanding Voltage

B.4.3.5.1.1 Barometric Pressure

Wired connectors shall be tested in accordance with test procedure EIA-364-20. Connectors shall be mated when the test is performed after the humidity test. The following conditions shall apply.

a) The magnitude of the test voltage shall be as specified in Table B-29 for high density miniature circular connectors or Table B-30 for miniature circular connectors.
b) 20% of contacts (at least 6 contacts) in the contact arrangement shall be tested. The test voltage shall be applied between adjacent contacts and between the contacts and the shell.
c) Test voltage shall be applied for 2 seconds or longer.
d) Leak current shall be 5mA or less.
e) The test may be performed using similar contacts or test jig.

Table B-29. Test Voltage (High Density Miniature Circular Connectors)

Unit: V_{AC}

Altitude	Test voltage (service rating: M)
Barometric Pressure	1,300
15,240m (50,000 feet)	550
21,340m (70,000 feet)	350
33,530m (110,000 feet)	250

Table B-30. Test Voltage (Miniature, Circular Connectors)

Unit: V_{AC}

Altitude	Test voltage (Service rating: I or II)	
	I	II
Barometric Pressure	1,500	2,300
15,240m (50,000 feet)	500	750
21,340m (70,000 feet)	375	500
33,530m (110,000 feet)	200	200

B.4.3.5.1.2 At Reduced Pressure

Wired connectors shall be tested in accordance with test procedure EIA-364-20. The following conditions shall apply.

a) The magnitude of the test voltage shall be as specified in Table B-29 for high density miniature circular connectors or Table B-30 for miniature circular connectors.
b) 20% of contacts (at least 6 contacts) in the contact arrangement shall be tested. The test voltage shall be applied between adjacent contacts and between contact and shell.
c) Test voltage shall be applied for 2 seconds or longer.
d) Leak current shall be 5mA or less.
e) The wires shall be run through the chamber wall. Any wire splices or wire end shall not exist in the chamber. The chamber shall be maintained to the specified altitude pressure listed in Table B-31.

Table B-31. Altitude Pressure

Unit: kPa {mmHg}

Altitude (m)	Equivalent pressure
15,240	11.7 {87.5}
21,340	4.7 {35.5}
33,530	0.77 {5.74}

B.4.3.5.2 Insulation Resistance

B.4.3.5.2.1 At Ambient Temperature

Connectors shall be tested in accordance with test procedure EIA-364-21. The following details shall apply.

a) The test may be performed using similar contacts or test jig.
b) The tolerance on the applied voltage shall be ±10%.
c) 50% of contacts (at least 6 contacts) in the contact arrangement shall be tested. The test voltage shall be applied between adjacent contacts and between contact and shell.

B.4.3.5.2.2 At Elevated Temperature

Connectors shall be tested in accordance with test procedure EIA-364-21. The following details shall apply.

a) 50% of contacts (at least 6 contacts) in the contact arrangement shall be tested. The test voltage shall be applied between adjacent contacts and between contact and shell.
b) Connectors shall be maintained at a temperature of 200±3°C for 30 minutes.
c) Measurements shall be made while the connectors are at the specified temperature.
d) The tolerance on the applied voltage shall be ±10%.

B.4.3.5.3 Shell-to-Shell Conductivity

The resistance of the connectors shall be measured from a point on rear accessory thread of the pug to the mounting flange of the receptacle. Measurement points on the square flange receptacle shall be adjacent to the mounting holes.
When measured by the voltmeter-ammeter method, a test current of $1 \pm 0.1 A_{DC}$ shall be applied to the shells of the mated connectors.
Probes with spherical ends of 1.27mm as a minimum in radius shall be used. The probe and the connector surface shall not be damaged.

B.4.3.5.4 EMI Shielding

The EMI shielding effectiveness of mated connectors with EMI backshells shall be measured in a triaxial radio frequency leakage fixture as shown in Supplementary Figure B-16. The EMI leakage from the conductor inside the connector in the

same inner coaxial line into the outer coaxial line shall be measured at the frequencies specified in Table B-8 within a frequency accuracy of ±5%.
The level of detected signal power shall be indicated by a tunable radio frequency field intensity meter isolated from the test circuit by a 3 to 10dB pad.
Care shall be taken to ensure that the signal is a result of the EMI leakage from the mated connector and not due to a faulty termination inside the fixture.
Leakage at all terminations inside the fixture, whether to the EMI backshells or between internal conductors, shall be 10dB or less than the test requirements.
The signal source shall be set to the designated frequency. The signal shall be fed through a 3 to 10dB isolation pad to a parallel circuit consisting of a coaxial switch (DPDT) so that the signal can be manually or electronically fed alternately to the fixture and to a variable 100dB reference attenuator.
The attenuator shall be adjustable in 1dB increment and calibrated to ±3dB.

a) The insert may be removed from the connector under test, or the contacts may be removed to make a hole through the insert to accommodate a center conductor of suitable geometry which shall fit with the inside diameter of the mated receptacle and plug with springs to achieve 50Ω impedance match. Tapered transition may be used to provide a means of changing diameters without introducing significant discontinuities in the line.
   The maximum voltage standing wave ratio (VSWR) in the inner coaxial line shall be 1.5. The outer shell of the test fixture shall be constructed to provide good 50Ω impedance match with the outside diameter of the mated connector shells, coupling ring, and EMI backshells. The maximum VSWR of the outer coaxial line shall be 1.5.
b) A sliding circumferential short shall be positioned behind the connector on the signal input end of the fixture to attune the outer coaxial line for the maximum output at each test frequency.
   The allowable travel of this short shall be 1.5mm as a minimum at 100MHz, and 1/2 wave length or greater at the lowest test frequency.
   The inner coaxial line shall be terminated with a 50Ω load impedance fixed behind the connector at the output end of the fixture.
c) The connectors used to couple the various elements of the test system together shall be of low-leakage type having a nominal impedance of 50Ω, VSWR of 1.5 or less, and a minimum leakage attenuation of 100dB.
   The output impedance of the signal source and the input impedance of the detector shall be nominally 50Ω with a maximum VSWR of 1.5.
   The input and output VSWR of the standard attenuator shall be not more than 1.5 in the 20 to 100dB range.
d) The relative signal level in the variable attenuator shall be equal to the signal level which passes through the leakage fixture by adjusting the attenuator. The signal loss in the fixture shall be read from the setting position on the variable attenuator.

B.4.3.5.5 Low-Signal Level Contact Resistance

20% of inserted pairs of contacts shall be tested in accordance with test procedure EIA-364-23. The test conditions specified in items a) and b) of paragraph B.4.3.5.6 shall apply.

B.4.3.5.6 Contact Resistance

Inserted contacts shall be tested in accordance with test procedure EIA-364-23. The following details shall apply.

a) Connectors
With connectors wired and mated, voltage drop for 20% of contact pairs in the contact arrangement shall be measured across the specified test points (152.4±3mm).

b) Individual contact
10 wired contacts shall be inserted to the depth of 0.7L as shown in Figure B-2. The voltage drop shall be measured across the specified points of 152.4±3mm.

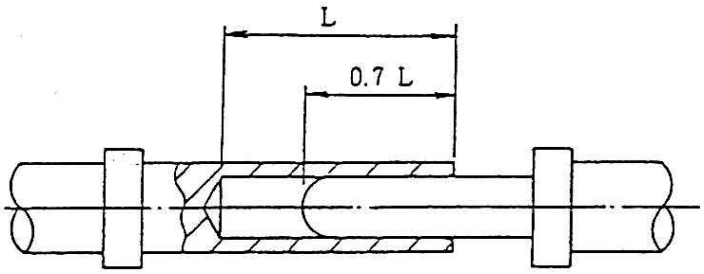


Figure B-2. Depth of Insertion for Contact Resistance

B.4.3.6 Mechanical Performance

Mechanical performance tests shall be performed as follows.

B.4.3.6.1 Contact Insertion and Removal Forces

Connectors shall be tested in accordance with test procedure EIA-364-5. The following details shall apply.

a) Insertion and removal shall be performed with proper tools as specified in paragraph B.3.3.2.6.

b) Measurement shall be made for at least 20% of contacts in the contact arrangement.

B.4.3.6.2 Gauge Retention

Applicable test gauges, shown in Supplementary Figure B-12 (a), (b) (for high density miniature circular connectors) or Supplementary Figure B-13 (a), (b) (for miniature circular connectors) shall be installed in three randomly selected cavities in each connector after the accessory rear hardware has been removed. An initial load of 8.8N {0.9kgf} shall be applied to remove all slacks. Then, the dimensions specified in Supplementary Figure B-9 (a), (b) shall be measured using a proper device capable of measuring gauge displacement. After the measurements, the axial load specified in paragraph B.4.3.6.3 shall be applied to the front and rear faces at a rate of 4.4N {0.45kgf} per second until the specified load is reached.

B.4.3.6.3 Contact Retention

Unmated connectors shall be tested in accordance with test procedure EIA-364-29. The following details shall apply.

a) Sample size: 20% of contacts in the contact arrangement (at least 6 contacts).
b) Applied initial load: 13.7N {1.4kgf} maximum.
c) Applied axial load: As shown in Table B-32.
d) Direction of applied load: Rear and front faces each.
e) Loading rate: Approximately 4.4N/s {0.45kgf/s}.
f) Others: The accessory hardware shall be removed.

Table B-32. Contact Retention Load

Unit: N {kgf}

Contact size	Axial load (±10%)
22D	44.1 {4.5}
20	89.2 {9.1}
16	110.8 {11.3}
12	133.4 {13.6}

B.4.3.6.4 Mating and Unmating Force

Connectors shall be tested in accordance with test procedure EIA-364-13. For qualification test, it is necessary to perform mated and unmated connectors each other. The test procedures specified in paragraphs 1.2.1, 1.2.2 and 2.1.2 of EIA-364-13 shall be in accordance with the testing procedures of manufacturer.

B.4.3.6.5 Durabiity

Wired and assembled plugs and receptacles shall be mated and unmated at a rate of 300 cycles per hour as a maximum. The following details shall apply.

a) Mating and Unmating cycles
    1) High density miniature circular connectors without spring fingers: 500 cycles.
    2) High density miniature circular connectors with spring fingers: 250 cycles.
    3) Miniature circular connectors: 500 cycles.
b) For manual testers, the repetition rate shall be at a rate of 300 cycles per hour maximum.
    For automatic testers, the repetition rate shall be at a rate of 550 cycles per hour maximum.
c) Cycling between the same connector pair shall be avoided as much as possible. The counterpart connector shall be changed for each cycle by moving the connector from one counterpart connector, which is mounted on a panel in a way that groups of counterpart connectors align in parallel, to the next one.

B.4.3.6.6 Accessory Thread Strength

Mated connectors shall be mounted normally on a rigid panel. The torque wrench shall be attached to the accessories as shown in Supplementary Figure B-15. After mating the plug and receptacle connectors, a torque shall be applied to the accessory end of the plug at a rate of approximately 44.1N {4.5kgf} per second until the required torque specified in Table B-14 is achieved. The applied load shall be held for 1 minute, and then the load shall be released.
The test shall then be repeated on the accessory end of the receptacle.

B.4.3.6.7 External Bending Moment

Receptacle connector shall be mounted normally on a rigid panel. An adapter or test torque arm shall be attached as shown in Supplementary Figure B-14 before the receptacles are mated with plugs. After the plug and receptacle connectors have been mated, the distance “L” from the point of load application "P" to the mounting panel shall be measured. The load to be applied at point "P" shall be calculated as bending moment specified in Table B-33 divided by the level arm "L." This load shall be applied at a rate of approximately 44.1N (4.5kgf) per second until the required load is achieved. The load shall be applied for 1 minute and removed. A test current of 100mA shall be applied and electrical continuity shall be monitored during the test.

Table B-33. External Bending Moment

Unit: N·cm {kgf·cm}

Shell size	8	10	12	14	16	18	20	22	24
Bending moment	563.9 {57.5}	843 {86}		1,128 {115}	1,412 {144}				1,696 {173}

B.4.3.6.8 Coupling Pin Strength

One coupling pin shall be subjected to $222.6^{+22.6}_{0}$N {$22.7^{+2.3}_{0}$kgf} load applied to the caulked end along the major axis of the pin. A steel test tip shall be used for load application.

B.4.3.6.9 Pin Contact Stability

At least 10% of pin contacts of an unmated connector shall be subjected to this test.

a) The connector shall be held using a holding device. Gauge pins conforming to Supplementary Figure B-12 (a) (for high-density miniature circular connectors) or Supplementary Figure B-13 (a) (for miniature circular connectors) shall be used.
b) The forces specified in Table B-15 shall be applied to the test gauges at a rate not exceeding 25.4mm per minute.
c) The total pin tip displacement shall be measured as shown in Supplementary Figure B-17.

B.4.3.6.10 Contact Walkout

Two contacts in each plug and receptacle shall be tested.

a) The contacts shall be crimped to stranded steel cables of a proper size and installed in the connector.
b) An unmated connector shall be mounted in a test fixture as shown in Supplementary Figure B-18. While a load of 13.7N {1.4kgf} is applied to the cable, the fixture shall be rotated 360°, which is counted as one cycle. Continuous 100 cycles shall be performed at a rate of 10 to 20 cycles per minute.

B.4.3.6.11 Installing and Removal Tool Abuse

Five contact cavities in each connector shall be subjected to each of the following tests. Different contact cavities shall be used for each test.
Tools for this test shall be as specified in paragraph B.3.3.2.6. If the tool is damaged during the test, the test can be continued after the damaged tool is replaced with a good one. Failure of a tool does not constitute a test failure.

a) Removal tool rotation
The tool shall be inserted as if a contact is removed and a total of 13.7N {1.4kgf} axial load shall be applied. With the force being applied, the tool shall be rotated 180° and released by removing the contact, and the contact shall be reinserted. These steps shall be repeated three times on each of the five contacts.
b) Installing tool rotation
A contact shall be removed and then inserted. A total of 13.7N {1.4kgf} axial load shall be applied. With the force being applied, the tool shall be rotated 180° and then released. The steps shall be repeated three times on each of the five contacts.
c) Installing tool insertion
A contact shall be removed and then inserted. A total of 13.7N {1.4kgf} axial load shall be applied. The steps shall be repeated once on each of the five contacts. A fresh tool shall be used for each contact cavity.
d) Removal tool insertion
The tool shall be inserted as if a contact is removed and a total of 13.7N {1.4kgf} axial load shall be applied. The tool shall be removed also removing the contact. The steps shall be repeated once on each of the five contacts. A fresh tool shall be used for each contact cavity.

B.4.3.6.12 Insert Retention

Unmated connectors shall be tested in accordance with test procedure EIA-365-35 with the following conditions.

a) A load of $69 \pm 3.43 N/cm^2$ $\{7 \pm 0.35 kgf/cm^2\}$, at least 110.8N {11.3kgf}, shall be applied.
b) Connectors may be wired.

B.4.3.6.13 Shell Spring Finger Forces

Plugs shall be completely mated and unmated 10 times with counterpart receptacles without coupling pins and inserts.

In the first cycle, forces necessary to engage the connectors shall be measured. In the last cycle, forces necessary to separate the connectors shall be measured.

B.4.3.6.14 Contact Axial Concentricity

Contacts shall be tested on ten sample contacts in accordance with test procedure EIA-364-07. The samples shall be chucked as shown in Supplementary Figure B-20 (a) and (b).

B.4.3.6.14.1 Unwired Contacts

While the contact is being rotated, points “A” and “B” shown in Supplementary Figure B-20 (a) and (b) shall be measured and shall meet the requirements specified in paragraph B.3.6.14.1. The measurement shall not be made at point B for socket contacts.

B.4.3.6.14.2 Wired Contacts

While the contact is being rotated, point “A” shown in Supplementary Figure B-20 (a) and (b) shall be measured and shall meet the requirements specified in paragraph B.3.6.14.2.

B.4.3.6.15 Contact Engagement and Separation Forces

B.4.3.6.15.1 (I) For Qualification Test

Unless otherwise specified, ten socket contacts shall be tested in accordance with test procedure EIA-364-37. The following details shall apply.

a) Contacts shall be inserted to a depth of 0.7L as a minimum as shown in Figure B-2.
b) Engagement force shall be measured with the maximum diameter pin of SAE-AS31971.
c) Separation force shall be measured with the minimum diameter pin of SAE-AS31971.

B.4.3.6.15.2 (II) For Quality Conformance Inspection

For the quality conformance inspection, only contact separation force shall be tested by the following weight retention method or by an equivalent method.

a) A socket contact shall be engaged with the minimum diameter pin specified in

b) Table B-17 to a depth of 0.7L as a minimum as specified in Figure B-2. The test pin shall be fixed on a weight of the minimum separation force or greater. See Figure B-3.
c) The socket contact shall be slowly lifted up in the vertical direction.
d) If the weight remains suspended, the contact shall pass the test.

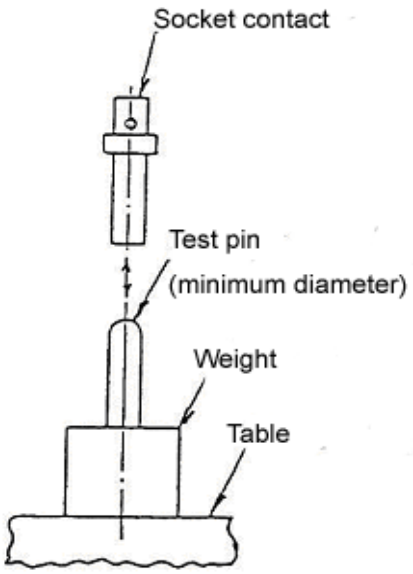


Figure B-3. Weight Retention

B.4.3.6.16 Crimp Tensile Strength

Tensile force specified in Table B-18 shall be applied to ten wire crimped pin and socket contacts at a speed of approximate 30mm per minute.

B.4.3.6.17 Probe Damage

Ten socket contacts shall be tested in accordance with test procedure EIA-364-25. The following details shall apply.

a) Refer to Supplementary Figure B-21 for detailed procedure.
b) The diameter of the handle (Φ4.8mm) shall not apply.
c) Probe depth, dimension “B” of Supplementary Figure B-22, shall be 1/2 and 3/4 of the specified minimum socket bore depth.

B.4.3.7 Environmental Performance

Environmental performance tests shall be performed as follows.

B.4.3.7.1 Random Vibration

Wired and mated connectors shall be tested in accordance with test procedure EIA-364-28. The following details shall apply.

a) Connectors shall be secured normally on a vibration table using jig.
b) Currents of 100mA or less shall be applied to all contacts. The contacts shall be monitored for electrical continuity using a detector capable of detecting any discontinuity in excess of 1μs.
c) Test condition VI, test condition letter J (409m/s^{2}rms {41.7Grms}).

d) Test duration shall be 8 hours in the longitudinal direction and 8 hours in a perpendicular direction for a total of 16 hours.
e) Connectors shall have the wire bundles clamped to fixed points approximately 203mm behind the connector.

B.4.3.7.2 Shock

Wired and mated connectors shall be tested in accordance with test procedure EIA-364-27. The following details shall apply.

a) Connectors shall be secured normally on a shock table using jig.
b) Currents of 100mA or less shall be applied to all contacts. The contacts shall be monitored for electrical continuity using a detector capable of detecting any discontinuity in excess of 1μs.
c) Test condition: D (2,942m/s^2 {300G}±15%, half-sine wave)

B.4.3.7.3 Industrial Gas

Uninserted contacts shall be placed on a noncorrosive rack in a sealed plastic or glass chamber (0.057m^3 {2ft^3} as a maximum in volume) which shall contain 10% solution of potassium sulfide in distilled water. Contacts shall not be immersed in the solution. Test duration shall be 100 hours.

B.4.3.7.4 Ozone Exposure

Wired and mated connectors shall be tested in accordance with test procedure EIA-364-14.

B.4.3.7.5 Altitude-Low Temperature

Wired and mated connectors shall be tested in accordance with test procedure EIA-364-105. The following conditions shall apply.

a) There shall be no wire ends or splices inside the chamber.
b) After the environments are returned to ambient conditions, dielectric withstanding voltage test shall be performed in accordance with paragraph B.4.3.5.1.1.
c) After the environments have returned to ambient conditions, insulation resistance test shall be performed in accordance with paragraph B.4.3.5.2.1.

B.4.3.7.6 Temperature Cycling

Wired and mated connectors shall be tested in accordance with test procedure EIA-364-32. The following conditions shall apply.

a) Test condition: A
b) The temperature of step 1 shall be -65^{0}_{-15}°C.
c) The temperature of step 3 shall be $+200^{+15}_{0}$°C.
d) Steps 2 and 4 shall be 2 minutes as a maximum in length.
e) Possible failure modes, and pass and fail criteria after test: As specified in FMAT of the Quality Assurance Program Plan.

B.4.3.7.7 Fluid Immersion

Connectors shall be tested in accordance with test procedure EIA-364-10. Following the immersion of one sample unit per fluid, the connectors shall be

tested for mating and unmating force as specified in paragraph B.4.3.6.4, and dielectric withstanding voltage as specified in paragraph B.4.3.5.1.1.

B.4.3.7.8 Altitude Immersion

Mated connectors shall be tested in accordance with test procedure EIA-364-03. The following details shall apply.

a) All wire ends shall be placed in the chamber and exposed to the chamber atmosphere, but shall not be submerged or sealed.
b) At the end of the third cycle, while the connectors are still submerged in the solution, the insulation resistance test and dielectric withstanding voltage test shall be performed as specified in paragraphs B.4.3.5.2.1 and B.4.3.5.1.1, respectively.

B.4.3.7.9 Humidity

Wired and mated connectors shall be tested in accordance with test procedure EIA-364-31. The following details shall apply.

a) Test condition: Method IV.
b) The mated connectors shall be mounted in a vertical position.
c) Step 7a shall be performed during the last cycle.
d) Three hours minimum after the start of step 7a in the final cycle and while the test chamber is at the high temperature, the insulation resistance test and dielectric withstanding voltage test shall be performed as specified in paragraphs B.4.3.5.2.1 and B.4.3.5.1.1, respectively. These tests shall be performed after the connector temperature returned to 20±5°C, while the connector temperature maintains 20±5°C and condensation is present on the connectors.
e) Insulation resistance readings shall be made on a minimum of 50% of the circuits. Dielectric withstanding voltage shall be measured on a minimum of 20% of the circuits. Outer circuits shall be measured to the connector shell.

B.4.3.7.10 Salt Spary

Mated connectors shall be tested in accordance with test procedure EIA-364-26. The following details shall apply.

a) Test condition B (48 hours)
b) The samples shall not be fixed, but shall be suspended from the top of the chamber using waxed twine or by appropriate manner.
c) Wire ends must be protected to prevent salt migration.

B.4.3.8 Durability

Durability tests shall be performed as follows.

B.4.3.8.1 High Temperature Exposure with Contact Loading

Wired and mated connectors shall be tested in accordance with test procedure EIA-364-17. The following details shall apply.

a) Test condition: 7 (200 ±5°C)
b) Test time condition: D (1,000 hours)
c) Test conditions

1) Mated connectors shall be mounted on jig as shown in Supplementary Figure B-19. A weight specified in Table B-34 shall be suspended with stranded steel cables from both contact ends.
2) A current of 100mA maximum shall be applied to the test contacts. Electrical continuity shall be monitored.

d) Before and after the test, contact resistance shall be measured on 20% of the contacts in the contact arrangement in accordance with paragraph B.4.3.5.6. The mated pair loaded during the test shall be excluded for the measurement.

e) The axial location of contacts shall be measured for conformance to the applicable dimensions of Supplementary Figure B-9. The procedures shall be as follows.
1) Before test
One inserting pair of contacts shall be removed and crimped to a stranded steel cable of proper size, and re-inserted to the connector. An axial load of approximately 8.8N {0.9kgf} shall be applied in the direction to push back the contacts. Then the measurement shall be made.
2) After test
After the temperature has returned to ambient temperature, the connectors shall be unmated and an axial load of approximately 8.8N {0.9kgf} shall be applied in the direction to push back the contacts. Then the measurement shall be made.

Table B-34. Load

Unit: N {kgf}

Contact size	Load
22D	22.26 {2.27}
20	33.3 {3.4}
16	55.9 {5.7}
12	55.9 {5.7}

B.4.4 Long-Term Storage

Long-term storage shall be as specified in paragraph 4.7.

B.4.5 Change and Optimization of Tests and Inspections

Change to tests and inspections shall be in accordance with paragraph 4.8.

B.5 Preparation for Delivery

Preparation for delivery shall be as specified in paragraph 5.

B.6 Notes

B.6.1 Notes for Manufacturer

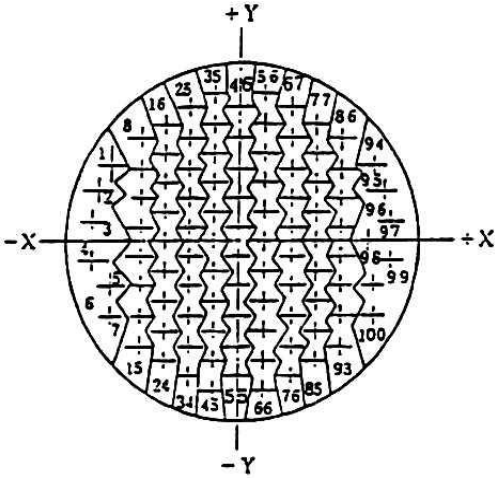
Notes for manufacturer shall be in accordance with paragraph 6.1.

B.6.2 Notes for Purchaser

Notes for purchaser shall be as specified in paragraph 6.2.

Contact arrangement \ Shell size	8	10	12	14	16	18	20	22	24
High density miniature circular connectors	35	35	35	35	35	35	35	35	35
Miniature circular connectors	N/A	6	3	4	8	8	16	21	19
			8	5	26	11	41	55	31
			10	18		32			61
				19					

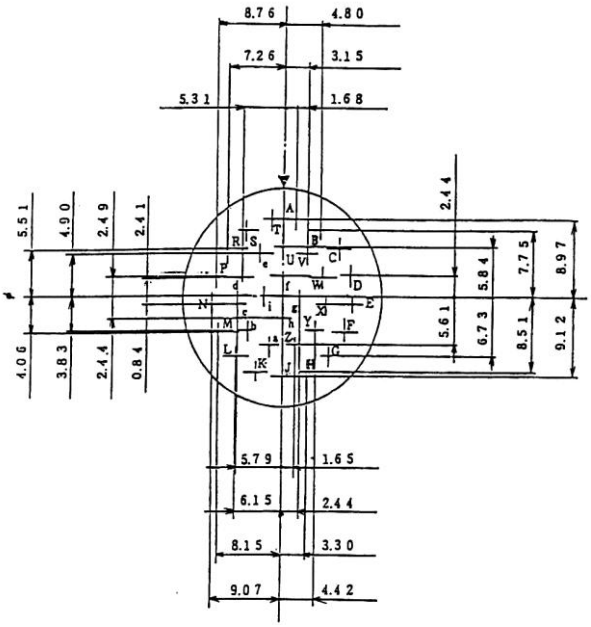
Note: For details such as dimensions and arrangements, see MIL-STD-1560 and MIL-STD-1669.



Contact arrangement: 22 – 35
Shell size: 22
Number of contacts: 100 contacts for contact size 22D
Service rating: M

Note: Pin insert (front view)

(a) Typical contact arrangement for high density miniature circular connectors

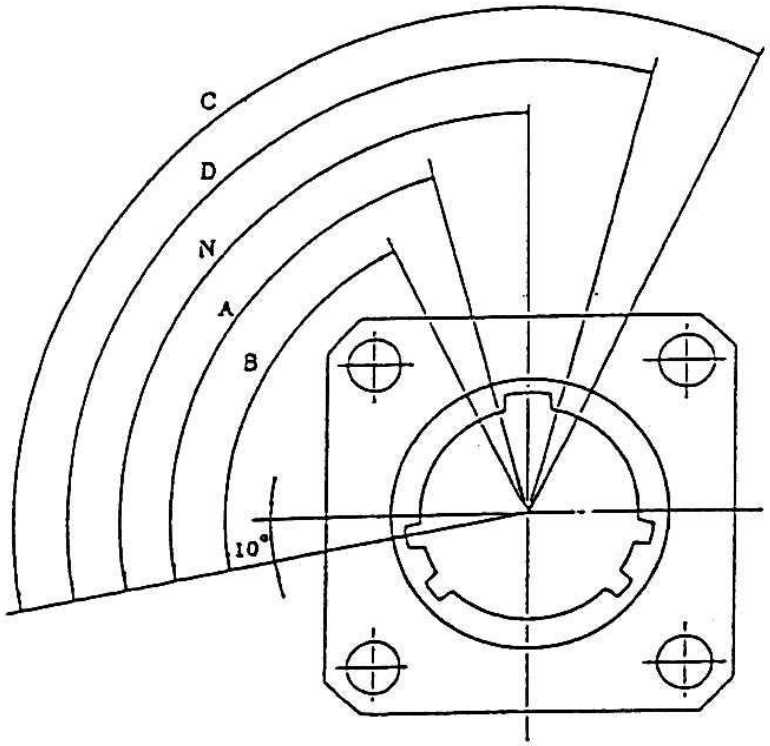


Contact arrangement: 18 – 32
Shell size: 18
Number of contacts: 32 contacts for contact size20

Note: Pin insert (front view)

(b) Typical contact arrangement for miniature circular connectors

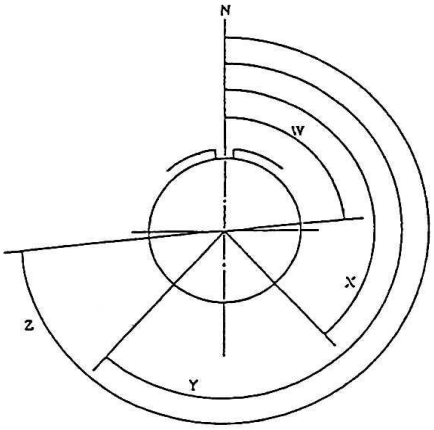
Supplementary Figure B-1. Contact Arrangement



Note: Receptacle (front view)

Shell size	N (Main key/ keyway)	A	B	C	D
8	100°	82°	–	–	118°
10	100°	86°	72°	128°	114°
12	100°	80°	68°	132°	120°
14	100°	79°	66°	134°	121°
16	100°	82°	70°	130°	118°
18	100°	82°	70°	130°	118°
20	100°	82°	70°	130°	118°
22	100°	85°	74°	126°	115°
24	100°	85°	74°	126°	115°

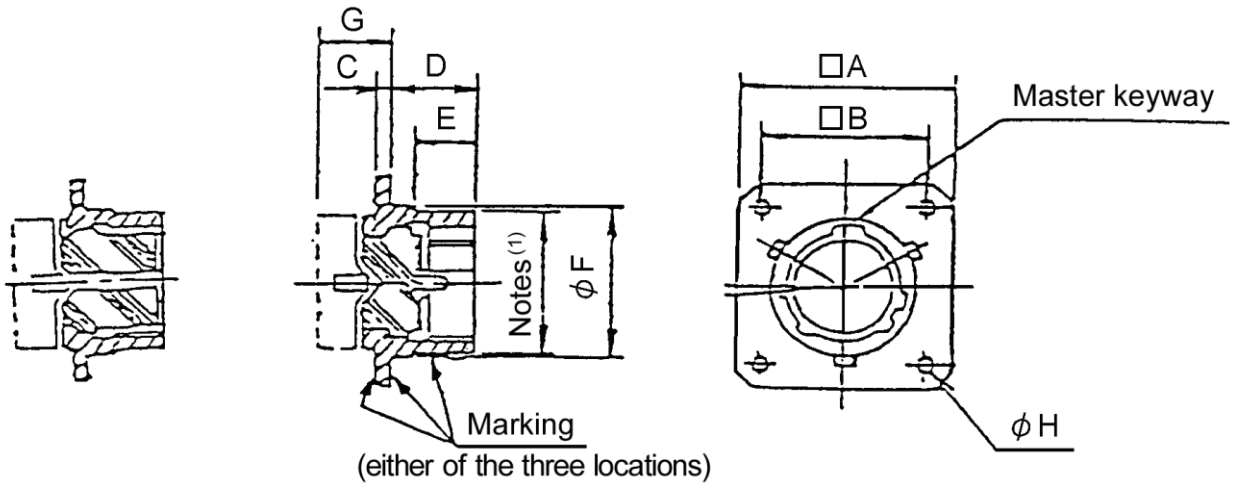
Supplementary Figure B-2. Main Key and Keyway Polarization
(High Density Miniature Circular Connectors)



Note: Pin insert (front view)

Shell size	Contact arrangement	N (Main key/ keyway)	W	X	Y	Z
10	6	0°	90°	–	–	–
12	3	0°	–	–	180°	–
	8	0°	90°	112°	203°	292°
	10	0°	60°	155°	270°	295°
14	4	0°	45°	–	–	–
	5	0°	40°	92°	184°	273°
	18	0°	15°	90°	180°	270°
	19	0°	30°	165°	315°	-
16	8	0°	54°	152°	180°	331°
	26	0°	60°	–	275°	338°
18	8	0°	180°	–	–	–
	11	0°	62°	119°	241°	340°
	32	0°	85°	138°	222°	265°
20	16	0°	238°	318°	333°	347°
	41	0°	45°	126°	225°	–
22	21	0°	16°	135°	175°	349°
	55	0°	30°	142°	226°	314°
24	19	0°	30°	165°	315°	–
	31	0°	90°	225°	255°	–
	61	0°	90°	180°	270°	324°

Supplementary Figure B-3. Main Key and Keyway Polarization (Miniature Circular Connectors)



Contact type: S Contact type: P

Notes:

(1) The dimension shall meet Supplementary Figure B-9 (a).

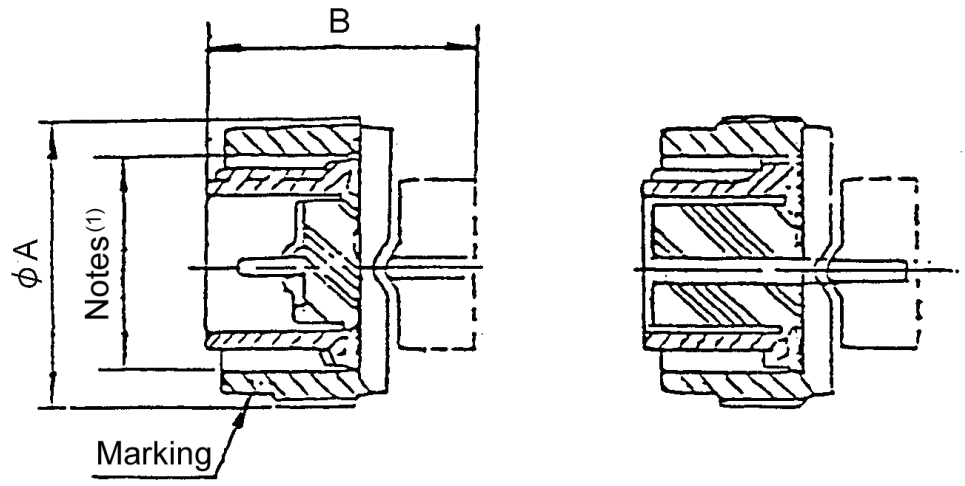
(2) Panel cutout dimensions shall be as shown in Supplementary Figure B-11 (a).

(3) Mass of the connector shall refer to Supplementary Table B-1.

Unit: mm

Shell size	Physical dimensions								
	□A maximum.	□B ±0.13	C +0.28 0	D 0 -0.13	E 0 -0.13	ΦF maximum	G maximum		ΦH +0.25 -0.13
							Class E	Class T	
8	21.03	15.09	1.47	11.35	8.18	13.89	14.27	9.93	3.05
10	24.23	18.26	1.47	11.35	8.18	17.07	14.27	9.93	3.05
12	26.59	20.62	1.47	11.35	8.18	21.44	14.27	9.93	3.05
14	28.98	23.01	1.47	11.35	8.18	24.61	14.27	9.93	3.05
16	31.34	24.61	1.47	11.35	8.18	27.79	14.27	9.93	3.05
18	33.73	26.97	1.47	11.35	8.18	30.96	14.27	9.93	3.05
20	36.91	29.36	1.47	11.35	8.18	34.14	14.27	9.93	3.05
22	40.08	31.75	1.47	11.35	8.18	37.31	14.27	9.93	3.05
24	43.26	34.92	1.47	11.35	8.18	40.49	14.27	11.91	3.73

Supplementary Figure B-4 (a).
Externals, Constructions, Physical Dimensions and Mass for
Back Panel Mounting Flange Receptacle
(High Density Miniature Circular Connectors)



Contact type: P

Contact type: S

Notes:
(1) The dimension shall meet to Supplementary Figure B-9 (a).
(2) Mass of the connector shall refer to Supplementary Table B-1.

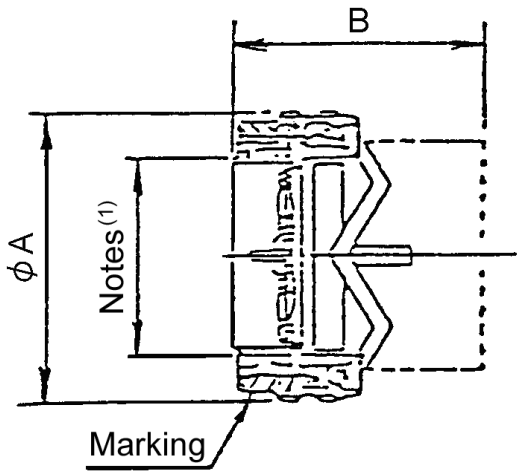
Unit: mm

Shell size	Physical dimensions		
	ΦA maximum	B maximum	
		Class E	Class T
8	19.05	24.21	19.46
10	21.82	24.21	19.46
12	26.19	24.21	19.46
14	29.36	24.21	19.46
16	32.54	24.21	19.46
18	35.71	24.21	19.46
20	38.89	24.21	19.46
22	41.68	24.21	19.46
24	44.86	24.21	21.44

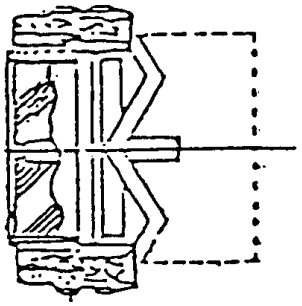
Supplementary Figure B-4 (b).

Externals, Constructions, Physical Dimensions and Mass for Straight Plug

(High Density Miniature Circular Connectors)



Contact type: P



Contact type: S

Notes:

(1) The dimension shall meet Supplementary Figure B-9 (a).

(2) Mass of the connector shall refer to Supplementary Table B-1.

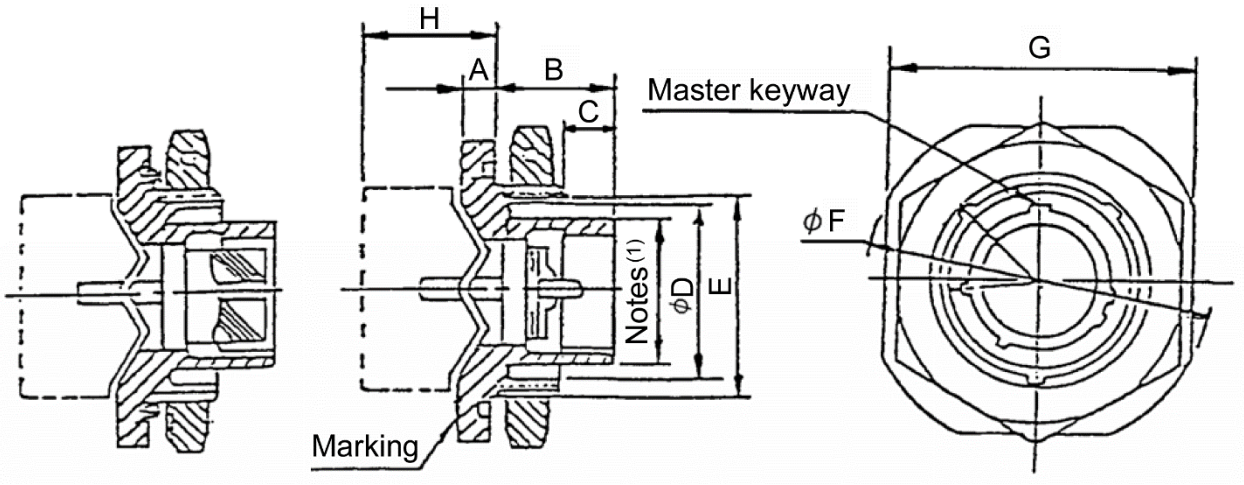
Unit: mm

Shell size	Physical dimensions		
	ΦA maximum	B maximum	
		Class E	Class T
8	19.05	24.21	19.46
10	21.82	24.21	19.46
12	26.19	24.21	19.46
14	29.36	24.21	19.46
16	32.54	24.21	19.46
18	35.71	24.21	19.46
20	38.89	24.21	19.46
22	41.68	24.21	19.46
24	44.86	24.21	21.44

Supplementary Figure B-4 (c).

Externals, Constructions, Physical Dimensions and Mass for Grounding Straight Plug

(High Density Miniature Circular Connectors)



Contact type: S Contact type: P

Notes:
(1) The dimension shall meet Supplementary Figure B-9 (a).
(2) Panel cutout dimensions shall be as specified in Supplementary Figure B-11 (a).
(3) Mass of the connector shall refer to Supplementary Table B-1.

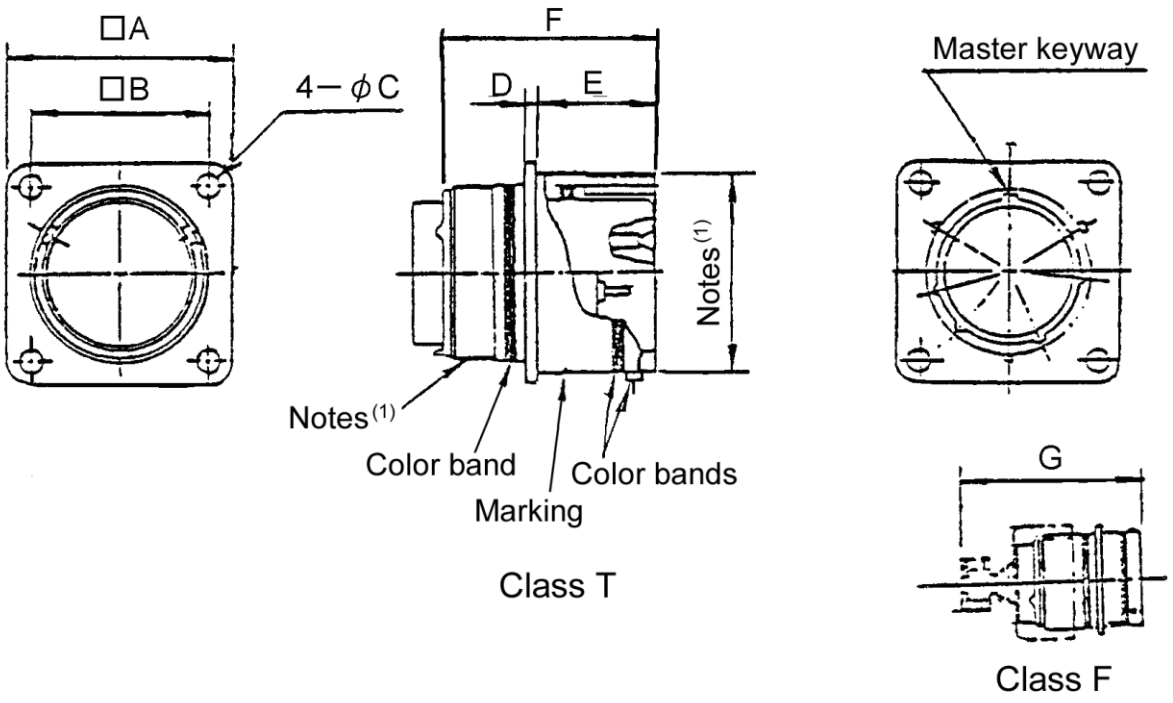
Unit: mm

Shell size	Physical dimensions								
	A +0.28 -0.25	B ±0.13	C +0.13 0	ΦD +0.25 0	E +0.03 -0.15	ΦF ±0.41	G ±0.41	H maximum	
								Class E	Class T
8	2.39	11.13	3.56	17.22	20.75	34.92	31.75	13.11	8.74
10	2.39	11.13	3.56	19.81	23.90	38.10	34.92	13.11	8.74
12	2.39	11.13	3.56	24.46	27.05	41.28	38.10	13.11	8.74
14	2.39	11.13	3.56	27.64	30.23	44.45	41.28	13.11	8.74
16	2.39	11.13	3.56	31.04	33.53	49.23	45.24	13.11	8.74
18	2.39	11.13	3.56	33.86	36.58	51.21	48.01	13.11	8.74
20	2.39	11.79	4.22	37.03	39.75	54.38	51.21	12.29	7.92
22	2.39	11.79	4.22	40.21	42.93	57.53	54.36	12.29	7.92
24	2.39	11.79	4.22	43.38	46.10	60.71	57.53	12.29	9.52

Supplementary Figure B-4 (d).

Externals, Constructions, Physical Dimensions and Mass for Jam-Nut Receptacle

(High Density Miniature Circular Connectors)



Notes:

(1) The dimension shall meet Supplementary Figure B-9 (b) and Supplementary Figure B-10 (b).

(2) Panel cutout dimensions shall be specified in Supplementary Figure B-11 (b).

(3) Mass of the connector shall refer to Supplementary Table B-2.

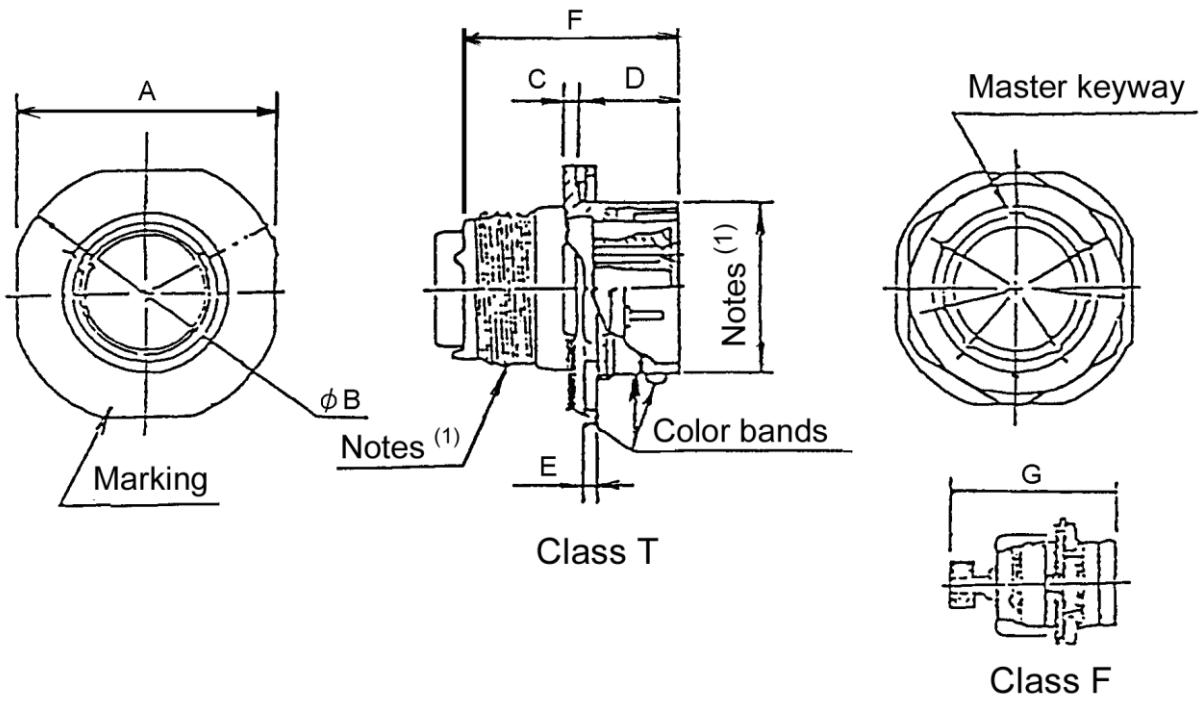
Unit: mm

Shell size	Physical dimensions						
	□A maximum	□B ±0.13	ΦC ±0.13	D	E	F maximum	G maximum
10	24.23	18.26	3.05	1.98/1.17	11.73/10.95	30.86	50.65
12	26.59	20.62	3.05	1.98/1.17	11.73/10.95	30.86	53.82
14	28.98	23.01	3.05	1.98/1.17	11.73/10.95	30.86	53.82
16	31.34	24.61	3.05	1.98/1.17	11.73/10.95	30.86	57.00
18	33.73	26.97	3.05	1.98/1.17	11.73/10.95	30.86	63.35
20	36.91	29.36	3.05	2.79/1.98	14.91/14.12	32.39	68.05
22	40.08	31.75	3.05	2.79/1.98	14.91/14.12	32.39	71.22
24	43.26	34.92	3.73	2.79/1.98	15.75/14.96	32.39	74.40

Supplementary Figure B-5 (a).

Externals, Constructions, Physical Dimensions and Mass for Mounting Flange Receptacle

(Miniature, Circular Connectors)



Notes:

(1) The dimension shall meet to Supplementary Figures B-9 (b) and B-10 (b).

(2) Panel cutout dimensions shall be specified in Supplementary Figure B-11 (b).

(3) Mass of the connector shall refer to Supplementary Table B-2.

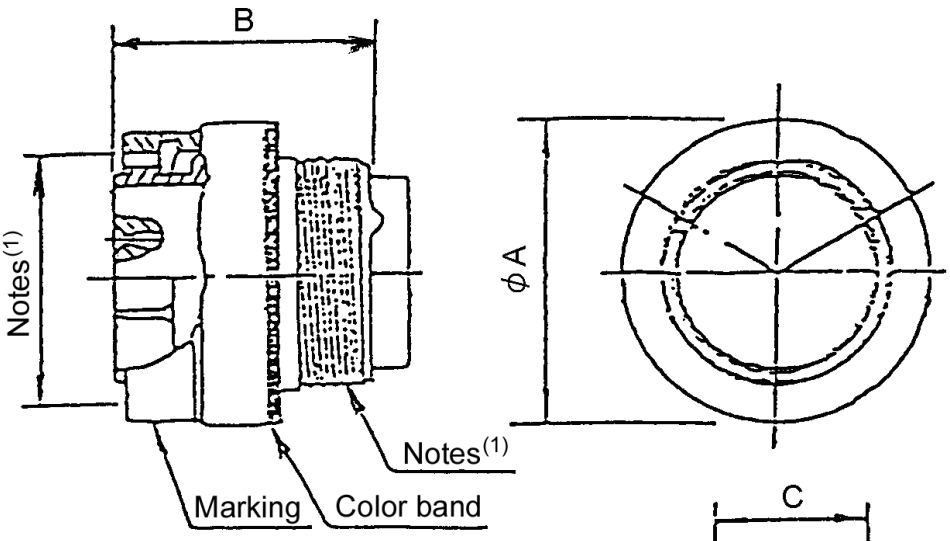
Unit: mm

Shell size	Physical dimensions						
	A	ΦB	C	D	E	F maximum	G maximum
10	27.38/26.59	30.56/29.77	2.87/2.18	17.96/16.71	3.18/2.74	30.86	50.65
12	32.16/31.37	35.33/34.54	2.87/2.18	17.96/16.71	3.18/2.74	30.86	53.82
14	35.33/34.54	38.51/37.72	2.87/2.18	17.96/16.71	3.18/2.74	30.86	53.82
16	38.51/37.72	41.68/40.89	2.87/2.18	17.96/16.71	3.18/2.74	30.86	57.00
18	41.68/40.89	44.86/44.07	2.87/2.18	17.96/16.71	3.18/2.74	30.86	63.35
20	46.43/45.64	49.63/48.84	3.76/2.44	19.61/18.31	3.18/2.74	32.39	68.05
22	49.63/48.84	52.78/51.99	3.76/2.44	19.61/18.31	3.18/2.74	32.39	71.22
24	52.78/51.99	55.96/55.17	3.76/2.44	19.61/18.31	3.18/2.74	32.39	74.40

Supplementary Figure B-5 (b).

Externals, Constructions, Physical Dimensions and Mass for Jam Nut Receptacle

(Miniature Circular Connectors)



Class T

Class F

Notes:
(1) The dimension shall meet Supplementary Figures B-9 (b) and B-10 (b).
(2) Mass of the connector shall refer to Supplementary Table B-2.

Unit: mm

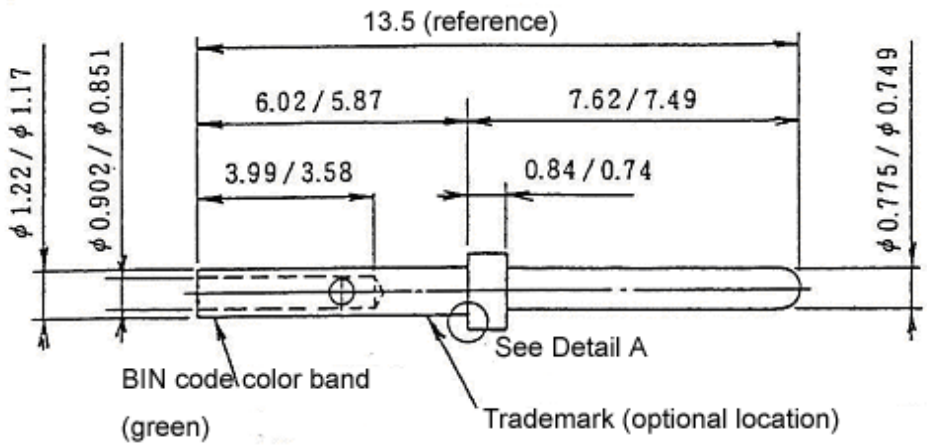
Shell size	Physical dimensions		
	ΦA maximum	B maximum	C maximum
10	23.52	31.24	51.03
12	26.49	31.24	54.20
14	30.05	31.24	54.20
16	33.15	31.24	57.38
18	35.33	31.24	63.73
20	38.89	31.24	66.90
22	42.06	31.24	70.08
24	45.14	31.24	73.25

Supplementary Figure B-5 (c).

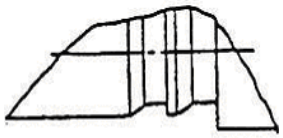
Externals, Constructions, Physical Dimensions and Mass for Straight Plug

(Miniature Circular Connectors)

Unit: mm



Mass: 0.08g ± 10%



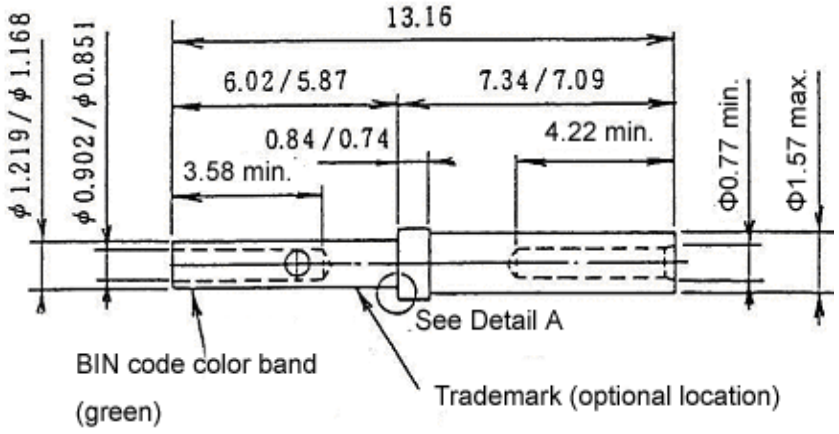
Note: (1) See SAE-AS39029/58 for detail dimensions.

Detail A (1)

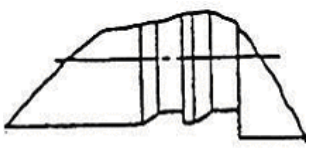
Supplementary Figure B-6 (a).

Constructions and Dimensions for Pin Contact (High Density Miniature Circular Connectors)

Unit: mm



Mass: 0.11g ± 10%

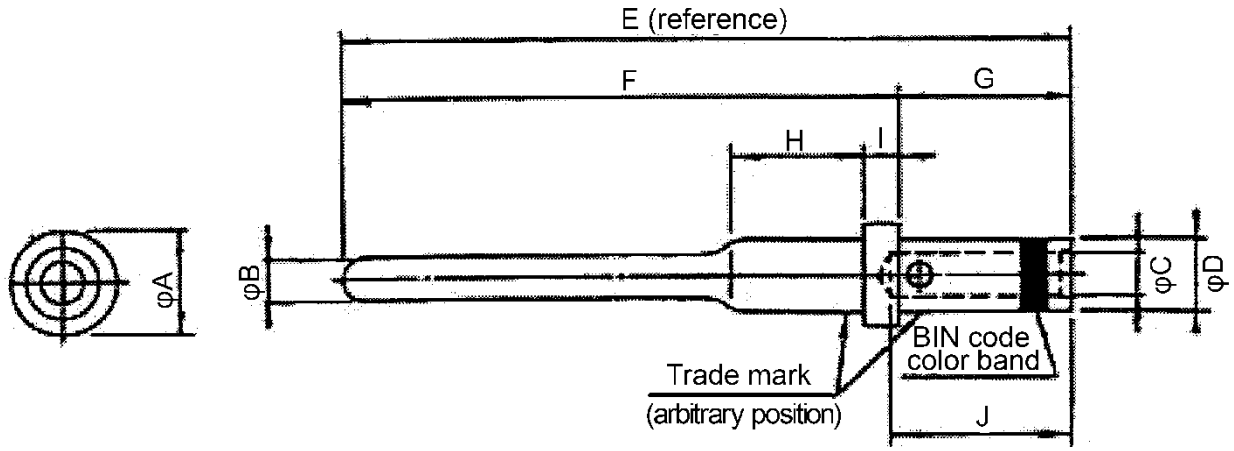


Note: (1) See SAE-AS39029/57 for detail dimensions.

Detail A (1)

Supplementary Figure B-6 (b).

Constructions and Dimensions for Socket Contact (High Density Miniature Circular Connectors)



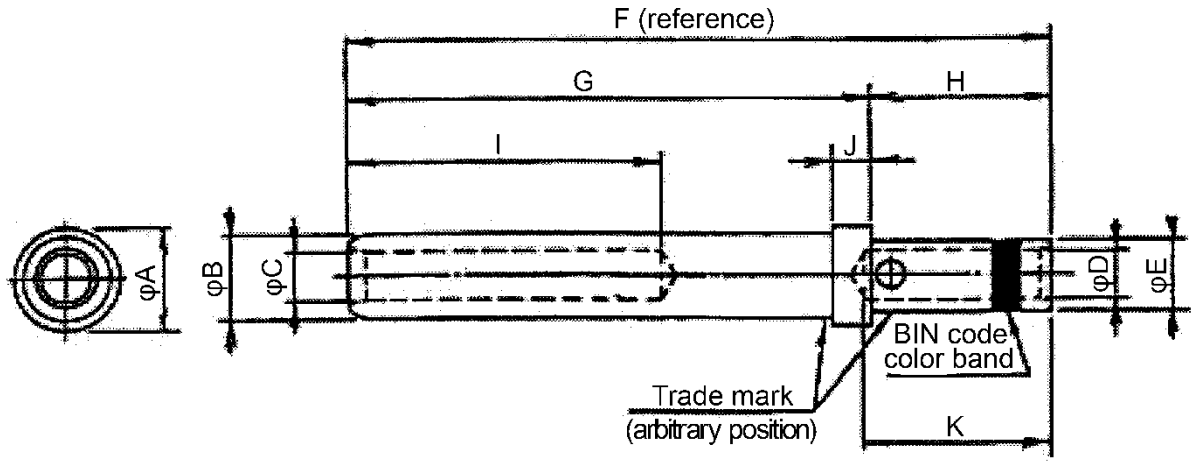
Unit: mm

Size	Physical dimension										BIN code color band	Mass (g) ±10%
	ΦA	ΦB	ΦC	ΦD	E maximum	F	G	H	I	J		
20	2.62 2.54	1.041 0.991	1.27 1.22	1.98 1.93	18.29	13.94 13.79	4.34 4.06	3.30 3.18	0.84 0.74	4.72 3.99	Red	0.26
16	3.38 3.30	1.613 1.562	1.73 1.68	2.62 2.57	20.86	14.33 14.17	6.53 6.25	3.30 3.18	1.22 1.12	7.21 6.35	Blue	0.58
12	4.83 4.75	2.413 2.362	2.59 2.49	3.84 3.76	20.86	14.33 14.17	6.53 6.25	3.05 2.92	1.22 1.12	7.21 6.35	Yellow	1.25

Note: See SAE-AS39029/4 for detail dimensions.

Supplementary Figure B-7 (a).

Constructions and Dimensions for Pin Contact (Miniature Circular Connectors)



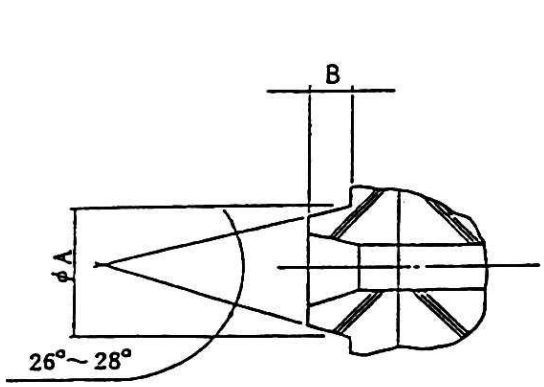
Unit: mm

Size	Physical dimension											BIN code color band	Mass (g) ±10%
	ΦA	ΦB	ΦC minimum	ΦD	ΦE	F maximum	G	H	I minimum	J	K		
20	2.62 2.54	1.98 1.93	1.054	1.27 1.22	1.98 1.93	16.66	12.32 12.17	4.34 4.06	7.37	0.84 0.74	4.72 3.99	Red	0.28
16	3.38 3.30	2.87 2.79	1.626	1.73 1.68	2.62 2.57	19.28	12.70 12.55	6.53 6.25	7.37	1.22 1.12	7.21 6.35	Blue	0.57
12	4.83 4.75	4.09 4.01	2.426	2.59 2.49	3.84 3.76	19.28	12.70 12.55	6.53 6.25	7.37	1.22 1.12	7.21 6.35	Yellow	1.20

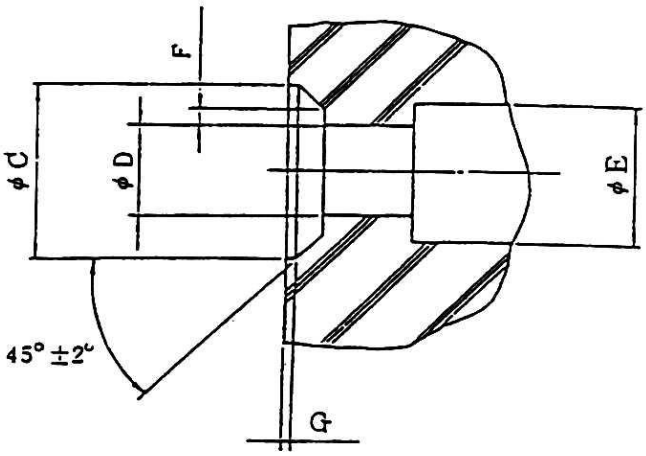
Note: See SAE-AS39029/5 for detail dimensions.

Supplementary Figure B-7 (b).

Constructions and Dimensions for Socket Contact (Miniature Circular Connectors)



Pin front

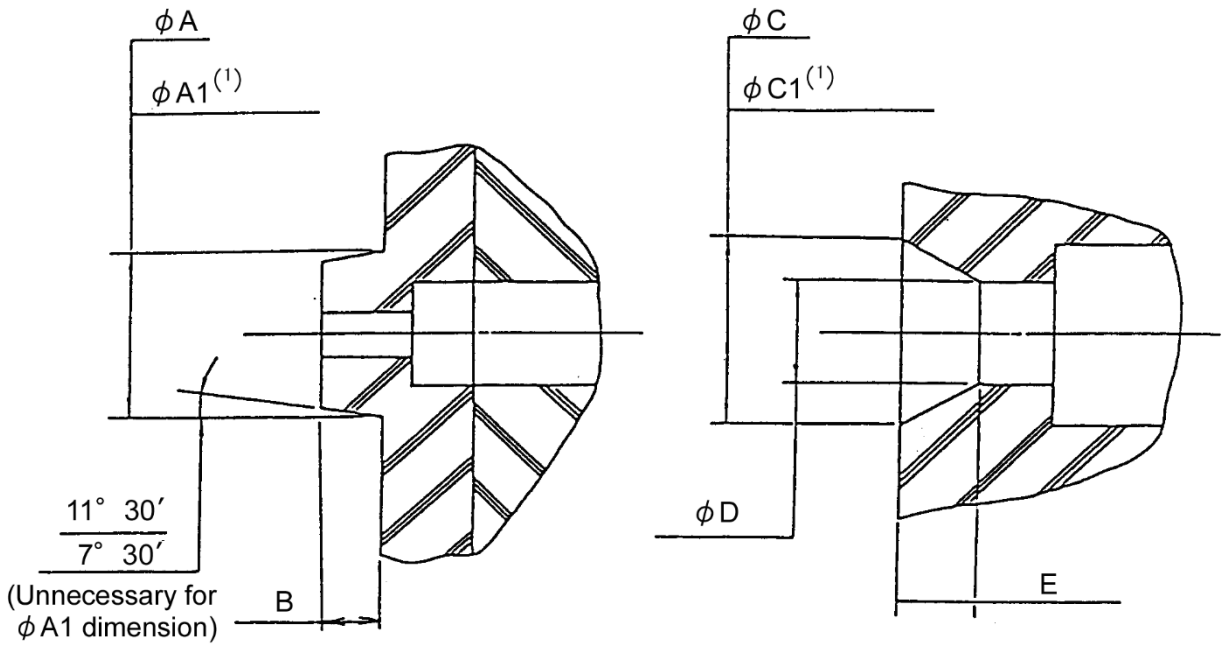


Socket front

Unit: mm

Contact size	Pin		Socket				
	ΦA	B	ΦC	ΦD	ΦE	F	G
22D	1.96 1.75	1.02 0.76	1.70 1.60	0.97 0.89	1.688 1.626	0.13 maximum	0.13 maximum

Supplementary Figure B-8 (a). Insert Interface Design (High Density Miniature Circular Connectors)



Pin front

Socket front

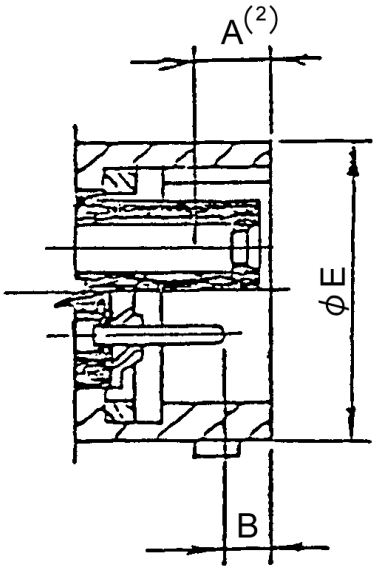
Unit: mm

Contact size	Pin front			Socket front			
	ΦA	ΦA1	B	ΦC	ΦC1	ΦD	E
20	2.84 2.69	2.29 2.13	0.94 0.69	3.00 2.90	2.44 2.34	1.50 1.24	1.30 0.89
16	3.66 3.51	–	0.94 0.69	3.81 3.71	–	2.06 1.80	1.30 0.89
12	5.18 5.03	–	0.94 0.69	5.33 5.23	–	2.84 2.59	1.30 0.89

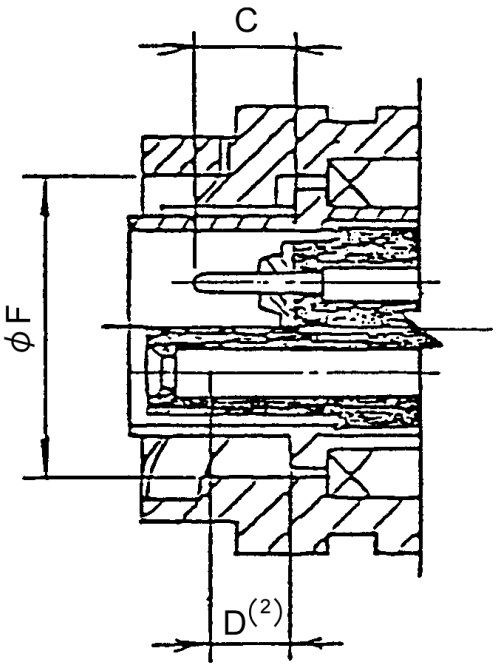
Note: (1) A1 and C1 shall apply to small contact cavities as shown in the following table.

Contact arrangement	12 – 10	14 –- 18	14 – 19	16 – 26	18 – 32
Cavity number	C, G	A, C, E, G, J, L	B, D, F, H, K, M	A to R	A to T

Supplementary Figure B-8 (b). Insert Interface Design (Miniature Circular Connectors)



Receptacle



Plug

Notes:

(1) Dimensions A through D shall be measured at tests.

(2) A distance to a point where a gauge pin with a flat tip touches socket contact spring. The gauge pin diameter shall be the same as that of the inserting contact.

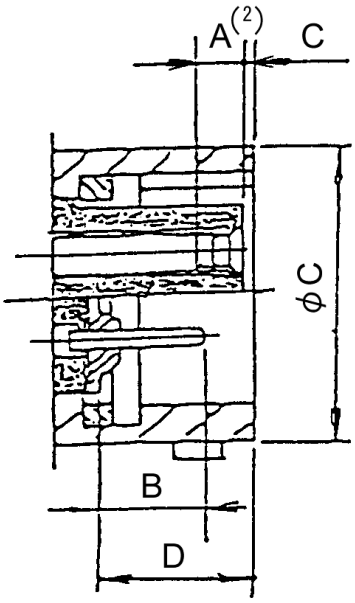
(3) See MIL-DTL-38999 for detail dimensions.

Unit: mm

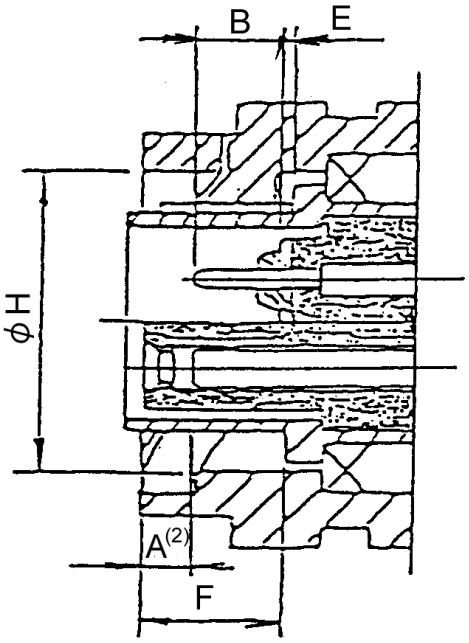
Shell size	A maximum	B	C	D maximum	ΦE +0.03 -0.13	ΦF +0.13 -0.03
8	2.82	1.70/0.79	5.79/4.83	3.71	12.01	12.22
10	2.82	1.70/0.79	5.79/4.83	3.71	14.99	15.29
12	2.82	1.70/0.79	5.79/4.83	3.71	19.05	19.33
14	2.82	1.70/0.79	5.79/4.83	3.71	22.22	22.48
16	2.82	1.70/0.79	5.79/4.83	3.71	25.40	25.65
18	2.82	1.70/0.79	5.79/4.83	3.71	28.58	28.85
20	2.82	1.70/0.79	5.79/4.83	3.71	31.75	32.00
22	2.82	1.70/0.79	5.79/4.83	3.71	34.92	35.18
24	2.82	1.70/0.79	5.79/4.83	3.71	38.10	38.35

Supplementary Figure B-9 (a).

Connector Intermateability Dimensions (High Density Miniature Circular Connectors)



Receptacle



Plug

Notes:

(1) Dimensions A through F shall be measured at tests.

(2) This length shall be the distance to the socket contact front face.

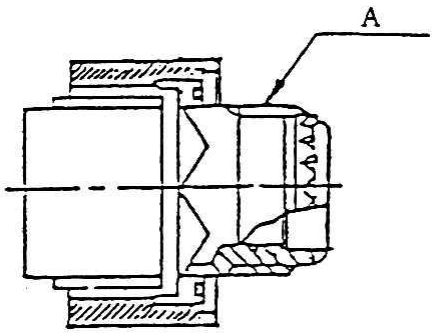
(3) See MIL-DTL-26482 for detail dimensions.

Unit: mm

Shell size	A	B	C	D	E	F	ΦG	ΦH
10	2.54/1.52	6.83/5.72	0.56/0.13	8.48/8.05	1.14/0.64	9.07/8.56	15.01/14.86	15.42/15.27
12	2.54/1.52	6.83/5.72	0.56/0.13	8.48/8.05	1.14/0.64	9.07/8.56	19.08/18.92	19.46/19.30
14	2.54/1.52	6.83/5.72	0.56/0.13	8.48/8.05	1.14/0.64	9.07/8.56	22.25/22.10	22.61/22.45
16	2.54/1.52	6.83/5.72	0.56/0.13	8.48/8.05	1.14/0.64	9.07/8.56	25.43/25.27	25.78/25.63
18	2.54/1.52	6.83/5.72	0.56/0.13	8.48/8.05	1.14/0.64	9.07/8.56	28.60/28.45	28.98/28.83
20	2.54/1.52	6.83/5.72	2.13/1.70	10.06/9.63	2.72/2.21	10.64/10.13	31.78/31.62	32.13/31.98
22	2.54/1.52	6.83/5.72	2.13/1.70	10.06/9.63	2.72/2.21	10.64/10.13	34.95/34.80	35.31/35.15
24	2.54/1.52	6.83/5.72	2.13/1.70	10.06/9.63	2.72/2.21	10.64/10.13	38.13/37.97	38.48/38.33

Supplementary Figure B-9 (b).

Connector Intermateability Dimensions (Miniature Circular Connectors)

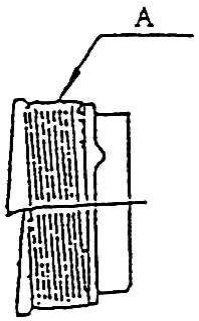


Note: See MIL-DTL-38999 for detail dimensions.

Shell size	A thread
8	7/16-28UNEF-2A
10	9/16-24UNEF-2A
12	11/16-24UNEF-2A
14	13/16-20UNEF-2A
16	15/16-20UNEF-2A
18	1-1/16-18UNEF-2A
20	1-3/16-18UNEF-2A
22	1-5/16-18UNEF-2A
24	1-7/16-18UNEF-2A

Supplementary Figure B-10 (a).

Connector Accessory Interface Dimensions (High Density Miniature Circular Connectors)



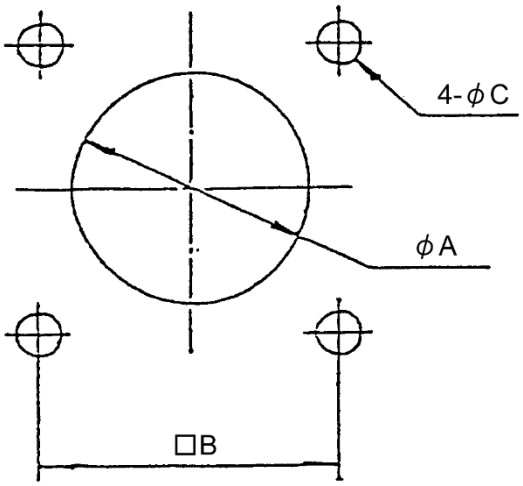
Note: See MIL-DTL-26482 for detail dimensions.

Shell size	A thread
10	5/8-24UNEF-2A
12	3/4-20UNEF-2A
14	7/8-20UNEF-2A
16	1-20UNEF-2A
18	1-1/16-18UNEF-2A
20	1-3/16-18UNEF-2A
22	1-5/16-18UNEF-2A
24	1-7/16-18UNEF-2A

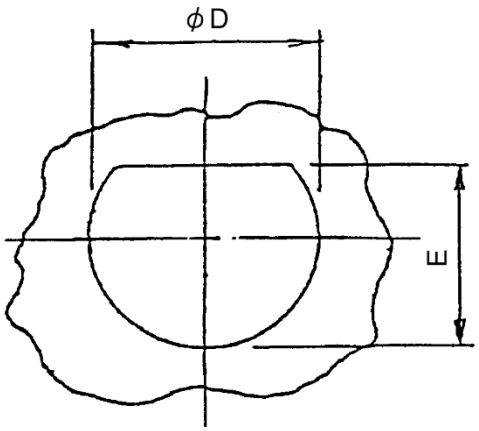
Supplementary Figure B-10 (b).

Connector Accessory Interface Dimensions (Miniature Circular Connectors)

Unit: mm



Mounting flange receptacle



$$\text{Panel thickness} = \frac{2.77}{1.57}$$

Jam-nut receptacle

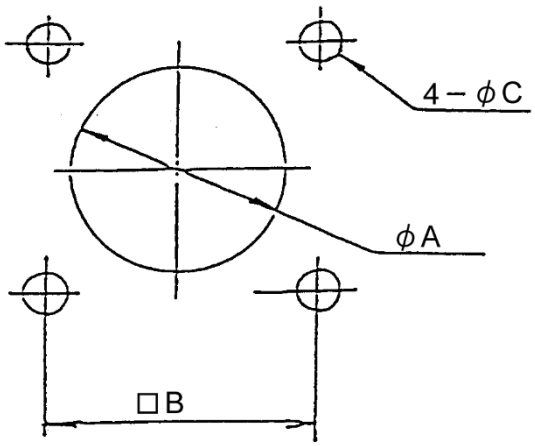
Shell size	ΦA minimum	□B ±0.13	ΦC ±0.13	ΦD +0.25 0	E 0 -0.25
8	14.15	15.09	3.25	22.45	21.08
10	17.32	18.26	3.25	25.58	24.26
12	21.69	20.62	3.25	28.80	27.53
14	24.87	23.01	3.25	31.98	30.68
16	28.04	24.61	3.25	35.15	33.86
18	31.22	26.97	3.25	38.28	37.06
20	34.39	29.36	3.25	41.50	40.03
22	37.57	31.75	3.25	44.68	43.21
24	40.74	34.93	3.91	47.85	46.38

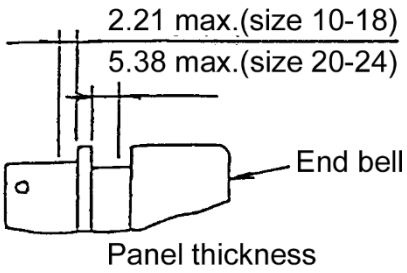
Supplementary Figure B-11 (a).

Panel Cutout Dimensions (High Density Miniature Circular Connectors)

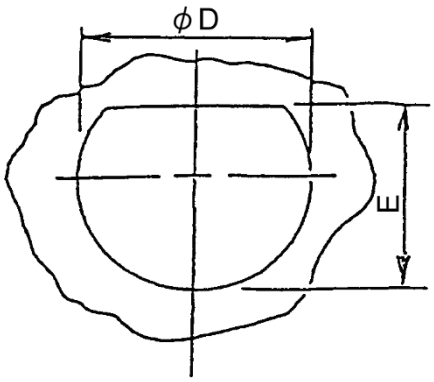
Unit: mm

Mounting flange receptacle





Jam-nut receptacle



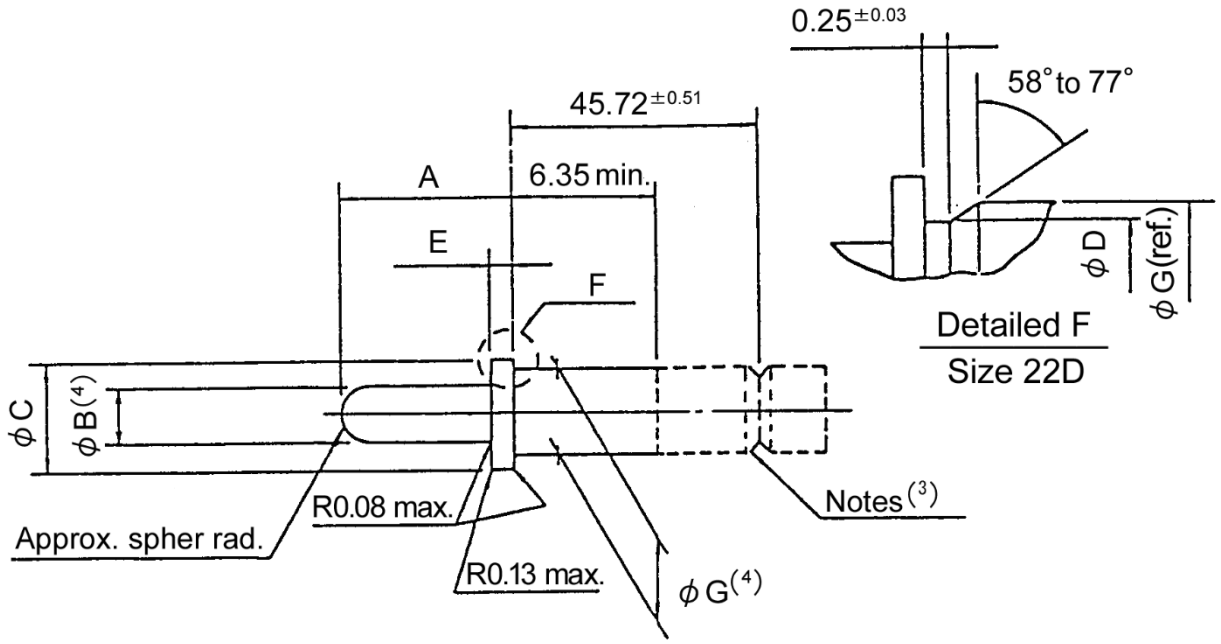
Panel thickness: 4.75/1.57 (size 10-18)
6.35/1.57 (size 20, 22)
5.56/1.57 (size24)

Shell size	ΦA	□B	ΦC	ΦD ±0.13	E ±0.13
10	17.53/17.27	18.39/18.14	3.30/2.79	17.70	16.79
12	22.07/21.82	20.75/20.50	3.30/2.79	22.73	20.93
14	25.25/24.99	23.14/22.89	3.30/2.79	25.65	24.08
16	28.40/28.14	24.74/24.49	3.30/2.79	28.83	27.23
18	31.57/31.32	27.10/26.85	3.30/2.79	32.00	30.40
20	34.75/34.49	29.49/29.24	3.30/2.79	35.18	33.58
22	37.92/37.67	31.88/31.62	3.30/2.79	38.35	36.75
24	41.15/40.89	35.05/34.80	3.99/3.48	41.53	39.93

Supplementary Figure B-11 (b).

Panel Cutout Dimensions (Miniature Circular Connectors)

Unit: mm



Contact size	A +0.013 0	ΦB +0.005 0	ΦC +0.005 0	ΦD 0 -0.005	E 0 -0.005	ΦG 0 -0.005
22D	7.493	0.749	1.524	1.041	0.838	1.219

Notes:

(1) Material: Hardened tool steel

(2) Finish: 3S as a minimum

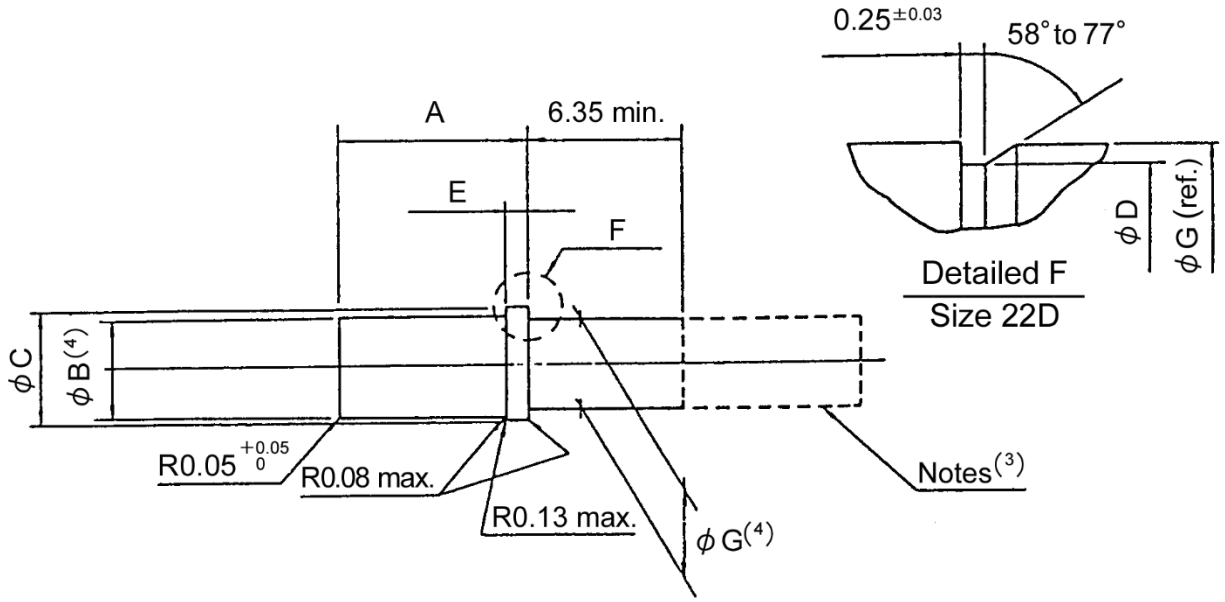
(3) Design of the rear extension is optional, but must have a groove for chucking.

(4) The eccentricity of ΦB and ΦG shall be within 0.008 TIR.

Supplementary Figure B-12 (a).

Test Gauge, Pin (High Density Miniature Circular Connectors)

Unit: mm



Contact size	A +0.013 0	ΦB +0.005 0	ΦC +0.005 0	ΦD 0 -0.005	E 0 -0.005	ΦG 0 -0.005
22D	7.341	1.524	1.524	1.041	–	1.219

Notes:

(1) Material: Hardened tool steel

(2) Finish: 3S as a minimum

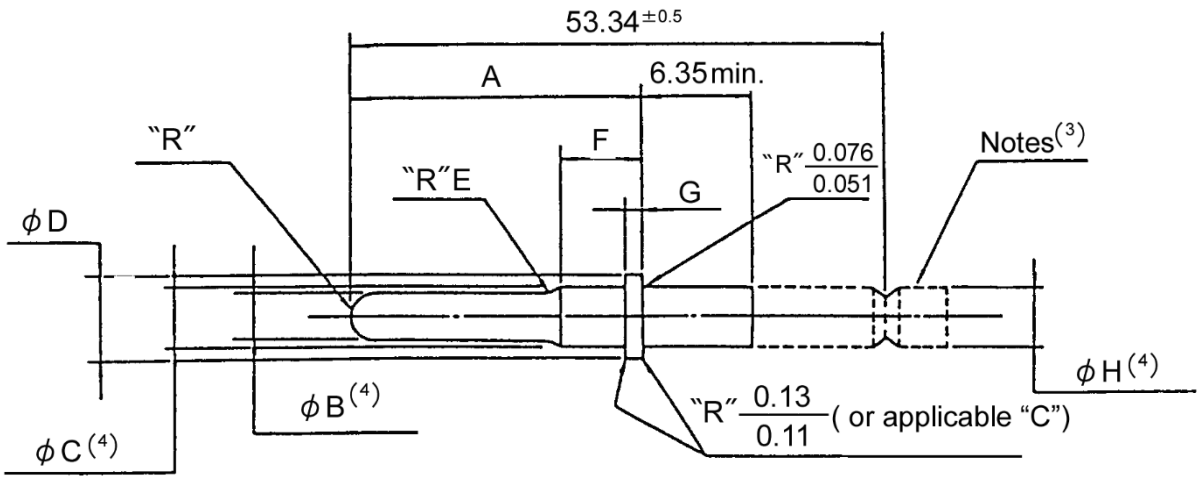
(3) Design of the rear extension is optional, but must have a groove for chucking.

(4) The eccentricity of ΦB and ΦG shall be within 0.008 TIR.

Supplementary Figure B-12 (b).

Test Gauge, Socket (High Density Miniature Circular Connectors)

Unit: mm



Contact size	A +0.010 0	ΦB +0.005 0	ΦC +0.005 0	ΦD +0.005 0	"R"E ±0.13	F 0 -0.013	G 0 -0.005	ΦH 0 -0.005
20	13.972	0.991	1.930	2.540	1.27	3.175	0.838	1.981
16	14.173	1.562	2.565	3.302	1.27	3.175	1.219	2.616
12	14.173	2.362	3.759	4.750	1.27	2.921	1.219	4.013

Notes:

(1) Material: Hardened tool steel

(2) Finish: 3S as a minimum

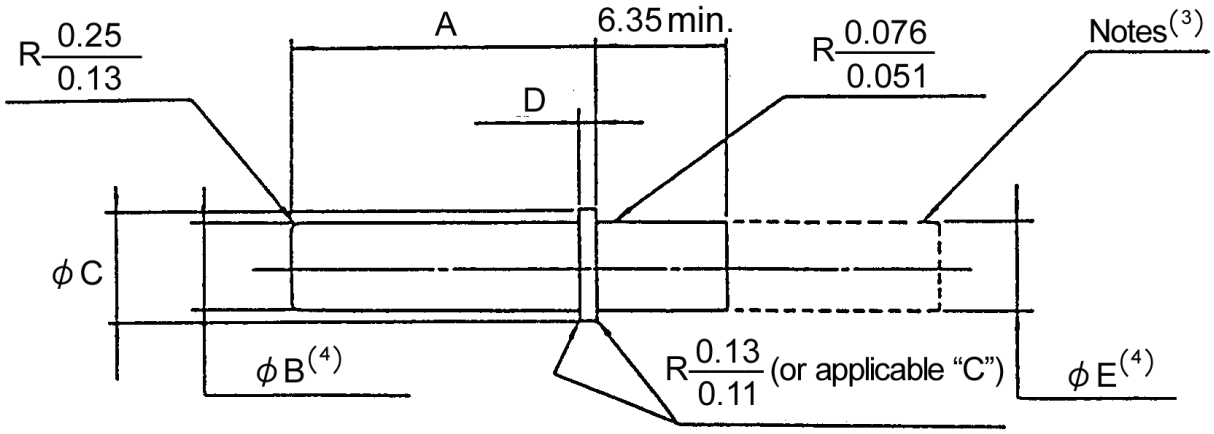
(3) Design of the rear extension is optional, but must have a groove for chucking.

(4) The eccentricity of ΦB, ΦC, and ΦH for ΦD shall be within 0.008 TIR.

(5) Test gauge of MS 3461-*P may be used.

Supplementary Figure B-13 (a). Test Gauge, Pin (Miniature Circular Connectors)

Unit: mm



Contact size	A +0.013 0	ΦB +0.005 0	ΦC +0.005 0	D 0 -0.005	ΦE 0 -0.005
20	12.167	1.930	2.540	0.838	1.981
16	12.548	2.794	3.302	1.219	2.616
12	12.548	4.013	4.750	1.219	4.013

Notes:

(1) Material: Hardened tool steel

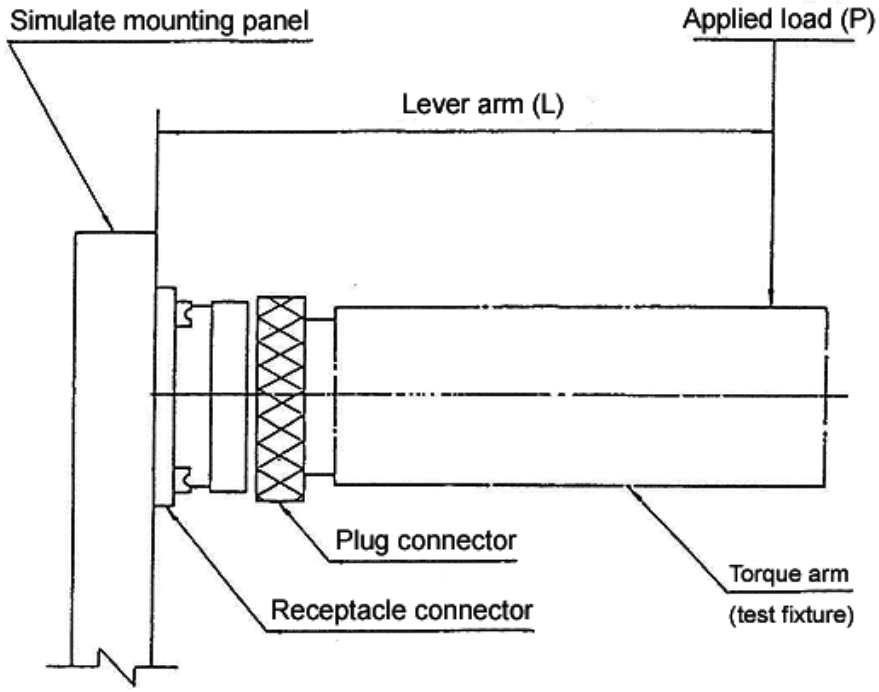
(2) Finish: 3S as a minimum

(3) Design of the rear extension is optional, but must have a groove for chucking.

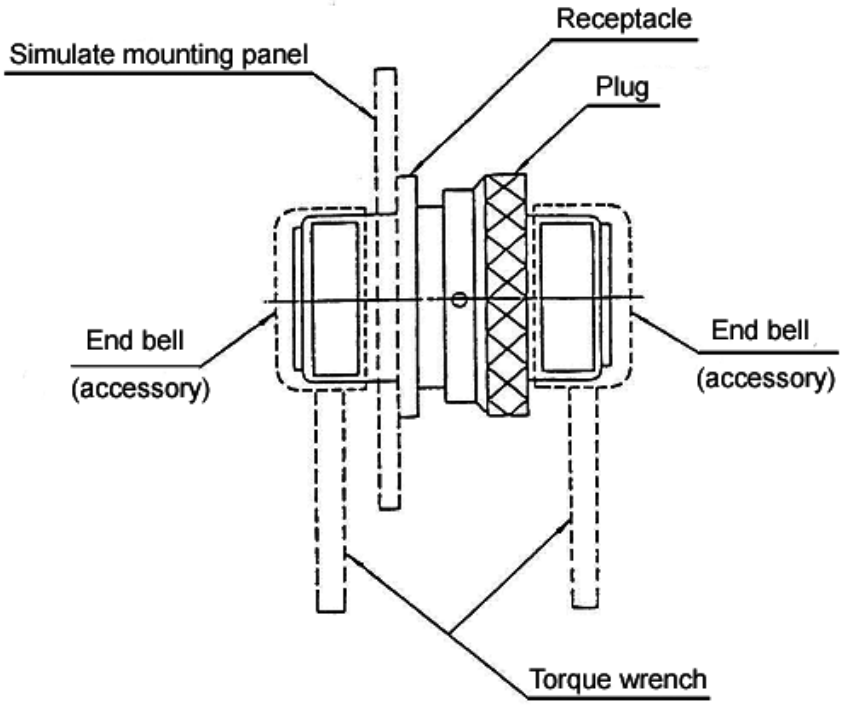
(4) The eccentricity of ΦB and ΦE for ΦC shall be within 0.008 TIR.

(5) Test gauge of MS 3461-*S may be used.

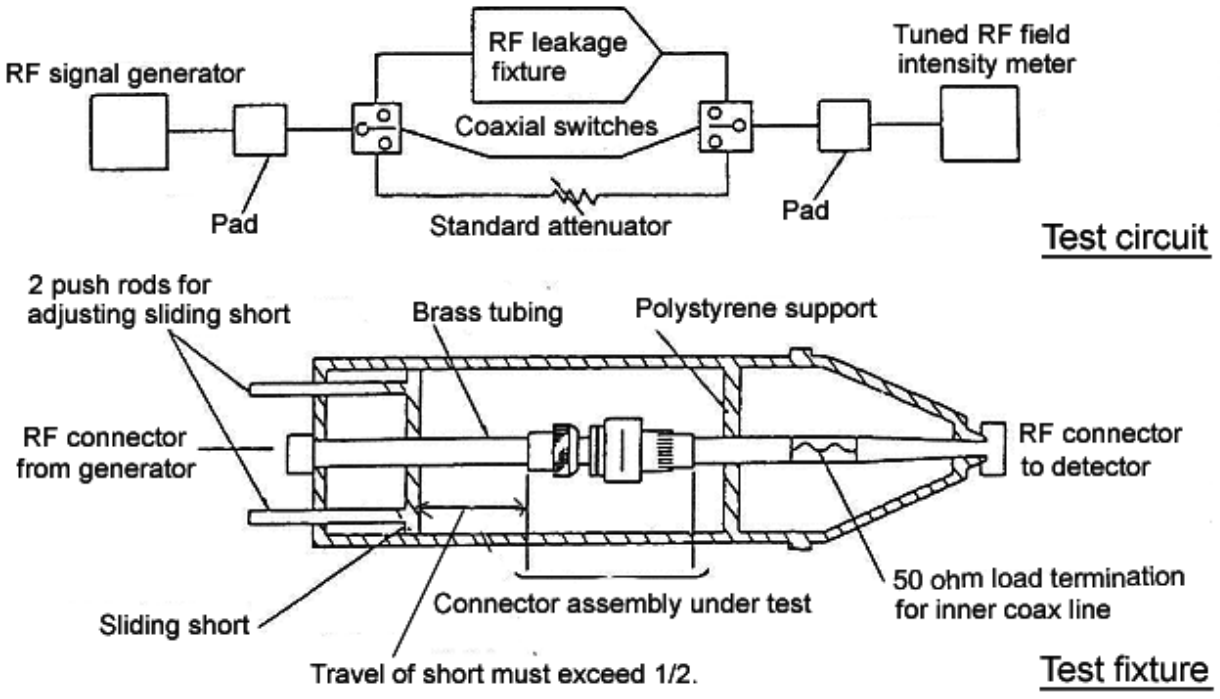
Supplementary Figure B-13 (b). Test Gauge, Socket (Miniature Circular Connectors)



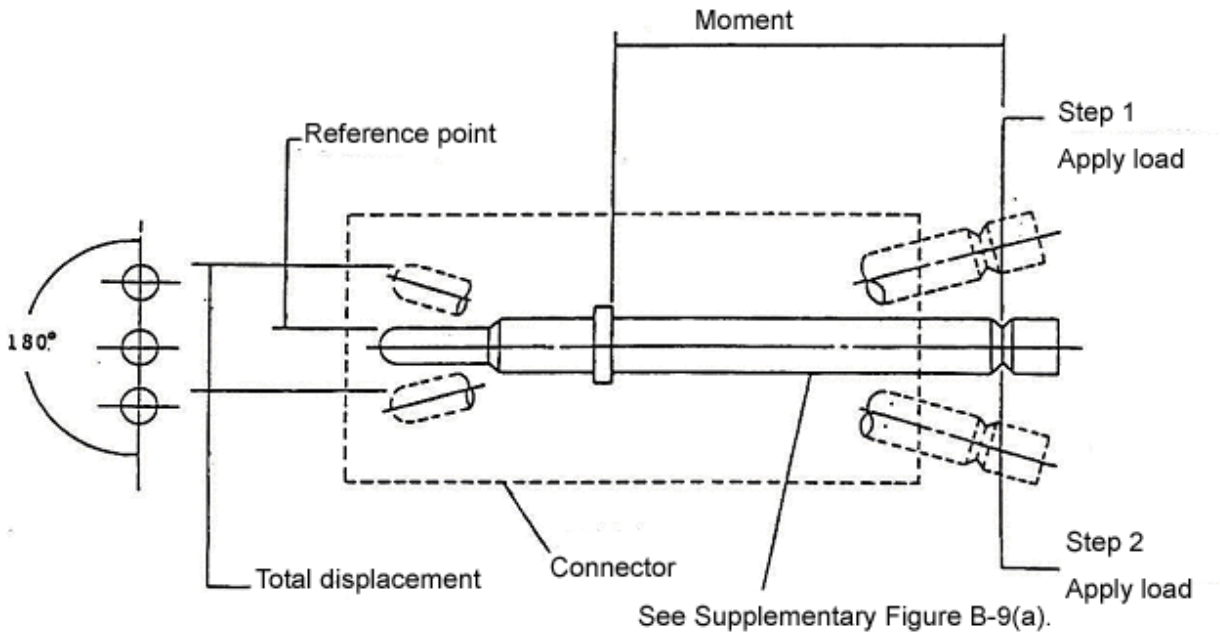
Supplementary Figure B-14. External Bending Moment Test Setup



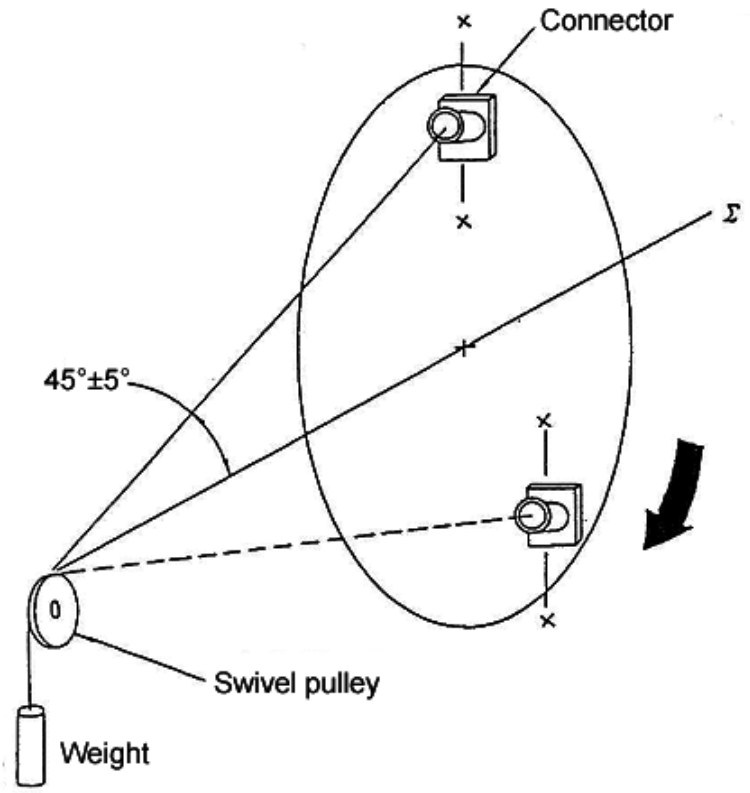
Supplementary Figure B-15. Rear Accessory Thread Strength Test



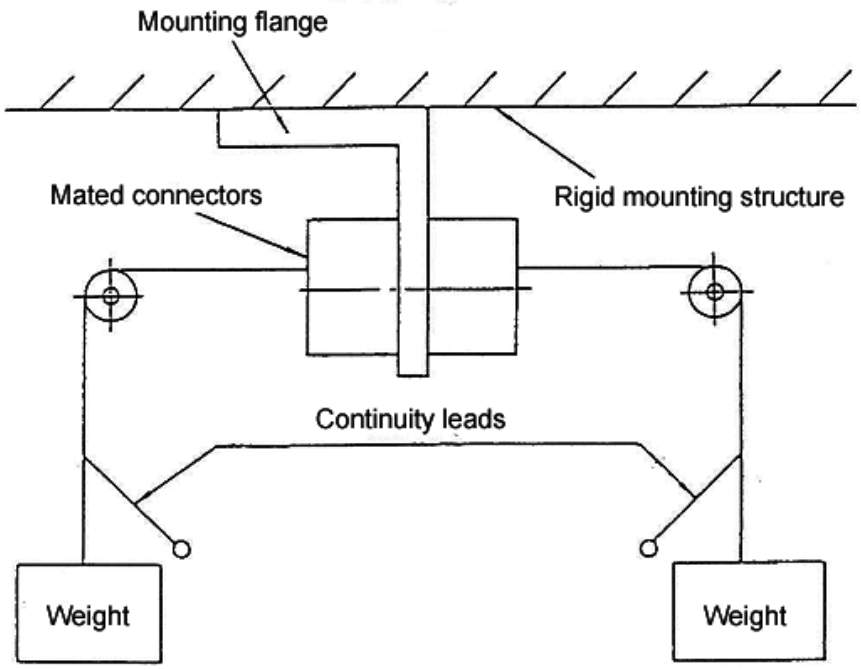
Supplementary Figure B-16. EMI Shielding Test Fixture



Supplementary Figure B-17. Pin Contact Stability Test

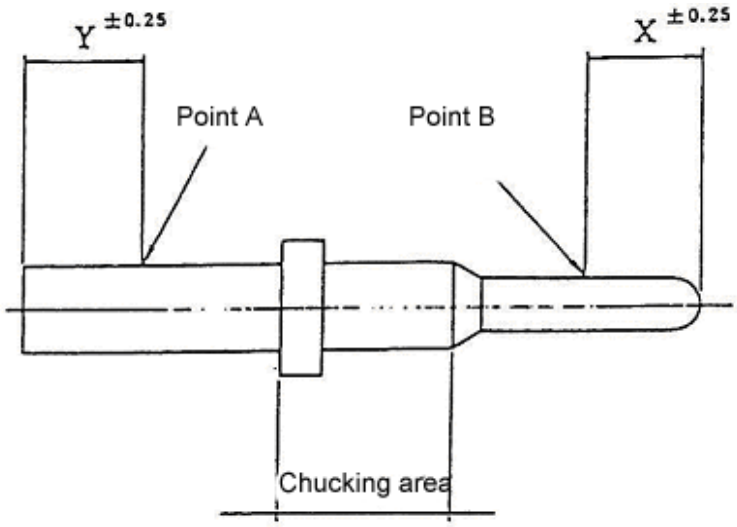


Supplementary Figure B-18. Contact Walk-Out Test Setup



Supplementary Figure B-19. Typical Fixturing for Temperature Life with Contact Loading

Unit: mm

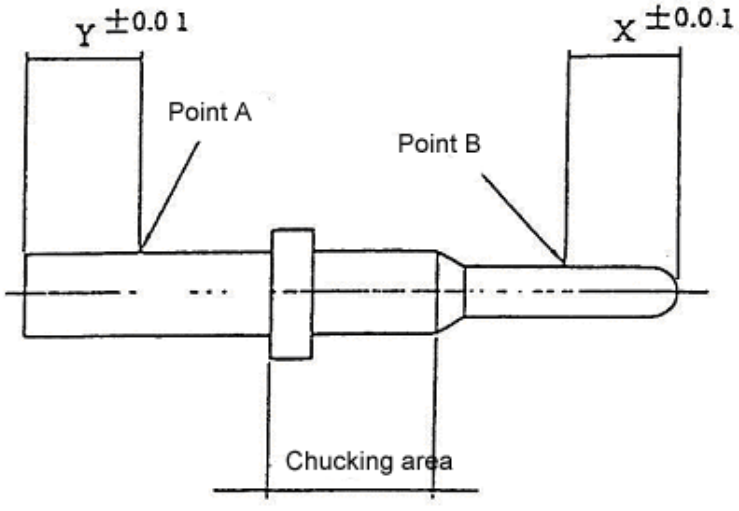


X = 2 x pin diameter
Y = The point of the beginning of the crimp indent, or 1/2 the distance from the rear of the wire barrel to the beginning of the crimp indent.

Supplementary Figure B-20 (a).

Axial Concentricity Measurement (High Density Miniature Circular Connectors)

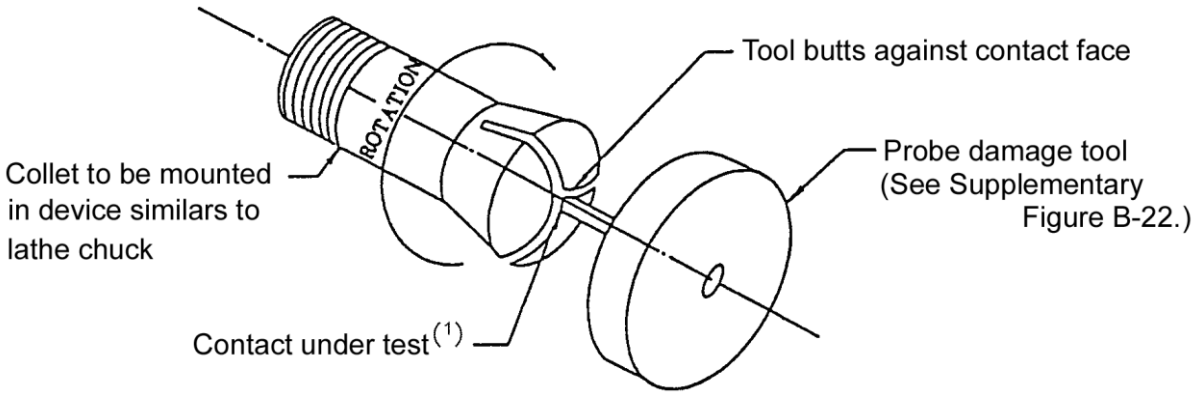
Unit: mm



X = 2 x pin diameter
Y = The point of the beginning of the crimp indent, or 1/2 the distance from the rear of the wire barrel to the beginning of the crimp indent.

Supplementary Figure B-20 (b).

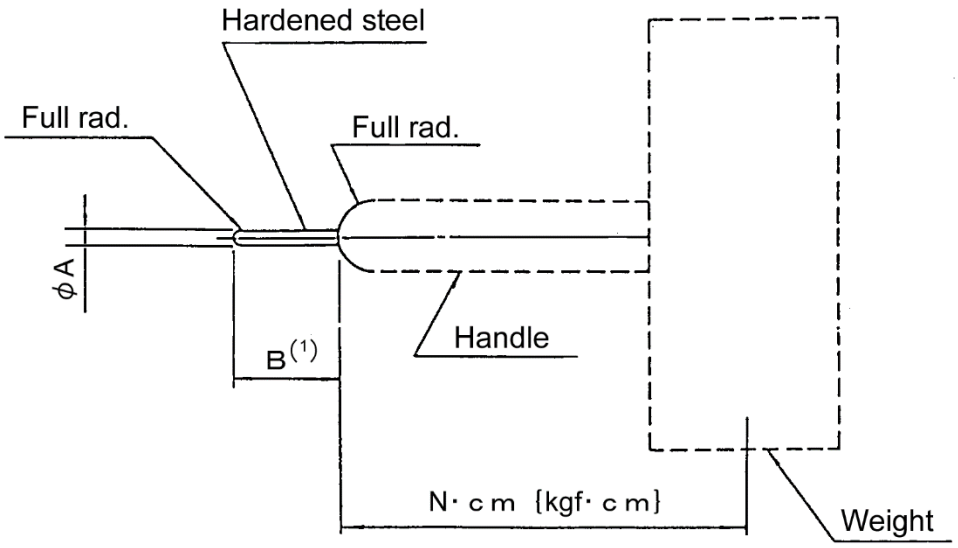
Axial Concentricity Measurement (Miniature Circular Connectors)



Collet Type Holding Device to Test Contacts outside the Connector

Note: (1) Contacts shall be fixed in a collet type holding device or an applicable connector.

Supplementary Figure B-21. Probe Damage Test Setup



Unit: mm

Contact size	ΦA ±0.013	N·cm ±10%
22D	0.762	1.47
20	1.016	5.69

Note: (1) The “B” dimension shall be adjustable for 1/2 and 3/4 of the minimum socket bore depth.

Supplementary Figure B-22. Probe Damage Tool

Supplementary Table B-1. Mass for High Density, Miniature, Circular Connectors

(g) ±10%

Contact arrangement	3E		3T		6E		6T		G6E		G6T		7E		7T	
	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
8–35	9.8	10.4	7.8	8.4	11.4	11.9	9.3	9.9	11.2	11.8	9.1	9.8	17.7	18.1	15.4	16.1
10–35	13.1	13.9	10.5	11.3	15.3	16.0	12.6	13.4	14.8	15.6	12.2	12.9	21.9	22.7	19.3	20.0
12–35	17.2	18.5	14.1	15.4	19.5	20.8	16.4	17.6	19.6	20.9	16.5	17.8	26.7	28.0	23.5	24.8
14–35	20.8	23.6	16.9	19.7	23.8	26.6	20.0	22.8	23.4	26.2	19.6	22.4	28.0	29.4	28.2	29.8
16–35	26.1	28.8	21.8	24.6	29.6	40.5	25.4	28.1	29.0	31.7	24.7	27.5	38.0	40.8	33.7	36.5
18–35	31.4	34.8	26.0	29.4	35.9	39.4	30.5	34.0	34.2	38.1	29.1	33.0	44.3	47.8	39.0	42.4
20–35	36.7	41.2	34.6	39.2	40.6	45.1	34.7	39.3	39.8	44.3	33.7	38.2	51.5	56.0	45.6	50.1
22–35	43.4	49.1	36.7	42.3	46.5	52.1	39.7	45.4	44.3	50.3	38.1	44.1	61.1	66.8	54.3	60.0
24–35	47.6	54.8	43.0	50.2	53.9	61.0	49.3	56.4	53.0	59.3	47.9	54.2	65.7	72.9	61.1	68.3

Supplementary Table B-2. Mass for Miniature, Circular Connectors

(g) ±10%

Contact arrangement	OT		OF		4T		4F		6T		6F	
	P	S	P	S	P	S	P	S	P	S	P	S
10–6	15.9	16.7	25.4	26.3	19.2	20.1	28.8	29.6	20.9	21.8	30.5	31.4
12–3	22.3	23.5	34.0	35.5	28.1	29.4	39.9	41.2	29.1	30.4	40.9	42.2
12–8	20.8	21.6	23.3	33.7	25.9	27.7	37.2	38.9	26.4	29.1	37.7	40.4
12–10	20.6	22.0	32.4	33.8	26.4	27.9	38.2	39.7	27.4	28.9	39.2	40.7
14–4	31.7	34.0	42.6	44.9	35.3	35.2	48.2	49.0	40.3	42.6	51.2	53.5
14–5	26.0	28.6	39.5	42.2	32.2	34.8	45.8	48.4	33.4	36.2	49.0	49.8
14–18	26.9	29.0	37.8	39.9	32.8	35.6	46.5	48.4	35.6	37.7	46.5	48.5
14–19	27.1	29.1	29.1	38.0	33.0	35.4	46.6	49.1	35.8	37.7	46.6	48.6
16–8	35.0	37.9	37.9	51.9	43.0	45.8	58.2	60.0	44.0	46.9	58.1	61.4
16–26	34.5	36.9	36.9	52.9	42.4	44.9	58.0	62.0	43.5	45.9	58.7	62.4
18–8	45.6	47.8	47.8	70.0	55.3	57.5	79.7	82.0	51.9	54.2	76.4	78.6
18–11	40.4	44.9	64.8	69.4	50.1	54.6	74.5	79.0	46.7	51.3	71.2	75.7
18–32	39.6	43.2	64.1	67.7	49.3	52.9	73.8	77.4	46.0	49.6	70.4	74.0
20–16	52.8	53.4	76.1	81.0	63.7	63.9	86.5	91.4	52.4	57.4	80.0	85.0
20–41	48.3	54.8	75.8	82.4	64.1	64.1	86.2	92.7	52.2	58.8	79.8	86.4
22–21	61.5	66.5	83.0	89.7	73.9	78.9	87.2	101.3	53.2	63.1	83.1	93.5
22–55	60.1	66.19	89.3	96.1	72.5	78.6	100.9	107.6	62.6	69.5	93.0	99.9
24–19	79.4	81.0	111.0	115.0	92.6	92.2	122.2	126.0	82.2	87.2	116.1	121.1
24–31	74.1	80.35	104.0	122.0	87.3	93.6	118.2	133.0	75.2	94.2	110.1	128.1
24–61	69.7	75.2	101.3	109.7	82.9	86.5	112.5	120.8	71.9	81.3	107.2	115.7

APPENDIX C

CONNECTORS, RECTANGULAR, MINIATURE

This document is the English version of JAXA QTS/ADS which was originally written and authorized in Japanese and carefully translated into English for international users. If any question arises as to the context or detailed description, it is strongly recommended to verify against the latest official Japanese version.

The release date of the English version of this specification: 25 March 2026

APPENDIX C

CONNECTORS, RECTANGULAR, MINIATURE

C.1 General

C.1.1 Scope

This appendix establishes the requirements and quality assurance provisions, among other things, for the miniature rectangular connectors (hereinafter referred to as "connectors").

C.1.2 Part Number

The part number identifies the connector type, identification number, contact arrangement, contact type, style of termination, and others as given in the following form. The detail information shall be as specified in the detail specification.

(Connectors)
[Example]

N (1) D 101 – 15 P – C L R – a (5)

- (5) — Terminal length (2)
- a — Key position (C.1.2.9)
- R — Grommet and location plate (C.1.2.8)
- L — Inclusion of contacts (C.1.2.6)
- C — Termination style (C.1.2.5)
- P — Contact type (C.1.2.4)
- 15 — Contact arrangement (C.1.2.3)
- 101 — Identification number (C.1.2.2)
- D — Connector type (C.1.2.1)

(Individual Contacts)
[Example]

N (1) D 101 – P – C 20

- 20 — Contact category (C.1.2.7)
- C — Termination style (C.1.2.5)
- P — Contact type (C.1.2.4)
- 101 — Identification number (C.1.2.2)
- D — Connector type (C.1.2.1)

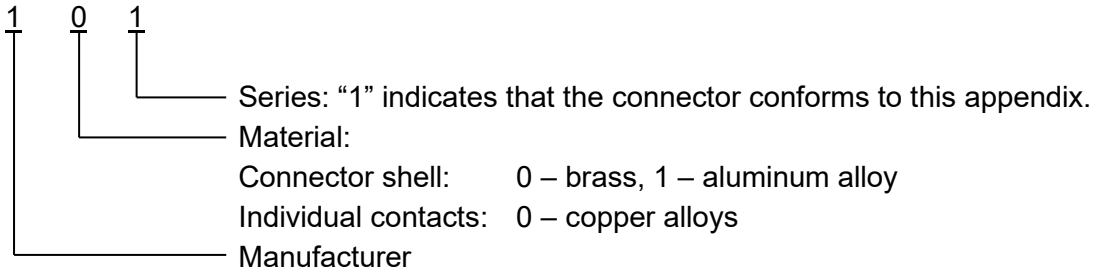
Notes:
(1) "N" indicates the part is for space use.
(2) See Note 8 of Supplementary Figures C-6 and 7 of C-7.

C.1.2.1 Connector Type

The connector type is identified by a single capital letter. “D” indicates a “D-sub connector.”

C.1.2.2 Identification Number

The identification number is identified by three digits as follows.



C.1.2.3 Contact Arrangement

The contact arrangement is identified by a single or two-digit number, and indicates the number of contacts (see Supplementary Figure C-1).

C.1.2.4 Contact Type

The contact type is identified by a single capital letter, “P” or “S”, which indicates a pin contact (male) or socket contact (female), respectively.

C.1.2.5 Termination Style

The termination style is identified by a single capital letter as shown in Table C-1.

Table C-1. Termination Style

Symbol	Termination style
C	Crimp
S	Solder
A	Right angle

C.1.2.6 Inclusion of Contacts

Blank denotes that the connector includes contacts. “L” denotes that the connector does not include any contact. For a crimp-contact connector, the connector includes type “20” contacts.

C.1.2.7 Contact Category

Contact category is defined only for termination types of crimp and right angle through hole, and denotes the following.

a) “20” Crimp contact of size 20-20
b) “26” Crimp contact of size 20-26
c) “1” Right angle through hole contact in the first row
d) “2” Right angle through hole contact in the second row
e) “3” Right angle through hole contact in the third row

C.1.2.8 Grommet and Location Plate

"R" denotes that the connector has a rear grommet. Blank denotes that the connector does not have any grommet. "B" denotes that the connector of right angle through hole type has no location plate, and blank denotes that the connector has a location plate.

C.1.2.9 Key Position (Polarization)

Rectangular, miniature connectors shall be available in two types: the standard type and those with key positions (to prevent erroneous mating). Key positions are indicated with a single letter (see Supplementary Figures C-10 and C-11). Blank denotes that the connector is not keyed.

C.2 Applicable Documents

C.2.1 Applicable Documents

The applicable documents shall be as specified in paragraph 2.1.

C.2.2 Reference Documents

The following document is a reference document in this appendix.
a) MIL-DTL-24308K Connectors, Electric, Rectangular, Nonenvironmental, Miniature, Polarized Shell, Rack and Panel, General Specification For.

C.3 Requirements

C.3.1 Certification

C.3.1.1 Qualification Coverage

The qualification coverage shall be limited to connectors that are produced by the manufacturing line that conforms to materials, designs, constructions, ratings, and performance specified in paragraphs C.3.2 to C.3.9. The qualification coverage shall be fully represented by samples that have passed the qualification test. Within this coverage, the manufacturer is allowed to supply qualified products in accordance with the detail specification.
If necessary, additional definitions of qualification coverage shall be specified in the detail specification.

C.3.2 Materials

The material shall be as specified in the following paragraphs and in paragraph 3.3.

C.3.2.1 Dissimilar Metals

Where dissimilar metals having a potential difference are used in direct contact, protection against galvanic corrosion shall be provided. For guidance on dissimilar metals, see guideline 16 of MIL-HDBK-454.

C.3.2.2 Nonmagnetic Materials

When tested as specified in paragraph C.4.3.2.1, residual magnetization of all parts and surface treatments used for connectors shall be 200nT or less.

C.3.2.3 Sublimation

Zinc or cadmium alloys, or zinc- or cadmium-plated parts shall not be used to avoid evaporation at a high temperature under high vacuum which will produce hazardous gases.

C.3.2.4 Contacts

Contacts shall be made of conductive copper alloys. Sleeves, if required on socket contacts, shall be made of copper alloys.

C.3.2.5 Inserts

Inserts shall be made of mechanically, electrically, and environmentally high grade diallyl phthalate resins or equivalents.

C.3.2.6 Shell

Shells shall be made of mechanically high grade brass alloys or equivalents. If lightweight is required, shells shall be made of mechanically high grade aluminum alloys or equivalents. The material selection criteria shall be defined in the detail specification. Shells shall be designed to be compatible with accessories which comply with ESCC No. 3401/022.

C.3.2.7 Contact Retention Clips

Contact retention clips shall be made of mechanically high grade copper-beryllium alloys or equivalents.

C.3.2.8 Sealing Plugs

Sealing plugs shall be made of environmentally high grade Teflon resins or equivalents.

C.3.2.9 Grommets

Grommets shall be made of environmentally high grade silicone rubbers or equivalents.

C.3.2.10 Filler Compounds

Filler compounds shall be made of environmentally high grade epoxy resins, silicone resins or equivalents.

C.3.2.11 Finish

C.3.2.11.1 Contacts

Unless otherwise specified, contacts shall be gold plated to a thickness of 2.54μm as a minimum per ASTM B488 or SAE-AMS 2422 over a copper plating whose thickness is 1.27μm as a minimum per SAE-AMS 2418. Contact sleeves shall be gold plated to a thickness of 1.27μm as a minimum per ASTM B488 or SAE-AMS 2422 over copper flash plating per SAE-AMS 2418. Applicable plating standards shall be specified in the detail specification.

C.3.2.11.2 Shells

Shells made of brass alloys or equivalents shall be gold plated to a thickness of 1.27μm as a minimum per ASTM B488 or SAE-AMS 2422 over copper flash plating per SAE-AMS 2418.
Shells made of aluminum alloys or equivalents shall be gold plated to a thickness of 1.27μm as a minimum per ASTM B488 or SAE-AMS 2422 over an electroless nickel plating whose thickness is 25.4μm as a minimum per ASTM B733 or SAE-AMS-C-26074. Applicable plating standards shall be specified in the detail specification.

C.3.2.11.3 Contact Retention Clips

Contact retention clips shall be gold plated to a thickness of 0.3μm as a minimum per ASTM B488 or SAE-AMS 2422 over copper flash plating per SAE-AMS 2418. Plating is not required if the performance requirements can be met without plating. Applicable plating standards shall be specified in the detail specification.

C.3.2.12 Outgassing

When tested as specified in paragraph C.4.3.2.2, inserts, sealing plugs, grommets, marking inks and adhesives shall meet the requirements of total mass loss (TML) and collected volatile condensable material (CVCM) as specified in paragraph 3.3.2.

C.3.3 Externals, Physical Dimensions and Marking

Externals, constructions, physical dimensions and mass of the connector shall be appropriate for normal handling during installation, usage, and maintenance. For details, see Supplementary Figures C-1 through C-21.

C.3.3.1 Contacts

Contacts shall be designed to be connected with wires, installed into and removed from inserts. However, except for right angle through hole contacts shall be non-removable from inserts. Contacts shall have physical dimensions and mass as shown in Supplementary Figures C-16 through C-21.
Unless otherwise specified, the contacts quantity per each connector package shall include one spare contact for each connector with 25 contacts or less, and two spare contacts for each connector with 26 contacts or more (except contacts for right angle through hole connector).

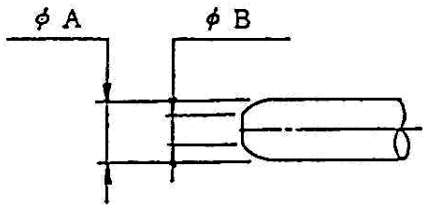
C.3.3.1.1 Pin Engagement End

The mating end of pin contacts engagement shall be formed with a spherical shape that is approximately half the pin diameter.
The flat diameter on the engagement end of the pin contacts shall be as specified in Table C-2.

Table C-2. Pin Dimensions at Engagement End

Unit: mm

Contact size	Engagement end diameter (ΦA)	Flat tip diameter (ΦB)
20	1.016±0.025	0.51 Maximum



C.3.3.1.2 Socket Mating End

The engagement end of the socket contacts shall be rounded or chamfered to direct and center pin contact. Socket contacts shall have mechanical pressure members to maintain contact pressure between mated pins and sockets. Socket contacts shall have a closed entry design to exclude engagement of pins whose diameters exceed the maximum allowable maximum pin diameter by 0.127mm or larger.

C.3.3.1.3 Roughness of Surface

The engagement surface shall be smooth without any tool mark.

C.3.3.1.4 Wire Barrel Sizes

For crimp or solder contacts, wire barrels shall accommodate the wires specified in Table C-3.

Table C-3. Wire Barrel Size

Termination style	Contact size	Wire gauge (AWG)
Crimp	20–20	20, 22, 24
	20–26	26
Solder	20	20, 22, 24, 26

C.3.3.2 Inserts

Inserts shall be molded or bonded of one-piece construction. Pin entry opening on the socket inserts shall be as small as practicable. Socket inserts shall provide adequate protection against a pin contacting a socket before the mating pair of connectors has been aligned. The inserts shall be so designed that the inserts cannot be removed from the shells.
The contact retaining system shall be free of foreign material, adhesive, or any obstruction that would prevent smooth contact insertion and positive retention.

The contact retention mechanism shall have a construction which uses metal retention clips. Inserts shall be designed to accommodate contacts of size 20, which meet to S-311-P-4/10 or ESCC No. 3401/005.

C.3.3.2.1 Contact Arrangement

Contact arrangement shall be as specified in Supplementary Figure C-1.

C.3.3.2.2 Contact Position

Inserts shall have a construction to enable mating regardless of the insert position with respect to the shell, contact distortions due to crimping, and differences in allowable dimensional tolerances.

C.3.3.3 Shell Design

Shells shall be designed to positively retain the insert and shall be constructed so that the insert cannot be removed.

C.3.3.3.1 Shell Polarization

Polarization shall be accomplished by a keystone shape shell design with polarization accomplished before engagement of the pins and sockets. For connectors with a key to prevent erroneous contact insertion, only the mating halves of connectors with the same key shall be able to mate.

C.3.3.3.2 Mounting

Connectors shall be provided with means for fasten the shell securely to a mounting surface such as fastening the shell on a mounting panel with screws.

C.3.3.4 Contact Retention Clips (if applicable)

Contact retention clips shall be retained in inserts, allow contacts to be easily installed into inserts by hand or using installing tools (refer to item c) of paragraph C.4.1.1.2), and shall be securely retained. In addition, the clips shall have a construction to allow contacts to be easily removed using removal tools. Installing and removal tools shall be specified in item c) of paragraph C.4.1.1.2.

C.3.3.5 Grommets

A grommet shall have a construction to keep foreign materials from entering the mating area of wired connector. Grommets shall be able to accommodate sealing plugs specified in MS27488 when contacts are not wired.
Grommets shall be bonded to inserts and retained. Each grommet shall be marked with the contact location number.

C.3.3.6 Coupling

When the plug and receptacle are mated as shown in Supplementary Figure C-22, the requirements specified herein shall be met.

C.3.3.6.1 Ease of Coupling

Connector shall be easily mated and unmated using a proper tool or by hand.

C.3.3.6.2 Fixing

Mated connectors shall be securely fixed using screw lock accessories.

C.3.3.7 Interchangeability

C.3.3.7.1 Interchangeability of Connectors

a) Plugs and receptacles having the same part number shall be completely mated in any combination and shall provide equal performance.
b) Crimp, solder, and right angle through hole type contact connectors having the same contact arrangement shall be intermatable in any combination.
c) Connectors having the same part number shall be completely mounted with specified mounting holes and printed wiring boards in any combination.

C.3.3.7.2 Interchangeability of Contacts (if applicable)

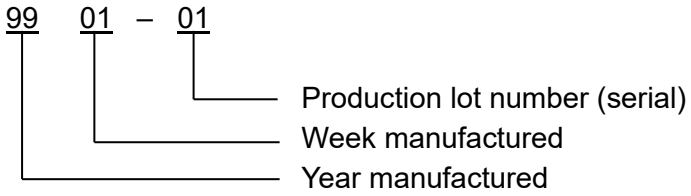
a) Crimp, solder, and right angle through hole contacts shall be completely installed with any insert.
b) Crimp type and solder type contacts shall be removed with specified removal tools in any combination.

C.3.3.8 Marking

C.3.3.8.1 Shells

The following items shall be marked in the locations shown in Supplementary Figures C-2 through C-15. The marking shall remain clearly legible after completion of all tests specified in this appendix, and even after one-minute immersion in ethanol.

a) Manufacturer's name and its abbreviation
b) Part number (paragraph C.1.2)
c) Identification code (year and week manufactured and production lot number) (paragraph C.3.3.9)



Notes:

(1) For the purpose of this appendix, "Year and week manufactured" denotes the year and week when the final assembly is completed.
(2) Manufacturing lot number identifies the lots, which include products of the same part number, manufactured within a week. When only one lot is manufactured in the week, the manufacturing lot number shall be "01."
(3) The marking shall not include the contact identification symbol, "L", which indicates a connector without contacts.

C.3.3.8.2 Inserts

Contact position markings shall be provided on both sides of the insert in accordance with Supplementary Figure C-1. Contact position markings shall be as close to the corresponding contact holes as possible.

C.3.3.8.3 Contacts

Crimp contacts shall be clearly marked with manufacturer's trademark and Basic Identification Number (BIN) code color bands as follows.
The marking shall remain legible after completion of all tests specified in this appendix.
If markings in crimped areas are peeled off and still remain identifiable, the markings shall not be rejected.

a) Trademark
The trademark shall be marked on the location shown in Figure C-1 or on the shoulder of wire barrel.

b) BIN code color bands
The BIN code color band shall be marked on the wire barrel end shown in Figure C-1 in accordance with Supplementary Figures C-16 and C-17.

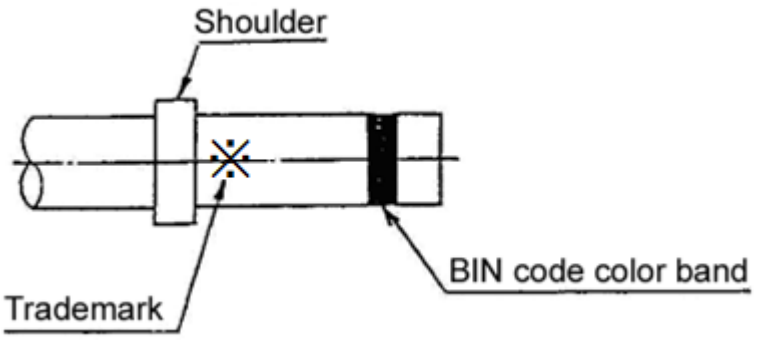


Figure C-1. Marking on Contact

C.3.3.9 Traceability

An identification code (year and week manufactured and production lot number) shall be marked on the connectors in accordance with paragraph C.3.3.8.1.
The identification code shall be provided to identify the material lot and to trace the complete manufacturing process up to the final assembly even after the connectors are installed in electronic equipment including inventories. Manufacturers shall retain records on identification codes for at least 8 years.

C.3.3.10 Workmanship

Connectors shall be manufactured and processed based on a good design in a manner to maintain uniform quality in accordance with manufacturing specifications established in the quality assurance program (see paragraph 3.2). In addition, connectors shall be free of crazing, holes, chips, sharp cutting edges, burrs or other defects that will degrade electrical, mechanical, or physical performance.

C.3.4 Plating

C.3.4.1 Plating Porosity

When tested as specified in paragraph C.4.3.4.1, there shall be no bubbling on the gold-finished contacts during a 30-second observation period.

C.3.4.2 Plating Thickness

When tested as specified in paragraph C.4.3.4.2, the thickness of gold plating shall be not less than 2.54μm, except for corners.

C.3.5 Rating

a) Voltage: 330V_{AC} under sea level (barometric pressure)
100V_{AC} under reduced pressure (4.4kPa {33.0mmHg})
b) Operating temperature range: -65 to +125°C

C.3.6 Electrical Performance

Connectors shall meet the following requirements.

C.3.6.1 Dielectric Withstanding Voltage

When tested as specified in paragraph C.4.3.5.1.1 or C.4.3.5.1.2, unmated connectors shall exhibit no evidence of short circuit and dielectric breakdown.

C.3.6.2 Insulation Resistance

When tested as specified in paragraph C.4.3.5.2, the insulation resistance between contacts and between the shell and any contact shall be as specified in Table C-4.

Table C-4. Insulation Resistance

Unit: MΩ

Initial	After humidity test		After fluid immersion
	Immediately after test	After 24 hours	
5,000 minimum	1 minimum	1,000 minimum	1,000 minimum

C.3.6.3 Contact Resistance

When tested as specified in paragraph C.4.3.5.3, the resistance of inserting pairs of pin contacts and socket contacts shall be as specified in Table C-5.

Table C-5. Contact Resistance (Voltage Drop)

Unit: mV

Style of termination	Contact size	Wire size (AWG)	Test current (A)	Initial		After test	
				Maximum	Maximum average	Maximum	Maximum average
Crimp	20–20	24	3.0	45	41	54	46
		22	5.0	73	66	88	75
		20	7.5	55	50	66	56
	20–26	26	2.0	58	53	70	61
Solder	20	26	2.0	14	9	24	14
		24	3.0	15	10	25	15
		22	5.0	17	12	27	17
		20	7.5	20	15	30	20
Right angle through hole	20	–	3.0	15	10	25	15

C.3.6.4 Low-Signal Level Contact Resistance

When tested as specified in paragraph C.4.3.5.4, low-signal level contact resistance shall be as specified in Table C-6.

Table C-6. Low-Signal Level Contact Resistance

Unit: mΩ

Contact size	Wire size (AWG)	Initial	After test
		Maximum	Maximum
20–20	24	20	23
	22	15	17
	20	9	11
20–26	26	34	42

C.3.7 Mechanical Performance

Connectors shall meet the following requirements.

C.3.7.1 Maintenance Aging

When tested as specified in paragraph C.4.3.6.1, connectors shall meet the requirements of paragraphs C.3.7.2 (contact insertion and removal forces) and C.3.7.3 (connector mating and unmating forces). This provision shall apply to crimp- and solder-contact connectors.

C.3.7.2 Contact Insertion and Removal Forces

When tested as specified in paragraph C.4.3.6.2, the axial forces required to insert and remove an individual removable contact shall be as specified in Table C-7. This provision shall apply to removable crimp- and solder-contact connectors.

Table C-7. Contact Insertion and Removal Forces

Unit: N {kgf}

Contact Size	Maximum insertion	Maximum removal
20	17.75 {1.81}	17.75 {1.81}

C.3.7.3 Connector Mating and Unmating Forces

When tested as specified in paragraph C.4.3.6.3, the force for mating and unmating of counterpart connectors shall meet the requirements specified in Table C-8.

Table C-8. Connector Mating and Unmating Forces

Unit: N {kgf}

Contact Arrangement	Mating	Unmating	
	Maximum	Maximum	Minimum
9	30.01 {3.06]	20.01 {2.04}	3.33 {0.34}
15	50.01 {5.10}	33.44 {3.41}	4.41 {0.45}
25	83.36 {8.50}	55.70 {5.68}	7.75 {0.79}
37	123.37 {12.58}	82.37 {8.40}	11.08 {1.13}
50	166.71 {17.00}	111.30 {11.35}	14.42 {1.47}

C.3.7.4 Contact Retention

When tested as specified in paragraph C.4.3.6.4, the axial displacement of contacts shall not exceed 0.3mm. In addition, there shall be no evidence of damages on contacts, contact retention clips or inserts.

C.3.7.5 Contact Engagement and Separation Forces

C.3.7.5.1 Qualification Test

When tested as specified in paragraph C.4.3.6.5.1, socket contacts shall be as specified in Table C-9.

Table C-9. Contact Engagement and Separation Forces

Unit: N {gf}

Contact size	Initial			After test		
	Engagement force		Separation force	Engagement force		Separation force
	Maximum	Maximum average	Minimum	Maximum	Maximum average	Minimum
20	5 {510}	3.3 {340}	0.2 {20}	6.12 {624}	3.9 {397}	0.17 {17}

C.3.7.5.2 Quality Conformance Inspection

When tested as specified in paragraph C.4.3.6.5.2, contact shall be capable to hold a weight of 0.2N {20gf} as a minimum.

C.3.7.6 Durability

When tested as specified in paragraph C.4.3.6.6, connectors shall exhibit no defects detrimental to the connector operation and shall meet the requirements of paragraphs C.3.7.3 (connector mating and unmating forces), and C.3.6.3 (contact resistance).

C.3.7.7 Oversize Pin Exclusion

When tested as specified in paragraph C.4.3.6.7, socket contacts shall exclude oversized test pin insertion and shall meet the requirements of paragraph C.3.6.3 (contact resistance).

C.3.7.8 Probe Damage

When tested as specified in paragraph C.4.3.6.8, socket contacts shall exhibit no defects which will adversely affect connector's performance and shall meet the requirements of paragraph C.3.7.3 (connector mating and unmating forces). Individual contacts shall meet the requirements of paragraphs C.3.7.5 (contact engagement and separation forces) and C.3.6.3 (contact resistance).

C.3.7.9 Insert Retention

When tested as specified in paragraph C.4.3.6.9, inserts shall be retained in proper positions in shells and shall not exhibit any crack or breakage. There shall be no looseness detrimental to coupling and electrical continuity.

C.3.7.10 Contact Axial Concentricity

When tested as specified in paragraph C.4.3.6.10, the axial concentricity shall meet the following requirements.

C.3.7.10.1 Unwired Contacts

The total indicator reading (TIR) shall be 0.13mm or less.

C.3.7.10.2 Wired Contacts

The total indicator reading (TIR) shall be 0.28mm or less.

C.3.7.11 Contact Pin Strength

When tested as specified in paragraph C.4.3.6.11, pin contacts shall not exhibit any permanent bending greater than 0.13mm at the insertion end.

C.3.7.12 Crimp Tensile Strength

When tested as specified in paragraph C.4.3.6.12, the crimp tensile strength shall be as specified in Table C-10.

Table C-10. Crimp Tensile Strength

Unit: N {kgf}

Contact size	Wire size (AWG)	Minimum crimp tensile strength
20–20	24	36 {3.67}
	22	57 {5.81}
	20	92 {9.38}
20–26	26	36 {3.67}

C.3.7.13 Resistance to Soldering Heat

When tested as specified in paragraph C.4.3.6.13, connectors shall exhibit no evidence of distortions, damages or other defects. This provision shall not apply to crimp-contact connectors.

C.3.7.14 Solderability

When tested as specified in paragraph C.4.3.6.14, a minimum of 95% of the immersed external surface shall be covered with solder. This provision shall not apply to crimp-contact connectors.

C.3.8 Environmental Performance

Connectors shall meet the following requirements.

C.3.8.1 Vibration

C.3.8.1.1 High Frequency Vibration

When tested as specified in paragraph C.4.3.7.1.1, there shall be no electrical discontinuity in excess of 1μs. Mated connectors shall not exhibit any separation, damage, crack, or loosening of parts.

C.3.8.1.2 Random Vibration

When tested as specified in paragraph C.4.3.7.1.2, there shall be no electrical discontinuity in excess of 1μs. There shall be no significant visual damages such as discolorations, chips, deformations, peelings and crazing. Marking shall remain legible. In addition, connectors shall meet the requirements of paragraphs C.3.6.3 (contact resistance), C.3.6.1 (dielectric withstanding voltage at sea level), and C.3.6.2 (insulation resistance).

C.3.8.2 Shock

C.3.8.2.1 Shock (I)

When tested as specified in paragraph C.4.3.7.2.1, there shall be no electrical discontinuity in excess of 1μs. Mated connectors shall not exhibit any separation, damage, crack, or loosening of parts.

C.3.8.2.2 Shock (II)

When tested as specified paragraph C.4.3.7.2.2, there shall be no electrical discontinuity in excess of 1μs. There shall be no significant visual damages such as discoloration, chips, deformation, peelings and crazing. Marking shall remain legible. In addition, connectors shall meet the requirements of paragraphs C.3.6.3 (contact resistance), C.3.6.1 (dielectric withstanding voltage at sea level), and C.3.6.2 (insulation resistance).

C.3.8.3 Temperature Cycling

C.3.8.3.1 Temperature Cycling (I)

When tested as specified in paragraph C.4.3.7.3.1, there shall be no visible evidence of any mechanical damages. Also, there shall be no failure modes identified in FMAT of the Quality Assurance Program Plan. Individual contacts shall meet the requirements of paragraphs C.3.7.5 (contact engagement and separation forces), and C.3.6.3 (contact resistance).

C.3.8.3.2 Temperature Cycling (II)

When tested as specified in paragraph C.4.3.7.3.2, there shall be no visible evidence of any mechanical damages. Also, there shall be no failure modes identified in FMAT of the Quality Assurance Program Plan. In addition, connectors shall meet the requirements of paragraphs C.3.6.3 (contact resistance), C.3.6.1 (dielectric withstanding voltage at sea level), and paragraph C.3.6.2 (insulation resistance).

C.3.8.4 Humidity

When tested as specified in paragraph C.4.3.7.4, connectors shall meet the requirements of paragraphs C.3.6.1 (dielectric withstanding voltage at sea level), and C.3.6.2 (insulation resistance).

C.3.8.5 Fluid Immersion

When tested as specified in paragraph C.4.3.7.5, connectors shall meet the requirements of paragraphs C.3.7.3 (connector mating and unmating forces), C.3.6.1 (dielectric withstanding voltage at sea level), and C.3.6.2 (insulation resistance).
This requirement shall apply when specified in the detail specification or when ordered by the purchaser in accordance with paragraph 6.2.1 (items to be ordered for procurement).

C.3.8.6 Resistance to Corrosive Gas

When tested as specified in paragraph C.4.3.7.6, contacts shall exhibit no defects detrimental to performance and shall meet the requirements of paragraph C.3.6.4 (low-signal level contact resistance).

C.3.8.7 Salt Spray (Corrosion)

When tested as specified in paragraph C.4.3.7.7, connectors shall not expose the base metal due to corrosion which will adversely affect connector performance. At the completion of the test, connectors shall meet the requirements of paragraphs C.3.7.3 (connector mating and unmating forces), and C.3.6.3 (contact resistance). Individual contacts shall meet the requirements of paragraphs C.3.6.4 (contact resistance at low-signal level), C.3.6.3 (contact resistance), and C.3.7.5 (contact engagement and separation forces).

C.3.8.8 Radiation Hardness

When tested as specified in paragraph C.4.3.7.8, connectors shall be no significant visual damages such as discolorations, chips, deformations, peelings and crazing, and the marking shall remain legible. At the completion of the test, connectors shall meet the requirements of paragraphs C.3.6.3 (contact resistance), C.3.6.1 (dielectric withstanding voltage at sea level), and C.3.6.2 (insulation resistance).
If equivalent tests have been conducted on individual insulating materials used in connectors, the test data may be substituted.

C.3.9 Durability

Connectors shall meet the following requirements.

C.3.9.1 Temperature Life

When tested as specified in paragraph C.4.3.8.1, contacts shall exhibit no defects detrimental to performance and shall meet the requirements of paragraphs C.3.6.4 (low-signal level contact resistance), C.3.6.3 (contact resistance), and C.3.7.5 (contact engagement and separation forces).

C.4 Quality Assurance Provisions

C.4.1 Qualification Test

C.4.1.1 Samples

Qualification test samples shall meet the requirements for materials specified in paragraph C.3.2. Unless otherwise specified, connectors with the maximum number of contacts shall be selected.

C.4.1.1.1 Sample Size

The number of samples shall be as specified below.

a) Crimp contacts and connectors
   1) 12 each of plugs and receptacles with size 20-20 contacts.
   2) 48 pin and socket contacts from the same manufacturing lot as item a), 1) above.

3) Additional 48 pin and socket contacts with size 20-26 if contacts of size 20-20 and 20-26 are to be qualified at the same time.

b) Solder contacts and connectors
   1) 9 plugs and receptacles when connectors/contacts of crimp termination and solder termination are to be qualified at the same time.
   2) 12 pin and socket contacts from the same manufacturing lot as item b), 1) above.

c) Right angle through hole contacts and connectors
   1) 3 plugs and receptacles when connectors/contacts of crimp termination and right angle through hole termination are to be qualified at the same time.
   2) 12 pin and socket contacts from the same manufacturing lot as item c), 1) above.

C.4.1.1.2 Preparation of Samples and Sample Grouping

Connectors shall be prepared as follows and shall be grouped as specified in Tables C-11 and C-12.

a) The following wires shall be used.
   1) JAXA-QTS-2120, Wires, electric, fluorinated ethylene propylene (FEP) insulated, polyimide, covering
      KT-20 (19) U-H-*
      KT-24 (19) U-H-*
   2) GSFC S-311-P-13 (1) Wire and Cable, Electrical, Insulated, for Space Flight Use, General Specification for
      Silver plated tensile strength copper alloy, AWG 26
      Note: (1) GSFC: Goddard Space Flight Center
   3) Other wires
      Wires shall have sufficient performance required for the tests. Applicable standards, types and manufacturer names shall be specified in the detail specification. Wire specifications including conductor construction, insulator, conductor resistance and insulation resistance shall be specified in the application data sheet.

b) Wire crimping tools shall be those as specified in MIL-C-39029/63, /64, or equivalents.

c) Contact insertion and removal tools shall be those specified in MIL-C-39029/63, /64, or equivalents.

d) Right angle through hole contact connectors shall be wired using proper printed wiring boards (see Supplementary figures C-24 and C-25).

e) Wire connection and running shall be performed after completion of the residual magnetization test.

Table C-11. Preparation of Samples and Sample Grouping (Connectors)

Unit: pair

Termination style	Test group							Wires used	
	Table C-13			Table C-14				Wire size (AWG)	Applicable standard
	1	2	3	4	5	6	7		
Crimp	1	1	1		2	2	2	20	JAXA-QTS-2120 or wires with sufficient performance
	1	1						24	
				1				–	
Solder	2				2	2	2	20	
	1							24	
Right angle through hole		3						–	

Note: (1) The specified sample number shall be applied when connectors of crimp termination, solder termination and right angle through hole termination are to be qualified at the same time.

Table C-12. Preparation of Samples and Sample Grouping (Individual Contacts)

Unit: pair

Termination style		Test group								Wires used	
		Table C-15					Table C-16			Wire size (AWG)	Applicable standard
		8	9	10	11	12	13	14	15		
Crimp	20-20	4	4	4	4	4				20	JAXA-QTS-2120 or wires with sufficient performance
		4	4	4	4	4				24	
							4	4		–	
	20-26	8	8	8	8	8				26	GSFC S-311-P-13 or wires with sufficient performance
							4	4		–	
Solder							4	4	4	–	–
Right angle through hole							4	4	4	–	–

C.4.1.2 Test Items and Order of Tests

Test items shall be as shown in Tables C-13 through C-16, and each test shall be conducted in the order listed in each table.
Sample size shall be as specified in paragraph C.4.1.1.1.

C.4.1.3 Determination of Pass or Fail

A failure of any test specified in Tables C-13 through C-16 shall constitute failure of the qualification test.

C.4.1.4 Disposition after Test

If failed to pass qualification test, the manufacturer shall take corrective action to assure quality of the materials, manufacturing processes and processing methods. Corrective actions shall also be taken on other products manufactured using the same materials and processes that may have the similar defects.
After the corrective action has been taken, the qualification test in Tables C-13 through C-16 shall be repeated on additional sample units. In this case, JAXA shall have the rights to determine whether all test items or failed test items shall be performed. After completion of the group A inspection of the quality conformance inspection shown in Table C-17, the additional samples shall be submitted for the qualification test.

Table C-13. Qualification Test and Quality Conformance Inspection (Group C) (Connectors)

Test item	Requirement paragraph	Test method paragraph	Test group (1)		
			1	2	3
Externals, physical dimensions and marking	C.3.3	C.4.3.3	×	×	×
Residual magnetization	C.3.2.2	C.4.3.2.1	×	×	×
Resistance to soldering heat (2)	C.3.7.13	C.4.3.6.13	×	×	
Maintenance aging (4)	C.3.7.1	C.4.3.6.1	×		
Contact insertion and removal forces (4)	C.3.7.2	C.4.3.6.2	×		
Connector Mating and unmating forces (4)	C.3.7.3	C.4.3.6.3	×		
Contact retention	C.3.7.4	C.4.3.6.4	×	×	
Dielectric withstanding voltage (sea level)	C.3.6.1	C.4.3.5.1.1	×	×	×
Dielectric withstanding voltage (reduced pressure)	C.3.6.1	C.4.3.5.1.2	×	×	×
Insulation resistance	C.3.6.2	C.4.3.5.2	×	×	×
Contact resistance	C.3.6.3	C.4.3.5.3	×	×	×
Contact engagement and separation forces	C.3.7.5	C.4.3.6.5	×	×	×
Connector Mating and unmating forces	C.3.7.3	C.4.3.6.3	×	×	×
Temperature cycling (I)	C.3.8.3.1	C.4.3.7.3.1	×	×	×
Humidity	C.3.8.4	C.4.3.7.4	×	×	×
Dielectric withstanding voltage (sea level)	C.3.6.1	C.4.3.5.1.1	×	×	×
Insulation resistance	C.3.6.2	C.4.3.5.2	×	×	×
High frequency vibration	C.3.8.1.1	C.4.3.7.1.1	×	×	×
Shock (I)	C.3.8.2.1	C.4.3.7.2.1	×	×	×
Durability	C.3.7.6	C.4.3.6.6	×	×	×
Connector Mating and unmating forces	C.3.7.3	C.4.3.6.3	×	×	×
Contact resistance	C.3.6.3	C.4.3.5.3	×	×	×
Salt spray (corrosion)	C.3.8.7	C.4.3.7.7	×	×	×
Connector Mating and unmating forces	C.3.7.3	C.4.3.6.3	×	×	×
Contact resistance	C.3.6.3	C.4.3.5.3	×	×	×
Oversize pin exclusion	C.3.7.7	C.4.3.6.7	×	×	×
Contact resistance	C.3.6.3	C.4.3.5.3	×	×	×
Probe damage	C.3.7.8	C.4.3.6.8	×	×	×
Contact engagement and separation forces	C.3.7.5	C.4.3.6.5.1	×	×	×
Fluid immersion (3) (5)	C.3.8.5	C.4.3.7.5	×	×	×
Connector Mating and unmating forces	C.3.7.3	C.4.3.6.3	×	×	×
Dielectric withstanding voltage (sea level)	C.3.6.1	C.4.3.5.1.1	×	×	×
Insulation resistance	C.3.6.2	C.4.3.5.2	×	×	×
Insert retention	C.3.7.9	C.4.3.6.9	×	×	×
Externals, physical dimensions and marking	C.3.3	C.4.3.3	×	×	×

Notes:

(1) The tests identified with the symbol “x” shall be performed.

(2) Not applicable to connectors with crimp contacts.

(3) Not applicable to connectors with a grommet.

(4) Applicable to removable contact connectors.

(5) Applicable when specified in the detail specification or when ordered by the purchaser in accordance with paragraph 6.2.1 (items to be ordered for procurement).

Table C-14. Qualification Test and Quality Conformance Inspection (Group C) (Connectors)

Test item	Requirement paragraph	Test method paragraph	Test group (1)			
			4	5	6	7
Externals, physical dimensions and marking	C.3.3	C.4.3.3	×	×	×	×
Outgassing	3.3.3, C.3.2.12	C.4.3.2.2	×			
Contact resistance	C.3.6.3	C.4.3.5.3		×	×	×
Dielectric withstanding voltage (sea level)	C.3.6.1	C.4.3.5.1.1		×	×	×
Insulation resistance	C.3.6.2	C.4.3.5.2		×	×	×
Random vibration	C.3.8.1.2	C.4.3.7.1.2		×		
Shock (II)	C.3.8.2.2	C.4.3.7.2.2			×	
Radiation hardness (2)	C.3.8.8	C.4.3.7.8				×
Externals and construction	C.3.2, C.3.3	C.4.3.3		×	×	×
Contact resistance	C.3.6.3	C.4.3.5.3		×	×	×
Dielectric withstanding voltage (sea level)	C.3.6.1	C.4.3.5.1.1		×	×	×
Insulation resistance	C.3.6.2	C.4.3.5.2		×	×	×
Temperature cycling (II)	C.3.8.3.2	C.4.3.7.3.2		×		
Externals and construction	C.3.2, C.3.3	C.4.3.3		×		
Contact resistance	C.3.6.3	C.4.3.5.3		×		
Dielectric withstanding voltage (sea level)	C.3.6.1	C.4.3.5.1.1		×		
Insulation resistance	C.3.6.2	C.4.3.5.2		×		

Notes: (1) The tests identified with the symbol “x” shall be performed.

(2) If equivalent tests have been conducted on individual insulating materials used in connectors, the test data may be substituted.

Table C-15. Qualification Test and Quality Conformance Inspection (Group C) (Crimp Contacts)

Test item	Requirement paragraph	Test method paragraph	Test group (1)				
			8	9	10	11	12
Externals, physical dimensions and marking	C.3.3	C.4.3.3	×	×	×	×	×
Residual magnetization	C.3.2.2	C.4.3.2.1	×	×	×	×	×
Contact axial concentricity	C.3.7.10	C.4.3.6.10	×	×	×	×	
Low-signal level contact resistance	C.3.6.4	C.4.3.5.4	×	×	×	×	
Contact resistance	C.3.6.3	C.4.3.5.3	×	×	×		
Contact engagement and separation forces	C.3.7.5	C.4.3.6.5	×	×	×		
Thermal cycling (I)	C.3.8.3.1	C.4.3.7.3.1	×				
Contact engagement and separation forces	C.3.7.5	C.4.3.6.5	×				
Contact resistance	C.3.6.3	C.4.3.5.3	×				
Probe damage	C.3.7.8	C.4.3.6.8	×				
Contact engagement and separation forces	C.3.7.5	C.4.3.6.5	×				
Contact resistance	C.3.6.3	C.4.3.5.3	×				
Salt spray (corrosion)	C.3.8.7	C.4.3.7.7		×			
Low-signal level contact resistance	C.3.6.4	C.4.3.5.4		×			
Contact resistance	C.3.6.3	C.4.3.5.3		×			
Contact engagement and separation forces	C.3.7.5	C.4.3.6.5		×			
Temperature life	C.3.9.1	C.4.3.8.1			×		
Low-signal level contact resistance	C.3.6.4	C.4.3.5.4			×		
Contact resistance	C.3.6.3	C.4.3.5.3			×		
Contact engagement and separation forces	C.3.7.5	C.4.3.6.5			×		
Resistance to corrosive gas	C.3.8.6	C.4.3.7.6				×	
Low-signal level contact resistance	C.3.6.4	C.4.3.5.4				×	
Contact pin strength	C.3.7.11	C.4.3.6.11				×	
Crimp tensile strength	C.3.7.12	C.4.3.6.12	×		×		×

Note: (1) The tests identified with the symbol “x” shall be performed.

Table C-16. Qualification Test and Quality Conformance Inspection (Group C) (All Contacts)

Test item	Requirement paragraph	Test method paragraph	Test group (1)		
			13	14	15
Externals, physical dimensions and marking	C.3.3	C.4.3.3	×	×	×
Plating porosity	C.3.4.1	C.4.3.4.1	×		
Plating thickness	C.3.4.2	C.4.3.4.2		×	
Solderability	C.3.7.14	C.4.3.6.14			×

Note: (1) The tests identified with the symbol “x” shall be performed.

C.4.2 Quality Conformance Inspection

The quality conformance inspection shall be as specified in Table C-17 for group A inspection, Table C-18 for group B inspection, and Tables C-13 through C-16

C.4.2.1 Inspection Items and Sample Size

Inspection items shall be as specified in Tables C-17, C-18, and C-13 through C-16. Each inspection shall be conducted in the order listed in each table.
Sample size shall be as specified in Table C-17 for group A inspection, Table C-18 for Group B inspection and paragraph C.4.1.1.1 for group C inspection. Group B or C inspection shall be conducted for products that have passed group A inspection.

C.4.2.2 Determination of Pass or Fail

Determination of pass or fail shall be in accordance with paragraphs 4.5.1.3 and 4.5.2.3.

C.4.2.3 Disposition after Inspection

Disposition after inspection shall be in accordance with paragraphs 4.5.1.4 and 4.5.2.4, and as follows.

a) Samples rejected in groups A and B inspections shall not be delivered.
b) If a lot is rejected due to non-compliance with the physical dimensions and residual magnetization requirements of group B inspection, the failed inspection items shall be repeated on all products and only products that have passed the inspections can be delivered.

Table C-17. Quality Conformance Inspection (Group A)

Inspection item	Requirement paragraph	Test method paragraph	Criteria for pass/fail (2)	
			No. of samples	No. of defectives permissible
Externals, physical dimensions and marking (1)	C.3.3	C.4.3.3	100%	Less than 10%
Dielectric withstanding voltage (sea level)	C.3.6.1	C.4.3.5.1.1		
Insulation resistance	C.3.6.2	C.4.3.5.2		
Contact separation forces	C.3.7.5	C.4.3.6.5.2		

Notes:

(1) Visual inspection.

(2) It is permissible to enter pass/fail determinations such as “pass” or “good” in the test data form.

Table C-18. Quality Conformance Inspection (Group B)

Inspection item			Requirement paragraph	Test method paragraph	Criteria for pass/fail (3)	
					No. of samples	No. of defectives permissible
Dimensions (1)	Connectors		C.3.3	C.4.3.3.1	13	0
	Individual contacts		C.3.3	C.4.3.3.2	30	0
Residual magnetization			C.3.2.2	C.4.3.2.1	AQL 4% (4)	
Plating thickness (for individual contacts) (2)			C.3.4.2	C.4.3.4.2	4	0
Crimp tensile strength	20-20	20AWG wire	C.3.7.12	C.4.3.6.12	4	0
		24AWG wire	C.3.7.12	C.4.3.6.12	4	0
	20-26	26AWG wire	C.3.7.12	C.4.3.6.12	4	0

Notes:

(1) When the number of inspection lots is less than the specified sample size for the test, 100% inspection shall be performed.

(2) Samples for the plating thickness test and crimp tensile strength test shall be randomly selected from the same manufacturing lot. The samples shall not be delivered as products.

(3) It is permissible to enter pass/fail determinations such as “pass” or “good” in the test data form.

(4) The acceptance quality level (AQL) is based on a single sampling plan for normal inspection, specified in JIS Z 9015-1, Attachment Table 2-A.

C.4.3 Methods of Test and Inspection

C.4.3.1 Test Conditions

The tests and inspections shall be performed under the following environmental conditions.

a) Temperature: 15 to 35°C
b) Relative humidity: 25 to 75%RH
c) Atmospheric pressure: 73.3 to 106.7kPa {550 to 800mmHg}

C.4.3.2 Materials

Materials shall be tested as specified in the following paragraphs.

C.4.3.2.1 Residual Magnetization

Unmated connectors shall be tested as follows and shall meet the requirements specified in paragraph C.3.2.2. Measuring apparatus shall be as shown in Figures C-2 and C-3.

C.4.3.2.1.1 When Using a Milliammeter

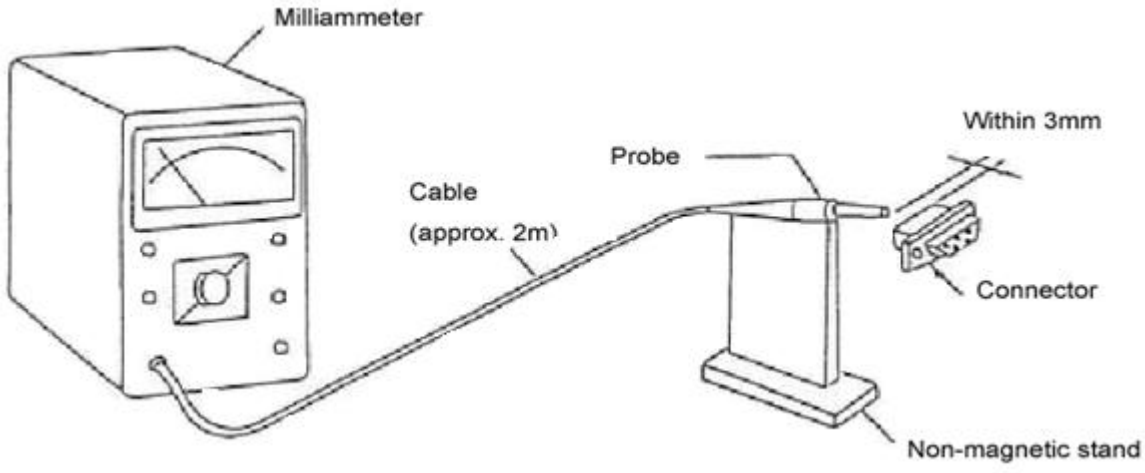


Figure C-2. Milliammeter

a) All contacts shall be installed in the connectors before testing.
b) Worm up the milliammeter for a minimum of 15 minutes.
c) Mount the probe on the non-magnetic stand in a horizontal position extending the cable at full length from the meter.
d) Set the meter in a proper scale range, and orient the probe in the magnetic east-west direction.
e) Pass the connector three times between magnet poles that create a field strength of 0.5T {5000 Gauss} or greater. The connector shall not contact the magnet pole piece, and shall be moved in the same direction.
f) Immediately after passing, bring the connector gradually within 3.0mm of the probe tip to record the maximum meter reading.
g) For the quality conformance inspection, the residual magnetization test shall be performed as follows.
    1) Non-contact connectors shall be tested without installing contacts.
    2) To test individual contacts, 50 contacts shall be selected at random from an inspection lot, and installed to a test jig which shall be a

connector with the maximum number of contacts among those passed the residual magnetization test.

Note: The test shall be performed in a magnetically quiet area, i.e. where operations of machines, electronic equipment and vehicles, and personnel traffic shall be restricted.

C. 4.3.2.1.2. When Using a Gaussmeter

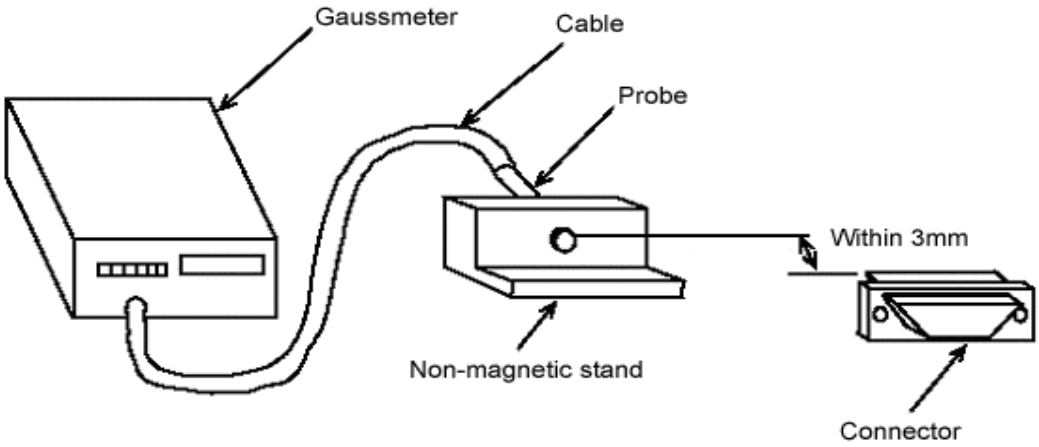


Figure C-3. Gaussmeter

a) All contacts shall be installed in the connectors before testing.
b) Warm up the gaussmeter for a minimum of 30 minutes
c) Mount the probe on the non-magnetic stand.
d) Set the meter in a proper scale range and orient the probe in the magnetic east-west direction.
e) Pass the connector three times between magnet poles that create a field strength of 0.5T {5000 Gauss} or greater.
f) The connector shall not contact the magnet pole piece, and shall be moved in the same direction.
g) Immediately after passing, bring the connector gradually within 3.0mm of the probe tip to record the maximum meter reading.
h) For the quality conformance inspection, the residual magnetization test shall be performed as follows.
    1) Non-contact connectors shall be tested without installing contacts.
    2) To test individual contacts, 50 contacts shall be selected at random from an inspection lot, and installed to a test jig which shall be a connector with the maximum number of contacts among those passed the residual magnetization test.

Note: The test shall be performed in a magnetically quiet area, i.e. where operations of machines, electronic equipment and vehicles, and personnel traffic shall be restricted.

C.4.3.2.2 Outgassing

Connector parts of inserts, sealing plug, grommets, marking inks and adhesives shall be tested in accordance with ASTM-E595. The result shall be evaluated in consideration of the weight allocation.

C.4.3.3 Externals, Physical Dimensions and Marking

Externals, dimensions, marking and workmanship shall be examined as specified in following paragraphs.

C.4.3.3.1 Connectors

Connectors shall be visually examined. Physical dimensions shall be inspected using a proper instrument such as vernier calipers compliant with JIS B 7507. Mass shall be measured using a weight scale.

C.4.3.3.2 Contacts

Contacts shall be examined using an approximate 3x magnifier. Physical dimensions shall be examined using vernier calipers compliant with JIS B 7507. For mass measurements, a weight scale shall be used.

C.4.3.4 Plating

C.4.3.4.1 Plating Porosity

Unwired pin and socket contacts shall be soaked in nitric acid (concentration: 70^{+3}_{-1} %) at 25±3°C and shall be monitored for 30 seconds.

C.4.3.4.2 Plating Thickness

Gold-plating thickness of unwired pin and socket contacts shall be measured as follows.

a) Thickness of gold-plating shall be measured by a proper method such as microscopic test method, beta backscatter radiation method and X-ray fluorescence method.
b) Measuring points shall be in the range specified below and at least three points shall be measured for each area.
    1) Pin contact: 2.54 to 3.81mm from insertion end
    2) Socket contact: 2.54 to 3.81mm on outside diameter from termination end

C.4.3.5 Electrical Performance

Electrical performance tests shall be performed as follows.

C.4.3.5.1 Dielectric Withstanding Voltage

C.4.3.5.1.1 At Sea level

Connectors shall be tested in accordance with test procedure EIA-364-20. The following details shall apply.

a) Test condition: I
b) The test voltage shall be as specified in Table C-19.

c) The test shall be made between adjacent contacts for 50% of the contact pairs in the contact arrangement (at least 4 pairs), and between contact and shell for 50% or more contacts in the contact arrangement (at least 6 contacts).
d) The leakage current shall be 5mA or less.
e) For qualification test, the voltage shall be applied for a minimum of one minute. For the quality conformance inspection, the application duration shall be 10 seconds or longer.
f) For quality conformance inspection, a proper test jig may be used.

Table C-19. Test Voltage

Unit: V_{AC} (commercial frequency)

Altitude	Initial	After humidity test or fluid immersion test
Sea level	1,000	600
Reduced pressure 21,340m (4.4kPa {33mmHg})	325	–

C.4.3.5.1.2 At Reduced Pressure

Connectors shall be tested in accordance with test procedure EIA-364-20. The following details shall apply.

a) Test condition: IV
b) The test voltage shall be as specified in Table C-19.
c) The test shall be made between adjacent contacts for 50% of the contacts in the contact arrangement (at least 4 pairs), and between contact and shell for 50% or more contacts in the contact arrangement (at least 6 contacts).
d) The leakage current shall be 5mA or less.
e) Five minutes after the specified pressure has been reached, the test voltage shall be applied for one minute.

C.4.3.5.2 Insulation Resistance

Connectors shall be tested in accordance with test procedure EIA-364-21. The following details shall apply.

a) The test voltage applied shall be $500V_{DC}$. After humidity test or fluid immersion test, the voltage shall be $100V_{DC}$.
b) The test shall be made between adjacent contacts for 50% of the contact pairs in the contact arrangement (at least 4 pairs), and between contact and shell for 50% or more contacts in the contact arrangement (at least 6 contacts).
c) For quality conformance inspection, a proper test jig may be used.

C.4.3.5.3 Contact Resistance

Connectors mated or mated contacts shall be tested in accordance with test procedure EIA-364-06. The following details shall apply.

a) The test current shall be as specified in Table C-5.
b) The test current shall be applied and measurement shall be made after the temperature becomes stable.
c) For mated connectors, the test shall be performed on 20% of the contact pairs in the contact arrangement (at least 4 pairs) by measuring a voltage drop across the specified test points (152.4±3mm).
d) For individual contacts, the contact shall be mated as deeply as normally used. The voltage drop shall be measured across the specified test points (152.4±3mm).
e) For solder-contact and right angle through hole contact connectors, the voltage drop shall be measured at the points specified in Supplementary Figure C-23.

C.4.3.5.4 Low-Signal Level Contact Resistance

Inserted pairs of contacts shall be tested in accordance with test procedure EIA-364-23. The following conditions shall apply.

a) Contacts shall be inserted as deeply as normally used. The voltage drop shall be measured across the specified test points (152.4±3mm).

C.4.3.6 Mechanical Performance

Mechanical performance tests shall be performed as follows.

C.4.3.6.1 Maintenance Aging

Connectors shall be tested in accordance with test procedure EIA-364-24. The following conditions shall apply.

a) 20% of the contact arrangement (at least 4 contacts) shall be tested.
b) Contact insertion and removal shall be performed with proper tools in accordance with item c) of paragraph C.4.1.1.2.
c) The force required for contact insertion and removal shall be measured during the 1st and 10th maintenance aging cycles.
d) After completion of the test, the mating and unmating forces of the connector shall be measured.

C.4.3.6.2 Contact Insertion and Removal Forces

Connectors shall be tested during the maintenance aging test in accordance with test procedure EIA-364-5. The following conditions shall apply.

a) 20% of the contact arrangement (at least 4 contacts) shall be tested.
b) Contact insertion and removal shall be performed with proper tools in accordance with item C) of paragraph C.4.1.1.2.
c) The rate of inserting and removing each contact shall be approximately 20mm per minute.

C.4.3.6.3 Mating and Unmating Forces

Connectors shall be performed in accordance with test procedure EIA-364-13. However, the test procedures specified in paragraphs 1.2.1, 1.2.2 and 2.1.2 of EIA-364-13 shall be the test procedures of the manufacturer.

C.4.3.6.4 Contact Retention

Connectors shall be performed in accordance with test procedure EIA-364-29. The following conditions shall apply.

a) 20% of the contact arrangement (at least 4 contacts) shall be tested.
b) The contact shall be preloaded with a maximum of 13.7N (1.4kgf) before measuring the axial displacement of contacts.
c) Apply an axial load to the contact from the insertion face and wait until the load reaches the value as specified in Table C-20. After maintained the specified load for 5 seconds, axial displacement of the contact shall be measured.
d) The rate to apply the load shall be approximately 4.4N/s {0.45kgf/s}

Table C-20. Contact Retention

Unit: N {kgf}

Contact size	Load
20	40.2 {4.1} minimum

C.4.3.6.5 Contact Engagement and Separation Forces

C.4.3.6.5.1 Qualification Test

Socket contacts shall be tested in accordance with test procedure EIA-364-37. The following conditions shall apply.

a) Test pins shall be as specified in Table C-21.
b) 20% of the contacts arrangement (at least 4 contacts) shall be tested.
c) Insert and remove a test pin of the maximum diameter, and a force required to remove a test pin of the minimum diameter from the same socket contact shall be measured. Then insert and remove a test pin of the maximum diameter two times, and a force required to insert the test pin in the same socket contact shall be measured.
d) The test pin shall be inserted to a depth of 3.6mm as a minimum from the mating cavity of the socket contact.
e) The rate of engagement and separation shall be approximately 20mm per minute.

Table C-21. Test Pin

Maximum diameter pin	As specified in SAE-AS31971.
Minimum diameter pin	As specified in SAE-AS31971.

C.4.3.6.5.2 Quality Conformance Inspection

For quality conformance inspection, the contact separation force shall meet the requirements specified in paragraph C.3.7.5.2 when tested by the weight retention method specified below or by an equivalent method.

a) A socket contact shall be inserted with a pin contact of the minimum diameter specified in Table C-21 to the depth of 3.6mm as a minimum. The test pin shall be mounted on a weight of 20g as a minimum as shown in Figure C-4.
b) The socket contact shall be slowly lifted up in the vertical direction.
c) The test passes if the test pin remains engaged.

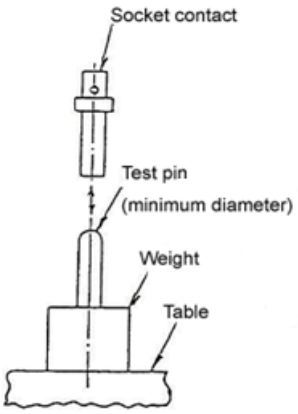


Figure C-4. Weight Retention Method

C.4.3.6.6 Durability

Connectors shall be tested in accordance with test procedure EIA-364-09. The following conditions shall apply.

a) The connectors shall be mated and unmated 500 times.
b) For manual testers, the repetition rate of mating and unmating shall be at a rate of 300 cycles per hour maximum.
   For automatic testers, the repetition rate of mating and unmating shall be at a rate of 550 cycles per hour maximum.
c) After completion of the test, mating and unmating forces, and contact resistance shall be measured.

C.4.3.6.7 Oversize Pin Exclusion

A hardened steel oversize pin shown in Table C-22 shall be placed at the insertion end of socket contact. A 5N {510gf} axial force shall be applied to force the test pin into the socket contact. After completion of the test, the contact resistance

shall be measured. This test shall be performed on 20% of the contact arrangement (at least 4 contacts).

Table C-22. Oversize Pin Exclusion

Unit: mm

Contact size	Pin diameter
20	$1.168_{-0.003}^{0}$

C.4.3.6.8 Probe Damage

Socket contacts shall be tested in accordance with test procedure EIA-364-25. The following conditions shall apply.

a) The test shall be performed on 20% of the contact arrangement (at least 4 contacts).
b) Contact support fixture shall be of type 1 or 2.
c) A test probe shall be inserted into the socket contact to the depth as specified in Table C-23.
d) At completion of the test, the following measurements shall be performed.
   1) Connectors: mating and unmating forces
   2) Individual contacts: contact engagement and separation forces, and contact resistance.

Table C-23. Insertion Depth of Probe Damage Tool

Unit: mm

Contact size	Holding fixture	
	Type 1	Type 2
20	5.13±0.13, 1.96±0.13	6.35±0.13, 3.18±0.18

C.4.3.6.9 Insert Retention

Unmated connectors shall be tested in accordance with test procedure EIA-364-35. The following details shall apply.

a) The test load shall be 414kPa {4.22kgf/cm^2}.
b) The contacts may be removed.

C.4.3.6.10 Contact Axial Concentricity

Contacts before crimping and after crimping shall be tested in accordance with test procedure EIA-364-07.

a) Unwired Contacts
   While the contact is being rotated, measurements shall be made at the points A and B specified in Figure C-5. For socket contacts, the measurement shall not be made at point B.

b) Wired Contacts
While the contact is being rotated, measurements shall be made at points A and B specified in Figure C-5. For socket contacts, the measurement shall not be made at point B. Wiring shall be made with the crimping tools specified in item b) of paragraph C.4.1.1.2.

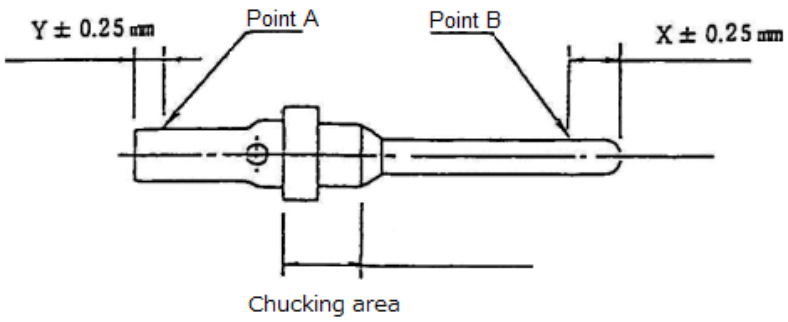
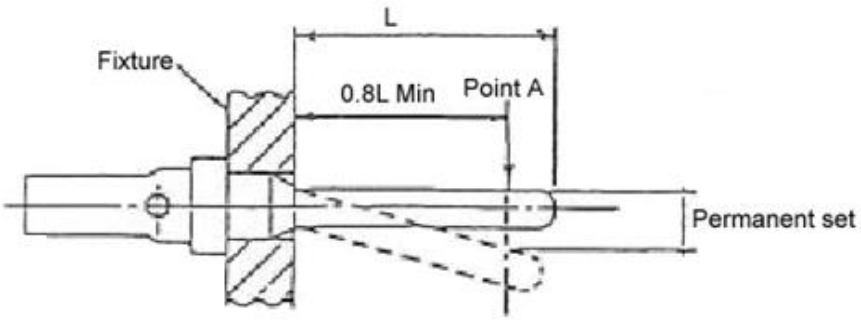


Figure C-5. Axial Concentricity Measurement

C.4.3.6.11 Contact Pin Strength

A pin contact shall be mounted on a proper fixture. A moment of 5.98N·cm {0.61kgf·cm} shall be applied at the point A specified in Figure C-6 at a rate of 25.4mm per minute as a maximum for 60^{+15}_{0} seconds. After completion of the test, the pin contact shall meet the requirements specified in paragraph C.3.7.11.



L = Overall length of pin insertion end

Figure C-6. Contact Pin Strength

C.4.3.6.12 Crimp Tensile Strength

Wire crimped pin and socket contacts shall be tested in accordance with test procedure EIA-364-37. The following details shall apply.

a) The wire crimping tools shall be as specified in item b) of paragraph C.4.1.1.2.
b) Failure to meet the crimp tensile strength for reasons not related to crimping, such as wire scratch, shall not be considered a failed test.

C.4.3.6.13 Resistance to Soldering Heat

Unmated connectors shall be tested in accordance with test method 210, condition A of MIL-STD-202. The following details shall apply.

a) Connectors shall be immersed to a depth of at least 3mm from the wire termination.
b) Flux shall not be used.
c) For solder-contact connectors, a minimum of 20% of the contact arrangement (at least 4 contacts) shall be in contact with a solder iron of 350±10°C for 3 seconds or longer.

C.4.3.6.14 Solderability

Contacts shall be tested in accordance with method 208 of MIL-STD-202. Contacts shall be immersed to a depth of at least 3mm from the wire termination.

C.4.3.7 Environmental Performace

Environmental performance tests shall be performed as follows.

C.4.3.7.1 Vibration

C.4.3.7.1.1 High Frequency Vibration

Mated connectors installed with wired contacts shall be tested in accordance with method 204 of MIL-STD-202. The following details shall apply.

a) Mounting method: Connectors shall be mounted normally on a vibration table using jig.
b) Currents of 100mA or less shall be applied to all contacts during the test. The contacts shall be monitored for electrical continuity using a detector capable of detecting any discontinuity in excess of 1μs.
c) Test condition: G ($294 m/s^2$ {30G}p-p).
d) Wire bundles shall be secured to a non-vibrating table located approximately 203mm from the rear side of the connector.

C.4.3.7.1.2 Random Vibration

Mated connectors installed with wired contacts shall be tested in accordance with test procedure EIA-364-28. The following conditions shall apply.

a) Mounting method: Connectors shall be mounted normally on a vibration table using jig.
b) Currents of 100mA or less shall be applied to all contacts during the test. The contacts shall be monitored for electrical continuity using a detector capable of detecting any discontinuity in excess of 1μs.
c) Test condition VI, effective acceleration: $334 m/s^2$rms {34.02Grms}.
d) Duration of vibration: 15 minutes for each axis, 45 minutes in total.
e) The wire bundles shall be secured to a non-vibrating table located approximately 203mm from the rear side of the connector.

C.4.3.7.2 Shock

Mated connectors shall be tested in accordance with test procedure EIA-364-27.

C.4.3.7.2.1 Shock (I)

The following details shall apply.

a) Test condition: D (2942m/s^2 {300G}), half-sine wave.
b) Receptacles shall be mounted on a shock table using test jig. Plugs shall be engaged with the receptacles and secured by a proper holding device.
c) Wires shall be bundled at approximately 10cm behind the rear of the connector, and secured to a no-shock table located at least 20cm apart from the rear side of the connector.
d) Currents of 100mA or less shall be applied to all contacts crimped in series during the test. The contacts shall be monitored for electrical continuity using a detector capable of detecting any discontinuity in excess of 1μs.

C.4.3.7.2.2 Shock (II)

The following details shall apply.

a) Test conditions
   1) Acceleration of gravity (A): 14710m/s^2 {1500G}±20%
   2) Duration of pulse (D): 0.5ms±15%
   3) Waveform: Half-sine wave
   4) Velocity change (vi): 4.68m/s
   5) Direction of shock application: ±X, ±Y, and ±Z (3 shocks per each direction, 18 shocks in total)
b) Mounting method: As specified in item b) of paragraph C.4.3.7.2.1.
c) Wires: As specified in item c) of paragraph C.4.3.7.2.1
d) Monitoring during test: As specified in item d) of paragraph C.4.3.7.2.1.

C.4.3.7.3 Temperature Cycling

Mated connectors installed with wired contacts shall be tested in accordance with test procedure EIA-364-32.
The following conditions shall apply.
a) Possible failure modes after test and pass/fail criteria:
In accordance with FMAT of the Quality Assurance Program Plan.

C.4.3.7.3.1 Temperature Cycling (I)

The following details shall apply.

a) The test shall be performed for 5 cycles at the temperatures specified in Table C-24.
b) At the completion of the last cycle, the connectors shall be removed from the chamber and examined for the following items.
   1) Connectors: Externals
   2) Individual contacts: Contact engagement and separation forces, and contact resistance

Table C-24. Temperature Extremes

Unit: °C

Low	-65^{0}_{-3}
High	$+125^{+3}_{0}$

C.4.3.7.3.2 Temperature Cycling (II)

The following details shall apply.

a) The temperature for step 1 shall be -30^{0}_{-5}°C.
b) The temperature for step 3 shall be $+100^{+3}_{0}$°C.
c) The number of cycles shall be 1,000.
d) Measurements during the test and visual inspection
   At 100^{+10}_{0}, 250^{+10}_{0}, and 500^{+10}_{0} cycles.
   All connectors shall be visually examined for cracks on the surface.

C.4.3.7.4 Humidity

Unmated connectors shall be tested in accordance with test procedure EIA-364-31. The following details shall apply.

a) Test condition: Method IV
b) Duration of test: 240 hours
c) Upon completion of the final cycle, the connector shall be removed from the chamber and moisture shall be removed from the surface. Upon removal, dielectric withstanding voltage (at sea level) and insulation resistance shall be measured.
d) After the 24 hour conditioning period at ambient temperature and normal humidity, insulation resistance shall be re-measured.

C.4.3.7.5 Fluid Immersion

Unmated connectors shall be tested in accordance with Table C-25 which is equivalent to fluid(a) and fluid(d) of test procedure EIA-364-10. The following details shall apply.

This provision shall not be applicable to connectors with a grommet.

a) Connectors shall be removed from the fluids and maintained at ambient temperature and normal humidity for one hour. Then mating and unmating forces shall be measured.
b) Fluids on the connector surface shall be removed by solvent and the surface shall be cleaned. Then mating and unmating force shall be re-measured.
c) Twenty-four hours after the cleaning specified in item b) above, dielectric withstanding voltage (at sea level) and insulation resistance shall be measured.

Table C-25. Test Fluids and Duration of Immersion

Fluid	Duration of immersion	Sample (See Table C-11)
Hydraulic fluid in MIL-PRF-5606	20 hours	One pair for each test group of 1 through 3.
Lubricating oil in MIL-PRF-23699	20 hours	One pair for each test group of 1 and 2.

Note: Samples shall be crimp-contact connectors.

C.4.3.7.6 Resistance to Corrosive Gas

10% solution of potassium sulfide in distilled water shall be placed on a noncorrosive rack in a sealed plastic or glass chamber ($0.057m^3$ {$2ft^3$}) and uninserted contacts shall be exposed to the sulfide vapor for 100 hours. After completion of the test, low-signal level contact resistance shall be measured. Contacts shall not be immersed in the solution during the test.

C.4.3.7.7 Salt Spray (Corrosion)

Mated connectors and individual engaged contacts shall be tested in accordance with test procedure EIA-364-26. The following details shall apply.

a) Test condition: B (48 hours)
b) Individual contacts shall be inserted as deeply as normally used.
c) After completion of the test, the following measurements shall be made.
    1) Connectors: Mating and unmating forces, and contact resistance
    2) Individual contacts: contact resistance, and contact engagement and separation forces.

C.4.3.7.8 Radiation Hardness

Mated connectors installed with wired contacts shall be tested under the following conditions.

a) Radiation type: ^{60}Co gamma ray
b) Total dose of radiation: 10^5Gy

C.4.3.8 Durability

Durability tests shall be performed as follows.

C.4.3.8.1 Temperature Life

Engaged contacts shall be tested in accordance with test procedure EIA-364-17. The following details shall apply.

a) Test temperature: 5 (125±2°C)
b) Test time: D (1000 hours)
c) Contacts shall be engaged as deeply as normally used. No electrical load shall be applied.
d) After completion of the test, low-signal level, contact resistance, and contact engagement and separation forces shall be measured.

C.4.4 Long-Term Storage

Long-term storage shall be as specified in paragraph 4.7.

C.4.5 Change to Tests and Inspections

Change to tests and inspections shall be in accordance with paragraph 4.8.

C.5 Preparation for Delivery

Preparation for delivery shall be as follows and as specified in paragraph 5.

C.6 Notes

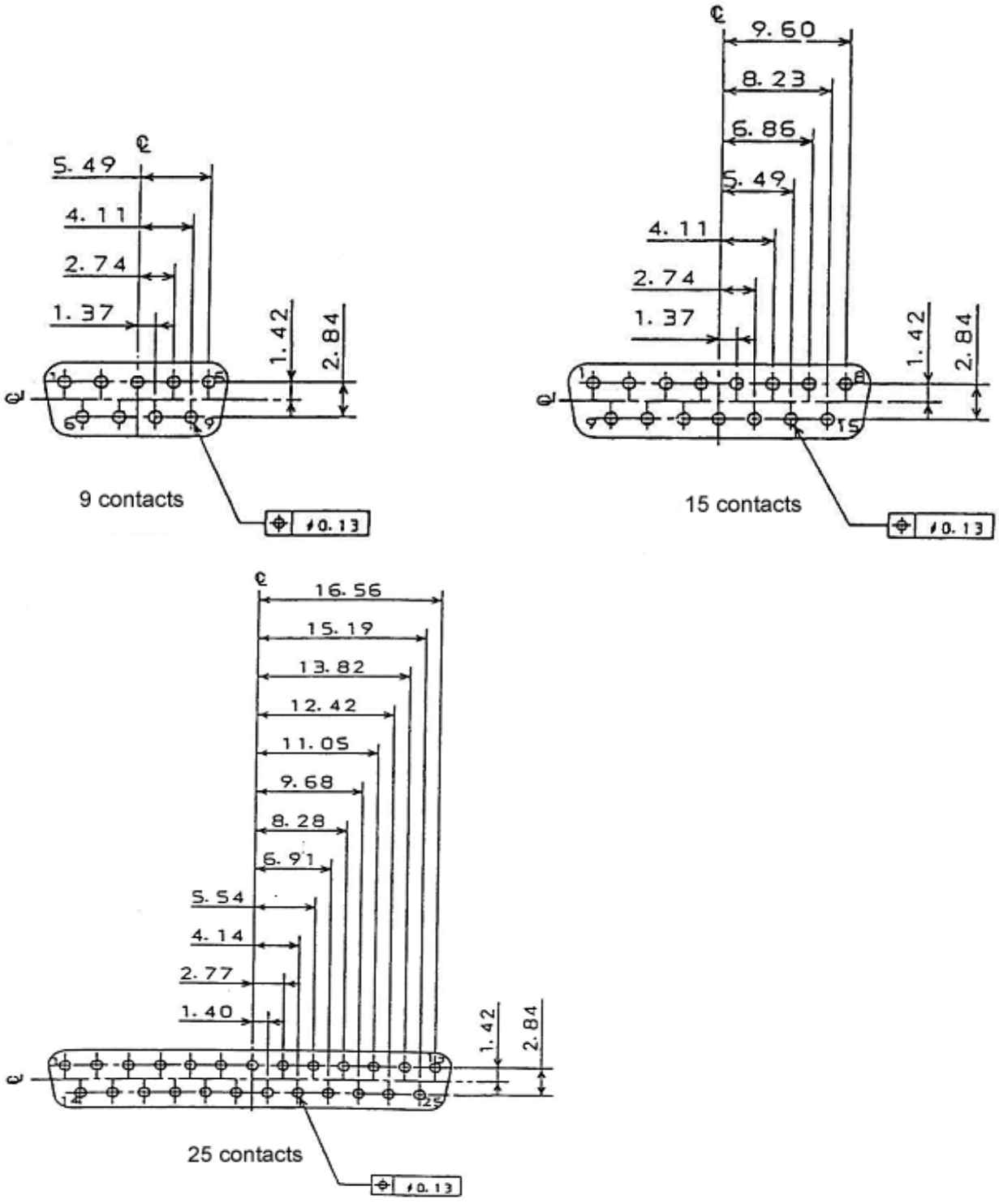
C.6.1 Notes for Manufacturer

Notes for manufacturer shall be in accordance with paragraph 6.1.

C.6.2 Notes for Purchaser

Notes for purchaser shall be as specified in paragraph 6.2.

Unit: mm



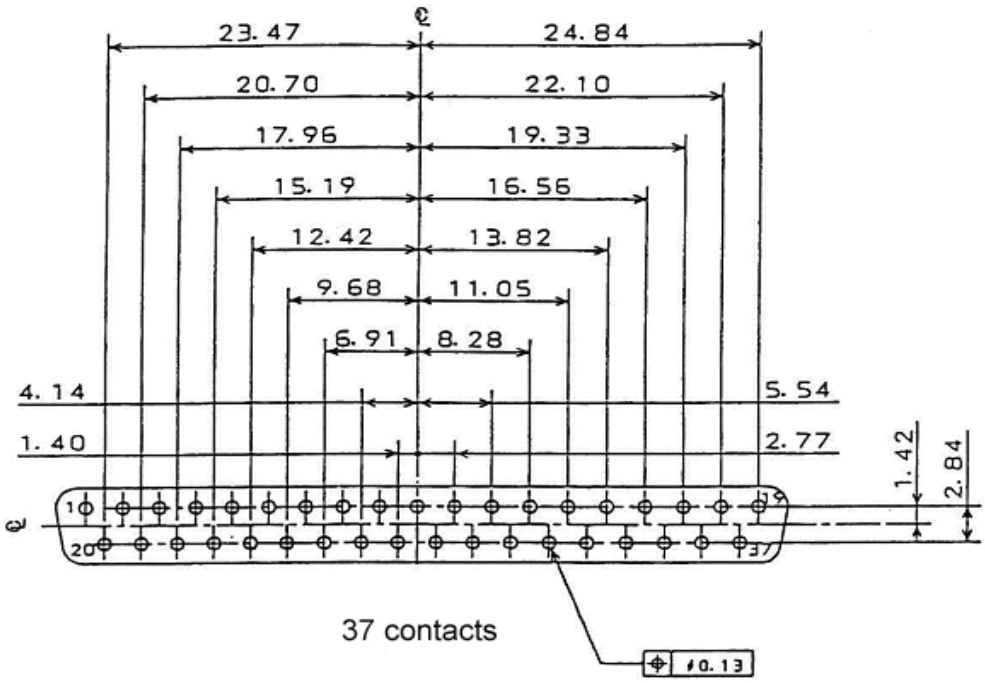
Notes:

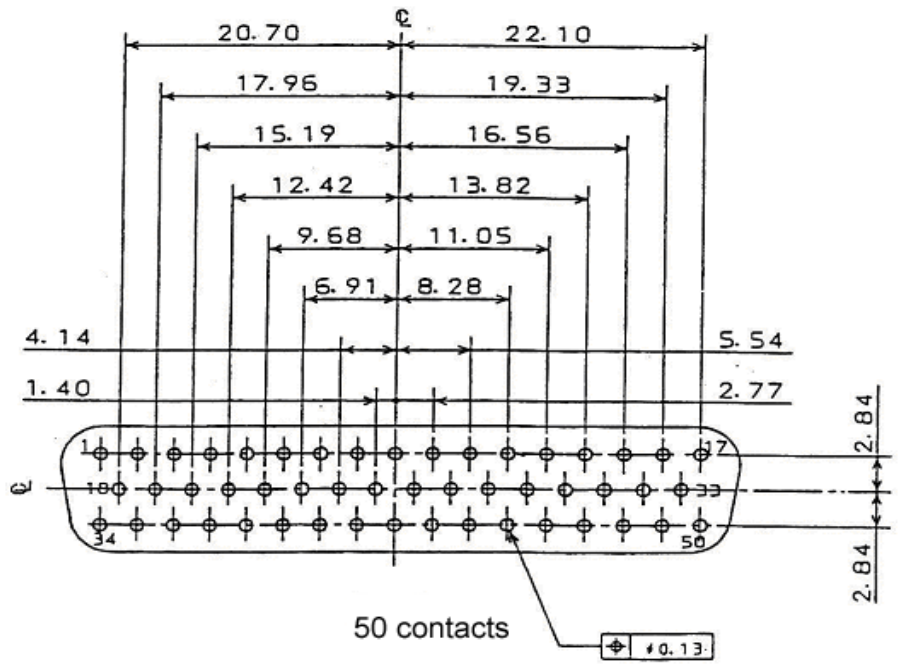
(1) Pin connectors (front view)

(2) Left and right of contact position numbers are reversed for socket insert.

Supplementary Figure C-1. Contact Arrangement (1/2)

Unit: mm



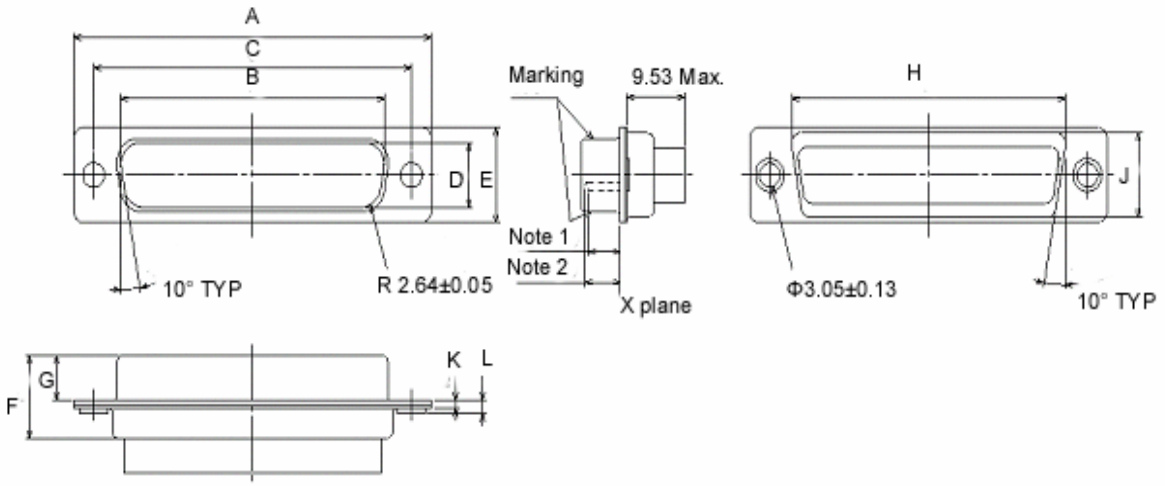


Notes:

1. Pin connectors (front view)
2. Left and right of contact position numbers are reversed for socket insert.

Supplementary Figure C-1. Contact Arrangement (2/2)

Unit: mm



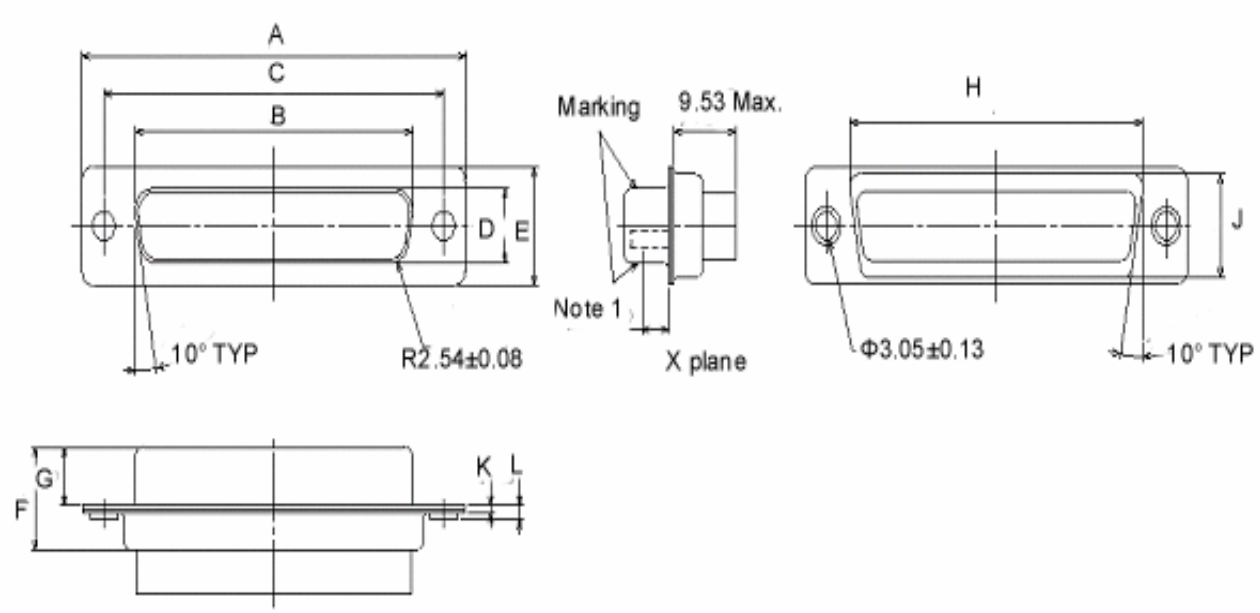
Part number	Contact arrangement	Physical dimensions											Mass (g)
		A	B	C	D	E	F	G	H	J	K	L	
		±0.38	±0.13	±0.13	±0.13	±0.38	Maximum	±0.15	Maximum	Maximum	±0.25	±0.32	Maximum
ND*01-9P-C	9	30.81	16.92	24.99	8.36	12.55	13.39	5.97	20.19	11.68	0.76	1.21	6.43
ND*01-15P-C	15	39.14	25.25	33.32					28.52				9.23
ND*01-25P-C	25	53.04	38.96	47.04				5.84	42.24		0.99	1.52	15.01
ND*01-37P-C	37	69.32	55.42	63.50					58.75				20.77
ND*01-50P-C	50	66.93	52.81	61.11	11.20	15.37			56.31	14.50			24.11

Notes:

1. Length between the X plane and the engagement tip minus the spherical radius shall be a minimum of 4.17mm for 9- or 15-contact connectors and a minimum of 3.94mm for 25-, 37-, or 50-contact connectors.
2. Length between the X plane and the engagement tip shall be a maximum of 5.59mm.
3. Contact arrangement shall be as shown in Supplementary Figure C-1.
4. Physical dimensions of a crimp pin contact shall be as shown in Supplementary Figure C-16.
5. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.

Supplementary Figure C-2. Physical Dimensions for Standard Shell, Crimp Pin Contact Connectors (Shell Material: Brass)

Unit: mm



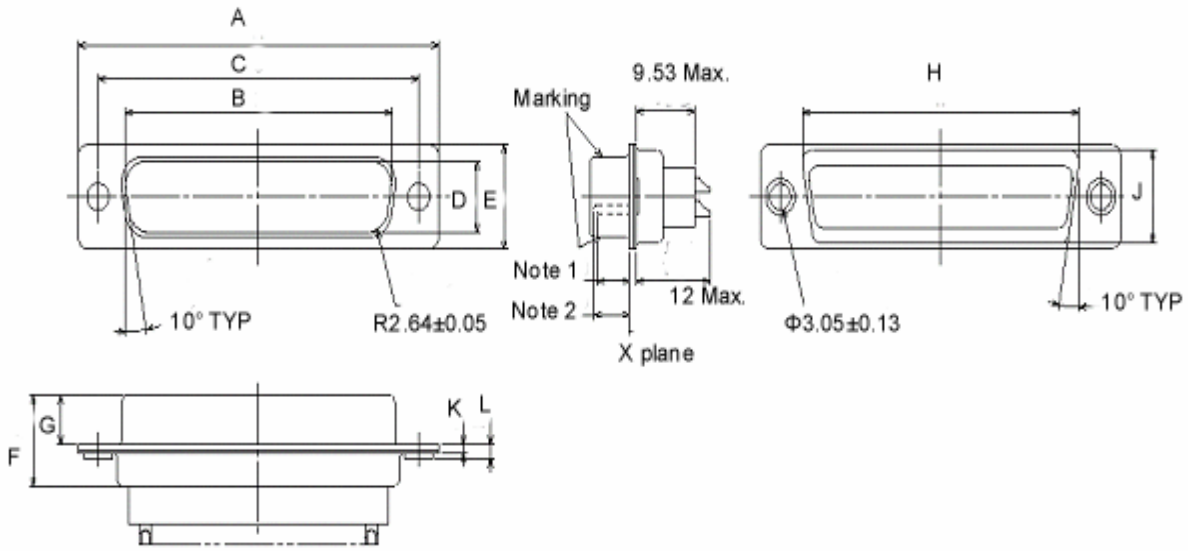
Part number	Contact arrangement	Physical dimensions											Mass (g)
		A	B	C	D	E	F	G	H	J	K	L	
		±0.38	±0.13	±0.13	–	±0.38	Maximum	±0.13	Maximum	Maximum	±0.25	±0.32	Maximum
ND*01-9S-C	9	30.81	16.33	24.99	7.85 ±0.18	12.55	16.63	6.17	20.19	11.68	0.76	1.21	7.45
ND*01-15S-C	15	39.14	24.66	33.32					28.52				10.92
ND*01-25S-C	25	53.04	38.38	47.04					42.24				16.43
ND*01-37S-C	37	69.32	54.84	63.50					58.75				22.94
ND*01-50S-C	50	66.93	52.43	61.11	10.74 ±0.13	15.37			56.31	14.50			27.35

Notes:

1. When a square ended test pin of Φ0.99 to 1.04mm makes contact with the tip of a socket insertion end, the mating depth from the X plane shall be a minimum of 3.63mm.
2. Contact arrangement shall be as shown in Supplementary Figure C-1.
3. Physical dimensions of a crimp socket contact shall be as shown in Supplementary Figure C-15.
4. Looseness of the socket contact shall be within ±0.5mm in the radial and lateral directions.

Supplementary Figure C-3. Physical Dimensions for Standard Shell, Crimp Socket Contact Connectors (Shell Material: Brass)

Unit: mm



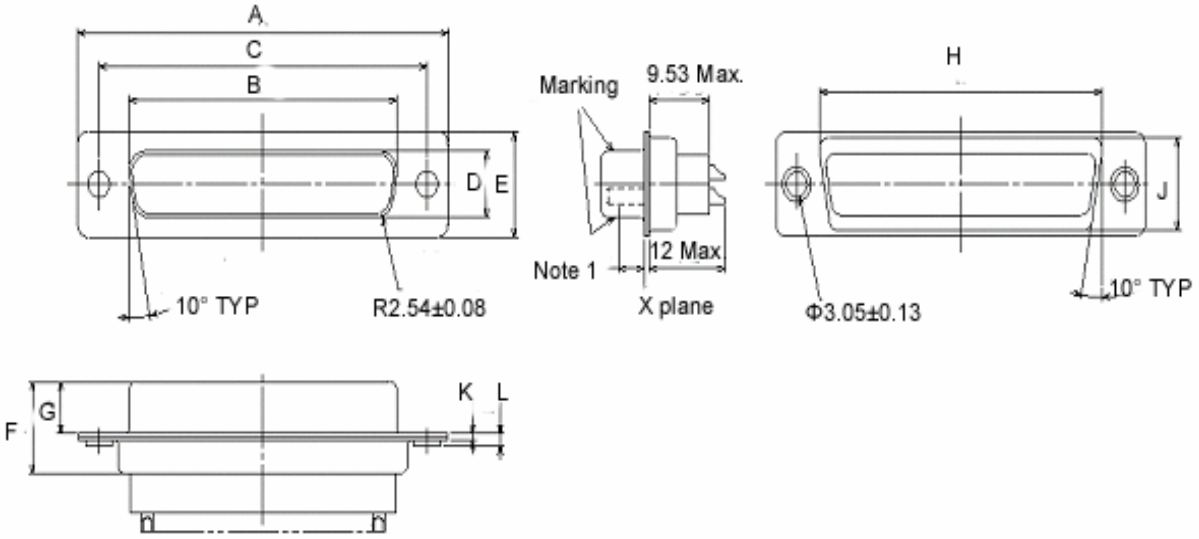
Part number	Contact arrangement	Physical dimensions											Mass (g)
		A	B	C	D	E	F	G	H	J	K	L	
		±0.38	±0.13	±0.13	±0.13	±0.38	Maximum	±0.15	Maximum	Maximum	±0.25	±0.32	Maximum
ND*01-9P-S	9	30.81	16.92	24.99	8.36	12.55	13.39	5.97	20.19	11.68	0.76	1.21	6.91
ND*01-15P-S	15	39.14	25.25	33.32					28.52				10.04
ND*01-25P-S	25	53.04	38.96	47.04				5.84	42.24		0.99	1.52	16.35
ND*01-37P-S	37	69.32	55.42	63.50					58.75				22.76
ND*01-50P-S	50	66.93	52.81	61.11	11.20	15.37			56.31	14.50			26.80

Notes:

1. Length between the X plane and the engagement tip minus the spherical radius shall be a minimum of 4.17mm for 9- or 15-contact pin and a minimum of 3.94mm for 25-, 37-, or 50-pin contact.
2. Length between the X plane and the insertion tip shall be a maximum of 5.59mm.
3. Contact arrangement shall be as shown in Supplementary Figure C-1.
4. Physical dimensions of a solder pin contact shall be as shown in Supplementary Figure C-18.
5. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.

Supplementary Figure C-4. Physical Dimensions for Standard Shell, Solder Pin Contact Connectors (Shell Material: Brass)

Unit: mm



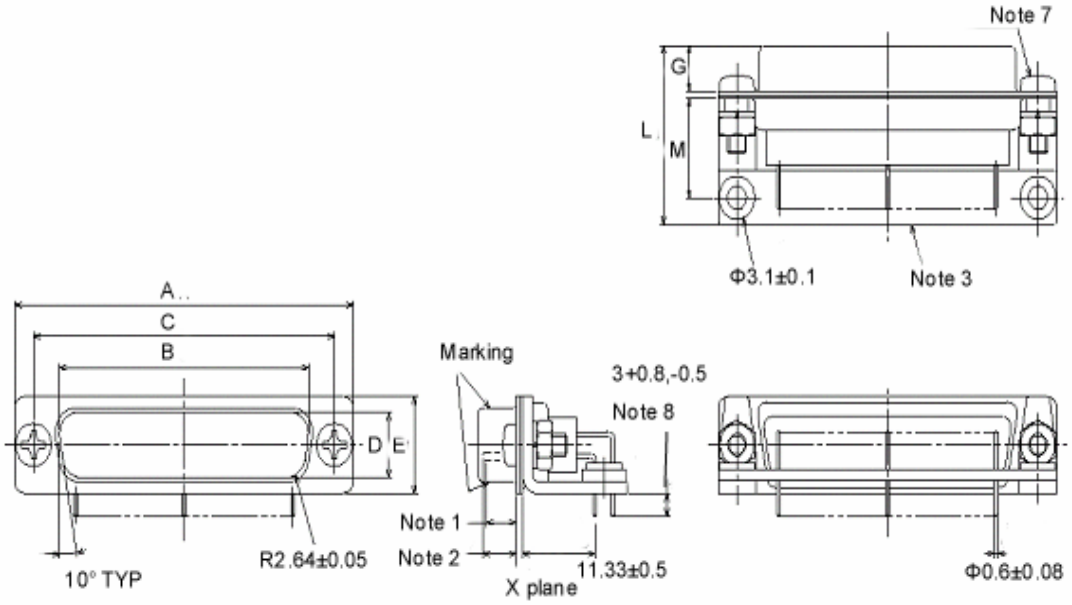
Part number	Contact arrangement	Physical dimensions											Mass (g)
		A	B	C	D	E	F	G	H	J	K	L	
		±0.38	±0.13	±0.13	–	±0.38	Maximum	±0.13	Maximum	Maximum	±0.25	±0.32	Maximum
ND*01-9S-S	9	30.81	16.33	24.99	7.85 ±0.18	12.55	16.63	6.17	20.19	11.68	0.76	1.21	7.96
ND*01-15S-S	15	39.14	24.66	33.32					28.52				12.43
ND*01-25S-S	25	53.04	38.38	47.04					42.24				18.95
ND*01-37S-S	37	69.32	54.84	63.50					58.75				25.05
ND*01-50S-S	50	66.93	52.43	61.11	10.74 ±0.13	15.37			56.31	14.50			30.21

Notes:

1. When a square ended test pin of Φ0.99 to 1.04mm makes contact with the tip of a socket insertion end, the mating depth from the X plane shall be a minimum of 3.63mm.
2. Contact arrangement shall be as shown in Supplementary Figure C-1.
3. Physical dimensions of a solder socket contact shall be as shown in Supplementary Figure C-19.
4. Looseness of the socket contact shall be within ±0.5mm in the radial and lateral directions.

Supplementary Figure C-5. Physical Dimensions for Standard Shell, Solder Socket Contact Connectors (Shell Material: Brass)

Unit: mm



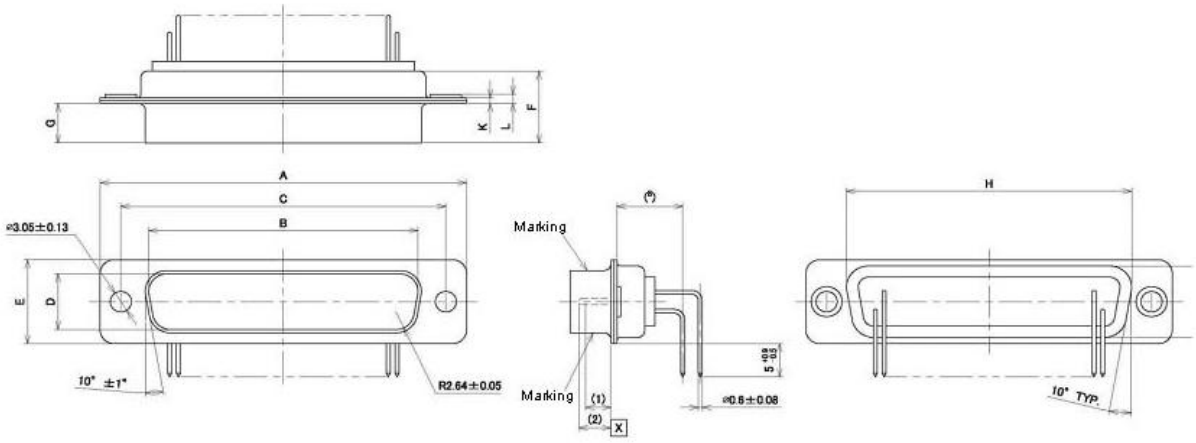
Part number	Contact arrangement	Physical dimensions								Mass (g)
		A	B	C	D	E	G	L	M	
		±0.38	±0.13	±0.13	±0.13	±0.38	±0.15	Maximum	±0.15	Maximum
ND*01- 9P-A	9	30.81	16.92	24.99	8.36	12.55	5.97	24.5	12.75	11.86
ND*01-15P-A	15	39.14	25.25	33.32						15.31
ND*01-25P-A	25	53.04	38.96	47.04			5.84			21.99
ND*01-37P-A	37	69.32	55.42	63.50						28.92
ND*01-50P-A	50	66.93	52.81	61.11	11.20	15.37		27.5	14.17	34.36

Notes:

1. Length between the X plane and the engagement tip minus the spherical radius shall be a minimum of 4.17mm for 9- or 15-contact connectors and a minimum of 3.94mm for 25-, 37-, or 50-contact connectors.
2. Length between the X plane and the engagement tip shall be a maximum of 5.59mm.
3. Bracket configuration is not specified.
4. Contact arrangement shall be as shown in Supplementary Figure C-1.
5. Physical dimensions of a right angle pin contact shall be as specified in Supplementary Figure C-20.
6. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.
7. The torque to fasten the screws is not specified.
8. If the size other than $3^{+0.8}_{-0.5}$mm is required, it shall be specified in parentheses at the end of the part number. For example, size $5^{+0.8}_{-0.5}$ shall be indicated as ND*01-9P-A(5).
9. Mounting hole dimensions on a printed wiring board shall be as specified in Supplementary Figures C-24 and C-25.

Supplementary Figure C-6. Physical Dimensions for Standard Shell, Right Angle Pin Contact Connectors (1/2) (Shell Material: Brass)

Unit: mm



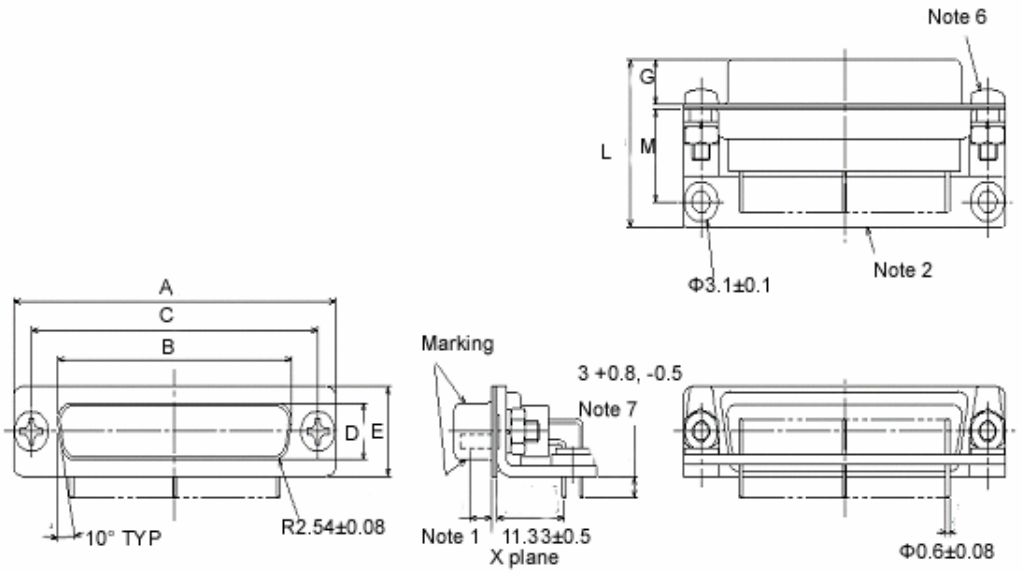
Part number	Contact arrangement	Physical dimensions											Mass (g)
		A	B	C	D	E	F	G	H	J	K	L	
		±0.38	±0.13	±0.13	±0.13	±0.38	Maximum	±0.13	Maximum	Maximum	±0.25	±0.32	Maximum
ND*01-9P-AAB	9	30.81	16.92	24.99	8.36	12.55	13.39	5.97	20.19	11.68	0.76	1.21	11.86
ND*01-15P-AAB	15	39.14	25.25	33.32					28.52				15.31
ND*01-25P-AAB	25	53.04	38.96	47.04				5.84	42.24		0.99	1.52	21.99
ND*01-37P-AAB	37	69.32	55.42	63.50					58.75				28.92
ND*01-50P-AAB	50	66.93	52.81	61.11	11.20	15.37			56.31	14.5			34.36

Notes:

1. Length between the X plane and the engagement tip minus the spherical radius shall be a minimum of 4.17mm for 9- or 15-pin contact and a minimum of 3.94mm for 25-, 37-, or 50-contact connectors.
2. Length between the X plane and the engagement tip shall be a maximum of 5.59mm.
3. Contact arrangement shall be as shown in Supplementary Figure C-1.
4. Physical dimensions of a right angle pin contact shall be as specified in Supplementary Figure C-20.
5. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.
6. If the size other than $3^{+0.8}_{-0.5}$mm is required, it shall be specified in parentheses at the end of the part number. For example, size $5^{+0.8}_{-0.5}$ shall be indicated as ND*01-9P-AAB(5).
7. Mounting hole dimensions on a printed wiring board shall be as specified in Supplementary Figure C-25.
8. 9- or 15-contacts: 9.44±0.5, 25-, 37- or 50-contacts: 9.41±0.5.

Supplementary Figure C-6. Physical Dimensions for Standard Shell, Right Angle Pin Contact Connectors (2/2) (without Location Plate) (Shell Material: Brass)

Unit: mm



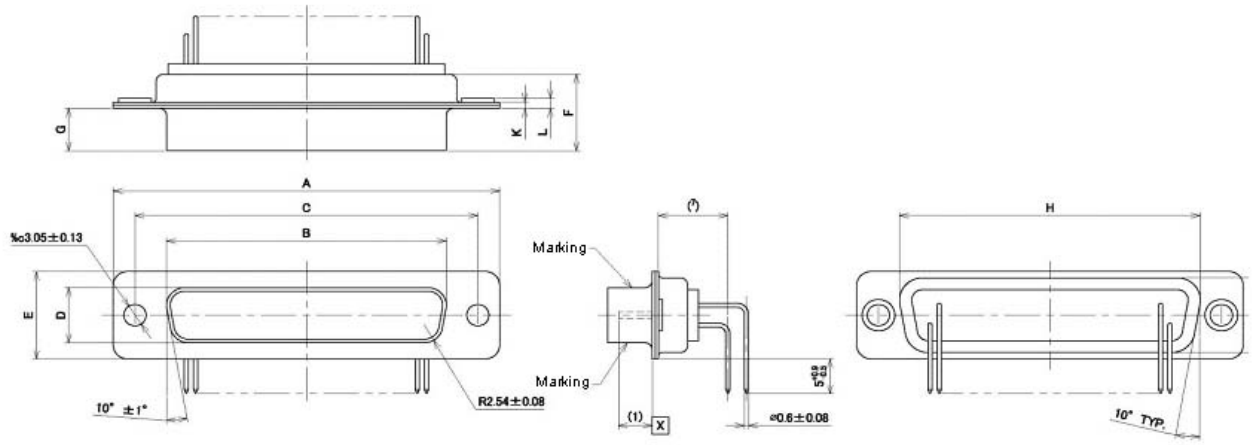
Part number	Contact arrangement	Physical dimensions								Mass (g)
		A	B	C	D	E	G	L	M	
		±0.38	±0.13	±0.13	–	±0.38	±0.13	Maximum	±0.15	Maximum
ND*01- 9S-A	9	30.81	16.33	24.99	7.85 ±0.18	12.55	6.17	24.5	12.75	12.92
ND*01-15S-A	15	39.14	24.66	33.32						17.04
ND*01-25S-A	25	53.04	38.38	47.04						23.49
ND*01-37S-A	37	69.32	54.84	63.50						31.21
ND*01-50S-A	50	66.93	52.43	61.11	10.74 ±0.13	15.37		27.5	14.17	37.77

Notes:

1. When a square ended test pin of Φ0.99 to 1.04mm makes contact with the tip of a socket insertion end, the mating depth from the X plane shall be a minimum of 3.63mm.
2. Bracket configuration is not specified.
3. Contact arrangement shall be as shown in Supplementary Figure C-1.
4. Physical dimensions of a right angle socket contact shall be as shown in Supplementary Figure C-21.
5. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.
6. The torque to fasten the screws is not specified.
7. If the size other than $3^{+0.8}_{-0.5}$mm is required, it shall be specified in parentheses at the end of the part number. For example, size $5^{+0.8}_{-0.5}$ shall be indicated as ND*01-9S-A(5).
8. Mounting hole dimensions on a printed wiring board shall be as specified in Supplementary Figures C-24 and C-25.

Supplementary Figure C-7. Physical Dimensions for Standard Shell, Right Angle Socket Contact Connectors (1/2) (Shell Material: Brass)

Unit: mm



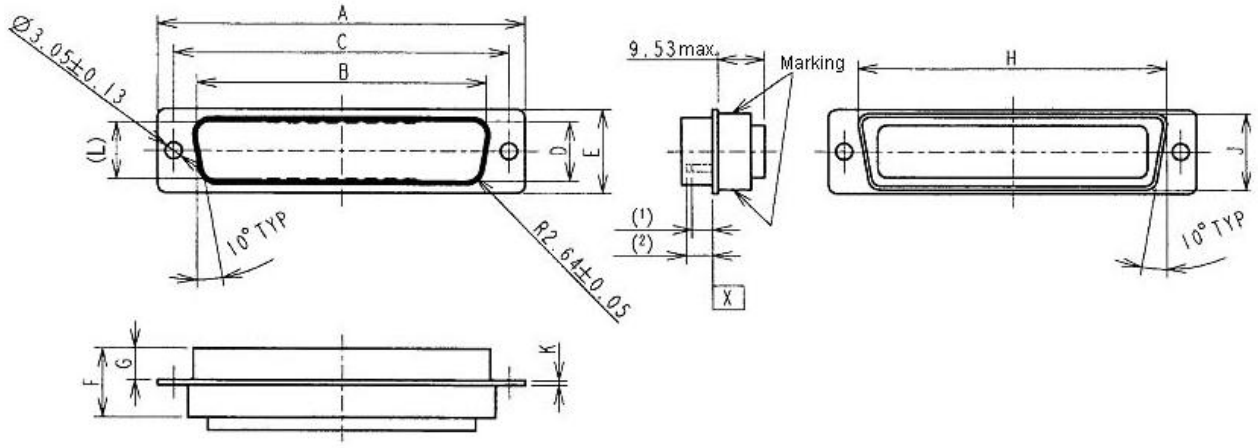
Part number	Contact arrangement	Physical dimensions											Mass (g)
		A	B	C	D	E	F	G	H	J	K	L	
		±0.38	±0.13	±0.13	–	±0.38	Maximum	±0.13	Maximum	Maximum	±0.25	±0.32	Maximum
ND*01-9S-AAB	9	30.81	16.33	24.99	7.85 ±0.18	12.55	16.63	6.17	20.19	11.68	0.76	1.21	12.92
ND*01-15S-AAB	15	39.14	24.66	33.32					28.52				17.04
ND*01-25S-AAB	25	53.04	38.38	47.04					42.24				23.49
ND*01-37S-AAB	37	69.32	54.84	63.50					58.75				31.21
ND*01-50S-AAB	50	66.93	52.43	61.11	10.74 ±0.13	15.37			56.31	14.50			37.77

Notes:

1. When a square ended test pin of Φ0.99 to 1.04mm makes contact with the tip of a socket insertion end, the mating depth from the X plane shall be a minimum of 3.63mm.
2. Contact arrangement shall be as shown in Supplementary Figure C-1.
3. Physical dimensions of a solder socket contact shall be as shown in Supplementary Figure C-2.
4. Looseness of the socket contact shall be within ±0.5mm in the radial and lateral directions.
5. If the size other than $3^{+0.8}_{-0.5}$mm is required, it shall be specified in parentheses at the end of the part number. For example, size $5^{+0.8}_{-0.5}$ shall be indicated as ND*01-9S-AAB(5).
6. Mounting hole dimensions on a printed wiring board shall be as specified in Supplementary Figure C-25.
7. 9-, 15-, 25-, 37- or 50-contacts: 9.44±0.5.

Supplementary Figure C-7. Physical Dimensions for Standard Shell, Right Angle Socket Contact Connectors (2/2) (without Location Plate) (Shell Material: Brass)

Unit: mm



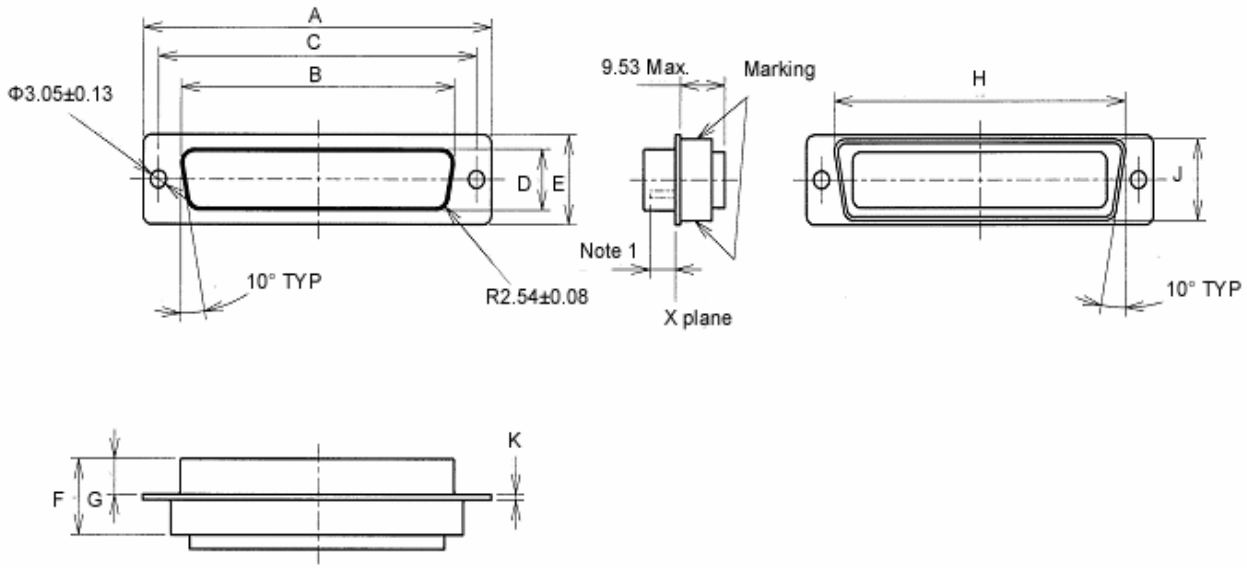
Part number	Contact arrangement	Physical dimensions											Mass (g)
		A	B	C	D	E	F	G	H	J	K	L(6)	
		±0.38	±0.13	±0.13	±0.13	±0.38	Maximum	±0.11	Maximum	Maximum	±0.25	–	Maximum
ND*11-9P-C	9	30.81	16.92	24.99	8.36	12.55	14.79	5.93	20.19	11.68	0.76	7.72	3.98
ND*11-15P-C	15	39.14	25.25	33.32					28.52				5.48
ND*11-25P-C	25	53.04	38.96	47.04					42.24		0.99		7.92
ND*11-37P-C	37	69.32	55.42	63.50					58.75				11.23
ND*11-50P-C	50	66.93	52.81	61.11	11.20	15.37			56.31	14.50		10.57	12.31

Notes:

1. Length between the X plane and the engagement tip minus the spherical radius shall be a minimum of 4.17mm for 9- or 15-contact connectors and a minimum of 3.94mm for 25-, 37-, or 50-contact connectors.
2. Length between the X plane and the insertion tip shall be a maximum of 5.59mm.
3. Contact arrangements shall be as shown in Supplementary Figure C-1.
4. Physical dimensions of a crimp pin contact shall be as shown in Supplementary Figure C-16.
5. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.
6. Dimple dimension “L” may not be specified.

Supplementary Figure C-8. Physical Dimensions for Standard Shell, Crimp Pin Contact Connectors (Shell Material: Aluminum Alloy)

Unit: mm



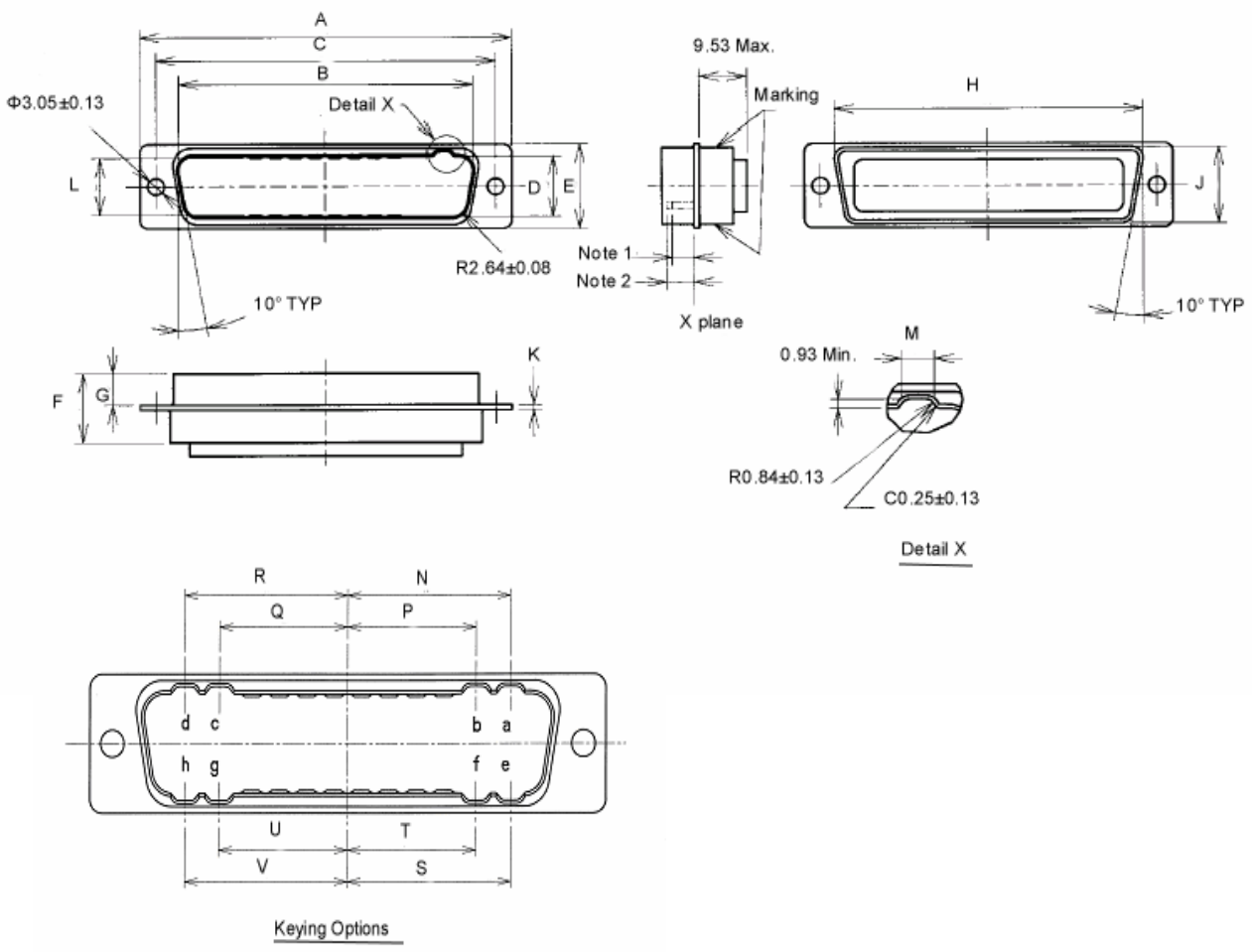
Part number	Contact arrangement	Physical dimensions										Mass (g)
		A	B	C	D	E	F	G	H	J	K	
		±0.38	±0.13	±0.13	–	±0.38	Maximum	±0.13	Maximum	Maximum	±0.25	Maximum
ND*11- 9S-C	9	30.81	16.33	24.99	7.85 ±0.18	12.55	14.95	6.17	20.19	11.68	0.76	4.49
ND*11-15S-C	15	39.14	24.66	33.32					28.52			6.24
ND*11-25S-C	25	53.04	38.38	47.04					42.24		0.99	9.15
ND*11-37S-C	37	69.32	54.84	63.50					58.75			12.72
ND*11-50S-C	50	66.93	52.43	61.11	10.74 ±0.13	15.37			56.31	14.50		14.97

Notes:

1. When a square ended test pin of Φ0.99 to 1.04mm makes contact with the tip of a socket insertion end, the mating depth from the X plane shall be a minimum of 3.63mm.
2. Contact arrangements shall be as shown in Supplementary Figure C-1.
3. Physical dimensions of a crimp socket contact shall be as shown in Supplementary Figure C-17.
4. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.

Supplementary Figure C-9. Physical Dimensions for Standard Shell, Crimp Socket Contact Connectors (Shell Material: Aluminum Alloy)

Unit: mm



Supplementary Figure C-10. Physical Dimensions for Polarized Shell, Crimp Pin Contact Connectors (Shell Material: Aluminum Alloy) (1/2)

Unit: mm

Part number	Contact arrangement	Physical dimensions												Mass (g)
		A	B	C	D	E	F	G	H	J	K	L (6)	M	
		±0.38	±0.13	±0.13	±0.13	±0.38	Maximum	±0.11	Maximum	Maximum	±0.25	–	±0.2	Maximum
ND*11-9P-C-*	9	30.81	16.92	24.99	8.36	12.55	14.79	5.93	20.19	11.68	0.76	7.72	1.96	4.77
ND*11-15P-C-*	15	39.14	25.25	33.32					28.52					6.60
ND*11-25P-C-*	25	53.04	38.96	47.04					42.24		0.99		3.18	9.55
ND*11-37P-C-*	37	69.32	55.42	63.50					58.75					13.28
ND*11-50P-C-*	50	66.93	52.81	61.11	11.20	15.37			56.31	14.50		10.57		14.56

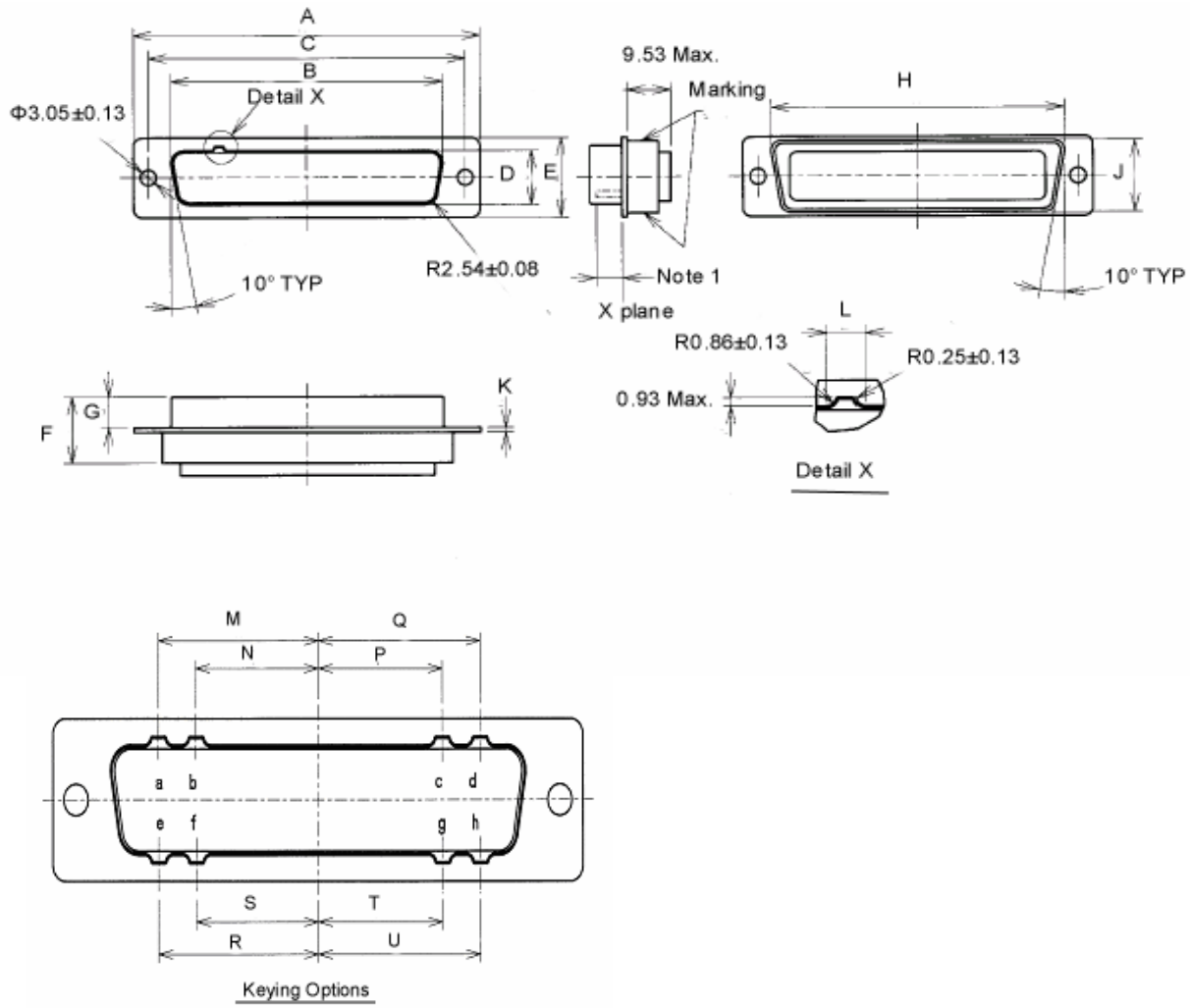
Part number	Contact arrangement	Keying options							
		a	b	c	d	e	f	g	h
		Physical dimensions							
		N	P	Q	R	S	T	U	V
		±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1
ND*11- 9P-C-*	9	3.89	–	–	3.89	–	–	–	–
ND*11-15P-C-*	15	8.26	7.06	–	–	–	–	7.06	7.70
ND*11-25P-C-*	25	14.50	11.23	11.23	14.50	13.94	11.23	11.23	13.94
ND*11-37P-C-*	37	22.58	18.49	–	–	–	–	18.31	22.20
ND*11-50P-C-*	50	21.11	16.87	16.87	21.11	20.42	16.51	16.51	20.42

Notes:

1. Length between the X plane and the engagement tip minus the spherical radius shall be a minimum of 4.17mm for 9- or 15-contact connectors and a minimum of 3.94mm for 25-, 37-, or 50-contact connectors.
2. Length between the X plane and the insertion tip shall be a maximum of 5.59mm.
3. Contact arrangements shall be as shown in Supplementary Figure C-1.
4. For physical dimensions of a crimp pin contact shall be as shown in Supplementary Figure C-16.
5. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.
6. Dimple dimension “L” may not be specified.

Supplementary Figure C-10. Physical Dimensions for Polarized Shell, Crimp Pin Contact Connectors (Shell Material: Aluminum Alloy) (2/2)

Unit: mm



Supplementary Figure C-11. Physical Dimensions for Polarized Shell, Crimp Socket Contact Connectors (Shell Material: Aluminum Alloy) (1/2)

Unit: mm

Part number	Contact arrangement	Physical dimensions											Mass (g)
		A	B	C	D	E	F	G	H	J	K	L	
		±0.38	±0.13	±0.13	–	±0.38	Maximum	±0.13	Maximum	Maximum	±0.25	±0.2	Maximum
ND*11-9S-C-*	9	30.81	16.33	24.99	7.85 ±0.18	12.55	14.95	6.17	20.19	11.68	0.76	2.59	4.48
ND*11-15S-C-*	15	39.14	24.66	33.32					28.52				6.25
ND*11-25S-C-*	25	53.04	38.38	47.04					42.24		0.99	3.56	9.19
ND*11-37S-C-*	37	69.32	54.84	63.50					58.75				12.75
ND*11-50S-C-*	50	66.93	52.43	61.11	10.74 ±0.13	15.37			56.31	14.50			15.00

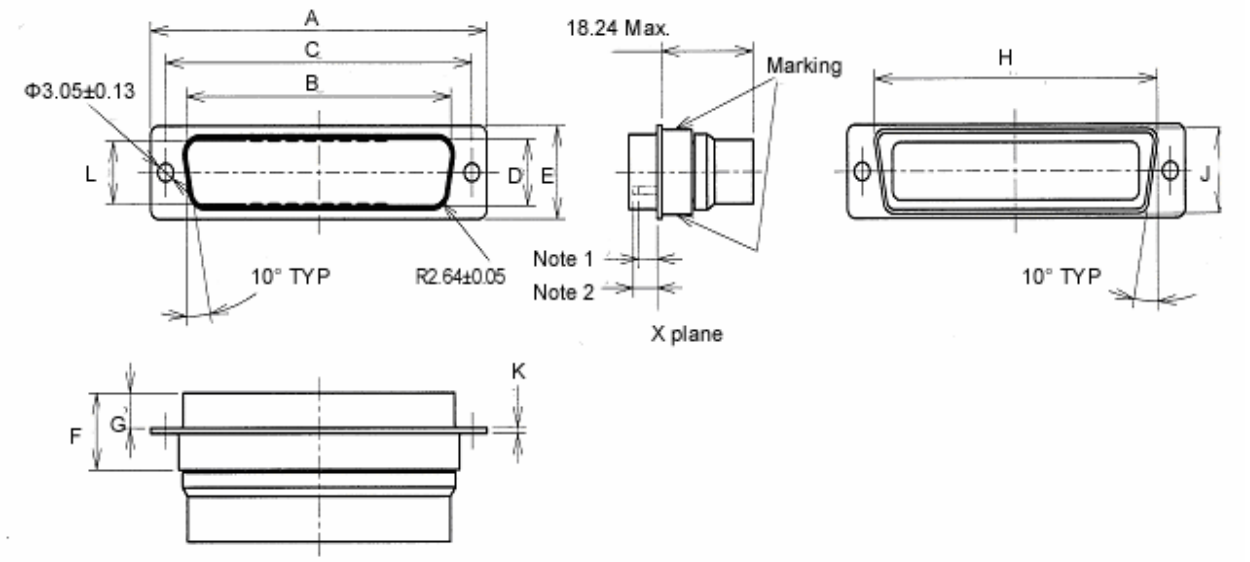
Part number	Contact arrangement	Keying options							
		a	b	c	d	e	f	g	h
		Physical dimensions							
		M	N	P	Q	R	S	T	U
		±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1
ND*11- 9S-C-*	9	3.89	–	–	3.89	–	–	–	–
ND*11-15S-C-*	15	8.26	7.06	–	–	–	–	7.06	7.70
ND*11-25S-C-*	25	14.50	11.23	11.23	14.50	13.94	11.23	11.23	13.94
ND*11-37S-C-*	37	22.58	18.49	–	–	–	–	18.31	22.20
ND*11-50S-C-*	50	21.11	16.87	16.87	21.11	20.42	16.51	16.51	20.42

Notes:

1. When a square ended test pin of Φ0.99 to 1.04mm makes contact with the tip of a socket insertion end, the mating depth from the X plane shall be a minimum of 3.63mm.
2. Contact arrangements shall be as shown in Supplementary Figure C-1.
3. Physical dimensions of a crimp socket contact shall be as shown in Supplementary Figure C-17.
4. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.

Supplementary Figure C-11. Physical Dimensions for Polarized Shell, Crimp Socket Contact Connectors (Shell Material: Aluminum Alloy) (2/2)

Unit: mm



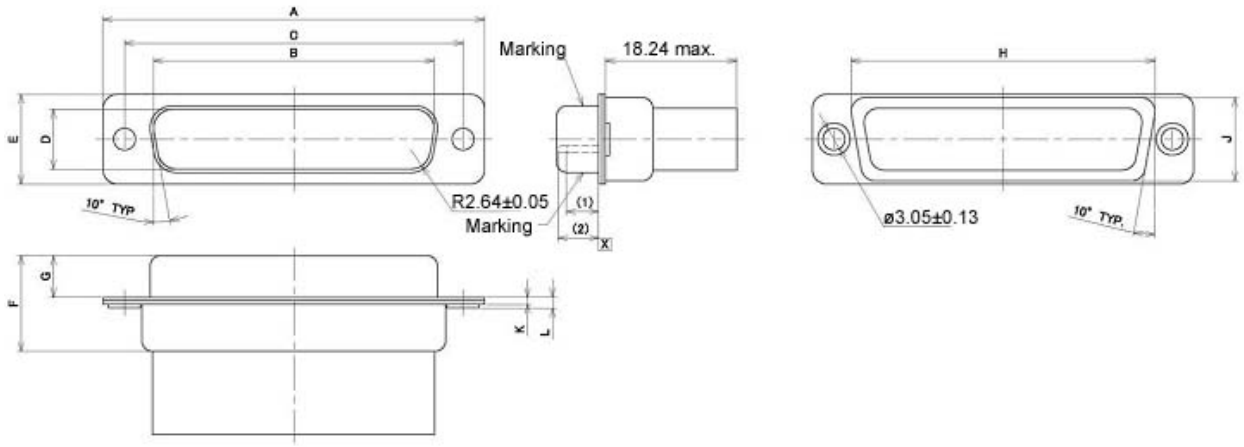
Part number	Contact arrangement	Physical dimensions											Mass (g)
		A	B	C	D	E	F	G	H	J	K	L (6)	
		±0.38	±0.13	±0.13	±0.13	±0.38	Maximum	±0.11	Maximum	Maximum	±0.25	–	Maximum
ND*11-9P-CR	9	30.81	16.92	24.99	8.36	12.55	14.79	5.93	20.19	11.68	0.76	7.72	5.49
ND*11-15P-CR	15	39.14	25.25	33.32					28.52				7.68
ND*11-25P-CR	25	53.04	38.96	47.04					42.24		0.99		11.26
ND*11-37P-CR	37	69.32	55.42	63.50					58.75				15.72
ND*11-50P-CR	50	66.93	52.81	61.11	11.20	15.37			56.31	14.50		10.57	17.55

Notes:

1. Length between the X plane and the engagement tip minus the spherical radius shall be a minimum of 4.17mm for 9- or 15-contact connectors and a minimum of 3.94mm for 25-, 37-, or 50-contact connectors.
2. Length between the X plane and the insertion tip shall be a maximum of 5.59mm.
3. Contact arrangements shall be as shown in Supplementary Figure C-1.
4. Physical dimensions of a crimp pin contact shall be as shown in Supplementary Figure C-16.
5. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.
6. Dimple dimension “L” may not be specified.

Supplementary Figure C-12. Physical Dimensions for Standard Shell, Crimp Pin Contact Connectors, Grommet Version (1/2) (Shell Material: Aluminum Alloy)

Unit: mm



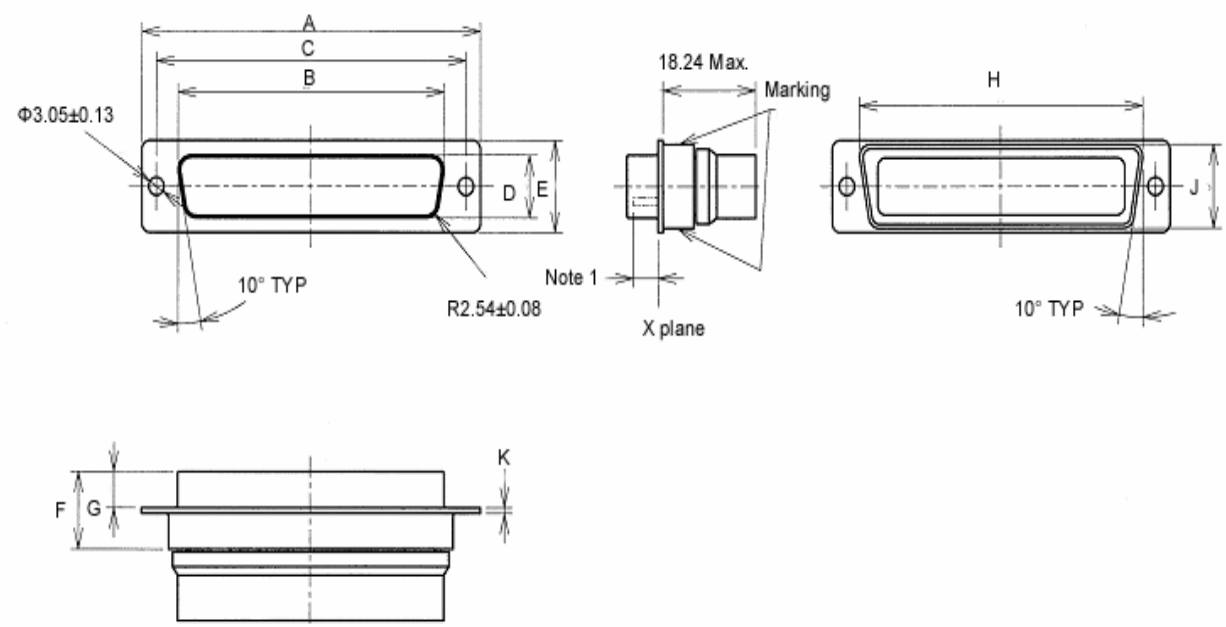
Part number	Contact arrangement	Physical dimensions											Mass (g)
		A	B	C	D	E	F	G	H	J	K	L	
		±0.38	±0.13	±0.13	±0.13	±0.38	Maximum	±0.15	Maximum	Maximum	±0.25	–	Maximum
ND*01-9P-CR	9	30.81	16.92	24.99	8.36	12.55	13.39	5.97	20.19	11.68	0.76	1.21	6.6
ND*01-15P-CR	15	39.14	25.25	33.32					28.52				9.2
ND*01-25P-CR	25	53.04	38.96	47.04				5.84	42.24		0.99	1.52	15.0
ND*01-37P-CR	37	69.32	55.42	63.50					58.75				20.9
ND*01-50P-CR	50	66.93	52.81	61.11	11.20	15.37			56.31	14.50			24.6

Notes:

1. Length between the X plane and the engagement tip minus the spherical radius shall be a minimum of 4.17mm for 15- or 26-contact connectors and a minimum of 3.94mm for 44-, 62-, or 78-contact connectors.
2. Length between the X plane and the insertion tip shall be a maximum of 5.59mm.
3. Contact arrangements shall be as shown in Supplementary Figure C-1.
4. Physical dimensions of a crimp pin contact shall be as shown in Supplementary Figure C-16.
5. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.

Supplementary Figure C-12. Physical Dimensions for Standard Shell, Crimp Pin Contact Connectors, Grommet Version (2/2) (Shell Material: Brass)

Unit: mm



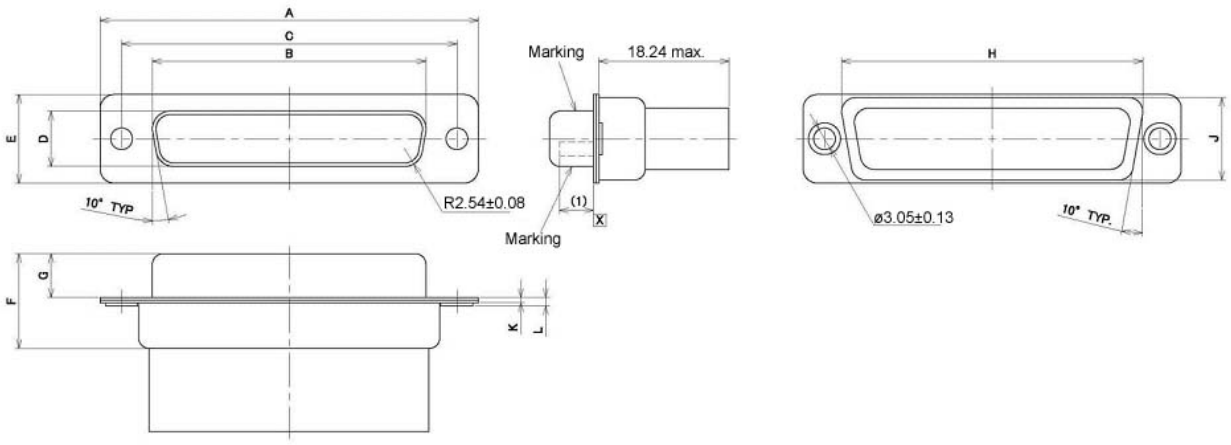
Part number	Contact arrangement	Physical dimensions										Mass (g)
		A	B	C	D	E	F	G	H	J	K	
		±0.38	±0.13	±0.13	–	±0.38	Maximum	±0.13	Maximum	Maximum	±0.25	Maximum
ND*11-9S-CR	9	30.81	16.33	24.99	7.85 ±0.18	12.55	14.95	6.17	20.19	11.68	0.76	5.95
ND*11-15S-CR	15	39.14	24.66	33.32					28.52			8.45
ND*11-25S-CR	25	53.04	38.38	47.04					42.24		0.99	12.51
ND*11-37S-CR	37	69.32	54.84	63.50					58.75			17.44
ND*11-50S-CR	50	66.93	52.43	61.11	10.74 ±0.13	15.37			56.31	14.50		20.12

Notes:

1. When a square ended test pin of Φ0.99 to 1.04mm makes contact with the tip of a socket insertion end, the mating depth from the X plane shall be a minimum of 3.63mm.
2. Contact arrangements shall be as shown in Supplementary Figure C-1.
3. Physical dimensions of a crimp socket contact shall be as specified in Supplementary Figure C-17.
4. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.

Supplementary Figure C-13**. Physical Dimensions for Standard Shell, Crimp Socket Contact Connectors, Grommet Version (1/2) (Shell Material: Aluminum Alloy)**

Unit: mm



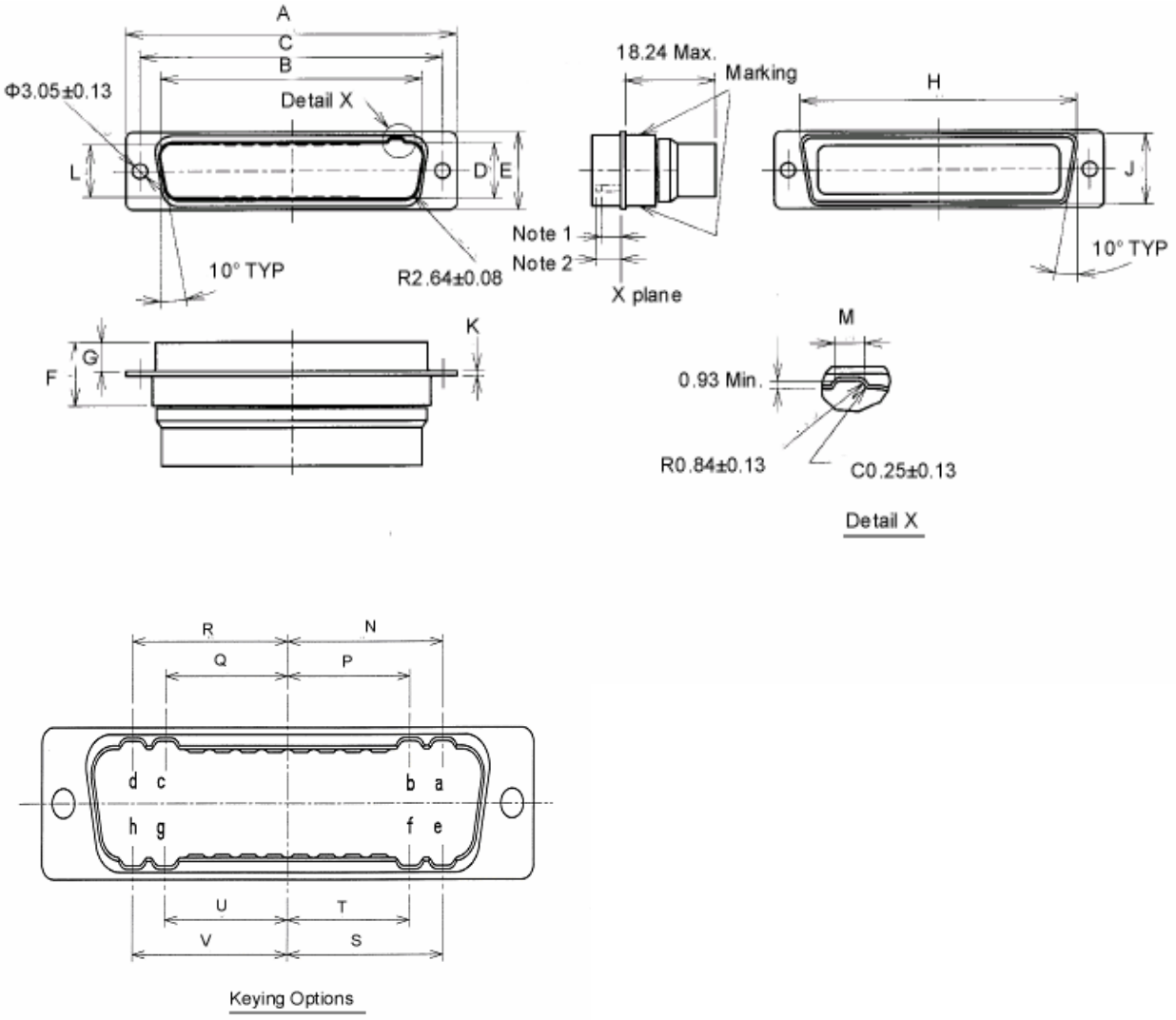
Part number	Contact arrangement	Physical dimensions											Mass (g)
		A	B	C	D	E	F	G	H	J	K	L	
		±0.38	±0.13	±0.13	-	±0.38	Maximum	±0.13	Maximum	Maximum	±0.25	±0.32	Maximum
ND*01-9S-CR	9	30.81	16.33	24.99	7.85 ±0.18	12.55	16.63	6.17	20.19	11.68	0.76	1.21	7.1
ND*01-15S-CR	15	39.14	24.66	33.32					28.52				9.9
ND*01-25S-CR	25	53.04	38.38	47.04					42.24				16.1
ND*01-37S-CR	37	69.32	54.84	63.50	10.74 ±0.13	15.37			58.75	14.50			22.4
ND*01-50S-CR	50	66.93	52.43	61.11					56.31				26.4

Notes:

1. When a square ended test pin of Φ0.75 to 0.77mm makes contact with the tip of a socket Insertion end, the mating depth from the X plane shall be a minimum of 3.63mm.
2. Contact arrangements shall be as shown in Supplementary Figure C-1.
3. Physical dimensions of a crimp socket contact shall be as specified in Supplementary Figure C-17.
4. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.

Supplementary Figure C-13. Physical Dimensions for Standard Shell, Crimp Socket Contact Connectors, Grommet Version (2/2) (Shell Material: Brass)

Unit: mm



Supplementary Figure C-14. Physical Dimensions for Polarized Shell, Crimp Pin Contact Connectors, Grommet Version (Shell Material: Aluminum Alloy) (1/2)

Unit: mm

Part number	Contact arrangement	Physical dimensions												Mass (g)
		A	B	C	D	E	F	G	H	J	K	L (6)	M	
		±0.38	±0.13	±0.13	±0.13	±0.38	Maximum	±0.11	Maximum	Maximum	±0.25	–	±0.2	Maximum
ND*11-9P-CR-*	9	30.81	16.92	24.99	8.36	12.55	14.79	5.93	20.19	11.68	0.76	7.72	1.96	6.27
ND*11-15P-CR-*	15	39.14	25.25	33.32					28.52					8.80
ND*11-25P-CR-*	25	53.04	38.96	47.04					42.24		0.99		3.18	12.90
ND*11-37P-CR-*	37	69.32	55.42	63.50					58.75					18.00
ND*11-50P-CR-*	50	66.93	52.81	61.11	11.20	15.37			56.31	14.50		10.57		19.79

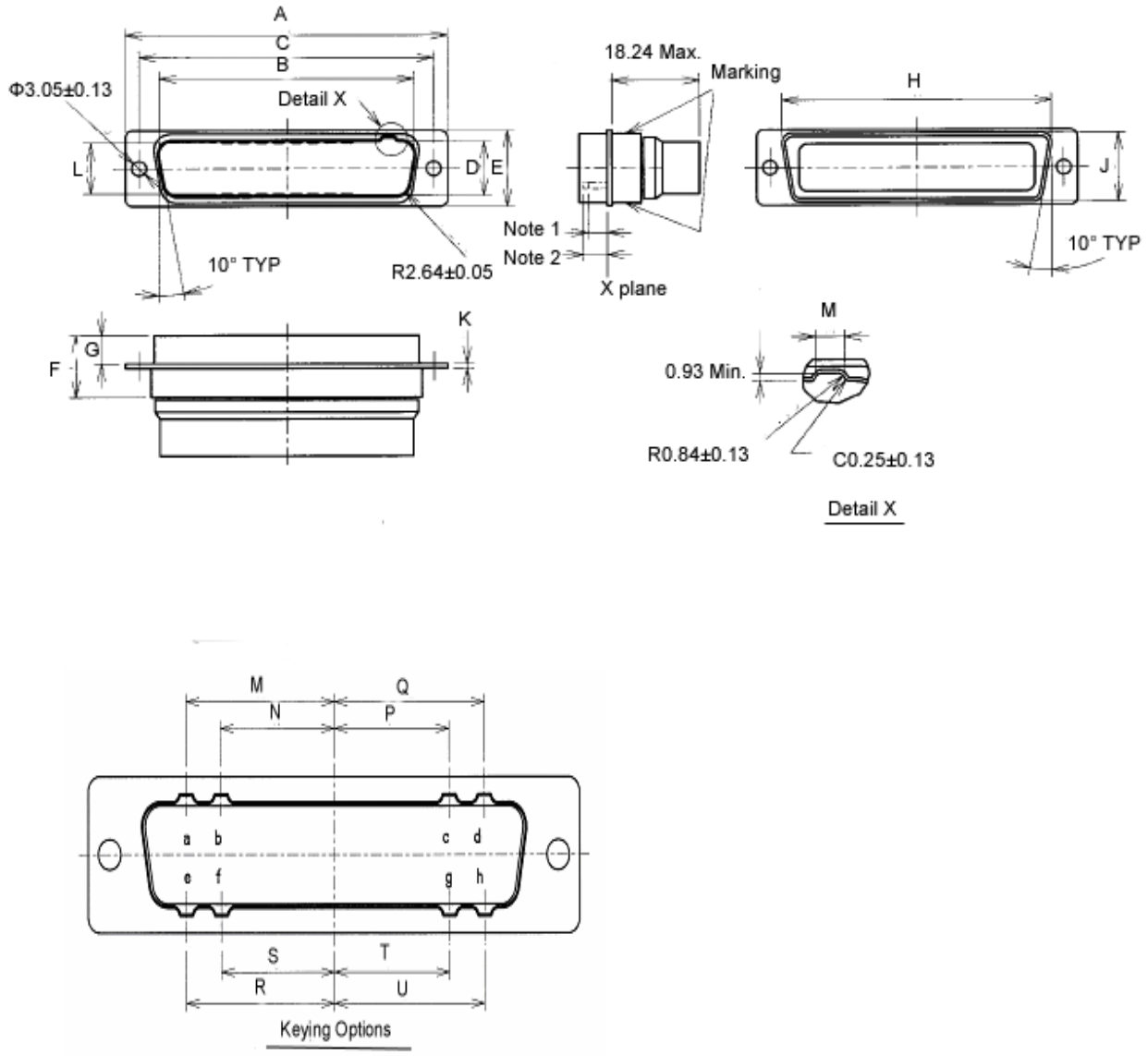
Part number	Contact arrangement	Keying options							
		a	b	c	d	e	f	g	h
		Physical dimensions							
		N	P	Q	R	S	T	U	V
		±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1
ND*11- 9P-CR-*	9	3.89	–	–	3.89	–	–	–	–
ND*11-15P-CR-*	15	8.26	7.06	–-	–	–	–	7.06	7.70
ND*11-25P-CR-*	25	14.50	11.23	11.23	14.50	13.94	11.23	11.23	13.94
ND*11-37P-CR-*	37	22.58	18.49	–	–	–	–	18.31	22.20
ND*11-50P-CR-*	50	21.11	16.87	16.87	21.11	20.42	16.51	16.51	20.42

Notes:

1. Length between the X plane and the engagement tip minus the spherical radius shall be a minimum of 4.17mm for 9- or 15-contact connectors and a minimum of 3.94mm for 25-, 37-, or 50-contact connectors.
2. Length between the X plane and the insertion tip shall be a maximum of 5.59mm.
3. Contact arrangements shall be as shown in Supplementary Figure C-1.
4. Physical dimensions of a crimp pin contact shall be as shown in Supplementary Figure C-16.
5. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.
6. Dimple dimension “L” may not be specified.

Supplementary Figure C-14. Physical Dimensions for Polarized Shell, Crimp Pin Contact Connectors, Grommet Version (Shell Material: Aluminum Alloy) (2/2)

Unit: mm



Supplementary Figure C-15. Physical Dimensions for Polarized Shell, Crimp Socket Contact Connectors, Grommet Version (Shell Material: Aluminum Alloy) (1/2)

Unit: mm

Part number	Contact arrangement	Physical dimensions											Mass (g)
		A	B	C	D	E	F	G	H	J	K	L	
		±0.38	±0.13	±0.13	–	±0.38	Maximum	±0.13	Maximum	Maximum	±0.25	±0.2	Maximum
ND*11-9S-CR-*	9	30.81	16.33	24.99	7.85 ±0.18	12.55	14.95	6.17	20.19	11.68	0.76	2.59	4.48
ND*11-15S-CR-*	15	39.14	24.66	33.32					28.52				6.25
ND*11-25S-CR-*	25	53.04	38.38	47.04					42.24		0.99	3.56	9.19
ND*11-37S-CR-*	37	69.32	54.84	63.50					58.75				12.75
ND*11-50S-CR-*	50	66.93	52.43	61.11	10.74 ±0.13	15.37			56.31	14.50			15.00

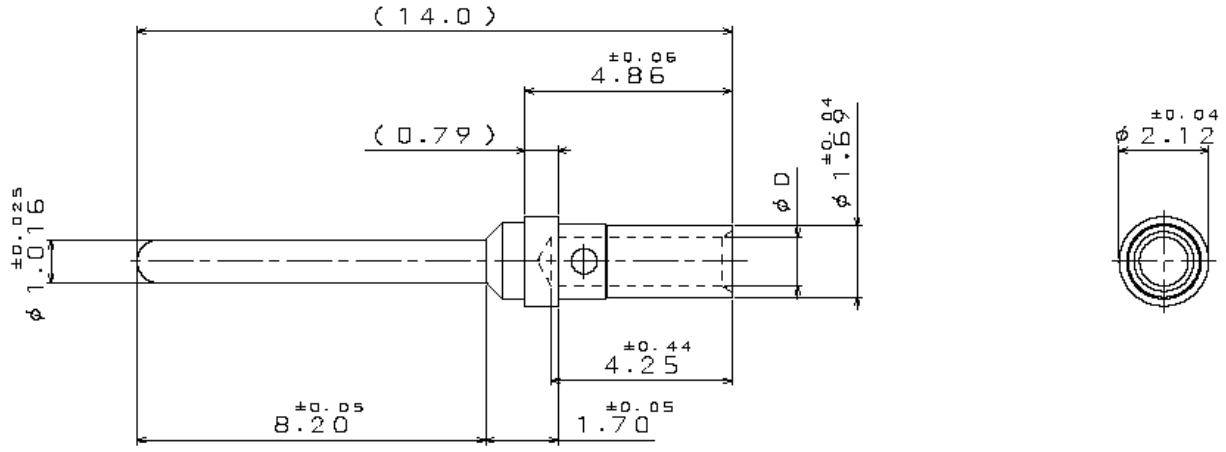
Part number	Contact arrangement	Keying options							
		a	b	c	d	e	f	g	h
		Physical dimensions							
		M	N	P	Q	R	S	T	U
		±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1
ND*11- 9S-CR-*	9	3.89	–	–	3.89	–	–	–	–
ND*11-15S-CR-*	15	8.26	7.06	–	–	–	–	7.06	7.70
ND*11-25S-CR-*	25	14.50	11.23	11.23	14.50	13.94	11.23	11.23	13.94
ND*11-37S-CR-*	37	22.58	18.49	–	–	–	–	18.31	22.20
ND*11-50S-CR-*	50	21.11	16.87	16.87	21.11	20.42	16.51	16.51	20.42

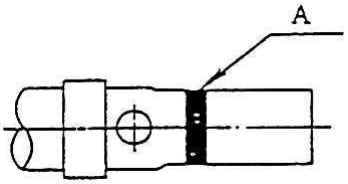
Notes:

1. When a square ended test pin of Φ0.99 to 1.04mm makes contact with the tip of a socket insertion end, the mating depth from the X plane shall be a minimum of 3.63mm.
2. Contact arrangements shall be as shown in Supplementary Figure C-1.
3. Physical dimensions of a crimp socket contact shall be as shown in Supplementary Figure C-17.
4. Looseness of the socket contact shall be within ±0.5mm in the radial and lateral directions.

Supplementary Figure C-15. Physical Dimensions for Polarized Shell, Crimp Socket Contact Connectors, Grommet Version (Shell Material: Aluminum Alloy) (2/2)

Unit: mm



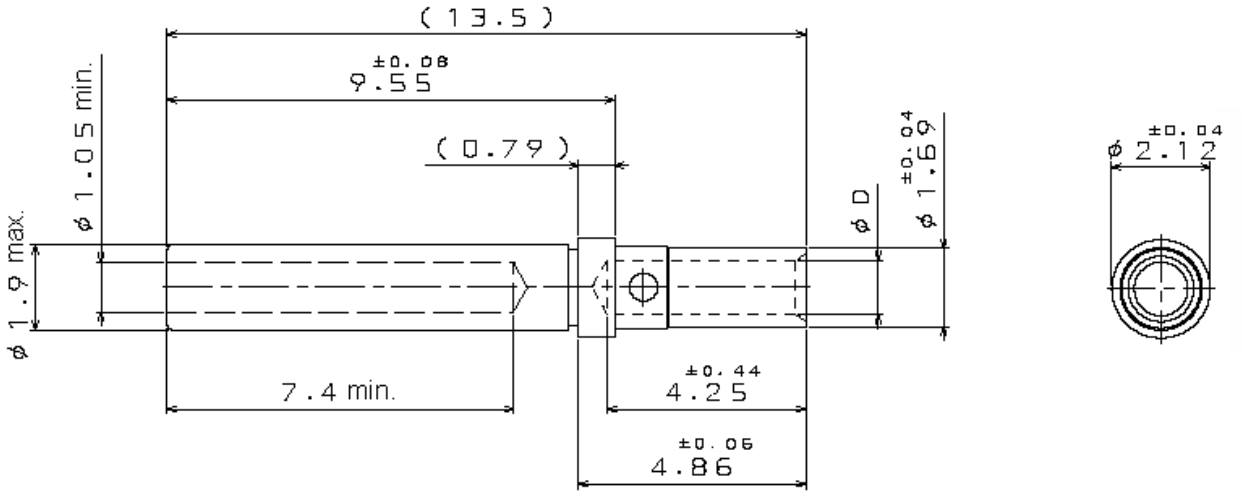


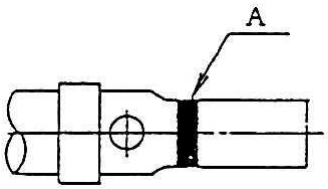
BIN Code Color Band

Part number	Contact size	ΦD±0.04	BIN code color band A	Mass (g) ±10%
ND*01-P-C20	20–20	1.13	Orange	0.143
ND*01-P-C26	20–26	0.64	Blue	0.163

Supplementary Figure C-16. Physical Dimensions for Crimp Pin Contacts (Removable)

Unit: mm



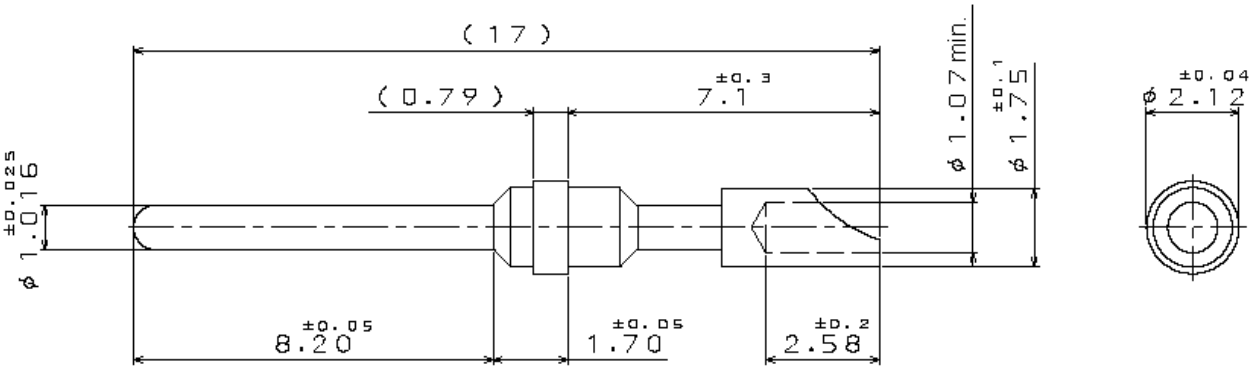


BIN Code Color Band

Part number	Contact size	ΦD±0.04	BIN code color band A	Mass (g) ±10%
ND*01-S-C20	20–20	1.13	Orange	0.174
ND*01-S-C26	20–26	0.64	Blue	0.206

Supplementary Figure C-17. Physical Dimensions for Crimp Socket Contacts (Removable)

Unit: mm

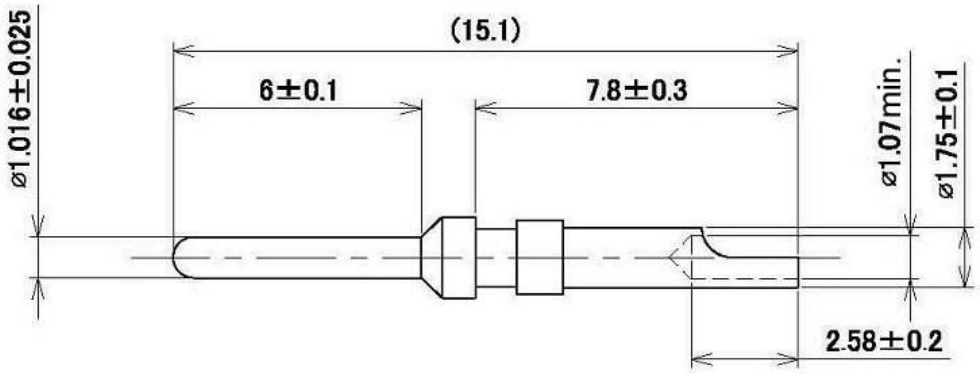


Mass: 0.192g±10%

Part number
ND*01-P-S

Supplementary Figure C-18. Physical Dimensions for Solder Pin Contacts (1/2) (Removable)

Unit: mm

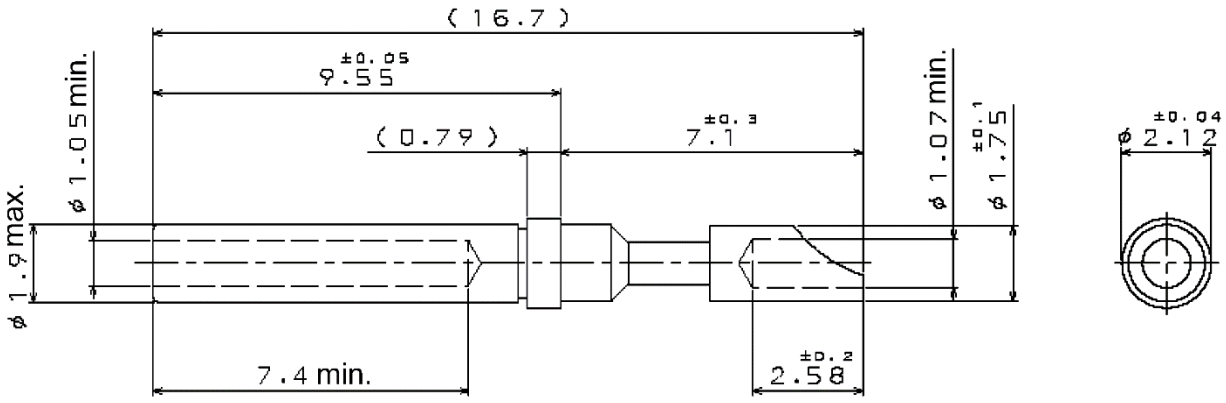


Mass: 0.19g (reference)

Note: This contact is equivalent of the contacts specified in Supplementary Figure G-14 of JAXA-QTS-2060.

Supplementary Figure C-18. Physical Dimensions for Solder Pin Contacts (2/2) (Non-removable)

Unit: mm

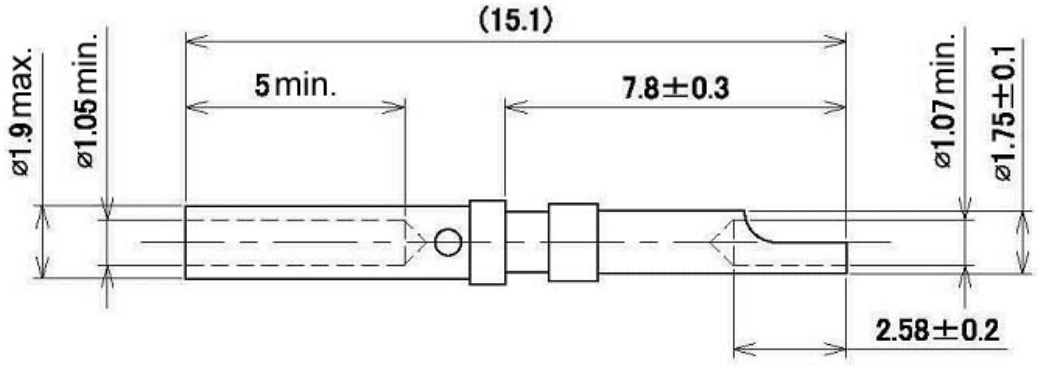


Mass: 0.226g ± 10%

Part number
ND*01-S-S

Supplementary Figure C-19. Physical Dimensions for Solder Socket Contacts (1/2) (Removable)

Unit: mm

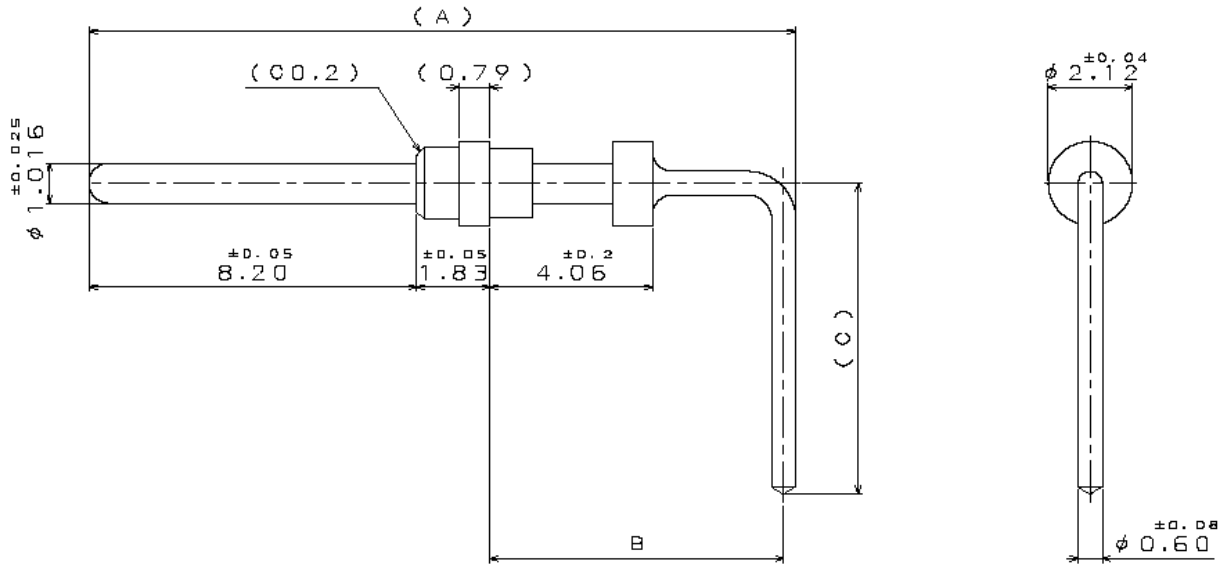


Mass: 0.22g (reference)

Note: This contact is equivalent of the contacts specified in Supplementary Figure G-14 of JAXA-QTS-2060.

Supplementary Figure C-19. Physical Dimensions for Solder Socket Contacts (2/2) (Non-removable)

Unit: mm

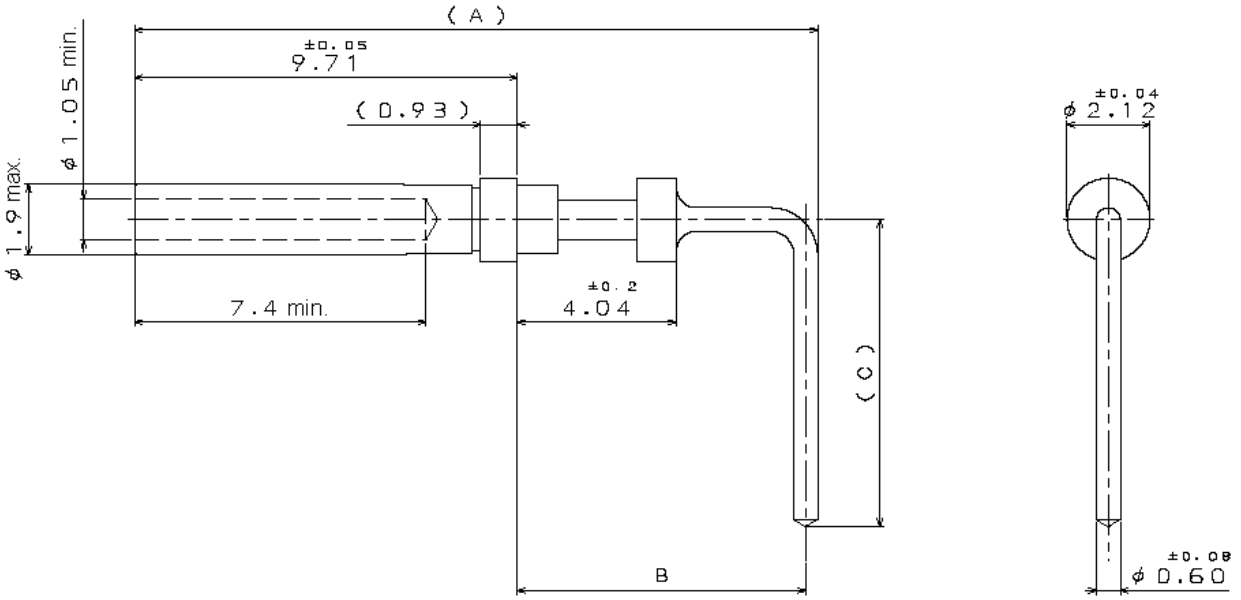


Part number	Physical dimensions			Mass (g) (reference)	Row
	A (reference)	B ±0.8	C (reference)		
ND*-01-P-A1	17.7	7.5	7.8	0.200	First
ND*-01-P-A2	20.5	10.16	10.6	0.212	Second
ND*-01-P-A3	23.4	13.06	13.5	0.228	Third

Note: The first and second row shall apply to 9-, 15-, 25-, 37- or 50-contact arrangement. The third row shall be used only for 50-contact arrangement.

Supplementary Figure C-20. Physical Dimensions for Right Angle Pin Contacts (Non-removable)

Unit: mm

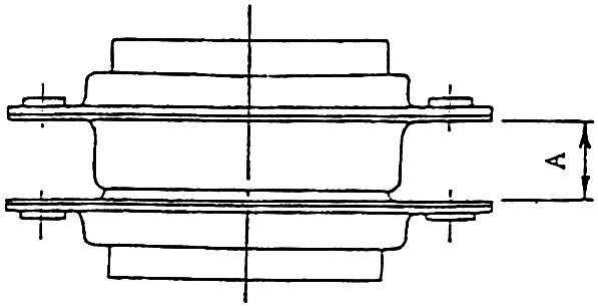


Part number	Physical dimensions			Mass (g) ±10%	Row
	A (reference)	B ± 0.8	C (reference)		
ND*-01-S-A1	17.4	7.5	7.8	0.234	First
ND*-01-S-A2	20.2	10.14	10.6	0.246	Second
ND*-01-S-A3	23.1	13.04	13.5	0.262	Third

Note: The first and second row shall apply to 9-, 15-, 25-, 37- or 50-contact arrangement. The third row shall be used only for 50-contact arrangement.

Supplementary Figure C-21. Physical Dimensions for Right Angle Socket Contacts (Non-removable)

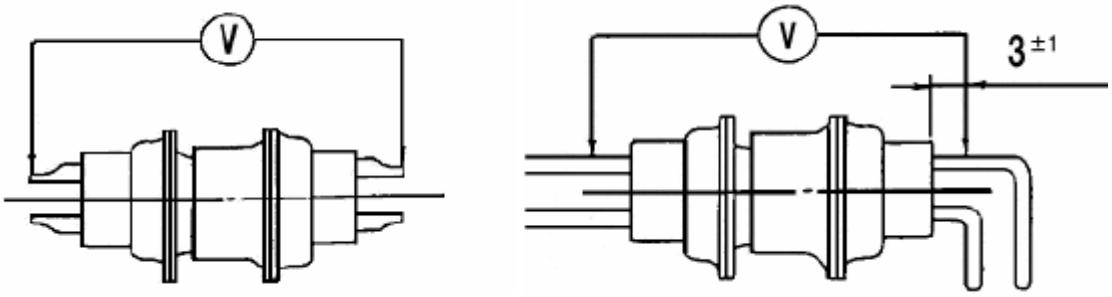
Unit: mm



The distance “A” between flanges of the mated plug and receptacle shall be as follows.
9- or 15-contact connector: 6.73±0.38mm
25-, 37- or 50-contact connector: 6.50±0.38mm

Supplementary Figure C-22. Distance between Flanges

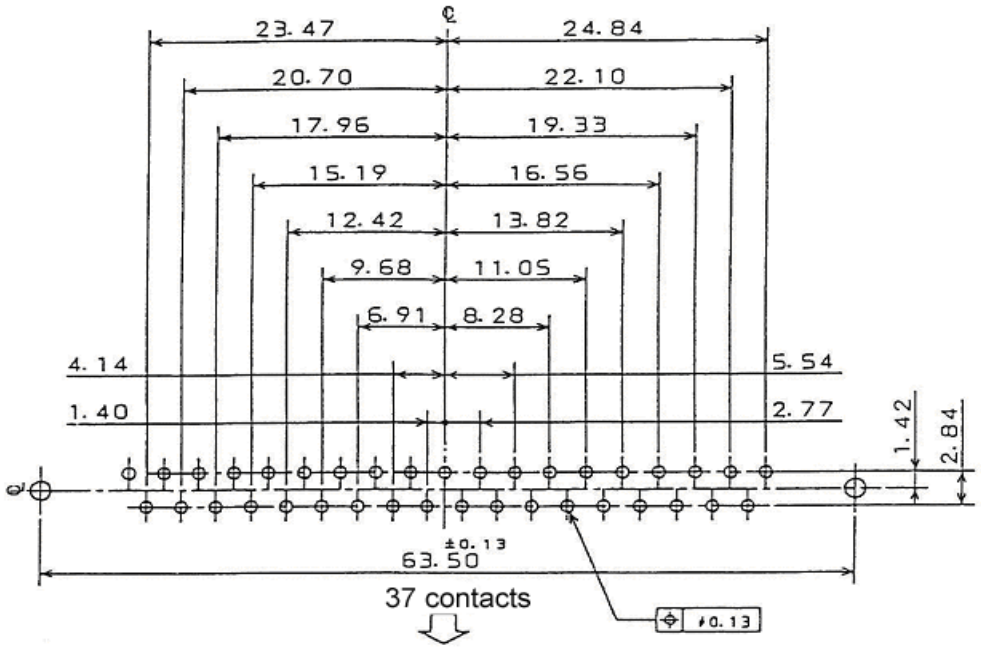
Unit: mm

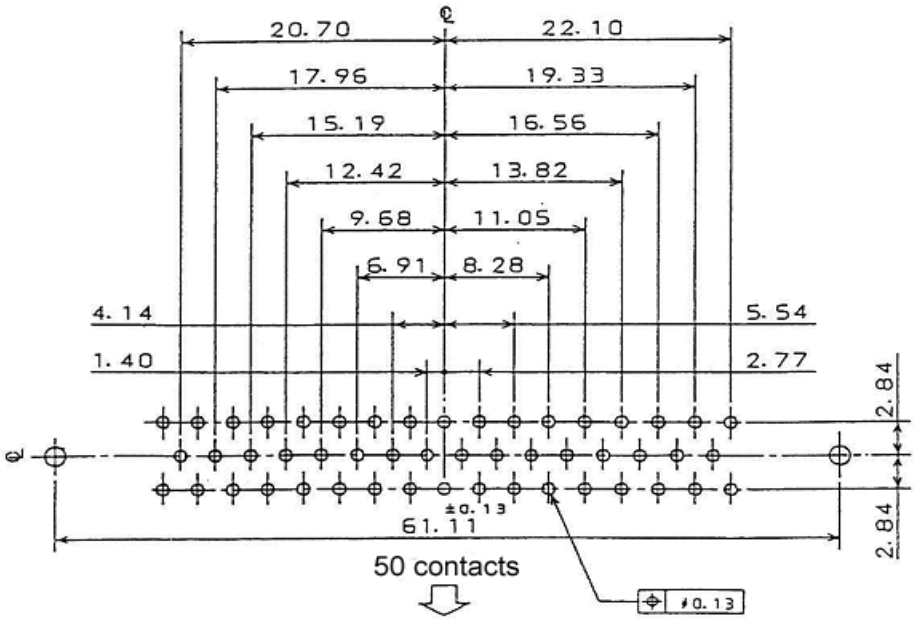


Solder contact connector　　Right angle through hole contact connector

Supplementary Figure C-23. Contact Resistance Measurement Points

Unit: mm



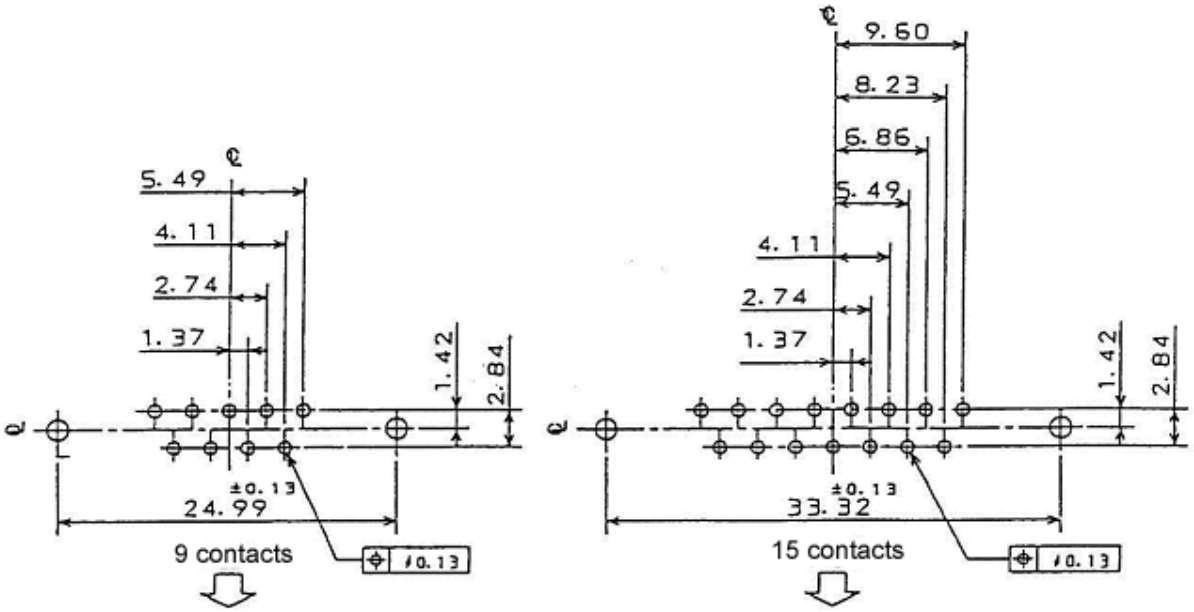


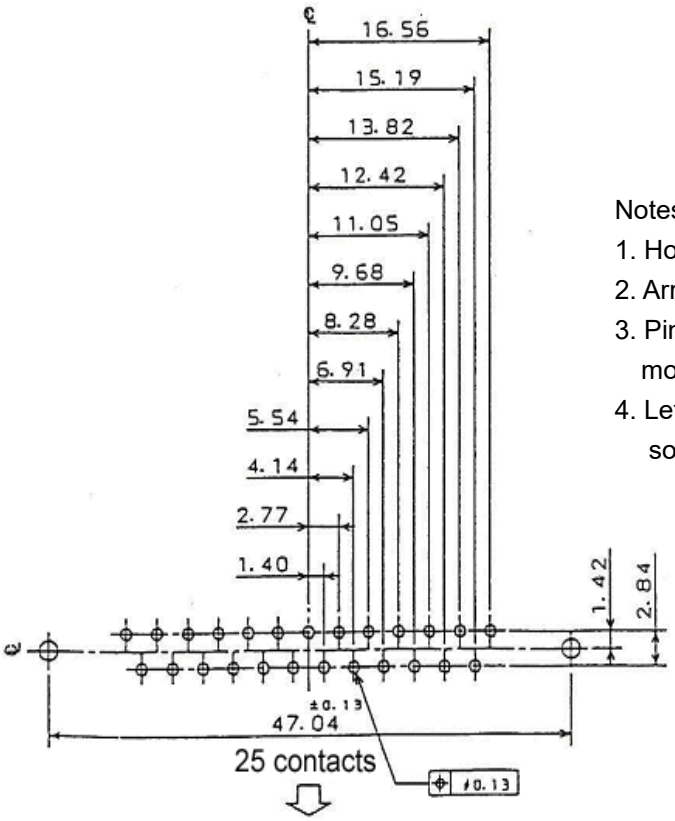
Notes:

1. Hole diameters are not specified.
2. Arrow shows the mating direction.
3. Pin connector arrangement is viewed from the mounting surface.
4. Left and right positions of holes are reversed for socket contacts.

Supplementary Figure C-24. Dimensions of Mounting Holes on Printed Wiring Board (for ND101) (1/2)

Unit: mm

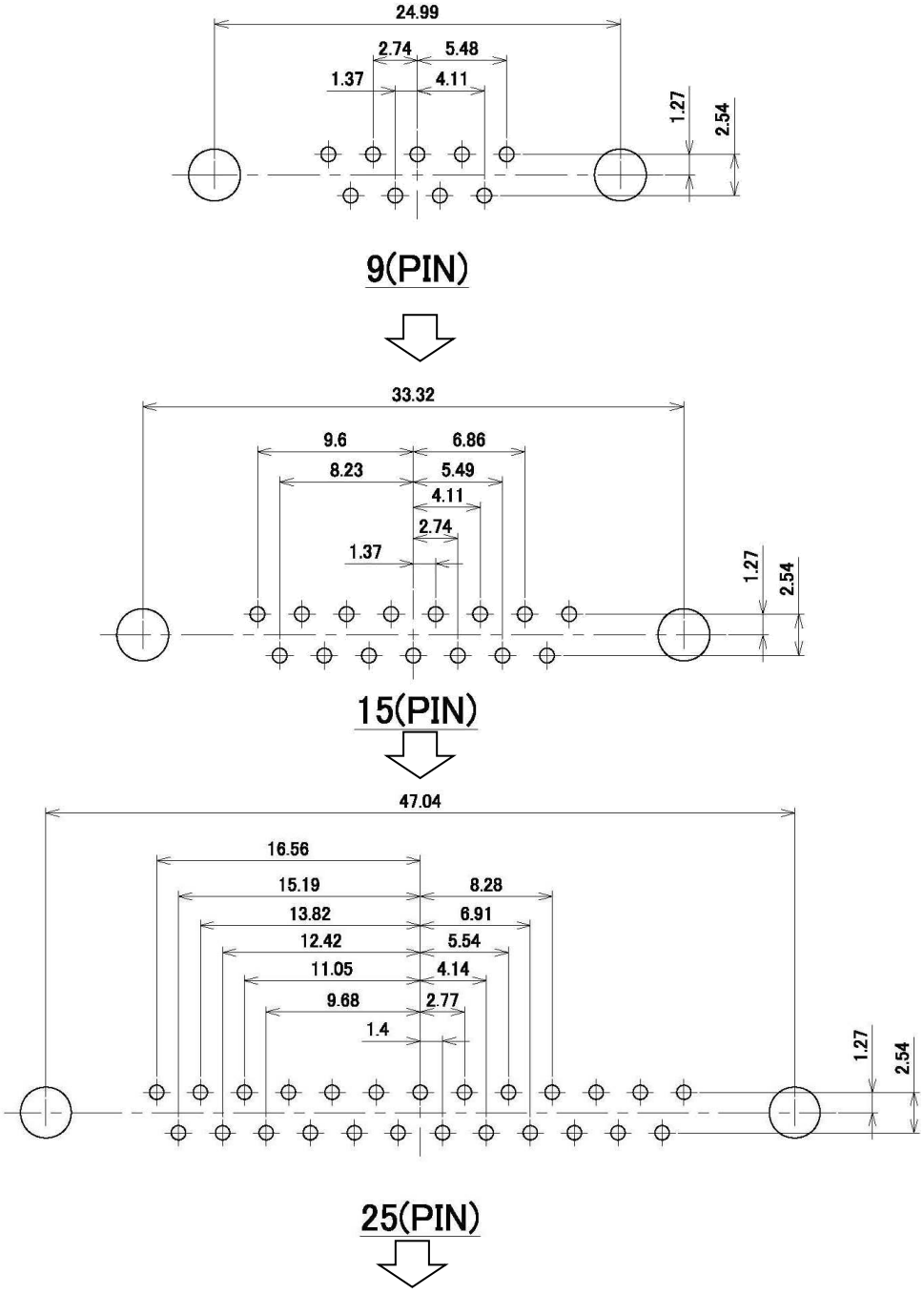




Notes:
1. Hole diameters are not specified.
2. Arrow shows the mating direction.
3. Pin connector arrangement is viewed from the mounting surface.
4. Left and right positions of holes are reversed for socket contacts.

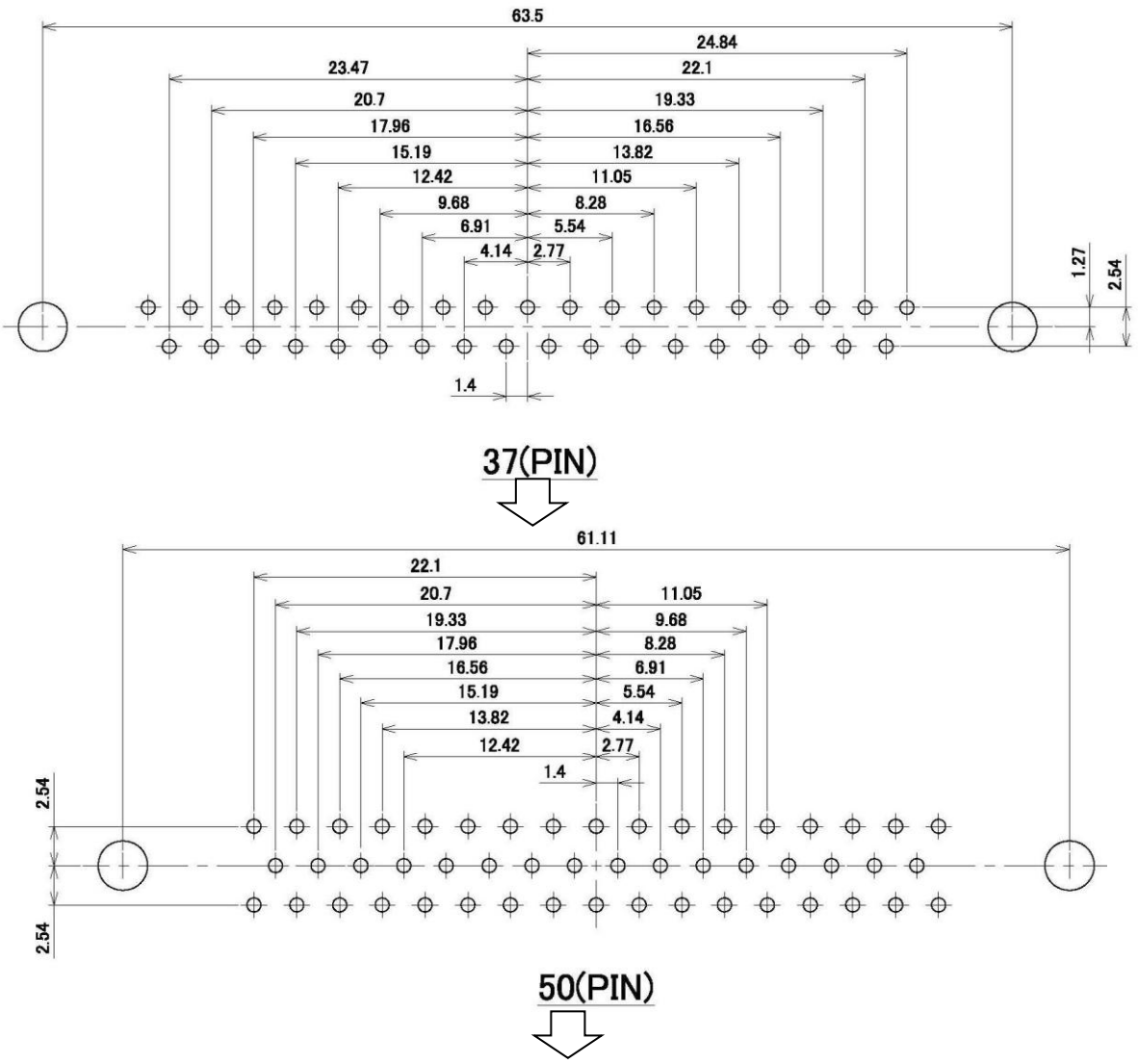
Supplementary Figure C-24. Dimensions of Mounting Holes on Printed Wiring Board (for ND101) (2/2)

Unit: mm



Supplementary Figure C-25. Dimensions of Mounting Holes on Printed Wiring Board (for ND301) (1/2)

Unit: mm



Notes:

1. Hole diameters are not specified.
2. Arrow shows the mating direction.
3. Pin connector arrangement is viewed from the mounting surface.
4. Left and right positions of holes are reversed for socket contacts.

Supplementary Figure C-25. Dimensions of Mounting Holes on Printed Wiring Board (for ND301) (2/2)

APPENDIX D

CONNECTORS, RECTANGULAR, MINIATURE, HIGH DENSITY

This document is the English version of JAXA QTS/ADS which was originally written and authorized in Japanese and carefully translated into English for international users. If any question arises as to the context or detailed description, it is strongly recommended to verify against the latest official Japanese version.
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The release date of the English version of this specification: 25 March 2026

APPENDIX D

CONNECTORS, RECTANGULAR, MINIATURE, HIGH DENSITY

D.1 General

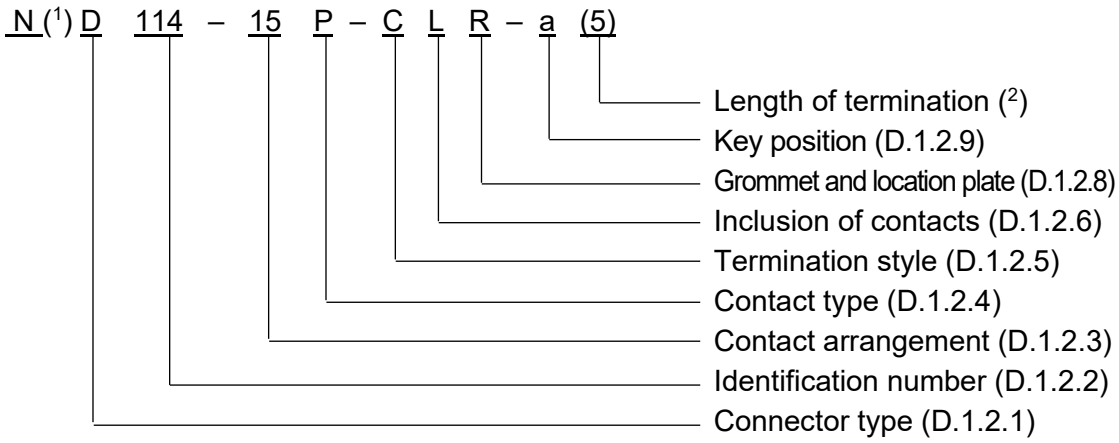
D.1.1 Scope

This appendix establishes the requirements and quality assurance provisions, among other things, for the miniature rectangular connectors (hereinafter referred to as "connectors").

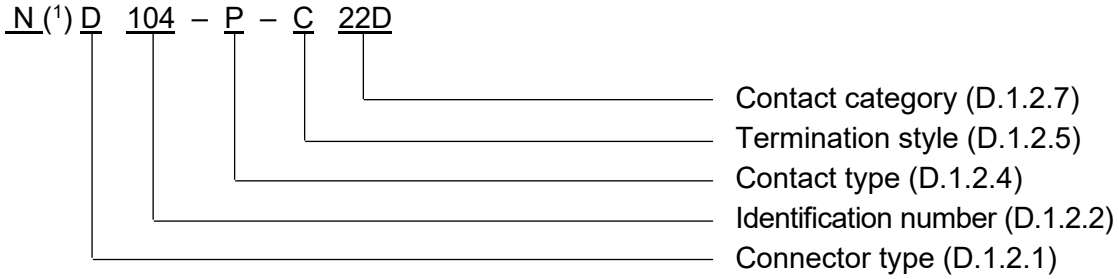
D.1.2 Part Number

The part number identifies the connector type, identification number, contact arrangement, contact type, style of termination, and others as given in the following form. The detail information shall be as specified in the detail specification.

[Connectors]
(Example)



[Individual Contacts]
(Example)



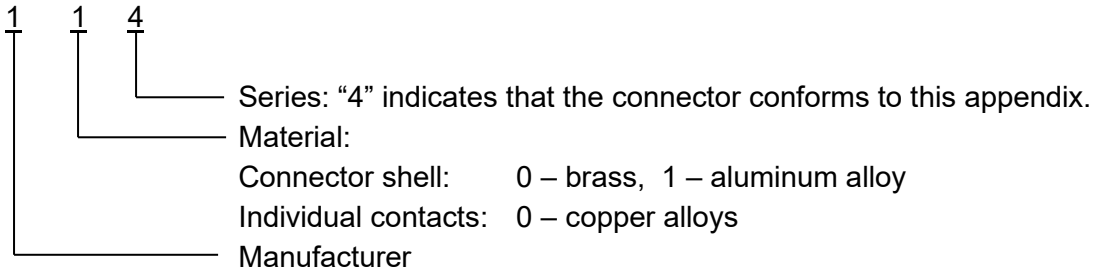
Notes:
(1) "N" indicates the part is for space use.
(2) See note 8 of Supplementary Figures D-6, note 7 of D-7, note 6 of D-8, and note 5 of D-9.

D.1.2.1 Connector Type

The connector type is identified by a single capital letter. “D” indicates a “D-sub connector.”

D.1.2.2 Identification Number

The identification number is identified by three digits as follows.



D.1.2.3 Contact Arrangement

The contact arrangement is identified by a two- or three-digit number, and indicates the number of contacts (see Supplementary Figure D-1).

D.1.2.4 Contact Type

The contact type is identified by a single letter, “P” or “S”, which indicates a pin contact (male) or a socket contact (female), respectively.

D.1.2.5 Termination Style

The termination style is identified by a single letter as shown in Table D-1.

Table D-1. Termination Style

Symbol	Termination style
C	Crimp
A	Right angle through hole

D.1.2.6 Inclusion of Contacts

Blank denotes that the connector includes contacts. “L” denotes that the connector does not include any contact. For a crimp-contact connector, the connector includes type “22D” contacts.

D.1.2.7 Contact Category

Contact category is defined only for termination types of crimp and right angle through hole, and denotes the following.

a) 22D: Crimp contact of size 22D
b) 1 : Right angle through hole contact in the first row
c) 2A: Right angle through hole contact in the second row of 15-, 26-, 44-, or 62-contact arrangement
d) 2B: Right angle through hole contact in the second row of 78- or 104-contact arrangement

e) 3A: Right angle through hole contact in the third row of 15-, 26-, 44- or 62-contact arrangement
f) 3B: Right angle through hole contact in the third row of 78- or 104-contact arrangement
g) 4 : Right angle through hole contact in the fourth row
h) 5 : Right angle through hole contact in the fifth row

D.1.2.8 Grommet and Location Plate

"R" denotes that the connector has a rear grommet. Blank denotes that the connector has no grommet. "B" denotes that the connector of right angle through hole type has no location plate, and blank denotes that the connector has a location plate.

D.1.2.9 Key Position (Polarization)

High-density miniature rectangular connectors shall be available in two types; the standard type and those with key positions (to prevent erroneous mating). Key positions are indicated with a single letter (see Supplementary Figures D-10, D-11, D-12, and D-13). Blank denotes that the connector is not keyed.

D.2 Applicable Documents

D.2.1 Applicable Documents

The applicable documents shall be as specified in paragraph 2.1.

D.2.2 Reference Documents

The following document is a reference document in this appendix.

a) MIL-DTL-24308K Connectors, Electric, Rectangular, Nonenvironmental, Miniature, Polarized Shell, Rack and Panel, General Specification For

D.3 Requirements

D.3.1 Certification

D.3.1.1 Qualification Coverage

The qualification coverage shall be limited to connectors that are produced by the manufacturing line that conforms to materials, designs, constructions, ratings and performance specified in paragraphs D.3.2 through D.3.9 The qualification coverage shall be fully represented by samples that have passed the qualification test. Within this coverage, the manufacturer is allowed to supply qualified products in accordance with the detail specification.
If necessary, additional definitions of qualification coverage shall be specified in the detail specification.

D.3.2 Materials

The material shall be as specified in the following paragraphs and in paragraph 3.3.

D.3.2.1 Dissimilar Metals

Where dissimilar metals having a potential difference are used in direct contact, protection against galvanic corrosion shall be provided. For guidance on dissimilar metals, see guideline 16 of MIL-HDBK-454.

D.3.2.2 Nonmagnetic Materials

When tested as specified in paragraph D.4.3.2.1, residual magnetization of all parts and surface treatments used for connectors shall be 200nT or less.

D.3.2.3 Sublimation

Zinc or cadmium alloys, or zinc- or cadmium-plated parts shall not be used to avoid, evaporation at a high temperature under high vacuum which will produce hazardous gases.

D.3.2.4 Contacts

Contacts shall be made of conductive copper alloys. Sleeves, if required on socket contacts, shall be also made of copper alloys.

D.3.2.5 Inserts

Inserts shall be made of mechanically, electrically, and environmentally high grade diallyl phthalate resins or equivalents.

D.3.2.6 Shells

Shells shall be made of mechanically high grade aluminum alloys or equivalents. The shell shall be designed to be compatible with accessories which comply with ESCC Detail Specification No. 3401/022.

D.3.2.7 Contact Retention Clips

Contact retention clips shall be made of mechanically high grade copper alloys or equivalents.

D.3.2.8 Sealing Plugs

Sealing plugs shall be made of environmentally high grade Teflon resins or equivalents.

D.3.2.9 Grommets

Grommets shall be made of environmentally high grade silicone rubbers or equivalents.

D.3.2.10 Filler Compounds

Filler compounds shall be made of environmentally high grade epoxy resins, silicone resins or equivalents.

D.3.2.11 Finish

D.3.2.11.1 Contacts

Contacts shall be gold plated to a thickness of 2.54μm as a minimum per ASTM B488 or SAE-AMS 2422 over a copper plating thickness of 1.27μm as a minimum

per SAE-AMS 2418. Contact sleeves shall be gold plated to a thickness of 1.27μm as a minimum per ASTM B488 or SAE-AMS 2422 over copper flash plating per SAE-AMS 2418. Applicable plating standards shall be specified in the detail specification.

D.3.2.11.2 Shells

Shells made of brass alloys or equivalents shall be gold plated to a thickness of 1.27μm as a minimum per ASTM B488 or SAE-AMS 2422 over copper flash plating per SAE-AMS 2418.
Shells made of aluminum alloys or equivalents shall be gold plated to a thickness of 1.27μm as a minimum per ASTM B488 or SAE-AMS 2422 over an electroless nickel plating whose thickness is 25.4μm as a minimum per ASTM B733 or SAE-AMS-C-26074. Applicable plating standards shall be specified in the detail specification.

D.3.2.11.3 Contact Retention Clips

Contact retention clips shall be gold plated to a thickness of 0.3μm as a minimum per ASTM B488 or SAE-AMS 2422 over copper flash plating per SAE-AMS 2418. Plating is not required if the performance requirements can be met without plating. Applicable plating standards shall be specified in the detail specification.

D.3.2.12 Outgassing

When tested as specified in paragraph D.4.3.2.2, inserts, sealing plugs, grommets, marking inks and adhesives shall meet the requirements of total mass loss (TML) and collected volatile condensable material (CVCM) as specified in paragraph 3.3.2.

D.3.3 Externals, Physical Dimensions and Marking

Externals, constructions, physical dimensions and mass of the connector shall be appropriate for normal handling during installation, usage and maintenance. For details, see Supplementary Figures D-1 through D-17.

D.3.3.1 Contacts

Contacts shall be designed to be connected with wires, installed into and removed from insert. Right angle through hole contacts shall be non-removable from insert. Contacts shall have physical dimensions and mass as specified in Supplementary Figures D-14 through D-17.
Unless otherwise specified, the quantity of the contacts per each connector package shall include one spare contact for each connector with 25 contacts or less, and two spare contacts for each connector with 26 contacts or more. This requirement shall not apply to right angle through hole contact connectors.

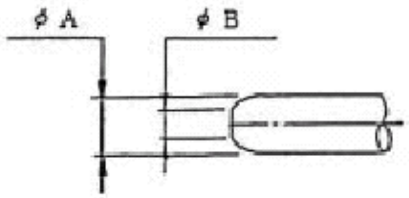
D.3.3.1.1 Pin Engagement End

The insertion end of pin contact shall be formed with an approximate hemisphere whose diameter is equal to the pin diameter. The flat diameter on the insertion end of the pin contact shall be as specified in Table D-2.

Table D-2. Pin Dimensions at Insertion End

Unit: mm

Contact size	Engagement end diameter (ΦA)	Flat tip diameter (ΦB)
22D	0.762±0.012	0.28 maximum



D.3.3.1.2 Socket Mating End

The insertion end of the socket contact shall be rounded or chamfered to direct a pin contact in the center of the insertion path. Socket contacts shall provide the spring action for maintaining the contact pressure between the pin and socket. Socket contacts shall have a closed entry design to exclude insertion of pins whose diameter exceed the maximum allowable maximum pin diameter by 0.127mm or greater.

D.3.3.1.3 Roughness of Surface

The insertion surface shall be smooth without any tool mark.

D.3.3.1.4 Wire Barrel Sizes

For crimp contacts, wire barrels shall accommodate the wires as specified in Table D-3.

Table D-3. Wire Barrel Size

Termination style	Contact size	Wire gauge (AWG)
Crimp	22D	22, 24, 26, 28

D.3.3.2 Inserts

Inserts shall have a one-piece bonded construction. Pin entry opening of the socket insert shall be as small as practical. Socket inserts shall have a construction to keep pin contacts from touching socket contacts before the plug and the receptacle are aligned in the mating position. The inserts shall be attached to the shell.
Any foreign material such as adhesives unrelated to the contact retention mechanism, and those interfere contact insertion and/or retention shall be removed.
The contact retention mechanism shall have a construction which uses metal retention clips.
Inserts shall be designed to accommodate contacts of size 22#, which conform to NASA S-311-P-4/08 standard or ESCC detail specification No. 3401/005.

D.3.3.2.1 Contact Arrangement

Contact arrangement shall be as specified in Supplementary Figure D-1.

D.3.3.2.2 Contact Position

Inserts shall have a construction to enable engagement regardless of the insert position with respect to the shell, contact distortions due to crimping, and differences in allowable dimensional tolerances.

D.3.3.3 Shells

Shells shall have a construction to retain inserts and not to allow removal of inserts.

D.3.3.3.1 Shell Polarization

Polarization shall be accomplished by a keystone shape shell design before engagement of the pins and sockets. For connectors with a key to prevent erroneous contact inserting, only the mating halves of connectors with the same key shall be able to mate.

D.3.3.3.2 Mounting

Connectors shall be provided with means to fasten the shell securely to a mounting surface on a mounting panel with screws.

D.3.3.4 Contact Retention Clips

Contact retention clips shall be retained in inserts, shall allow contacts to be easily installed into inserts by hand or using insertion tools, and shall be securely retained. In addition, the clips shall have a construction to allow contacts to be easily removed using removal tools. Insertion and removal tools shall be specified in item c) of paragraph D.4.1.1.2.

D.3.3.5 Grommets

Grommets shall have a construction to keep foreign materials from entering the mating area of wired connector. Grommets shall be able to accommodate sealing plugs specified in MS27488 when contacts are not wired.
Grommets shall be bonded to inserts and retained.
Each grommet shall be marked with the contact location number.

D.3.3.6 Coupling

When the plug and receptacle are mated as shown in Supplementary Figure D-18, the requirements specified herein shall be met.

D.3.3.6.1 Ease of Coupling

Connector mating halves shall be easily mated and unmated using a proper tool or by hand.

D.3.3.6.2 Fixing

Mated connectors shall be securely mounted using screw lock accessories.

D.3.3.7 Interchangeability

D.3.3.7.1 Interchangeability of Connectors

a) All plugs and receptacles having the same part number shall be completely mated in any combination and shall provide equal performance.

b) All crimp and right angle through hole contact connectors having the same contact arrangement shall be intermatable in any combination. Connectors of high density contacts shall be capable of being coupled and uncoupled using applicable tools.
c) All connectors having the same part number shall be completely mounted with specified mounting holes and printed wiring boards in any combination.

D.3.3.7.2 Interchangeability of Contacts

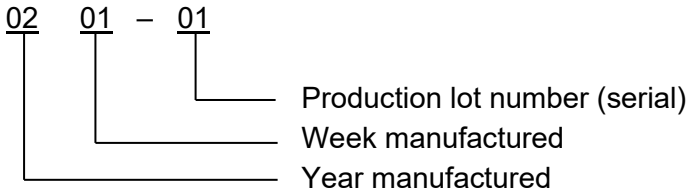
a) All crimp and right angle through hole contacts shall be completely installed with any inserts.
b) All crimp contacts shall be completely removed with removal tools in any combination.

D.3.3.8 Marking

D.3.3.8.1 Shells

The following items shall be marked in the locations shown in Supplementary Figures D-2 through D-13. The marking shall remain clearly legible after completion of all tests specified in this appendix, and even after one-minute immersion in ethanol.

a) Manufacturer's name and its trademark
b) Part number (paragraph D.1.2)
c) Identification code (year and week manufactured and production lot number) (paragraph D.3.3.9)



Notes:

(1) For the purpose of this appendix, "Year and Week manufactured" denotes the year and week when the final assembly is completed.
(2) Production lot number is identification for lots when the products having the same part number are manufactured two or more lots within a week. When only one lot is manufactured in a week, the manufacturing lot number shall be "01".
(3) The marking shall not include the contact identification symbol, "L", which indicates a connector without contacts.

D.3.3.8.2 Inserts

Contact position markings shall be provided on both sides of the insert specified . Contact position markings shall be as close to the corresponding contact holes as possible.

D.3.3.8.3 Contacts

Manufacturer's trademark shall be marked on crimp contacts as follows. The marking shall remain legible after completion of all tests specified in this appendix. If the marking in crimped areas is peeled off and still remain identifiable, the marking shall not be determined as failed.

Trademark: The trademark shall be marked on the location shown in Figure D-1 or on the shoulder of wire barrel.

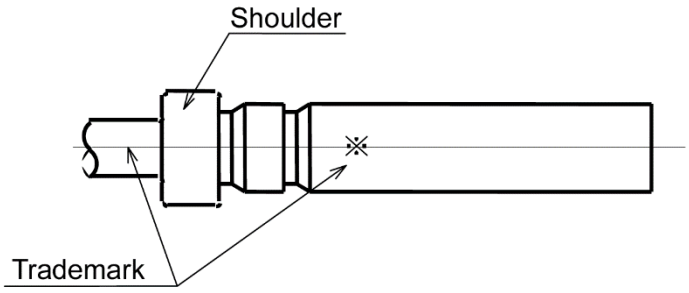


Figure D-1. Marking on Contact

D.3.3.9 Traceability

An identification code (year and week manufactured and production lot number) shall be marked on the connectors in accordance with paragraph D.3.3.8.1.
The identification code shall be provided to identify the material lot and to trace the complete manufacturing process up to the final assembly even after the connectors are installed in electronic equipment including inventories.
Manufacturers shall retain records on identification codes for at least 8 years.

D.3.3.10 Workmanship

Connectors shall be manufactured and processed based on a good design in a manner to maintain uniform quality in accordance with manufacturing specifications established in the quality assurance program (see paragraph 3.2.1). In addition, connectors shall be free of crazing, holes, chips, sharp cutting edges, burrs or other defects that will degrade electrical, mechanical or physical performance.

D.3.4 Plating

D.3.4.1 Plating Porosity

When tested as specified in paragraph D.4.3.4.1, there shall be no bubbling on the gold-finished contacts during a 30-second observation period.

D.3.4.2 Plating Thickness

When tested as specified in paragraph D.4.3.4.2, the thickness of gold plating shall be not less than 2.54μm, except for corners.

D.3.5 Rating

a) Voltage: $330V_{AC}$ under sea level (barometric pressure)
$100V_{AC}$ under reduced pressure (4.4kPa {33.0mmHg})

b) Operating temperature range: -65 to +125°C

D.3.6 Electrical Performance

Connectors shall meet the following requirements.

D.3.6.1 Dielectric Withstanding Voltage

When tested as specified in paragraphs D.4.3.5.1.1 or D.4.3.5.1.2, unmated connectors shall exhibit no evidence of short-circuiting and dielectric breakdown.

D.3.6.2 Insulation Resistance

When tested as specified in paragraph D.4.3.5.2, insulation resistance between contacts and between the shell and any contact shall be as specified in Table D-4.

Table D-4. Insulation Resistance

Unit: MΩ

Initial	After humidity test		After fluid immersion
	Immediately after test	After 24 hours	
5,000 minimum	1 minimum	1,000 minimum	1,000 minimum

D.3.6.3 Contact Resistance

When tested as specified in paragraph D.4.3.5.3, contact resistance for inserted pairs of pin and socket contacts shall be as specified in エラー! 参照元が見つかりません。.

Table D-5. Contact Resistance (Voltage Drop)

Unit: mV

Termination style	Contact size	Wire size (AWG)	Test current (A)	Initial		After test	
				Maximum	Maximum average	Maximum	Maximum average
Crimp	22D	22	5	73	66	88	75
		24	3.0	45	41	54	46
		26	2.0	58	53	70	61
		28	1.5	64	59	77	68
Right angle through hole		–	1.5	25	20	35	30

D.3.6.4 Low-Signal Level Contact Resistance

When tested as specified in paragraph D.4.3.5.4, low-signal level contact resistance for inserted pairs of pin and socket contacts shall be as specified in エラー! 参照元が見つかりません。.

Table D-6. Low-Signal Level Contact Resistance

Unit: mΩ

Contact size	Wire size (AWG)	Initial	After test
		Maximum	Maximum
22D	22	15	17
	24	20	23
	26	34	42
	28	55	67

D.3.7 Mechanical Performance

Connectors shall meet the following requirements.

D.3.7.1 Maintenance Aging

When tested as specified in paragraph D.4.3.6.1, connectors shall meet the requirements of paragraphs D.3.7.2 and D.3.7.3. This provision shall apply to crimp-contact connectors.

D.3.7.2 Contact Insertion and Removal Forces

When tested as specified in paragraph D.4.3.6.2, the axial forces required to insert and remove an individual removable contact shall be as specified in エラー! 参照元が見つかりません。.

This provision shall apply to crimp-contact connectors.

Table D-7. Contact Insertion and Removal Forces

Unit: N {kgf}

Contact Size	Maximum insertion	Maximum removal
22D	17.75 {1.81}	17.75 {1.81}

D.3.7.3 Connector Mating and Unmating Forces

When tested as specified in paragraph D.4.3.6.3, the force for mating and unmating of counterpart connectors shall be as specified in エラー! 参照元が見つかりません。.Table D-8

Table D-8. Connector Mating and Unmating Forces

Unit: N {kgf}

Contact Arrangement	Mating	Unmating	
	Maximum	Maximum	Minimum
15	39.62 {4.04}	33.30 {3.40}	2.92 {0.30}
26	68.67 {7.00}	57.72 {5.89}	5.06 {0.52}
44	116.21 {11.85}	97.68 {9.96}	8.56 {0.87}
62	163.75 {16.70}	137.64 {14.04}	12.07 {1.23}
78	206.01 {21.01}	173.16 {17.66}	15.18 {1.55}
104	274.68 {28.01}	230.88 {23.54}	20.24 {2.06}

D.3.7.4 Contact Retention

When tested as specified in D.4.3.6.4, the axial displacement of contacts shall not exceed 0.3mm. In addition, there shall be no evidence of damages on contacts, contact retention clips or inserts.

D.3.7.5 Contact Insertion and Removal Forces

D.3.7.5.1 Qualification Test

When tested as specified in paragraph D.4.3.6.5.1, socket contacts shall be as specified in Table D-9.

Table D-9. Contact Engagement and Separation Forces

Unit: N {gf}

Contact size	Initial			After test		
	Engagement force		Separation force	Engagement force		Separation force
	Maximum	Maximum average	Minimum	Maximum	Maximum average	Minimum
22D	3.3 {340}	2.6 {269}	0.2 {20}	3.9 {397}	3.2 {323}	0.17 {17}

D.3.7.5.2 Quality Conformance Inspection

When tested as specified in paragraph D.4.3.6.5.2, contact shall be capable to hold a weight of 0.2N {20gf} as a minimum.

D.3.7.6 Durability

When tested as specified in paragraph D.4.3.6.6, connectors shall exhibit no defects detrimental to the connector operation and shall meet the requirements of paragraphs D.3.7.3 and D.3.6.3.

D.3.7.7 Oversize Pin Exclusion

When tested as specified in paragraph D.4.3.6.7, socket contacts shall exclude oversized test pin insertion and shall meet the requirements of paragraph D.3.6.3.

D.3.7.8 Probe Damage

When tested as specified in paragraph D.4.3.6.8, socket contacts shall exhibit no defects which will adversely affect connector's performance and shall meet the requirements of paragraph D.3.7.3. Individual contacts shall meet the requirements of paragraphs D.3.7.5 and D.3.6.3.

D.3.7.9 Insert Retention

When tested as specified in paragraph D.4.3.6.9, inserts shall be retained in proper positions in shells and shall not exhibit any crack or breakage. There shall be no looseness detrimental to coupling and electrical continuity.

D.3.7.10 Contact Axial Concentricity

When tested as specified in paragraph D.4.3.6.10, contact axial concentricity shall meet the following requirements.

D.3.7.10.1 Unwired Contacts

The total indicator reading (TIR) shall be 0.13mm or less.

D.3.7.10.2 Wired Contacts

The total indicator reading (TIR) shall be 0.28mm or less.

D.3.7.11 Contact Pin Strength

When tested as specified in paragraph D.4.3.6.11, pin contacts shall not exhibit any permanent bending greater than 0.13mm at the insertion end.

D.3.7.12 Crimp Tensile Strength

When tested as specified in paragraph D.4.3.6.12, crimp tensile strength shall meet the requirements specified in Table D-10.

Table D-10. Crimp Tensile Strength

Unit: N {kgf}

Contact size	Wire size (AWG)	Minimum crimp tensile strength
22D	22	57 {5.81}
	24	36 {3.67}
	26	36 {3.67}
	28	22 {2.24}

D.3.7.13 Resistance to Soldering Heat

When tested as specified in paragraph D.4.3.6.13, connectors shall exhibit no evidence of distortions, damages or other defects. This provision shall not apply to crimp-contact connectors.

D.3.7.14 Solderability

When tested as specified in paragraph D.4.3.6.14, a minimum of 95% of the immersed external surface shall be covered with solder. This provision shall not apply to crimp-contact connectors.

D.3.8 Environmental Performance

Connectors shall meet the following requirements.

D.3.8.1 Vibration

D.3.8.1.1 High Frequency Vibration

When tested as specified in paragraph D.4.3.7.1.1, there shall be no electrical discontinuity in excess of 1μs. Mated connectors shall not exhibit any separation, damage, crack or loosening of parts.

D.3.8.1.2 Random Vibration

When tested as specified in paragraph D.4.3.7.1.2, there shall be no electrical current discontinuity in excess of 1μs. There shall be no significant visual damages such as discolorations, chips, deformations, peelings and crazing. Marking shall remain legible. In addition, connectors shall meet the requirements of paragraphs D.3.6.3, D.3.6.1, and D.3.6.2.

D.3.8.2 Shock

D.3.8.2.1 Shock (I)

When tested as specified in paragraph D.4.3.7.2.1, there shall be no electrical discontinuity in excess of 1μs. Mated connectors shall not exhibit any separation, damage, crack or loosening of parts.

D.3.8.2.2 Shock (II)

When tested as specified in paragraph D.4.3.7.2.2, there shall be no electrical discontinuity in excess of 1μs. There shall be no significant visual damages such as discolorations, chips, deformations, peelings and crazing. Marking shall remain legible. In addition, connectors shall meet the requirements of paragraphs D.3.6.3, D.3.6.1, and D.3.6.2.

D.3.8.3 Temperature Cycling

D.3.8.3.1 Temperature Cycling (I)

When tested as specified in paragraph D.4.3.7.3.1, there shall be no visible evidence of any mechanical damages. Also, there shall be no failure modes identified in FMAT of the Quality Assurance Program Plan. In addition, individual contacts shall meet the requirements of paragraphs D.3.7.5 and D.3.6.3.

D.3.8.3.2 Temperature Cycling (II)

When tested in accordance with paragraph D.4.3.7.3.2, there shall be no visible evidence of any mechanical damages. Also, there shall be no failure modes identified in FMAT of the Quality Assurance Program Plan. In addition, connectors shall meet the requirements of paragraphs D.3.6.3, D.3.6.1, and D.3.6.2.

D.3.8.4 Humidity

When tested in accordance with paragraph D.4.3.7.4, connectors shall meet the requirements of paragraphs D.3.7.5 and D.3.6.2.

D.3.8.5 Fluid Immersion

When tested as specified in paragraph D.4.3.7.5, connectors shall meet the requirements of paragraphs D.3.7.3, D.3.6.1, and D.3.6.2.
This requirement shall apply when specified in the detail specification or when ordered by the purchaser in accordance with paragraph 6.2.1.

D.3.8.6 Resistance to Corrosive Gas

When tested as specified in paragraph D.4.3.7.6, contacts shall exhibit no defects detrimental to performance and shall meet the requirements of paragraph D.3.6.4.

D.3.8.7 Salt Spray (Corrosion)

When tested as specified in paragraph D.4.3.7.7, mated connectors shall not expose the base metal due to corrosion which will adversely affect connector's performance. At the completion of the test, connectors shall meet the requirements of paragraphs D.3.7.3, and D.3.6.3. Individual contacts shall meet the requirements of paragraphs D.3.6.4, D.3.6.3, and D.3.7.5.

D.3.8.8 Radiation Hardness

When tested as specified in paragraph D.4.3.7.8, connectors shall be no significant visual damages such as discolorations, chips, deformations, peelings, and crazing, and the marking shall remain legible. At the completion of the test, connectors shall meet the requirements of paragraphs D.3.6.3, D.3.6.1, and D.3.6.2.
If equivalent tests have been conducted on individual insulating materials used in connectors, the test data may be substituted.

D.3.9 Durability

Connectors shall meet the following requirements.

D.3.9.1 Temperature Life

When tested as specified in paragraph D.4.3.8.1, contacts shall exhibit no defects detrimental to performance and shall meet the requirements of paragraphs D.3.6.4, D.3.6.3, and D.3.7.5.

D.4 Quality Assurance Provisions

D.4.1 Qualification Test

D.4.1.1 Samples

Qualification test samples shall meet the requirements for materials specified in paragraph D.3.2. Unless otherwise specified, connectors with the maximum number of contacts shall be selected.

D.4.1.1.1 Sample Size

The number of samples shall be as specified below.

a) Crimp-contacts and connectors
   1) 16 each of plugs and receptacles with size 22D contacts.
   2) 88 pin and socket contacts from the same production lot as item a) 1) above.

b) Right angle through hole contact and connector
   1) When connectors/contacts of crimp termination and right angle through hole termination are to be qualified at the same time, 3 plugs and receptacles.
   2) 12 pin and socket contacts from the same production lot as item b) 1) above.

D.4.1.1.2 Preparation of Samples and Sample Grouping

Connectors shall be prepared as follows and shall be grouped as specified in Tables D-11 and D-12.

a) The following wires shall be used.
   1) JAXA-QTS-2120, Wires, electric, fluorinated ethylene propylene (FEP) insulated, polyimide, covering
      - KT-22(19) U-H-*
      - KT-24(19) U-H-*
      - KT-26 (7) U-H-*
      - KT-28 (7) U-H-*
   2) GSFC S-311-P-13[(1)], Wire and Cable, Electrical, Insulated, for Space Flight Use, General Specification for
      - Silver plated tensile strength copper alloy, AWG 26
      - Silver plated tensile strength copper alloy, AWG 28

      Note: [(1)] GSFC: Goddard Space Flight Center
   3) Other wires

      Wires shall have sufficient performance required for the tests. Applicable standards, types and manufacturer names shall be specified in the detail specification. Wire specifications including conductor construction, insulator, conductor resistance and insulation resistance, shall be specified in the application data sheet.

b) Wire crimping tools shall be those as specified in MIL-C-39029/57, /58 or equivalents.

c) Contact insertion or removal tools shall be those specified in MIL-C-39029/57, /58 or equivalents

d) Right angle through hole contact connectors shall be wired using proper printed wiring boards (see Supplementary Figure D-20).
e) Wire connection and running shall be performed after completion of the residual magnetization test.

Table D-11. Preparation of Samples and Sample Grouping (Connectors)

Unit: pair

Termination style	Test group							Wires used	
	エラー! 参照元が見つかりません。			Table D-14				Wire size (AWG)	Applicable standard
	1	2	3	4	5	6	7		
Crimp 22D	1	1	1		2	2	2	22	JAXA-QTS-2120 or wires with sufficient performance
	1	1						24	
	1	1						26	
	1	1						28	
				1				–	
Right angle through hole		3						–	

Table D-12. Preparation of Samples and Samples Grouping (Individual Contacts)

Unit: pair

Termination style	Test group								Wires used	
	Table D-15					Table D-16			Wire size (AWG)	Applicable standard
	8	9	10	11	12	13	14	15		
Crimp 22D	4	4	4	4	4				22	JAXA-QTS-2120 or wires with sufficient performance
	4	4	4	4	4				24	
	4	4	4	4	4				26	
	4	4	4	4	4				28	
						4	4		–	
Right angle through hole						4	4	4	–	

D.4.1.2 Test Items and Order of Tests

Test items shall be as shown in Tables D-13 through D-16 and each test shall be conducted in the order listed in each table.

D.4.1.3 Determination of Pass or Fail

A failure of any test specified in Tables D-13 through D-16 shall constitute failure of the qualification test.

D.4.1.4 Disposition after Test

If failed to pass qualification test, the manufacturer shall take corrective action to assure quality of the materials, manufacturing processes and processing method. Corrective actions shall also be taken on other products manufactured using the same materials and processes that may have the similar defects.
After the corrective action has been taken, the qualification test in Tables D-13 through D-16 shall be repeated on additional sample units. In this case, JAXA shall have the rights to determine whether all test items or failed test items shall be performed. After completion of the Group A inspection of the quality conformance inspection shown in Table D-17, the additional samples shall be submitted for the qualification test.

Table D-13. Qualification Test and Quality Conformance Inspection (Group C) (Connectors)

Test item	Requirement paragraph	Test method paragraph	Test group (1)		
			1	2	3
Externals, physical dimensions and marking	D.3.3	D.4.3.3	×	×	×
Residual magnetization	D.3.2.2	D.4.3.2.1	×	×	×
Resistance to soldering heat (2)	D.3.7.13	D.4.3.6.13	×	×	
Maintenance aging	D.3.7.1	D.4.3.6.1	×		
Contact insertion and removal forces	D.3.7.2	D.4.3.6.2	×		
Connector mating and unmating forces	D.3.7.3	D.4.3.6.3	×		
Contact retention	D.3.7.4	D.4.3.6.4	×	×	
Dielectric withstanding voltage (sea level)	D.3.6.1	D.4.3.5.1.1	×	×	×
Dielectric withstanding voltage (reduced pressure)	D.3.6.1	D.4.3.5.1.2	×	×	×
Insulation resistance	D.3.6.2	D.4.3.5.2	×	×	×
Contact resistance	D.3.6.3	D.4.3.5.3	×	×	×
Contact engagement and separation forces	D.3.7.5	D.4.3.6.5	×	×	×
Connector mating and unmating forces	D.3.7.3	D.4.3.6.3	×	×	×
Temperature cycling (I)	D.3.8.3.1	D.4.3.7.3.1	×	×	×
Humidity	D.3.8.4	D.4.3.7.4	×	×	×
Dielectric withstanding voltage (sea level)	D.3.6.1	D.4.3.5.1.1	×	×	×
Insulation resistance	D.3.6.2	D.4.3.5.2	×	×	×
High frequency vibration	D.3.8.1.1	D.4.3.7.1.1	×	×	×
Shock (I)	D.3.8.2.1	D.4.3.7.2.1	×	×	×
Durability	D.3.7.6	D.4.3.6.6	×	×	×
Connector mating and unmating forces	D.3.7.3	D.4.3.6.3	×	×	×
Contact resistance	D.3.6.3	D.4.3.5.3	×	×	×
Salt spray (corrosion)	D.3.8.7	D.4.3.7.7	×	×	×
Connector mating and unmating forces	D.3.7.3	D.4.3.6.3	×	×	×
Contact resistance	D.3.6.3	D.4.3.5.3	×	×	×
Oversize pin exclusion	D.3.7.7	D.4.3.6.7	×	×	×
Contact resistance	D.3.6.3	D.4.3.5.3	×	×	×
Probe damage	D.3.7.8	D.4.3.6.8	×	×	×
Contact engagement and separation forces	D.3.7.5	D.4.3.6.5	×	×	×
Fluid immersion (3) (4)	D.3.8.5	D.4.3.7.5	×	×	×
Connector mating and unmating forces	D.3.7.3	D.4.3.6.3	×	×	×
Dielectric withstanding voltage (sea level)	D.3.6.1	D.4.3.5.1.1	×	×	×
Insulation resistance	D.3.6.2	D.4.3.5.2	×	×	×
Insert retention	D.3.7.9	D.4.3.6.9	×	×	×
Externals, physical dimensions and marking	D.3.3	D.4.3.3	×	×	×

Notes:

(1) The tests identified with the symbol “x” shall be performed.

(2) Not applicable to connectors with crimp contacts.

(3) Not applicable to connectors with a grommet.

(4) Applicable when specified in the detail specification or when ordered by the user in accordance with paragraph 6.2.1 (Items to be ordered for procurement).

Table D-14. Qualification Test and Quality Conformance Inspection (Group C) (Connectors)

Test item	Requirement paragraph	Test method paragraph	Test group (1)			
			4	5	6	7
Externals, physical dimensions and marking	D.3.3	D.4.3.3	×	×	×	×
Outgassing	3.3.2, D.3.2.12	D.4.3.2.2	×			
Contact resistance	D.3.6.3	D.4.3.5.3		×	×	×
Dielectric withstanding voltage (sea level)	D.3.6.1	D.4.3.5.1.1		×	×	×
Insulation resistance	D.3.6.2	D.4.3.5.2		×	×	×
Random vibration	D.3.8.1.2	D.4.3.7.1.2		×		
Shock (II)	D.3.8.2.2	D.4.3.7.2.2			×	
Radiation hardness (2)	D.3.8.8	D.4.3.7.8				×
Externals and construction	D.3.2, D.3.3	D.4.3.3.1		×	×	×
Contact resistance	D.3.6.3	D.4.3.5.3		×	×	×
Dielectric withstanding voltage (sea level)	D.3.6.1	D.4.3.5.1.1		×	×	×
Insulation resistance	D.3.6.2	D.4.3.5.2		×	×	×
Temperature cycling (II)	D.3.8.3.2	D.4.3.7.3.2		×		
Externals and construction	D.3.2, D.3.3	D.4.3.3.1		×		
Contact resistance	D.3.6.3	D.4.3.5.3		×		
Dielectric withstanding voltage (sea level)	D.3.6.1	D.4.3.5.1.1		×		
Insulation resistance	D.3.6.2	D.4.3.5.2		×		

Notes: (1) The tests identified with the symbol “x” shall be performed.

(2) If equivalent tests have been conducted on individual insulating materials used in connectors, the test data may be substituted.

Table D-15. Qualification Test and Quality Conformance Inspection (Group C) (Crimp Contacts)

Test item	Requirement paragraph	Test method paragraph	Test group (1)				
			8	9	10	11	12
Externals, physical dimensions and marking	D.3.3	D.4.3.3	×	×	×	×	×
Residual magnetization	D.3.2.2	D.4.3.2.1	×	×	×	×	×
Contact axial concentricity	D.3.7.10	D.4.3.6.10	×	×	×	×	
Low-signal level contact resistance	D.3.6.4	D.4.3.5.4	×	×	×	×	
Contact resistance	D.3.6.3	D.4.3.5.3	×	×	×		
Contact engagement and separation forces	D.3.7.5	D.4.3.6.5	×	×	×		
Temperature cycling (I)	D.3.8.3.1	D.4.3.7.3.1	×				
Contact engagement and separation forces	D.3.7.5	D.4.3.6.5	×				
Contact resistance	D.3.6.3	D.4.3.5.3	×				
Probe damage	D.3.7.8	D.4.3.6.8	×				
Contact engagement and separation forces	D.3.7.5	D.4.3.6.5	×				
Contact resistance	D.3.6.3	D.4.3.5.3	×				
Salt spray (corrosion)	D.3.8.7	D.4.3.7.7		×			
Low-signal level contact resistance	D.3.6.4	D.4.3.5.4		×			
Contact resistance	D.3.6.3	D.4.3.5.3		×			
Contact engagement and separation forces	D.3.7.5	D.4.3.6.5		×			
Temperature life	D.3.9.1	D.4.3.8.1			×		
Low-signal level contact resistance	D.3.6.4	D.4.3.5.4			×		
Contact resistance	D.3.6.3	D.4.3.5.3			×		
Contact engagement and separation forces	D.3.7.5	D.4.3.6.5			×		
Resistance to corrosive gas	D.3.8.6	D.4.3.7.6				×	
Low-signal level contact resistance	D.3.6.4	D.4.3.5.4				×	
Contact pin strength	D.3.7.11	D.4.3.6.11				×	
Crimp tensile strength	D.3.7.12	D.4.3.6.12	×		×		×

Note: (1) The tests identified with the symbol “x” shall be performed.

Table D-16. Qualification Test and Quality Conformance Inspection (Group C) (All Contacts)

Test item	Requirement paragraph	Test method paragraph	Test group (1)		
			13	14	15
Externals, physical dimensions and marking	D.3.3	D.4.3.3	×	×	×
Plating porosity	D.3.4.1	D.4.3.4.1	×		
Plating thickness	D.3.4.2	D.4.3.4.2		×	
Solderability	D.3.7.14	D.4.3.6.14			×

Note: (1) The tests identified with the symbol “x” shall be performed.

D.4.2 Quality Conformance Inspection

D.4.2.1 Inspection Items and Sample Size

Inspection items shall be as specified in Tables D-17, D-18, and D-13 through D-16. Each inspection shall be conducted in the order listed in each table.
Sample size shall be as specified in Table D-17 for Group A inspection, Table D-18 for Group B inspection and paragraph D.4.1.1.1 Sample Size for Group C inspection. Group B or C inspection shall be conducted for products that have passed Group A inspection.

D.4.2.2 Determination of Pass or Fail

Determination of pass or fail shall be in accordance with paragraphs 4.5.1.3 and 4.5.2.3.

D.4.2.3 Disposition after Inspection

Disposition after inspection shall be in accordance with paragraphs 4.5.1.4 and 4.5.2.4, and as follows.

a) Samples rejected in Groups A and B inspections shall not be delivered.
b) If a lot is failed due to non-compliance with physical dimension and residual magnetization requirements of Group B inspection, the failed inspection items shall be repeated on all products and only products that have passed the inspections can be delivered.

Table D-17. Quality Conformance Inspection (Group A)

Inspection item	Requirement paragraph	Test method paragraph	Criteria for pass/fail (2)	
			No. of samples	No. of allowable defectives
Externals, physical dimensions and marking (1)	D.3.3	D.4.3.3	100%	Less than 10%
Dielectric withstanding voltage (sea level)	D.3.6.1	D.4.3.5.1.1		
Insulation resistance	D.3.6.2	D.4.3.5.2		
Contact separation forces	D.3.7.5.2	D.4.3.6.5.2		

Notes: (1) Visual inspection.
(2) It is permissible to enter pass/fail determinations such as “pass” or “good” in the test data form.

Table D-18. Quality Conformance Inspection (Group B)

Inspection item			Requirement paragraph	Test method paragraph	Criteria for pass/fail (3)	
					No. of samples	No. of defectives permissible
Dimensions (1)	Connectors		D.3.3	D.4.3.3.1	13	0
	Individual contacts		D.3.3	D.4.3.3.2	30	0
Residual magnetization			D.3.2.2	D.4.3.2.1	AQL 4% (4)	
Plating thickness (for individual contacts) (2)			D.3.4.2	D.4.3.4.2	4	0
Crimp tensile strength	22D	22AWG wire	D.3.7.12	D.4.3.6.12	4	0
		24AWG wire	D.3.7.12	D.4.3.6.12	4	0
		26AWG wire	D.3.7.12	D.4.3.6.12	4	0
		28AWG wire	D.3.7.12	D.4.3.6.12	4	0

Notes:
(1) When the number of inspection lots is less than the specified sample size for the test, 100% inspection shall be performed.
(2) Samples for the plating thickness test and crimp tensile strength test shall be randomly selected from the same manufacturing lot. The samples shall not be delivered as products.
(3) It is permissible to enter pass/fail determinations such as “pass” or “good” in the test data form.
(4) The acceptance quality level (AQL) is based on a single sampling plan for normal inspection, specified in JIS Z 9015-1, Attachment Table 2-A.

D.4.3 Methods of Test and Inspection

D.4.3.1 Test Conditions

The tests and inspections shall be performed under the following environmental conditions.

a) Temperature: 15 to 35°C
b) Relative humidity: 25 to 75%RH
c) Atmospheric pressure: 73.3 to 106.7kPa {550 to 800mmHg}

D.4.3.2 Materials

D.4.3.2.1 Residual Magnetization

Unmated connectors shall be tested as follows and shall meet the requirements specified in paragraph Inserts. Measuring apparatus shall be as shown in Figures D-2 and D-3.

D.4.3.2.1.1 When Using a Milliammeter

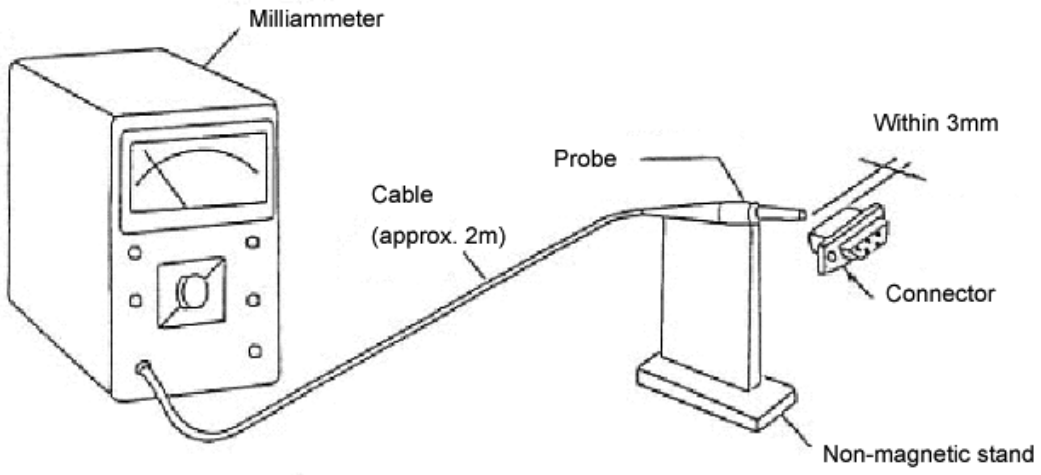


Figure D-2. Milliammeter

a) All contacts shall be installed in the connectors before testing.
b) Worm up the milliammeter for a minimum of 15 minutes.
c) Mount the probe on the non-magnetic stand in a horizontal position extending the cable at full length from the meter.
d) Set the meter in a proper scale range, and orient the probe in the magnetic east-west direction.
e) Pass the connector three times between magnet poles that create a field strength of 0.5T {5000 Gauss} or greater. The connector shall not contact the magnet pole piece, and shall be moved in the same direction.
f) Immediately after passing, bring the connector gradually within 3.0mm of the probe tip to record the maximum meter reading.
g) For the quality conformance inspection, the residual magnetization test shall be performed as follows.
    1) Non-contact connectors shall be tested without insertion contacts.
    2) To test individual contacts, 50 contacts shall be selected at random from an inspection lot, and installed to a test jig which shall be a connector with the maximum number of contacts among those passed the residual magnetization test.

Note: The test shall be performed in a magnetically quiet area, i.e., where operations of machines, electronic equipment and vehicles, and personnel traffic shall be restricted.

D.4.3.2.1.2 When Using a Gaussmeter

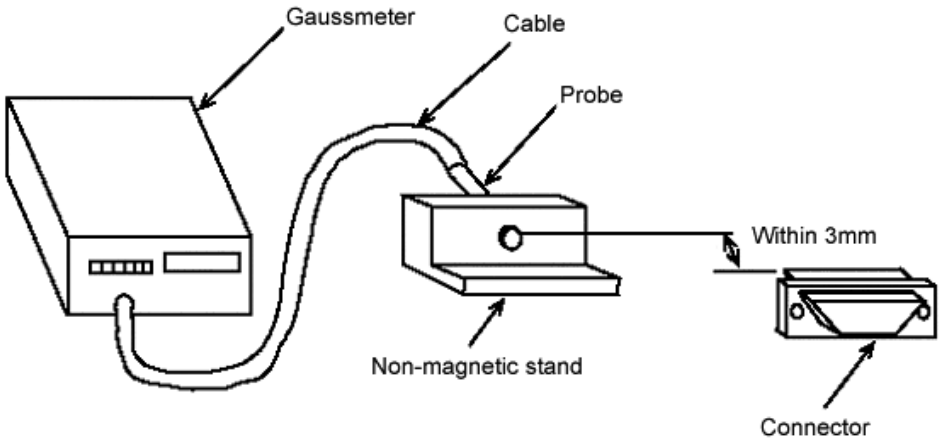


Figure D-3. Gaussmeter

a) All contacts shall be installed in the connectors before testing.
b) Warm up the gaussmeter for a minimum of 30 minutes
c) Mount the probe on the non-magnetic stand.
d) Set the meter in a proper scale range, and orient the probe in the magnetic east-west direction.
e) Pass the connector three times between magnet poles that create a field strength of 0.5T {5000 Gauss} or greater. The connector shall not contact the magnet pole piece, and shall be moved in the same direction.
f) Immediately after passing, bring the connector gradually within 3.0mm of the probe tip to record the maximum meter reading.
g) For the quality conformance inspection, the residual magnetization test shall be performed as follows.
    1) Non-contact connectors shall be tested without insertion contacts.
    2) To test individual contacts, 50 contacts shall be selected at random from an inspection lot, and installed to a test jig which shall be a connector with the maximum number of contacts among those passed the residual magnetization test.

Note: The test shall be performed in a magnetically quiet area, i.e., where operations of machines, electronic equipment and vehicles, and personnel traffic shall be restricted.

D.4.3.2.2 Outgassing

Connector parts of inserts, sealing plugs, grommets, marking inks and adhesives shall be tested in accordance with ASTM-E595. The result shall be evaluated in consideration of the weight allocation.

D.4.3.3 Externals, Physical Dimensions and Marking

Externals, dimensions, marking and workmanship shall be examined as specified in following paragraphs.

D.4.3.3.1 Connectors

Connector shall be visually examined. Physical dimensions shall be inspected using a proper instrument such as vernier calipers compliant with JIS B 7507. Mass shall be measured using a weight scale.

D.4.3.3.2 Contacts

Contacts shall be examined using an approximate 3x magnifier. Physical dimensions shall be examined using vernier calipers compliant with JIS B 7507. For mass measurements, a weight scale shall be used.

D.4.3.4 Plating

D.4.3.4.1 Plating Porosity

Unwired pin and socket contacts shall be soaked in nitric acid (concentration: 70^{+3}_{-1} %) the at 25±3°C and shall be monitored for 30 seconds.

D.4.3.4.2 Plating Thickness

Gold-plating thickness of unwired pin and socket contacts shall be measured as follows.

a) Thickness of gold-plating shall be measured by a proper method such as microscopic test method, beta backscatter radiation method and X-ray fluorescence method.
b) Measuring points shall be in the range specified below and at least three points shall be measured for each area.
    1) Pin contact: 2.54 to 3.81mm from insertion end.
    2) Socket contact: 2.54 to 3.81mm on outside diameter from termination end.

D.4.3.5 Electrical Performance

Electrical performance tests shall be performed as follows.

D.4.3.5.1 Dielectric Withstanding Voltage

D.4.3.5.1.1 At Sea level

Connectors shall be tested in accordance with test procedure EIA-364-20. The following details shall apply.

a) Test condition: I
b) The test voltage shall be as specified in Table D-19.
c) The test shall be made between adjacent contacts for 50% of the contact pairs in the contact arrangement (at least 4 pairs), and between contact and shell for 50% or more contacts in the contact arrangement (at least 6 contacts).
d) The leakage current shall be 5mA or less.
e) For qualification tests, the voltage shall be applied for a minimum of one minute. For the quality conformance inspection, the application duration shall be 10 seconds or longer.
f) For the quality conformance inspection, a proper test jig may be used.

Table D-19. Test Voltage

Unit: V_{AC}

Altitude	Initial	After humidity test or fluid immersion test
Sea level	1,000	600
Reduced pressure 21,340m (4.4kPa {33mmHg})	325	–

D.4.3.5.1.2 At Reduced Pressure

Connectors shall be tested in accordance with test procedure EIA-364-20. The following details shall apply.

a) Test condition: IV
b) The test voltage shall be as specified in Table D-19.
c) The test shall be made between adjacent contacts for 50% of the contacts in the contact arrangement (at least 4 pairs), and between contact and shell for 50% or more contacts in the contact arrangement (at least 6 contacts).
d) The leakage current shall be 5mA or less.
e) Five minutes after the specified pressure has been reached, the test voltage shall be applied for one minute.

D.4.3.5.2 Insulation Resistance

Connectors shall be tested in accordance with test procedure EIA-364-21. The following details shall apply.

a) The test voltage applied shall be $500V_{DC}$. After humidity test or fluid immersion test, the voltage shall be $100V_{DC}$.
b) The test shall be made between adjacent contacts for 50% of the contact pairs in the contact arrangement (at least 4 pairs), and between contact and shell for 50% or more contacts in the contact arrangement (at least 6 contacts).
c) For the quality conformance inspection, a proper test jig may be used.

D.4.3.5.3 Contact Resistance

Connectors mated or mated contacts shall be tested in accordance with test procedure EIA-364-06. The following details shall apply.

a) The test current shall be as specified in エラー! 参照元が見つかりません。.
b) The test current shall be applied and measurement shall be made after the temperature becomes stable.
c) For mated connectors, the test shall be performed on 20% of the contact pairs in the contact arrangement (at least 4 pairs) by measuring a voltage drop across the specified test points (152.4±3mm).
d) For individual contacts, the contact shall be inserted as deeply as normally used. The voltage drop shall be measured across the specified test points (152.4±3mm).
e) For right angle through hole contact connectors, the voltage drop shall be measured at the points specified in Supplementary Figure D-19.

D.4.3.5.4 Low-Signal Level Contact Resistance

Inserted pairs of contacts shall be tested in accordance with test procedure EIA-364-23. The following conditions shall apply.

a) Contacts shall be inserted as deeply as normally used. The voltage drop shall be measured across the specified test points (152.4±3mm).

D.4.3.6 Mechanical Performance

Mechanical performance tests shall be performed as follows.

D.4.3.6.1 Maintenance Aging

Connectors shall be tested in accordance with test procedure EIA-364-24. The following conditions shall apply.

a) 20% of the contact arrangement (at least 4 contacts) shall be tested.
b) Contact insertion and removal shall be performed with proper tools in accordance with item c) of paragraph D.4.1.1.2.
c) The force required for contact insertion and removal shall be measured during the 1st and 10th maintenance aging cycles.
d) After completion of the test, the mating and unmating forces of the connector shall be measured.

D.4.3.6.2 Contact Insertion and Removal Forces

Connectors shall be tested during the maintenance aging test in accordance with test procedure EIA-364-05. The following conditions shall apply.

a) 20% of the contact arrangement (at least 4 contacts) shall be tested.
b) Contact insertion and removal shall be performed with proper tools in accordance with item c) of paragraph D.4.1.1.2.
c) The rate of inserting and removing each contact shall be approximately 20mm per minute.

D.4.3.6.3 Connector Mating and Unmating Forces

The test shall be performed in accordance with test procedure EIA-364-13. However, the test procedures specified in paragraphs 1.2.1, 1.2.2 and 2.1.2 of EIA-364-13 shall be the test procedures of the manufacturer.

D.4.3.6.4 Contact Retention

The test shall be performed in accordance with test procedure EIA-364-29. The following conditions shall apply.

a) 20% of the contact arrangement (at least 4 contacts) shall be tested.
b) The contact shall be preloaded with a maximum of 13.7N {1.4kgf} before measuring the axial displacement of contacts.
c) Apply an axial load to the contact from the insertion face and wait until the load reaches the value as specified in Table D-20. After maintained the specified load for 5 seconds, axial displacement of the contact shall be measured.
d) The rate to apply the load shall be approximately 4.4N/s {0.45kgf/s}.

Table D-20. Contact Retention

Unit: N {kgf}

Contact size	Load
22D	40.2 {4.1} minimum

D.4.3.6.5 Contact Engagement and Separation Forces

D.4.3.6.5.1 Qualification Test

Socket contacts shall be tested in accordance with test procedure EIA-364-37. The following conditions shall apply.

a) Test pins shall be as specified in Table D-21.
b) 20% of the contacts arrangement (at least 4 contacts) shall be tested.
c) Insert and remove a test pin of the maximum diameter, and a force required to remove a test pin of the minimum diameter from the same socket contact shall be measured. Then insert and remove a test pin of the maximum diameter two times, and a force required to insert the test pin in the same socket contact shall be measured.
d) The test pin shall be inserted to a depth of 3.6mm as a minimum from the mating cavity of the socket contact.
e) The rate of engagement and separation shall be approximately 20mm per minute.

Table D-21. Test Pin

Maximum diameter pin	As specified in SAE-AS31971.
Minimum diameter pin	As specified in SAE-AS31971.

D.4.3.6.5.2 Quality Conformance Inspection

For the quality conformance inspection, the contact removal force shall meet the requirements specified in paragraph D.3.7.5.2 when tested by the weight retention method specified below, or by an equivalent method.

a) A socket contact shall be inserted with a pin contact of the minimum diameter specified in Table D-21 to the depth of 3.6mm as a minimum. The test pin shall be mounted on a weight of 20g as a minimum as shown in Figure D-4.
b) The socket contact shall be slowly lifted up in the vertical direction.
c) The test passes if the test pin remains engaged.

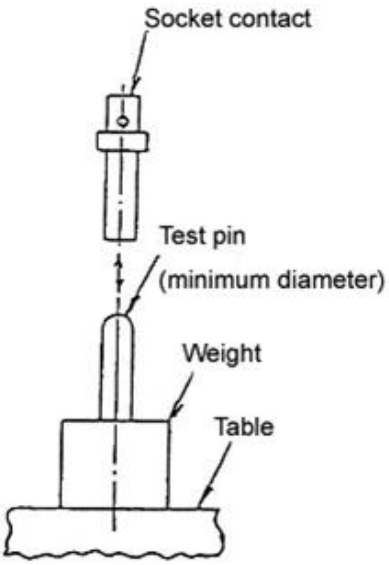


Figure D-4. Weight Retention Method

D.4.3.6.6 Durability

Connectors shall be tested in accordance with test procedure EIA-364-09. The following conditions shall apply.

a) The connectors shall be mated and unmated 500 times.
b) For manual testers, the repetition rate of mating and unmating shall be at a rate of 300 cycles per hour maximum.
   For automatic testers, the repetition rate of mating and unmating shall be at a rate of 550 cycles per hour maximum.
c) After completion of the test, mating and unmating forces and contact resistance shall be measured.

D.4.3.6.7 Oversize Pin Exclusion

A hardened steel oversize pin shown in Table D-22 shall be placed at the insertion end of socket contact. A 5N {510gf} axial force shall be applied to force the test pin into the socket contact. After completion of the test, the contact resistance shall be measured. This test shall be performed on 20% of the contact arrangement (at least 4 contacts).

Table D-22. Oversize Pin Exclusion

Unit: mm

Contact size	Pin diameter
22D	$0.907\ ^{0}_{-0.002}$

D.4.3.6.8 Probe Damage

Socket contacts shall be tested in accordance with test procedure EIA-364-25. The following conditions shall apply.

a) The test shall be performed on 20% of the contact arrangement (at least 4 contacts).
b) Contact support fixture shall be of type 1.
c) A test probe shall be inserted into the socket contact to the depths as specified in Table D-23.
d) At completion of the test, the following measurements shall be performed.
   1) Connectors: mating and unmating forces.
   2) Individual contacts: contact engagement and separation forces, and contact resistance.

Table D-23. Insertion Depth of Probe Damage Tool

Unit: mm

Contact size	Contact Support Fixture
	Type I
22D	$2.11^{+0.51}_{0}$ $3.18^{+0.51}_{0}$

D.4.3.6.9 Insert Retention

Unmated connectors shall be tested in accordance with test procedure EIA-364-35. The following details shall apply.

a) The test load shall be 414kPa {4.22kgf/cm^2}.
b) The contacts may be removed.

D.4.3.6.10 Contact Axial Concentricity

Contacts before crimping and after crimping shall be tested in accordance with test procedure EIA-364-07.

a) Unwired Contacts
   While the contact is being rotated, measurements shall be made at the points A and B specified in Figure D-5.
   For socket contacts, the measurement shall not be made at point B.
b) Wired Contacts
   While the contact is being rotated, measurements shall be made at the points A and B specified in Figure D-5 and requirements specified in paragraph D.3.7.10.2 shall be met.
   For socket contacts, the measurement shall not be made at point B. Wiring shall be made with the crimping tools specified in item b) of paragraph D.4.1.1.2.

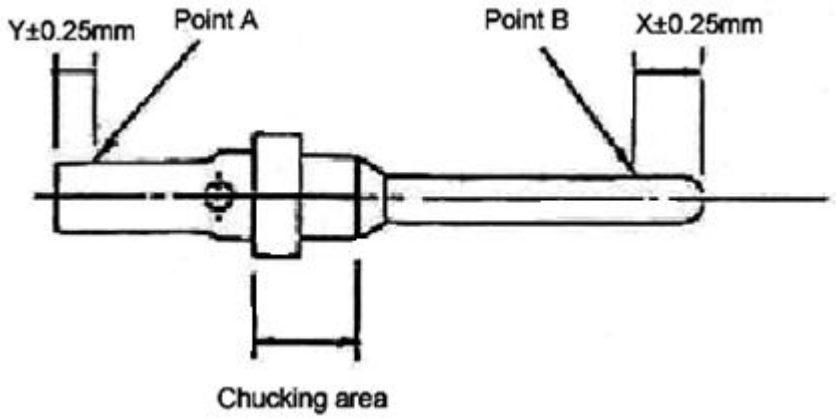
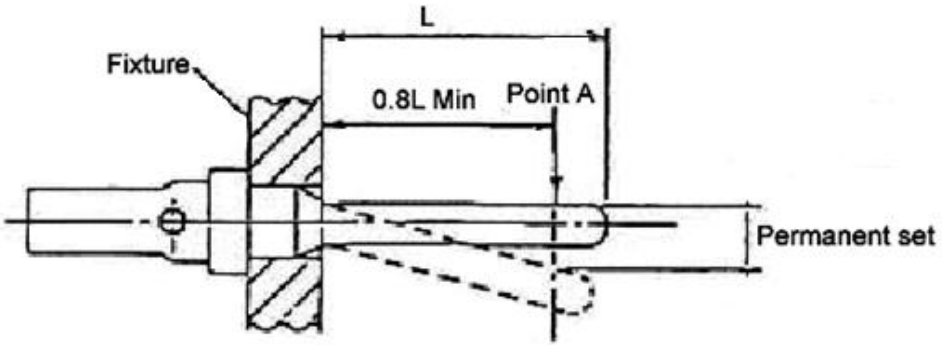


Figure D-5. Axial Concentricity Measurement

D.4.3.6.11 Contact Pin Strength

A pin contact shall be mounted on a proper fixture. A moment of 5.98N·cm {0.61kgf·cm} shall be applied at the point A specified in Figure D-6 at a rate of 25.4mm per minute as a maximum for $60\,^{+15}_{0}$ seconds. After completion of the test, the pin contact shall meet the requirements specified in paragraph D.3.7.11.



L = Overall length of pin insertion end

Figure D-6. Contact Pin Strength

D.4.3.6.12 Crimp Tensile Strength

Wire crimped pin and socket contacts shall be tested in accordance with test procedure EIA-364-37. The following details shall apply.

a) The wire crimping tools shall be as specified in item b) of paragraph D.4.1.1.2.
b) Failures to meet the crimp tensile strength due to reasons unrelated to crimping such as wire scratches shall not be considered failures of the test.

D.4.3.6.13 Resistance to Soldering Heat

Unmated connectors shall be tested in accordance with test method 210, condition A of MIL-STD-202. The following details shall apply.

a) Connectors shall be immersed to a depth of at least 3mm from the wire termination.
b) Flux shall not be used.

c) For solder-contact connectors, a solder iron of 350±10°C shall be applied to a minimum of 20% of the contact arrangement (at least 4 contacts) for 3 seconds or longer.

D.4.3.6.14 Solderability

Contacts shall be tested in accordance with method 208 of MIL-STD-202. Contacts shall be immersed to a depth of at least 3mm from the wire termination.

D.4.3.7 Environmental Performance

Environmental performance tests shall be performed as follows.

D.4.3.7.1 Vibration

D.4.3.7.1.1 High Frequency Vibration

Mated connectors installed with wired contacts shall be tested in accordance with test method 204 of MIL-STD-202. The following details shall apply.

a) Mounting method: Connectors shall be mounted normally on a vibration table using jig.
b) Currents of 100mA or less shall be applied to all contacts during the test. The contacts shall be monitored for electrical continuity using a detector capable of detecting any discontinuity in excess of 1μs.
c) Test condition: G (294m/s^2 {30G}p-p).
d) Wire bundles shall be secured to a non-vibrating table located approximately 203mm from the rear side of the connector.

D.4.3.7.1.2 Random Vibration

Mated connectors installed with wired contacts shall be tested in accordance with test procedure EIA-364-28. The following conditions shall apply.

a) Mounting method: Connectors shall be mounted normally on a vibration table using jig.
b) Currents of 100mA or less shall be applied to all contacts during the test. The contacts shall be monitored for electrical continuity using a detector capable of detecting any discontinuity in excess of 1μs.
c) Test condition VI, test condition letter H (334m/s^{2}rms {34.02Grms})
d) Duration of vibration: 15 minutes for each axis, 45 minutes in total.
e) The wire bundles shall be secured to a non-vibrating table located approximately 203mm from the rear side of the connector.

D.4.3.7.2 Shock

Mated connectors shall be tested in accordance with test procedure EIA-364-27.

D.4.3.7.2.1 Shock (I)

The following details shall apply.

a) Test condition: D (2942m/s^2 {300G}), half-sine wave
b) Receptacles shall be mounted on a shock table using test jig. Plugs shall be engaged with receptacles and secured by a proper holding device.

c) Wires shall be bundled at approximately 10cm behind the rear of the connector, and secured to a no-shock table located at least 20cm apart from the rear side of the connector.
d) Currents of 100mA or less shall be applied to all the contacts wired in series during the test. The contacts shall be monitored for electrical continuity using a detector capable of detecting any discontinuity in excess of 1μs.

D.4.3.7.2.2 Shock (II)

The following details shall apply.

a) Test conditions
   1) Acceleration of gravity (A): 14,710m/s^2 {1500G}±20%
   2) Duration of pulse (D): 0.5ms±15%
   3) Waveform: Half-sine wave
   4) Velocity change (vi): 4.68m/s±10%
   5) Direction of shock application: ±X, ±Y, and ±Z (3 shocks per each direction, 18 shocks in total)
b) Mounting method: As specified in item b) of paragraph D.4.3.7.2.1.
c) Wires: As specified in item c) of paragraph D.4.3.7.2.1.
d) Monitoring during test: As specified in item d) of paragraph D.4.3.7.2.1.

D.4.3.7.3 Temperature Cycling

Mated connectors installed with wired contacts shall be tested in accordance with test procedure EIA-364-32.
The following conditions shall apply

a) Possible failure modes after test and pass/fail criteria: In accordance with FMAT of the Quality Assurance Program Plan

D.4.3.7.3.1 Temperature Cycling (I)

The following details shall apply.

a) The test shall be performed for 5 cycles at the temperatures specified in Table D-24.
b) At the completion of the last cycle, the connectors shall be removed from the oven and examined for the following items.
   1) Connectors: Externals
   2) Individual contacts: Contact engagement and separation forces, and contact resistance

Table D-24. Temperature Extremes

Unit: °C

Low	-65^{0}_{-3}
High	$+125^{+3}_{0}$

D.4.3.7.3.2 Temperature Cycling (II)

The following details shall apply.

a) The temperature for plateau 1 shall be -30^{0}_{-5}
b) The temperature for plateau 3 shall be $+100^{+3}_{0}$
c) The number of cycles shall be 1,000.

d) Measurements during the test and visual inspection
   1) At 100^{+10}_{0}、250^{+10}_{0} and 500^{+10}_{0} cycles.
   2) All connectors shall be visually examined for cracks on the surface.

D.4.3.7.4 Humidity

Unmated connectors shall be tested in accordance with test procedure EIA-364-31. The following details shall apply.

a) Test condition: Method IV
b) Duration of test: 240 hours
c) Upon completion of the final cycle, the connector shall be removed from the chamber and moisture shall be removed from the surface. Upon removal, dielectric withstanding voltage (at sea level) and insulation resistance shall be measured.
d) After 24-hour conditioning period at ambient temperature and normal humidity, insulation resistance shall be re-measured.

D.4.3.7.5 Fluid Immersion

Unmated connectors shall be tested in accordance with Table D-25 which is equivalent to fluid (a) and fluid (d) of test procedure EIA-364-10. The following details shall apply.
This provision shall not be applicable to connectors with a grommet.

a) Connectors shall be removed from the fluids and maintained at ambient temperature and normal humidity for one hour. Then mating and unmating forces shall be measured.
b) Fluids on the connector surface shall be removed by solvent and the surface shall be cleaned. Then mating and unmating forces shall be re-measured.
c) Twenty-four hours after the cleaning specified in item b) above, dielectric withstanding voltage (at sea level) and insulation resistance shall be measured.

Table D-25. Test Fluids and Duration of Immersion

Fluid	Duration of immersion	Sample (see Table D-11)
Hydraulic fluid in MIL-PRF-5606	20 hours	One pair for each test group of 1 through 3.
Lubricating oil in MIL-PRF-23699	20 hours	One pair for each test group of 1 and 2.

Note: Samples shall be crimp-contact connectors.

D.4.3.7.6 Resistance to Corrosive Gas

10% solution of potassium sulfide in distilled water shall be placed on a noncorrosive rack in a sealed plastic or glass chamber ($0.057m^3$ {$2ft^3$}) and uninserted contacts shall be exposed to the sulfide vapor for 100 hours, and shall meet the requirements specified in paragraph D.3.8.6. Contacts shall not be immersed in the solution during the test.
After completion of the test, low-signal level contact resistance shall be measured.

D.4.3.7.7 Salt Spray (Corrosion)

Mated connectors and individual engaged contacts shall be tested in accordance with test procedure EIA-364-26. The following details shall apply.

a) Test condition: B (48 hours)

b) Individual contacts shall be mated as deeply as normally used.

c) At completion of the test, the following measurements shall be made.

1) Connectors: Mating and unmating forces, and contact resistance

2) Individual contacts: low signal level contact resistance, contact resistance, and contact engagement and separation forces.

D.4.3.7.8 Radiation Hardness

Mated connectors installed with wired contacts shall be tested under the following conditions.

a) Radiation type: ^{60}Co gamma ray

b) Total dose of radiation: 105Gy

D.4.3.8 Durability

Durability tests shall be performed as follows.

D.4.3.8.1 Temperature Life

Inserted contacts shall be tested in accordance with test procedure EIA-364-17. The following details shall apply.

a) Test temperature: 5 (125±2°C)

b) Test time condition: D (1,000 hours)

c) Contacts shall be engaged as deeply as normally used. No electrical load shall be applied.

d) After completion of the test, low-signal level, contact resistance, and contact engagement and separation forces shall be measured.

D.4.4 Long-Term Storage

Long-term storage shall be as specified in paragraph 4.7.

D.4.5 Change and Optimization of Tests and Inspections

Change to tests and inspections shall be in accordance with paragraph 4.8.

D.5 Preparation for Delivery

Preparation for delivery shall be as specified in paragraph 5.

D.6 Notes

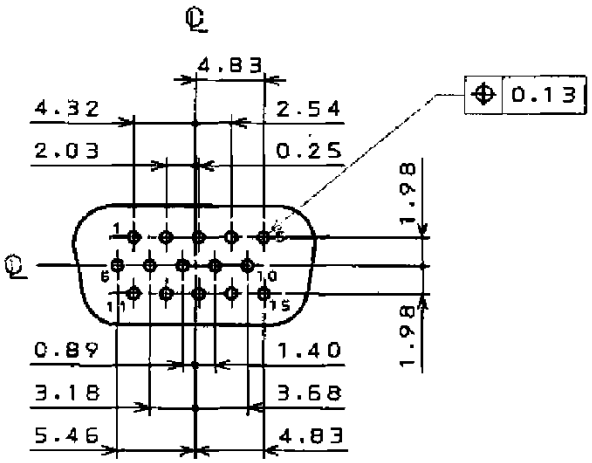
D.6.1 Notes for Manufacturer

Notes for manufacturer shall be in accordance with paragraph 6.1.

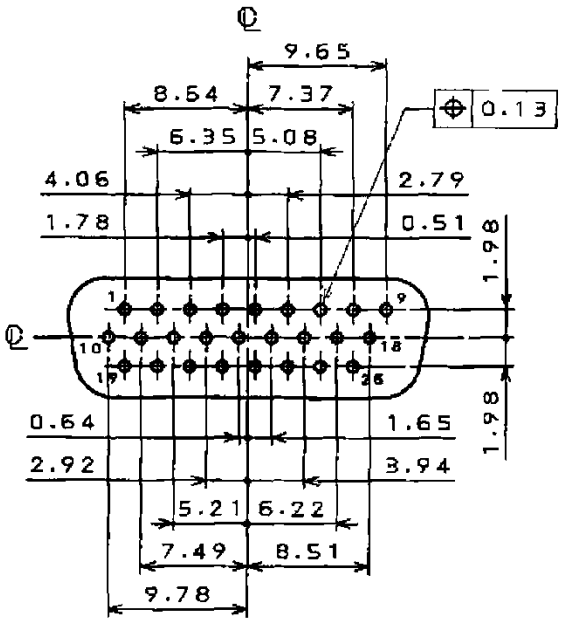
D.6.2 Notes for Purchaser

Notes for purchaser shall be as specified in paragraph 6.2.

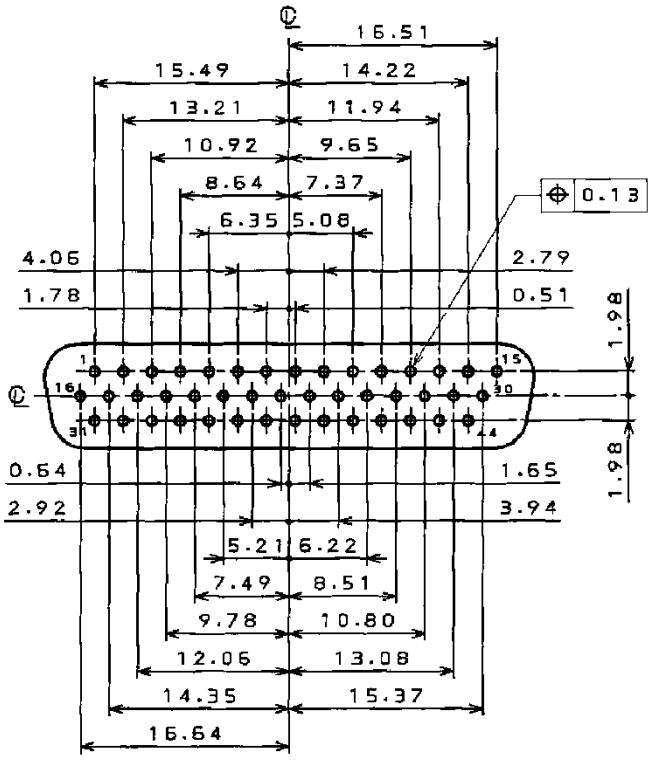
Unit: mm



15 contacts (PIN)



26 contacts (PIN)

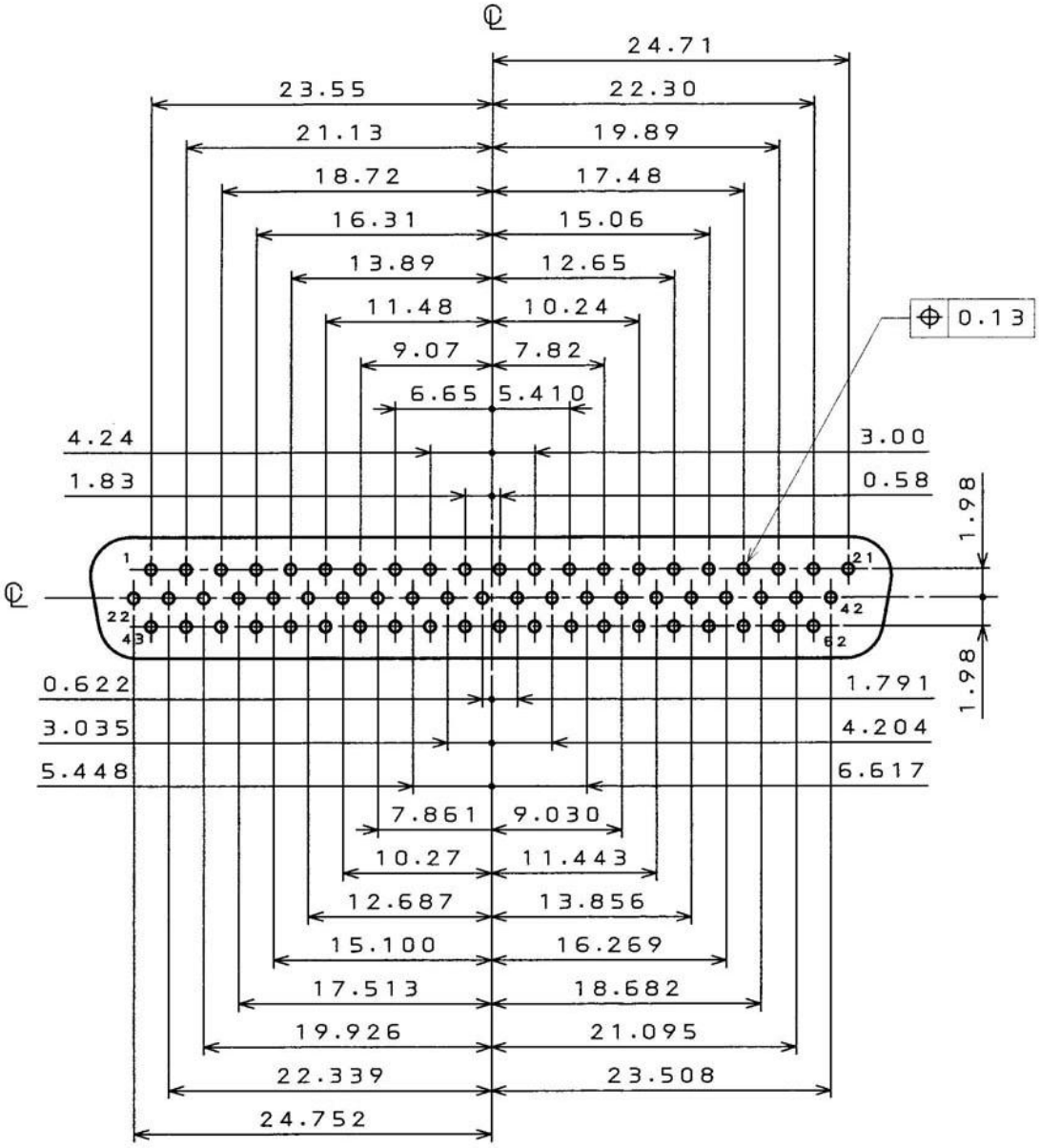


44 contacts (PIN)

Notes:
1. Pin connectors (front view)
2. Left and right of contact position numbers are reversed for socket insert.

Supplementary Figure D-1. Contact Arrangement (1/4)

Unit: mm

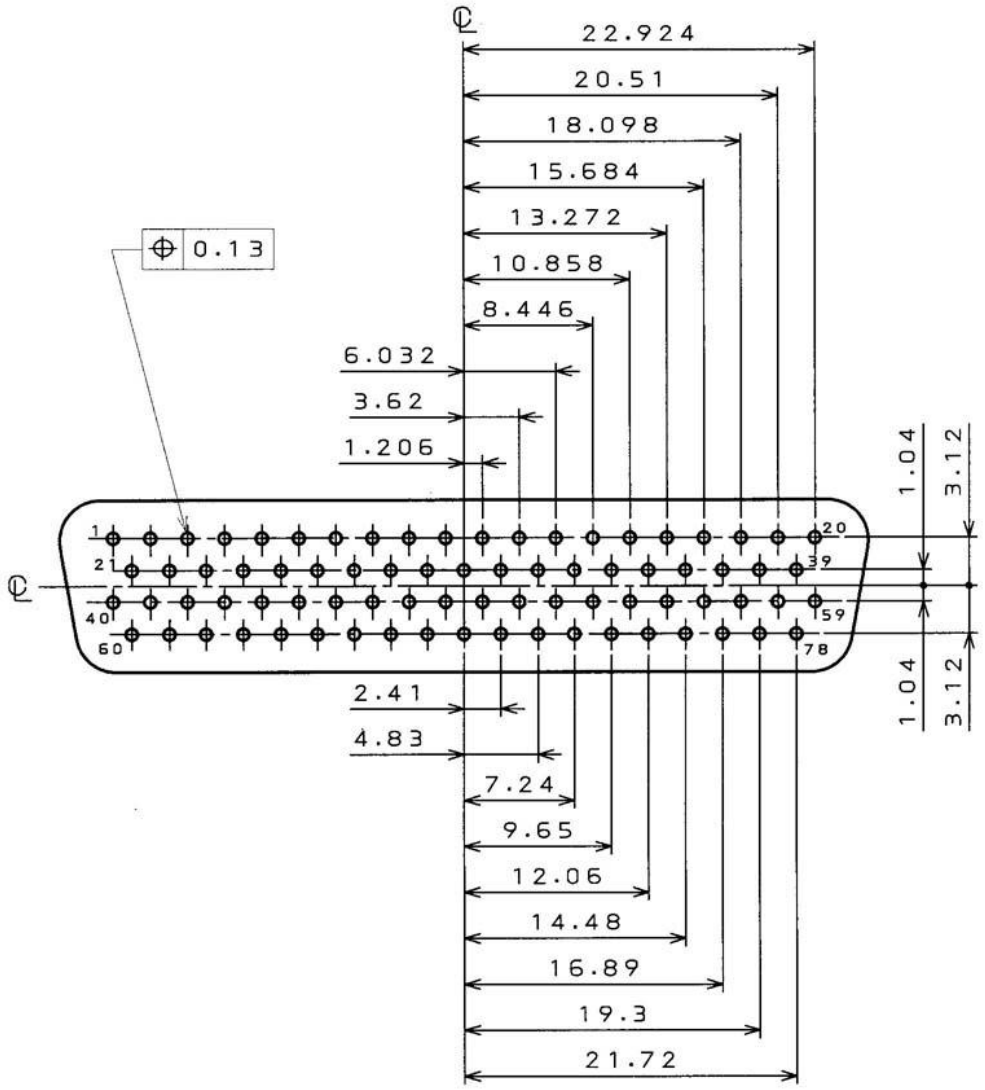


62 contacts (PIN)

Notes:
1. Pin connectors (front view)
2. Left and right of contact position numbers are reversed for socket insert.

Supplementary Figure D-1. Contact Arrangement (2/4)

Unit: mm

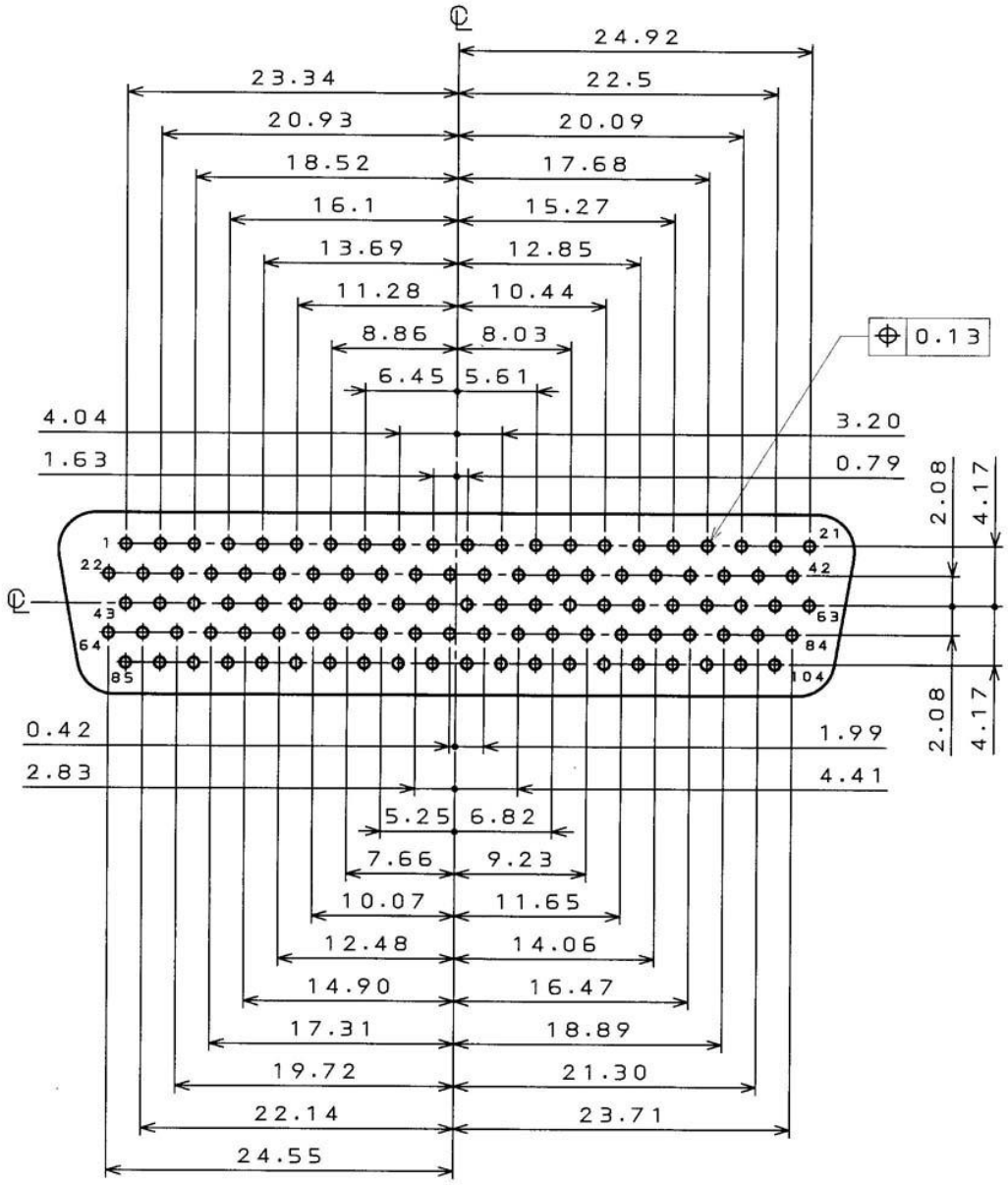


78 contacts (PIN)

Notes:
1. Pin connectors (front view)
2. Left and right of contact position numbers are reversed for socket insert.

Supplementary Figure D-1. Contact Arrangement (3/4)

Unit: mm

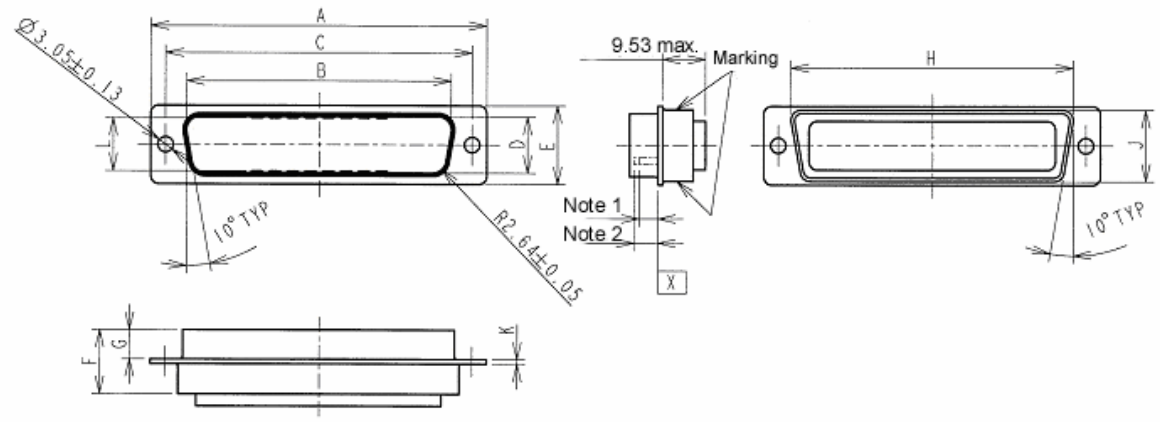


104 contacts (PIN)

Notes:
1. Pin connectors (front view)
2. Left and right of contact position numbers are reversed for socket insert.

Supplementary Figure D-1. Contact Arrangement (4/4)

Unit: mm



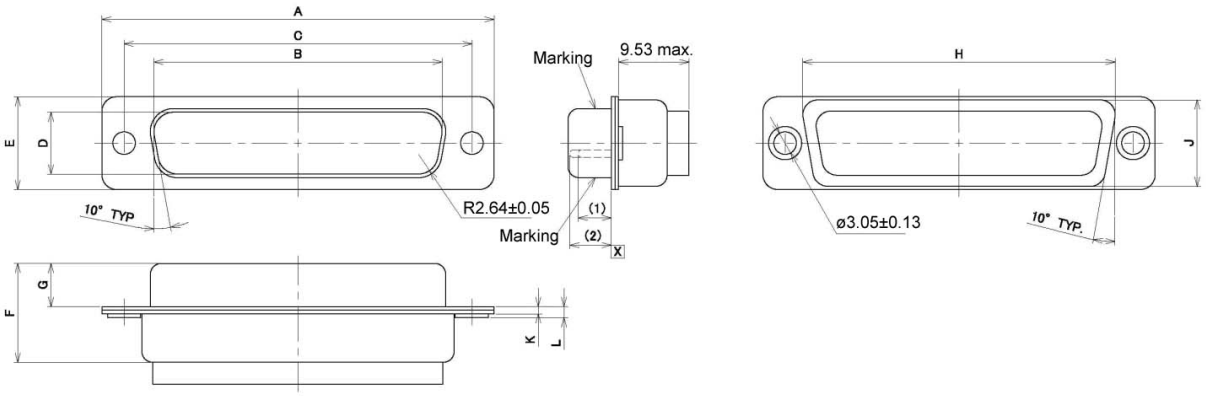
Part number	Contact arrangement	Physical dimensions											Mass (g)
		A	B	C	D	E	F	G	H	J	K	(L)	
		±0.38	±0.13	±0.13	±0.13	±0.38	Maximum	±0.11	Maximum	Maximum	±0.25	–	Maximum
ND*14-15P-C	15	30.81	16.92	24.99	8.36	12.55	14.79	5.93	20.19	11.68	0.76	7.73	3.93
ND*14-26P-C	26	39.14	25.25	33.32					28.52				5.34
ND*14-44P-C	44	53.04	38.96	47.04					42.24		0.99		7.69
ND*14-62P-C	62	69.32	55.42	63.50					58.75				10.74
ND*14-78P-C	78	66.93	52.81	61.11	11.20	15.37			56.31	14.50		10.57	12.12
ND*14-104P-C	104	69.32	56.18	63.50	12.78	16.97			59.28	16.09		12.15	13.60

Notes:

1. Length between the X plane and the engagement tip minus the spherical radius shall be a minimum of 4.17mm for 15- or 26-contact connectors and a minimum of 3.94mm for 44-, 62-, 78- or 104-contact connectors.
2. Length between the X plane and the engagement tip shall be a maximum of 5.59mm.
3. Contact arrangement shall be as shown in Supplementary Figure D-1.
4. Physical dimensions of a crimp pin contact shall be as shown in Supplementary Figure D-14.
5. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.

Supplementary Figure D-2. Physical Dimensions for Connector, Standard Shell, Crimp Pin Contacts (1/2) (Shell Material: Aluminum Alloy)

Unit: mm



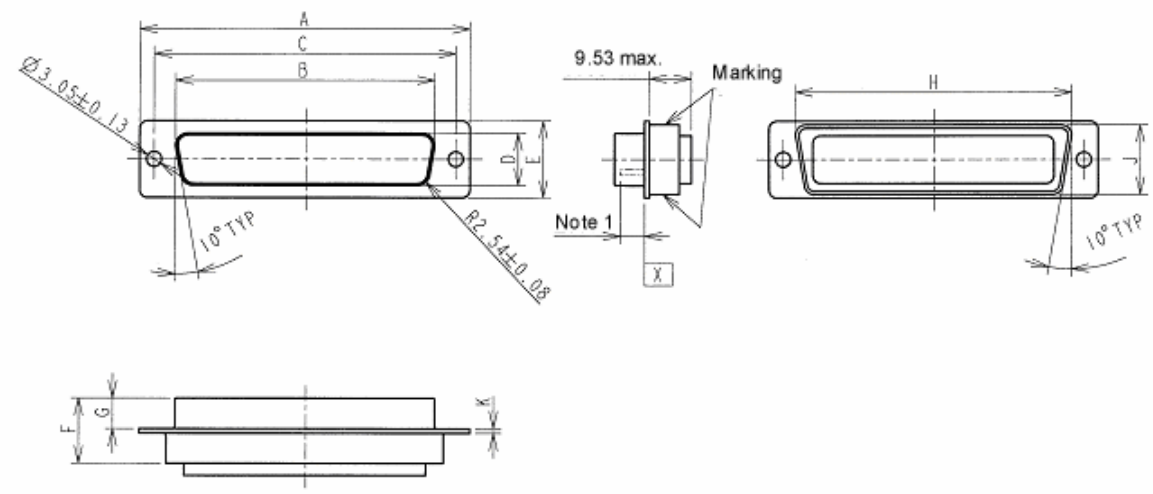
Part number	Contact arrangement	Physical dimensions											Mass (g)
		A	B	C	D	E	F	G	H	J	K	L	
		±0.38	±0.13	±0.13	±0.13	±0.38	Maximum	±0.15	Maximum	Maximum	±0.25	±0.32	
ND*04-15P-C	15	30.81	16.92	24.99	8.36	12.55	13.39	5.97	20.19	11.68	0.76	1.21	5.2
ND*04-26P-C	26	39.14	25.25	33.32					28.52				7.4
ND*04-44P-C	44	53.04	38.96	47.04				5.84	42.24		0.99	1.11052	11
ND*04-62P-C	62	69.32	55.42	63.50					58.75				15.6
ND*04-78P-C	78	66.93	52.81	61.11	11.20	15.37			56.31	14.50			18.2

Notes:

1. Length between the X plane and the engagement tip minus the spherical radius shall be a minimum of 4.17mm for 15- or 26-contact connectors and a minimum of 3.94mm for 44-, 62-, or 78-contact connectors.
2. Length between the X plane and the engagement tip shall be a maximum of 5.59mm.
3. Contact arrangement shall be as shown in Supplementary Figure D-1.
4. Physical dimensions of a crimp pin contact shall be as shown in Supplementary Figure D-14.
5. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.

Supplementary Figure D-2. Physical Dimensions for Connector, Standard Shell, Crimp Pin Contacts (2/2) (Shell Material: Brass)

Unit: mm



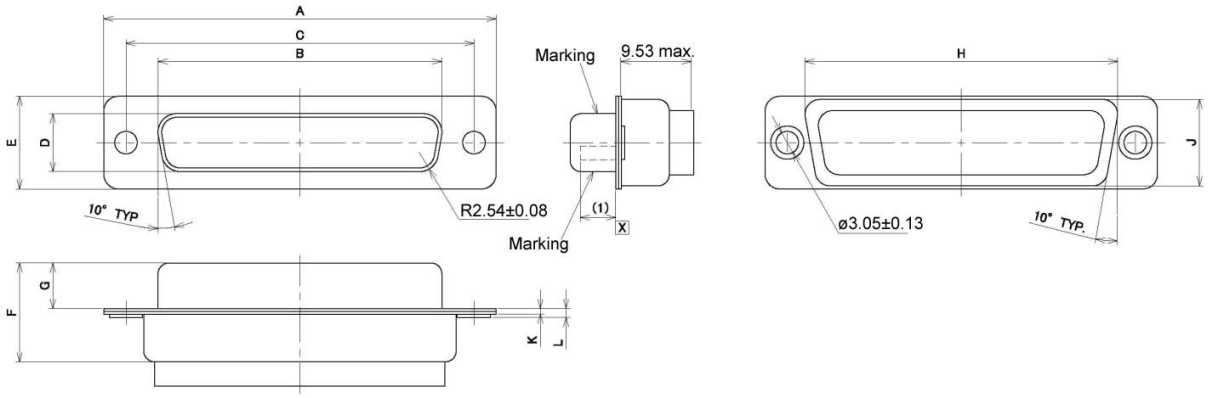
Part number	Contact arrangement	Physical dimensions										Mass (g)
		A	B	C	D	E	F	G	H	J	K	
		±0.38	±0.13	±0.13	–	±0.38	Maximum	±0.13	Maximum	Maximum	±0.25	Maximum
ND*14-15S-C	15	30.81	16.33	24.99	7.85 ±0.18	12.55	14.95	6.17	20.19	11.68	0.76	4.81
ND*14-26S-C	26	39.14	24.66	33.32					28.52			6.67
ND*14-44S-C	44	53.04	38.38	47.04					42.24		0.99	9.78
ND*14-62S-C	62	69.32	54.84	63.50					58.75			13.68
ND*14-78S-C	78	66.93	52.43	61.11	10.74 ±0.13	15.37			56.31	14.50		16.49
ND*14-104S-C	104	69.32	55.60	63.50	12.32 ±0.13	16.97			59.28	16.09		17.95

Notes:

1. When a square ended test pin of Φ0.75 to 0.77mm makes contact with the tip of a socket insertion end, the mating depth from the X plane shall be a minimum of 3.63mm.
2. Contact arrangement shall be as shown in Supplementary Figure D-1.
3. Physical dimensions of a crimp socket contact shall be as shown in Supplementary Figure D-15.
4. Looseness of the socket contact shall be within ±0.5mm in the radial and lateral directions.

Supplementary Figure D-3. Physical Dimensions for Connector, Standard Shell, Crimp Socket Contacts (1/2) (Shell Material: Aluminum Alloy)

Unit: mm



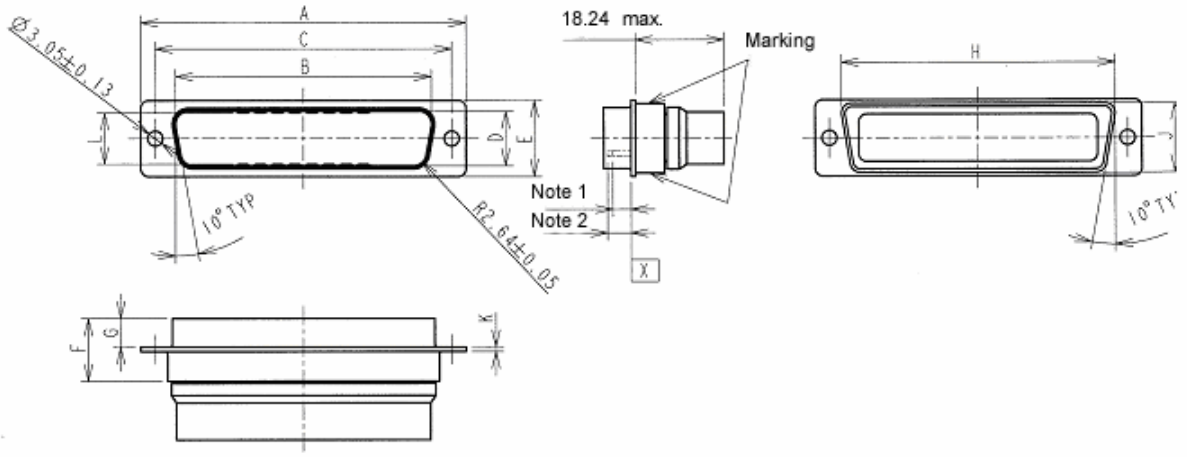
Part number	Contact arrangement	Physical dimensions											Mass (g)
		A	B	C	D	E	F	G	H	J	K	L	
		±0.38	±0.13	±0.13	-	±0.38	Maximum	±0.13	Maximum	Maximum	±0.25	±0.32	Maximum
ND*04-15S-C	15	30.81	16.33	24.99	7.85 ±0.18	12.55	16.63	6.17	20.19	11.68	0.76	1.21	6
ND*04-26S-C	26	39.14	24.66	33.32					28.52				8
ND*04-44S-C	44	53.04	38.38	47.04					42.24				12
ND*04-62S-C	62	69.32	54.84	63.50	10.74 ±0.13	15.37			58.75	14.50			17
ND*04-78S-C	78	66.93	52.43	61.11					56.31				20

Notes:

1. When a square ended test pin of Φ0.75 to 0.77mm makes contact with the tip of a socket insertion end, the mating depth from the X plane shall be a minimum of 3.63mm.
2. Contact arrangement shall be as shown in Supplementary Figure D-1.
3. Physical dimensions of a crimp socket contact shall be as shown in Supplementary Figure D-15.
4. Looseness of the socket contact shall be within ±0.5mm in the radial and lateral directions.

Supplementary Figure D-3. Physical Dimensions for Connector, Standard Shell, Crimp Socket Contacts (2/2) (Shell Material: Brass)

Unit: mm



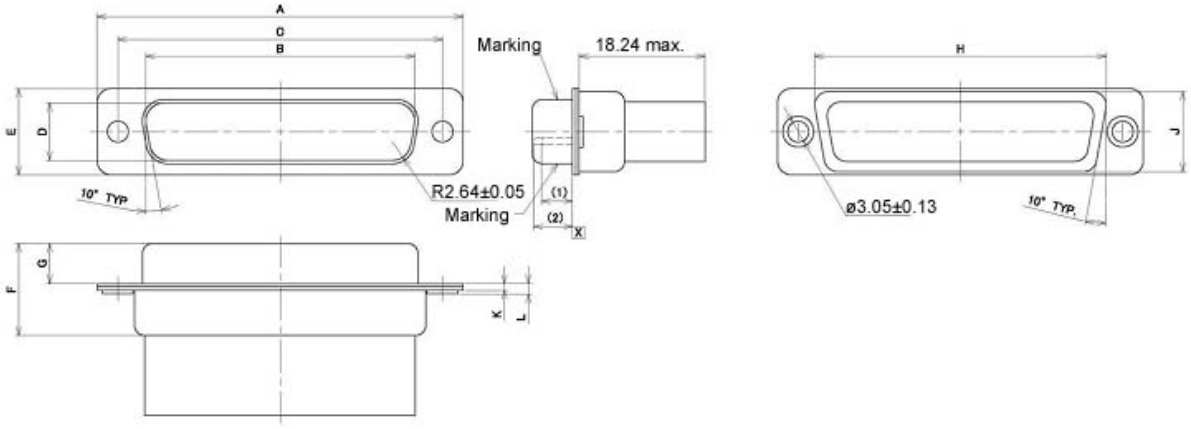
Part number	Contact arrangement	Physical dimensions											Mass (g)
		A	B	C	D	E	F	G	H	J	K	(L)	
		±0.38	±0.13	±0.13	±0.13	±0.38	Maximum	±0.11	Maximum	Maximum	±0.25	–	Maximum
ND*14-15P-CR	15	30.81	16.92	24.99	8.36	12.55	14.79	5.93	20.19	11.68	0.76	7.73	5.49
ND*14-26P-CR	26	39.14	25.25	33.32					28.52				7.62
ND*14-44P-CR	44	53.04	38.96	47.04					42.24		0.99		11.17
ND*14-62P-CR	62	69.32	55.42	63.50					58.75				15.69
ND*14-78P-CR	78	66.93	52.81	61.11	11.20	15.37			56.31	14.50		10.57	17.77
ND*14-104P-CR	104	69.32	56.18	63.50	12.78	16.97			59.28	16.09		12.15	19.49

Notes:

1. Length between the X plane and the inserted tip minus the spherical radius shall be a minimum of 4.17mm for 15- or 26-contact connectors and a minimum of 3.94mm for 44-, 62-, 78- or 104-contact connectors.
2. Length between the X plane and the engagement tip shall be a maximum of 5.59mm.
3. Contact arrangement shall be as shown in Supplementary Figure D-1.
4. Physical dimensions of a crimp pin contact shall be as shown in Supplementary Figure D-14.
5. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.

Supplementary Figure D-4. Physical Dimensions for Connector, Standard Shell, Crimp Pin Contacts, Grommet Version (1/2) (Shell Material: Aluminum Alloy)

Unit: mm



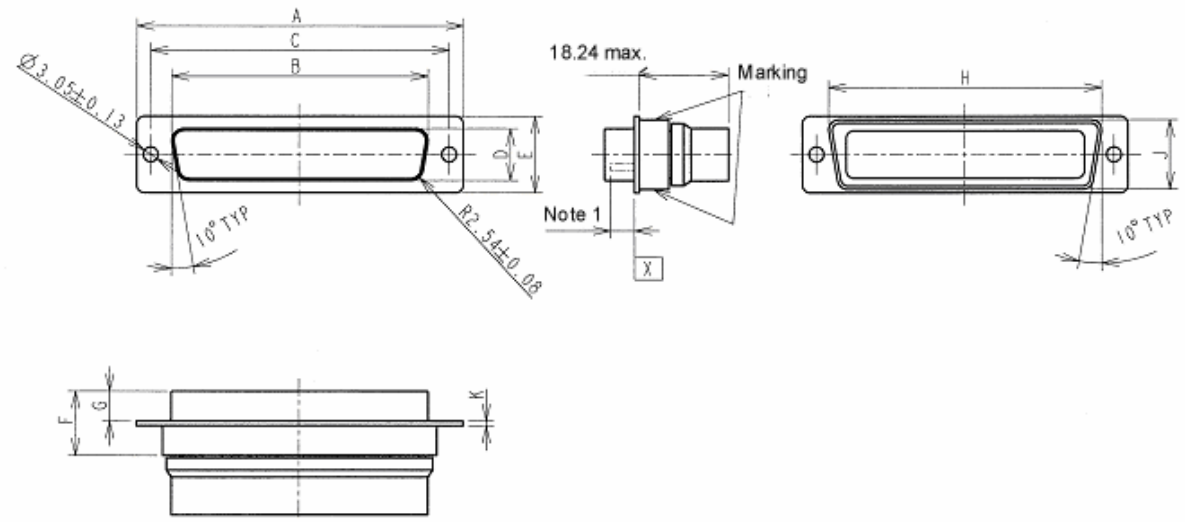
Part number	Contact arrangement	Physical dimensions											Mass (g)
		A	B	C	D	E	F	G	H	J	K	L	
		±0.38	±0.13	±0.13	±0.13	±0.38	Maximum	±0.15	Maximum	Maximum	±0.25	±0.32	
ND*04-15P-CR	15	30.81	16.92	24.99	8.36	12.55	13.39	5.97	20.19	11.68	0.76	1.21	6.3
ND*04-26P-CR	26	39.14	25.25	33.32					28.52				8.9
ND*04-44P-CR	44	53.04	38.96	47.04				5.84	42.24		0.99	1.52	13.3
ND*04-62P-CR	62	69.32	55.42	63.50					58.75				18.9
ND*04-78P-CR	78	66.93	52.81	61.11	11.20	15.37			56.31	14.50			22.2

Notes:

1. Length between the X plane and the engagement tip minus the spherical radius shall be a minimum of 4.17mm for 15- or 26-contact connectors and a minimum of 3.94mm for 44-, 62-, or 78-contact connectors.
2. Length between the X plane and the engagement tip shall be a maximum of 5.59mm.
3. Contact arrangement shall be as shown in Supplementary Figure D-1.
4. Physical dimensions of a crimp pin contact shall be as shown in Supplementary Figure D-14.
5. Deleted.
6. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.

Supplementary Figure D-4. Physical Dimensions for Connector, Standard Shell, Crimp Pin Contacts, Grommet Version (2/2) (Shell Material: Brass)

Unit: mm



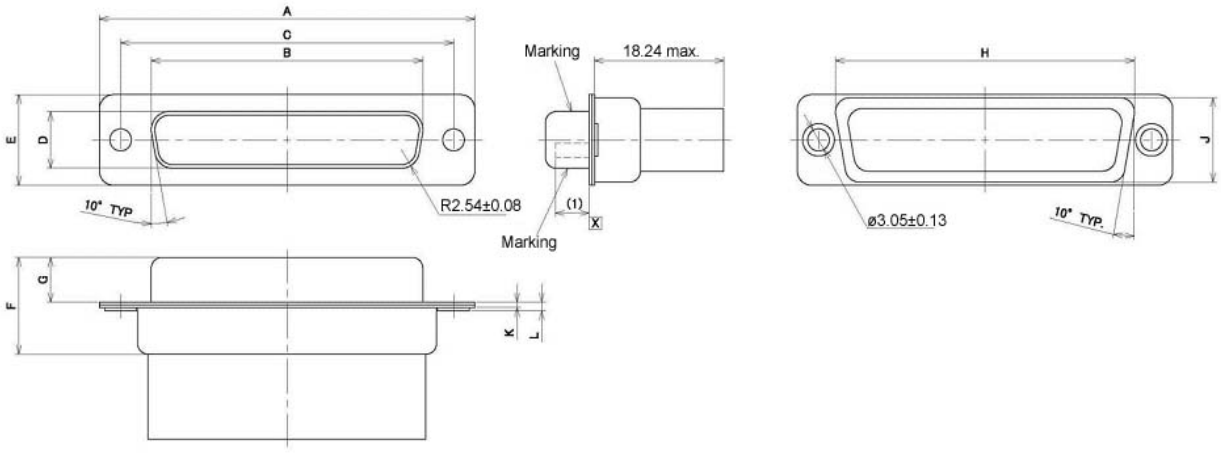
Part number	Contact arrangement	Physical dimensions										Mass (g)
		A	B	C	D	E	F	G	H	J	K	
		±0.38	±0.13	±0.13	–	±0.38	Maximum	±0.13	Maximum	Maximum	±0.25	Maximum
ND*14-15S-CR	15	30.81	16.33	24.99	7.85 ±0.18	12.55	14.95	6.17	20.19	11.68	0.76	6.37
ND*14-26S-CR	26	39.14	24.66	33.32					28.52			8.94
ND*14-44S-CR	44	53.04	38.38	47.04					42.24		0.99	13.24
ND*14-62S-CR	62	69.32	54.84	63.50					58.75			18.63
ND*14-78S-CR	78	66.93	52.43	61.11	10.74 ±0.13	15.37			56.31	14.50		22.13
ND*14-104S-CR	104	69.32	55.60	63.50	12.32 ±0.13	16.97			59.28	16.09		24.63

Notes:

1. When a square ended test pin of Φ0.75 to 0.77mm makes contact with the tip of a socket engagement end, the mating depth from the X plane shall be a minimum of 3.63mm.
2. Contact arrangement shall be as shown in Supplementary Figure D-1.
3. Physical dimensions of a crimp socket contact shall be as shown in Supplementary Figure D-15.
4. Looseness of the socket contact shall be within ±0.5mm in the radial and lateral directions.

Supplementary Figure D-5. Physical Dimensions for Connector, Standard Shell, Crimp Socket Contacts, Grommet Version (1/2) (Shell Material: Aluminum Alloy)

Unit: mm



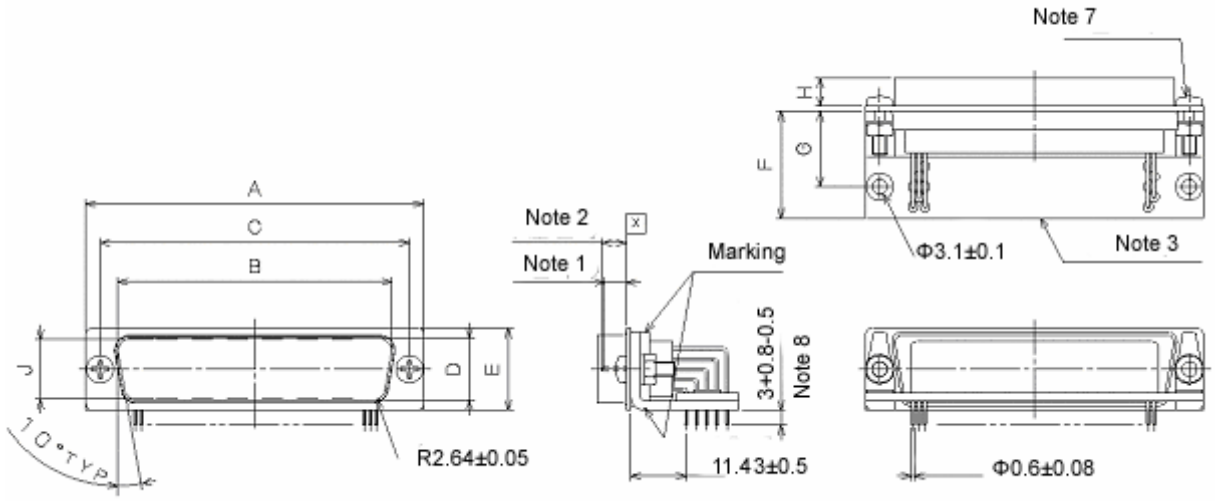
Part number	Contact arrangement	Physical dimensions											Mass (g)
		A	B	C	D	E	F	G	H	J	K	L	
		±0.38	±0.13	±0.13	-	±0.38	Maximum	±0.13	Maximum	Maximum	±0.25	±0.32	
ND*04-15S-C	15	30.81	16.33	24.99	7.85 ±0.18	12.55	16.63	6.17	20.19	11.68	0.76	1.21	7.1
ND*04-26S-C	26	39.14	24.66	33.32					28.52				9.5
ND*04-44S-C	44	53.04	38.38	47.04					42.24				14.3
ND*04-62S-C	62	69.32	54.84	63.50	10.74 ±0.13	15.37			58.75	14.50			20.3
ND*04-78S-C	78	66.93	52.43	61.11					56.31				24

Notes:

1. When a square ended test pin of Φ0.75 to 0.77mm makes contact with the tip of a socket engagement end, the mating depth from the X plane shall be a minimum of 3.63mm.
2. Contact arrangement shall be as shown in Supplementary Figure D-1.
3. Physical dimensions of a crimp socket contact shall be as shown in Supplementary Figure D-15.
4. Looseness of the socket contact shall be within ±0.5mm in the radial and lateral directions.

Supplementary Figure D-5. Physical Dimensions for Connector, Standard Shell, Crimp Socket Contacts, Grommet Version (2/2) (Shell Material: Brass)

Unit: mm



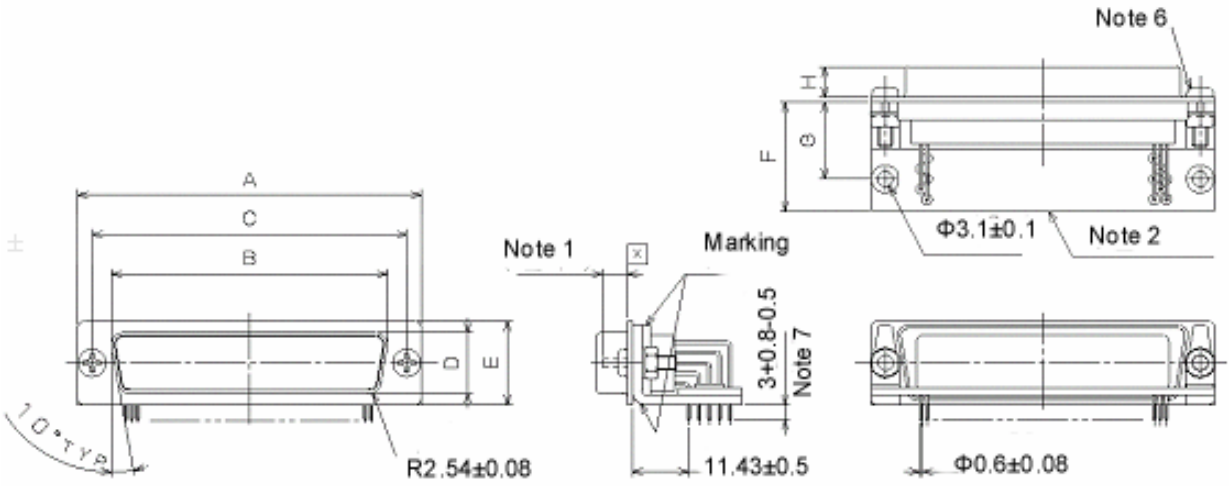
Part number	Contact arrangement	Physical dimensions									Mass (g)
		A	B	C	D	E	F	G	H	(J)	
		±0.38	±0.13	±0.13	±0.13	±0.38	Maximum	±0.38	±0.11	–	Maximum
ND*14-15P-A	15	30.81	16.92	24.99	8.36	12.55	19.18	13.82	5.93	7.73	10.64
ND*14-26P-A	26	39.14	25.25	33.32							13.72
ND*14-44P-A	44	53.04	38.96	47.04							18.96
ND*14-62P-A	62	69.32	55.42	63.50							24.68
ND*14-78P-A	78	66.93	52.81	61.11	11.20	15.37	20.45	15.39		10.57	29.37
ND*14-104P-A	104	69.32	56.19	63.50	12.78	16.97	22.53	15.60		12.15	35.94

Notes:

1. Length between the X plane and the inserted tip minus the spherical radius shall be a minimum of 4.17mm for 15- or 26-contact connectors and a minimum of 3.94mm for 44-, 62-, 78- or 104-contact connectors.
2. Length between the X plane and the engagement tip shall be a maximum of 5.59mm.
3. Bracket construction is not specified.
4. Contact arrangement shall be as shown in Supplementary Figure D-1.
5. Physical dimensions of a right angle pin contact shall be as specified in SSupplementary Figure D-16.
6. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.
7. The torque to fasten the screws is not specified.
8. If the size other than $3^{+0.8}_{-0.5}$ mm is required, it shall be specified in parentheses at the end of the part number. For example, size $5^{+0.8}_{-0.5}$ shall be indicated as ND*14-104P-A(5).
9. Mounting hole dimensions on a printed wiring board shall be as specified in Supplementary Figure D-20.

Supplementary Figure D-6. Physical Dimensions for Connector, Standard Shell, Right Angle Pin Contacts

Unit: mm



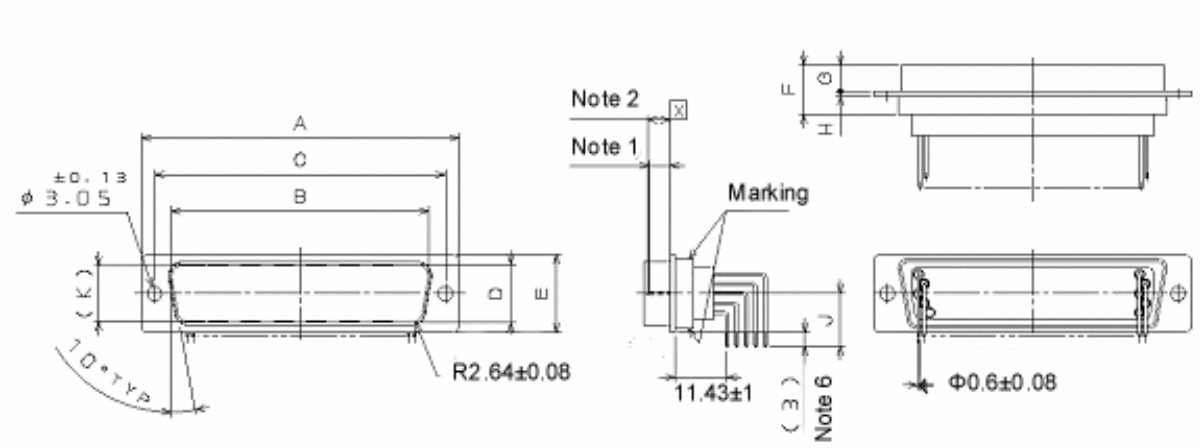
Part number	Contact arrangement	Physical dimensions								Mass (g)
		A	B	C	D	E	F	G	H	
		±0.38	±0.13	±0.13	–	±0.38	Maximum	±0.38	±0.13	Maximum
ND*14-15S-A	15	30.81	16.33	24.99	7.85 ±0.18	12.55	19.18	13.82	6.17	11.88
ND*14-26S-A	26	39.14	24.66	33.32						15.66
ND*14-44S-A	44	53.04	38.38	47.04						22.26
ND*14-62S-A	62	69.32	54.84	63.50						29.53
ND*14-78S-A	78	69.93	52.43	61.11	10.74 ±0.13	15.37	20.45	15.39		36.01
ND*14-104S-A	104	69.32	55.60	63.50	12.32 ±0.13	16.97	22.53	15.60		44.30

Notes:

1. When a square ended test pin of Φ0.75 to 0.77mm makes contact with the tip of a socket engagement end, the mating depth from the X plane shall be a minimum of 3.63mm.
2. Bracket construction is not specified.
3. Contact arrangement shall be as shown in Supplementary Figure D-1.
4. Physical dimensions of a right angle socket contact shall be as shown in Supplementary Figure D-17.
5. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.
6. The torque to fasten the screws is not specified.
7. If the size other than $3^{+0.8}_{-0.5}$ mm is required, it shall be specified in parentheses at the end of the part number. For example, size $5^{+0.8}_{-0.5}$ shall be indicated as ND*14-104S-A(5).
8. Mounting hole dimensions on a printed wiring board shall be as specified in Supplementary Figure D-20.

Supplementary Figure D-7. Physical Dimensions for Connector, Standard Shell, Right Angle Socket Contacts

Unit: mm



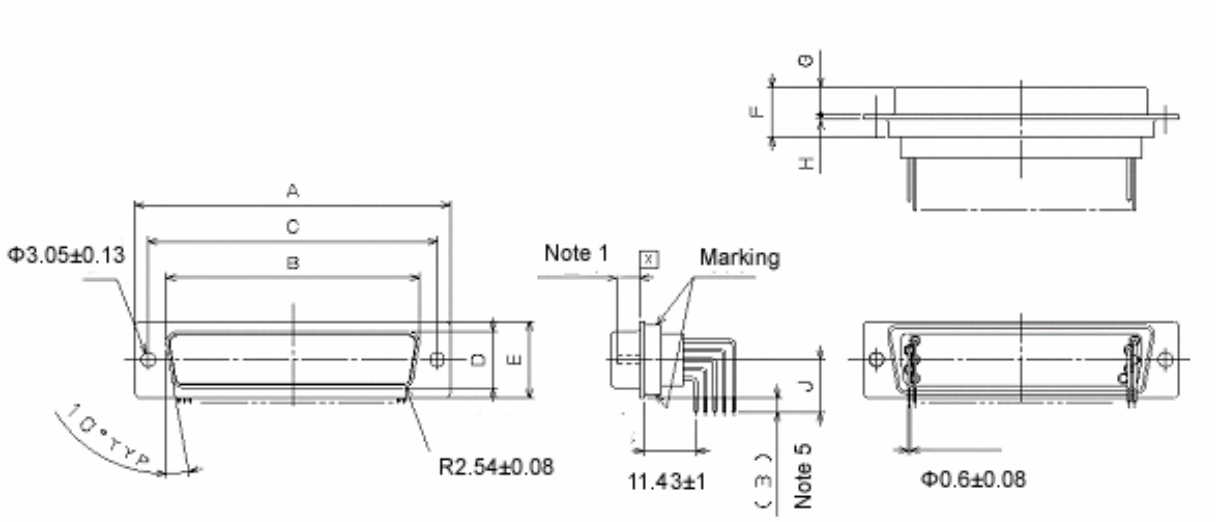
Part number	Contact arrangement	Physical dimensions										Mass (g)
		A	B	C	D	E	F	G	H	J	(K)	
		±0.38	±0.13	±0.13	±0.13	±0.38	Maximum	±0.11	±0.25	+0.8 -0.5	–	Maximum
ND*14-15P-AB	15	30.81	16.92	24.99	8.36	12.55	14.79	5.93	0.76	9.28	7.73	5.55
ND*14-26P-AB	26	39.14	25.25	33.32								8.39
ND*14-44P-AB	44	53.04	38.96	47.04					0.99			13.22
ND*14-62P-AB	62	69.32	55.42	63.50								18.47
ND*14-78P-AB	78	66.93	52.81	61.11	11.20	15.37				10.69	10.57	22.78
ND*14-104P-AB	104	69.32	56.19	63.50	12.78	16.97				11.49	12.15	28.68

Notes:

1. Length between the X plane and the inserted tip minus the spherical radius shall be a minimum of 4.17mm for 15- or 26-contact connectors and a minimum of 3.94mm for 44-, 62-, 78- or 104-contact connectors.
2. Length between the X plane and the engagement tip shall be a maximum of 5.59mm.
3. Contact arrangement shall be as shown in Supplementary Figure D-1.
4. Physical dimensions of a right angle pin contact shall be as shown in SSupplementary Figure D-16.
5. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.
6. If the size other than 3mm is required, it shall be specified in parentheses at the end of the part number. For example, size 5 shall be indicated as ND*14-104P-AB(5).
7. Mounting hole dimensions on a printed wiring board shall be as specified in Supplementary Figure D-20. Through hole contacts shall be adjusted for the correct array by using a jig fixture and then the connector shall be mounted on a printed wiring board.

Supplementary Figure D-8. Physical Dimensions for Connector, Standard Shell, Right Angle Pin Contacts without Location Plate

Unit: mm



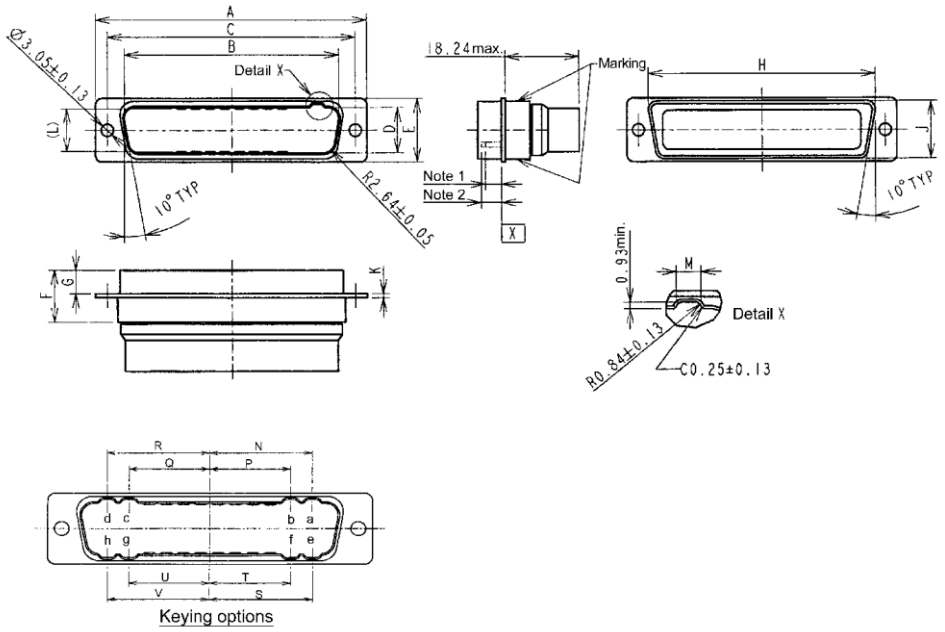
Part number	Contact arrangement	Physical dimensions									Mass (g)
		A	B	C	D	E	F	G	H	J	
		±0.38	±0.13	±0.13	±0.13	±0.38	Maximum	±0.13	±0.25	+0.8 -0.5	Maximum
ND*14-15S-AB	15	30.81	16.33	24.99	7.90	12.55	14.95	6.17	0.76	9.28	6.79
ND*14-26S-AB	26	39.14	24.66	33.32							10.32
ND*14-44S-AB	44	53.04	38.38	47.04					0.99		16.53
ND*14-62S-AB	62	69.32	54.84	63.50							23.32
ND*14-78S-AB	78	66.93	52.43	61.11	10.74	15.37				10.69	29.64
ND*14-104S-AB	104	69.32	55.60	63.50	12.32	16.97				11.49	36.98

Notes:

1. When a square ended test pin of Φ0.75 to 0.77mm makes contact with the tip of a socket engagement end, the mating depth from the X plane shall be a minimum of 3.63mm.
2. Contact arrangement shall be as shown in Supplementary Figure D-1.
3. Physical dimensions of a right angle socket contact shall be as shown in Supplementary Figure D-17.
4. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.
5. If the size other than 3mm is required, it shall be specified in parentheses at the end of the part number. For example, size 5 shall be indicated as ND*14-104S-AB(5).
6. Mounting hole dimensions on a printed wiring board shall be as specified in Supplementary Figure D-20. Through hole contacts shall be adjusted for the correct array by using a jig fixture and then the connector shall be mounted on a printed wiring board.

Supplementary Figure D-9. Physical Dimensions for Connector, Standard Shell, Right Angle Socket Contacts without Location Plate

Unit: mm



Supplementary Figure D-10. Physical Dimensions for Connector, Polarized Shell, Crimp Pin Contacts (1/2)

Unit: mm

Part number	Contact arrangement	Physical dimensions												Mass (g)
		A	B	C	D	E	F	G	H	J	K	L (note 6)	M	
		±0.38	±0.13	±0.13	±0.13	±0.38	Maximum	±0.11	±0.25	Maximum	±0.25	–	±0.2	Maximum
ND*14-15P-C-*	15	30.81	16.92	24.99	8.36	12.55	14.79	5.93	20.19	11.68	0.76	7.72	1.96	4.54
ND*14-26P-C-*	26	39.14	25.25	33.32					28.52					6.22
ND*14-44P-C-*	44	53.04	38.96	47.04					42.24		0.99		3.18	8.94
ND*14-62P-C-*	62	69.32	55.42	63.50					58.75					12.46
ND*14-78P-C-*	78	66.93	52.81	61.11	11.20	15.37			56.31	14.50		10.57		13.76
ND*14-104P-C-*	104	69.32	56.18	63.50	12.78	16.97			59.28	16.09		12.15		17.61

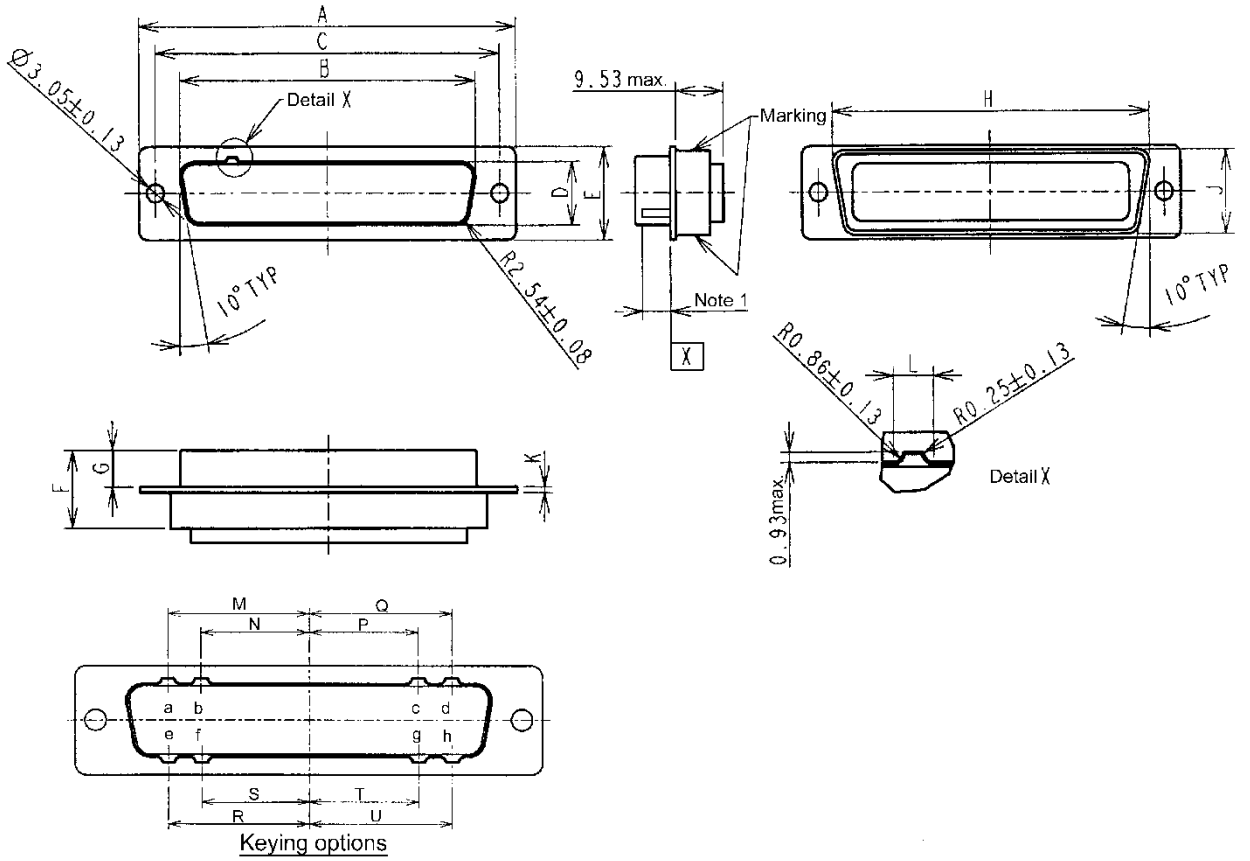
Part number	Contact arrangement	Keying options							
		a	b	c	d	e	f	g	h
		Physical dimensions							
		N	P	Q	R	S	T	U	V
		±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1
ND*14-15P-C-*	15	3.89	–	–	3.89	–	–	–	–
ND*14-26P-C-*	26	8.26	7.06	–	–	–	–	7.06	7.70
ND*14-44P-C-*	44	14.50	11.23	11.23	14.50	13.94	11.23	11.23	13.94
ND*14-62P-C-*	62	22.58	18.49	–	–	–	–	18.31	22.20
ND*14-78P-C-*	78	21.11	16.87	16.87	21.11	20.42	16.51	16.51	20.42
ND*14-104P-C-*	104	23.11	20.12	–	–	–	–	20.12	21.77

Notes:

1. Length between the X plane and the engagement tip minus the spherical radius shall be a minimum of 4.17mm for 15- or 26-contact connectors and a minimum of 3.94mm for 44-, 62-, 78- or 104-contact connectors.
2. Length between the X plane and the engagement tip shall be a maximum of 5.59mm.
3. Contact arrangement shall be as shown in Supplementary Figure D-1.
4. For physical dimensions of a crimp pin contact shall be as shown in Supplementary Figure D-14.
5. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.
6. Dimple dimension “L” may not be specified.

Supplementary Figure D-10. Physical Dimensions for Connector, Polarized Shell, Crimp Pin Contacts (2/2)

Unit: mm



Supplementary Figure D-11. Physical Dimensions for Connector, Polarized Shell, Crimp Socket Contacts (1/2)

Unit: mm

Part number	Contact arrangement	Physical dimensions											Mass (g)
		A	B	C	D	E	F	G	H	J	K	L	
		±0.38	±0.13	±0.13	–	±0.38	Maximum	±0.13	Maximum	Maximum	±0.25	±0.2	Maximum
ND*14-15S-C-*	15	30.81	16.33	24.99	7.85 ±0.18	12.55	14.95	6.17	20.19	11.68	0.76	2.59	4.83
ND*14-26S-C-*	26	39.14	24.66	33.32					28.52				6.68
ND*14-44S-C-*	44	53.04	38.38	47.04					42.24		0.99	3.56	9.81
ND*14-62S-C-*	62	69.32	54.84	63.50					58.75				13.72
ND*14-78S-C-*	78	66.93	52.43	61.11	10.74 ±0.13	15.37			56.31	14.50			16.52
ND*14-104S-C-*	104	69.32	55.60	63.50	12.32 ±0.13	16.97			59.28	16.09			17.97

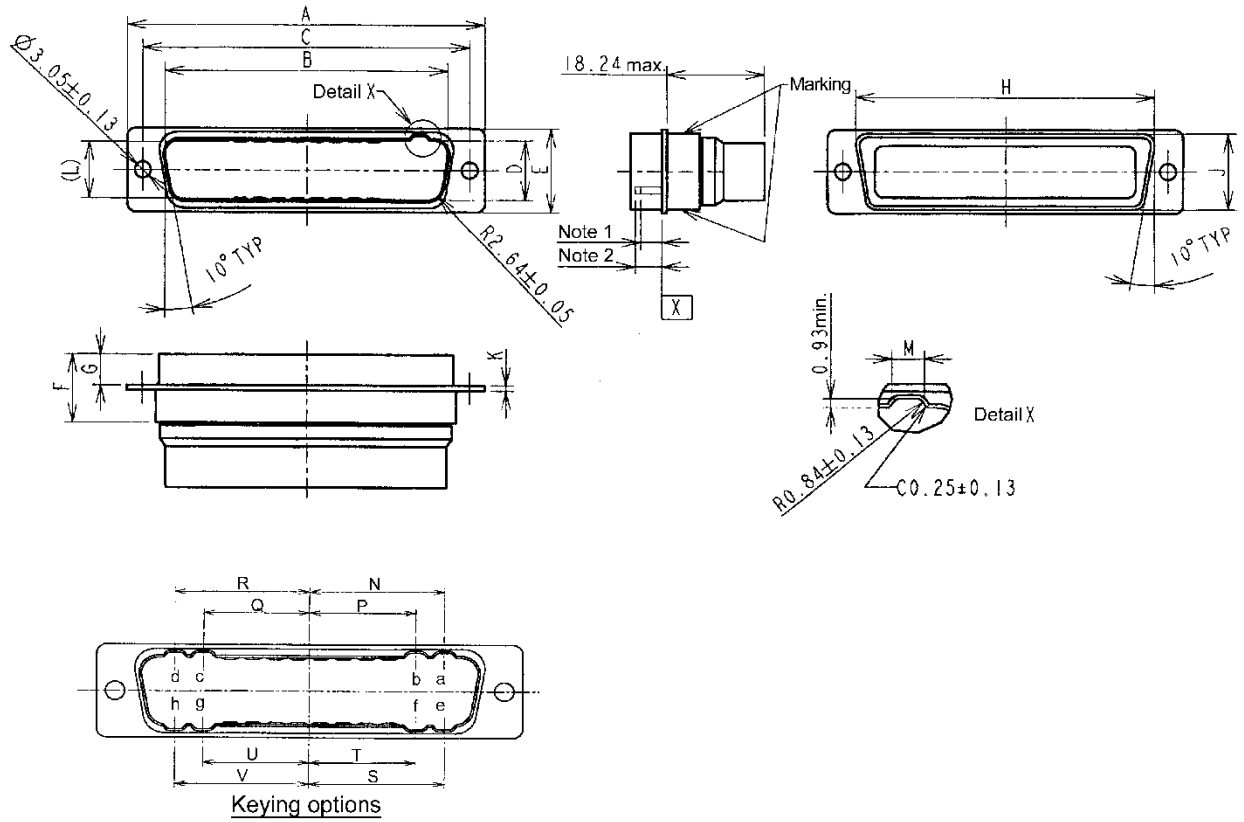
Part number	Contact arrangement	Keying options							
		a	b	c	d	e	f	g	h
		Physical dimensions							
		M	N	P	Q	R	S	T	U
		±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1
ND*14-15S-C-*	15	3.89	–	–	3.89	–	–	–	–
ND*14-26S-C-*	26	8.26	7.06	–-	–	–	–	7.06	7.70
ND*14-44S-C-*	44	14.50	11.23	11.23	14.50	13.94	11.23	11.23	13.94
ND*14-62S-C-*	62	22.58	18.49	–	–	–-	–	18.31	22.20
ND*14-78S-C-*	78	21.11	16.87	16.87	21.11	20.42	16.51	16.51	20.42
ND*14-104S-C-*	104	23.11	20.12	–	–	–	–	20.12	21.77

Notes:

1. When a square ended test pin of Φ0.75 to 0.77mm makes contact with the tip of a socket engagement end, the mating depth from the X plane shall be a minimum of 3.63mm.
2. Contact arrangement shall be as shown in Supplementary Figure D-1.
3. Physical dimensions of a crimp socket contact shall be as shown in Supplementary Figure D-15.
4. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.

Supplementary Figure D-11. Physical Dimensions for Connector, Polarized Shell, Crimp Socket Contacts (2/2)

Unit: mm



Supplementary Figure D-12. Physical Dimensions for Connector, Polarized Shell, Crimp Pin Contacts, Grommet Version (1/2)

Unit: mm

Part number	Contact arrangement	Physical dimensions												Mass (g)
		A	B	C	D	E	F	G	H	J	K	L (note 6)	M	
		±0.38	±0.13	±0.13	±0.13	±0.38	Maximum	±0.11	±0.25	Maximum	±0.25	–	±0.2	Maximum
ND*14-15P-CR-*	15	30.81	16.92	24.99	8.36	12.55	14.79	5.93	20.19	11.68	0.76	7.72	1.96	3.93
ND*14-26P-CR-*	26	39.14	25.25	33.32					28.52					5.34
ND*14-44P-CR-*	44	53.04	38.96	47.04					42.24		0.99		3.18	7.69
ND*14-62P-CR-*	62	69.32	55.42	63.50					58.75					10.74
ND*14-78P-CR-*	78	66.93	52.81	61.11	11.20	15.37			56.31	14.50		10.57		12.12
ND*14-104P-CR-*	104	69.32	56.18	63.50	12.78	16.97			59.28	16.09		12.15		13.55

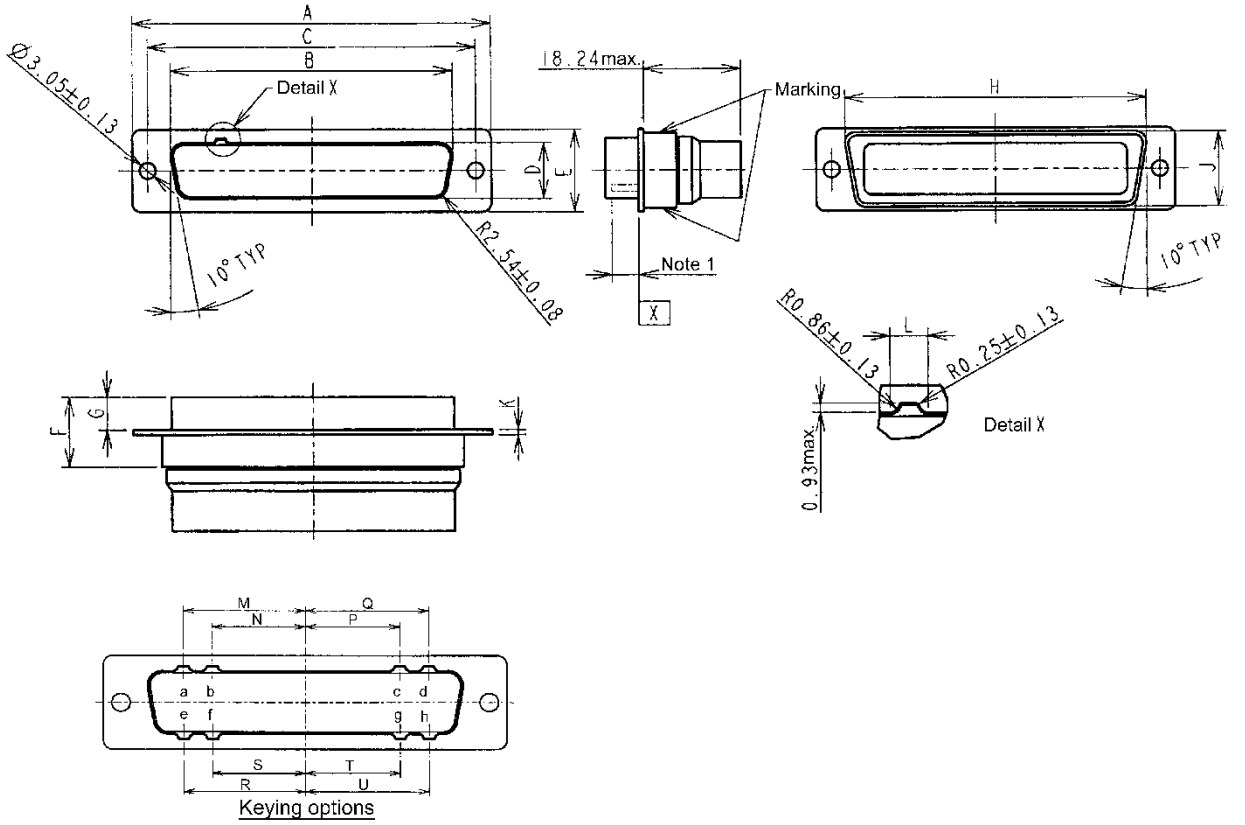
Part number	Contact arrangement	Keying options							
		a	b	c	d	e	f	g	h
		Physical dimensions							
		N	P	Q	R	S	T	U	V
		±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1
ND*14-15P-CR-*	15	3.89	–	–	3.89	–	–	–	–
ND*14-26P-CR-*	26	8.26	7.06	–	–	–	–	7.06	7.70
ND*14-44P-CR-*	44	14.50	11.23	11.23	14.50	13.94	11.23	11.23	13.94
ND*14-62P-CR-*	62	22.58	18.49	–	–	–	–	18.31	22.20
ND*14-78P-CR-*	78	21.11	16.87	16.87	21.11	20.42	16.51	16.51	20.42
ND*14-104P-CR-*	104	23.11	20.12	–	–	–	–	20.12	21.77

Notes:

1. Length between the X plane and the engagement tip minus the spherical radius shall be a minimum of 4.17mm for 15- or 26-contact connectors and a minimum of 3.94mm for 44-, 62-, 78- or 104-contact connectors.
2. Length between the X plane and the engagement tip shall be a maximum of 5.59mm.
3. Contact arrangement shall be as shown in Supplementary Figure D-1.
4. Physical dimensions of a crimp pin contact shall be as shown in Supplementary Figure D-14.
5. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.
6. Dimple dimension “L” may not be specified.

Supplementary Figure D-12. Physical Dimensions for Connector, Polarized Shell, Crimp Pin Contacts, Grommet Version (2/2)

Unit: mm



Supplementary Figure D-13. Physical Dimensions for Connector, Polarized Shell, Crimp Socket Contacts, Grommet Version (1/2)

Unit: mm

Part number	Contact arrangement	Physical dimensions											Mass (g)
		A	B	C	D	E	F	G	H	J	K	L	
		±0.38	±0.13	±0.13	–	±0.38	Maximum	±0.13	Maximum	Maximum	±0.25	±0.2	Maximum
ND*14-15S-CR-*	15	30.81	16.33	24.99	7.85 ±0.18	12.55	14.95	6.17	20.19	11.68	0.76	2.59	6.39
ND*14-26S-CR-*	26	39.14	24.66	33.32					28.52				8.95
ND*14-44S-CR-*	44	53.04	38.38	47.04					42.24		0.99	3.56	13.28
ND*14-62S-CR-*	62	69.32	54.84	63.50					58.75				18.67
ND*14-78S-CR-*	78	66.93	52.43	61.11	10.74 ±0.13	15.37			56.31	14.50			22.17
ND*14-104S-CR-*	104	69.32	55.60	63.50	12.32 ±0.13	16.97			59.28	16.09			24.56

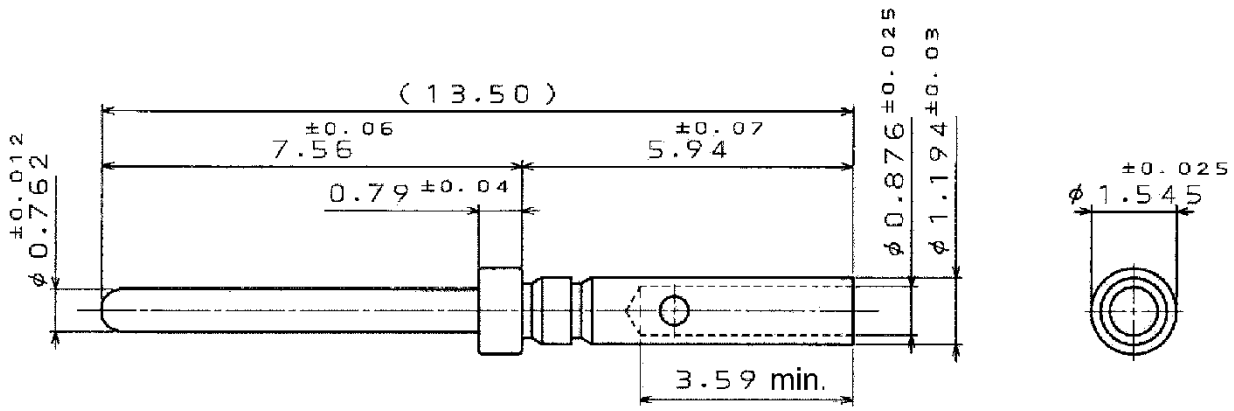
Part number	Contact arrangement	Keying options							
		a	b	c	d	e	f	g	h
		Physical dimensions							
		M	N	P	Q	R	S	T	U
		±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1
ND*14-15S-CR-*	15	3.89	–	–	3.89	–	–	–	–
ND*14-26S-CR-*	26	8.26	7.06	–	–	–	–	7.06	7.70
ND*14-44S-CR-*	44	14.50	11.23	11.23	14.50	13.94	11.23	11.23	13.94
ND*14-62S-CR-*	62	22.58	18.49	–	–	–	–	18.31	22.20
ND*14-78S-CR-*	78	21.11	16.87	16.87	21.11	20.42	16.51	16.51	20.42
ND*14-104S-CR-*	104	23.11	20.12	–	–	–	–	20.12	21.77

Notes:

1. When a square ended test pin of Φ0.75 to 0.77mm makes contact with the tip of a socket insertion end, the mating depth from the X plane shall be a minimum of 3.63mm.
2. Contact arrangement shall be as shown in Supplementary Figure D-1.
3. Physical dimensions of a crimp socket contact shall be as specified in Supplementary Figure D-15.
4. Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.

Supplementary Figure D-13. Physical Dimensions for Connector, Polarized Shell, Crimp Socket Contacts, Grommet Version (2/2)

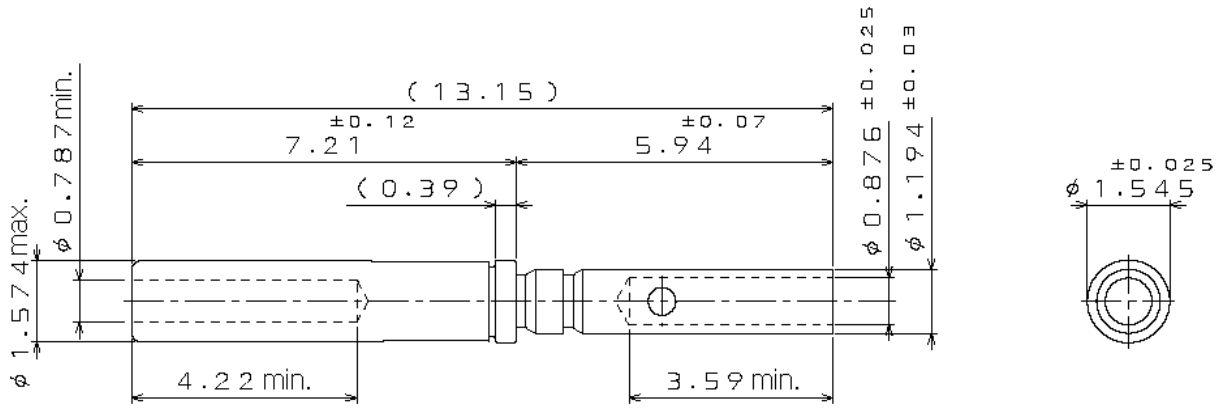
Unit: mm



Part number	Contact size	Mass (g) ±10%
ND*04-P-22D	22D	0.078

Supplementary Figure D-14. Physical Dimensions for Crimp Pin Contact

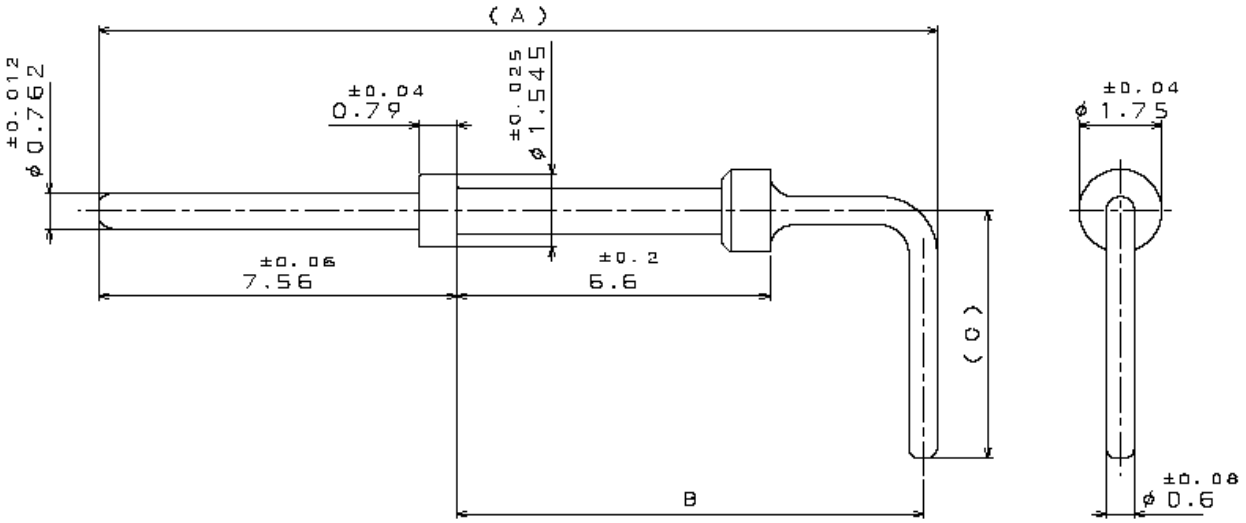
Unit: mm



Part number	Contact size	Mass (g) ±10%
ND*04-S-22D	22D	0.105

Supplementary Figure D-15. Physical Dimensions for Crimp Socket Contact

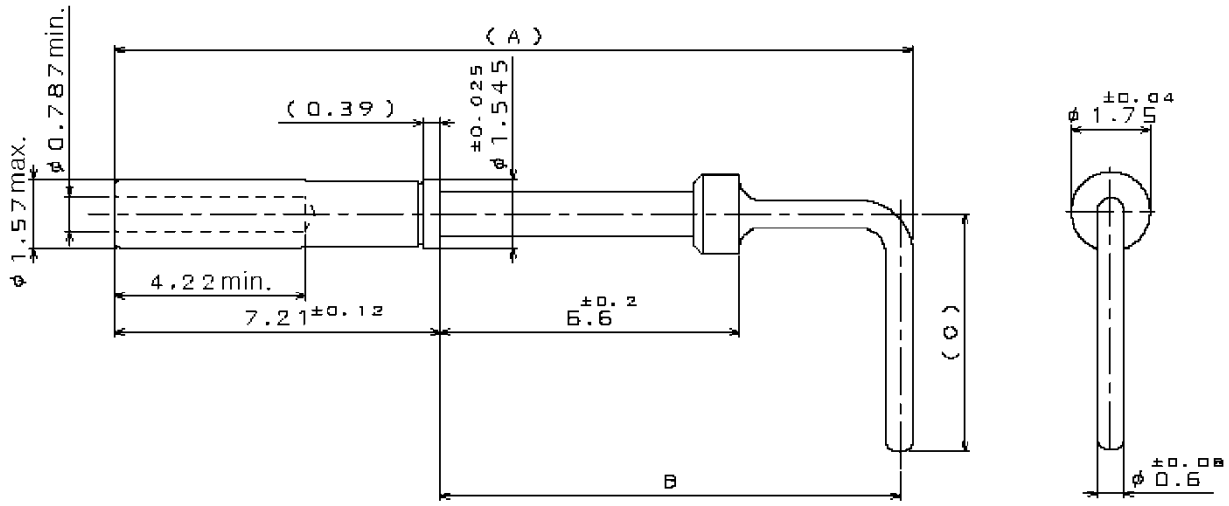
Unit: mm



Part number	Physical dimensions			Mass (g) (reference)	Remark
	A (reference)	B ± 0.8	C (reference)		
ND*-04-P-A1	17.99	10.13	7.58	0.116	First row
ND*-04-P-A2A	19.97	12.11	9.56	0.124	Second row of 15-, 26-, 44- or 62-contact arrangement
ND*-04-P-A2B	19.97	12.21	9.66	0.124	Second row of 78- or 104-contact arrangement
ND*-04-P-A3A	21.95	14.09	11.54	0.131	Third row of 15-, 26-, 44- or 62-contact arrangement
ND*-04-P-A3B	21.95	14.29	11.76	0.131	Third row of 78- or 104-contact arrangement
ND*-04-P-A4	24.24	16.37	13.82	0.139	Fourth row
ND*-04-P-A5	26.32	18.46	15.91	0.149	Fifth row

SSupplementary Figure D-16. Physical Dimensions for Right Angle Pin Contact

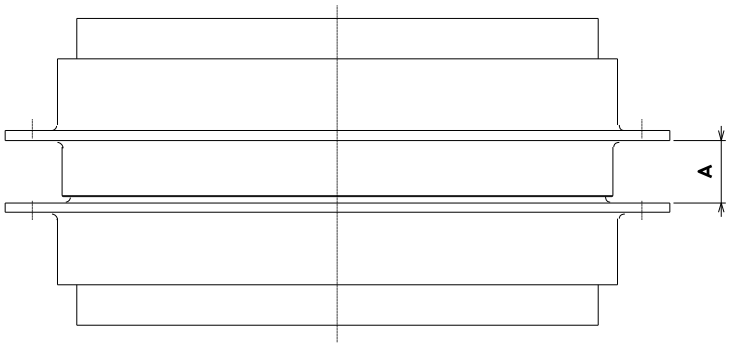
Unit: mm



Part number	Physical dimensions			Mass (g) (reference)	Remark
	A (reference)	B □ 0.8	C (reference)		
ND*-04-S-A1	17.64	10.13	7.58	0.149	First row
ND*-04-S-A2A	19.62	12.11	9.56	0.159	Second row of 15-, 26-, 44- or 62-contact arrangement
ND*-04-S-A2B	19.72	12.21	9.66	0.159	Second row of 78- or 104-contact arrangement
ND*-04-S-A3A	21.60	14.09	11.54	0.166	Third row of 15-, 26-, 44- or 62-contact arrangement
ND*-04-S-A3B	21.81	14.29	11.76	0.166	Third row of 78- or 104-contact arrangement
ND*-04-S-A4	23.89	16.37	13.82	0.174	Fourth row
ND*-04-S-A5	25.97	18.46	15.91	0.184	Fifth row

Supplementary Figure D-17. Physical Dimensions for Right Angle Socket Contact

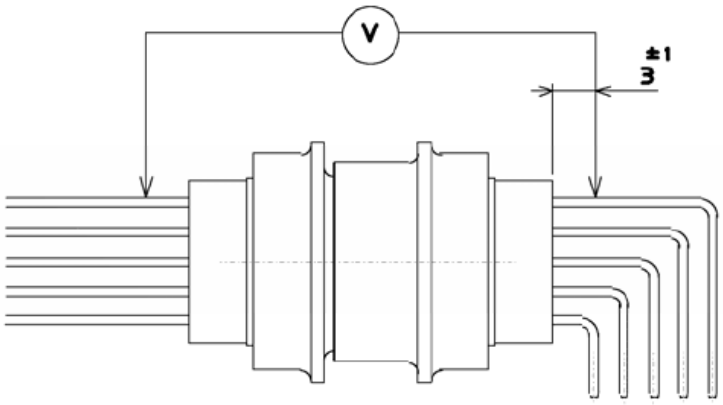
Unit: mm



The distance (A) between flanges of the mated plug and receptacle shall be as follows.
15- or 26-contact connector: 6.73±0.38mm
44-, 62-, 78- or 104-contact connector: 6.50±0.38mm

Supplementary Figure D-18. Distance between Flanges

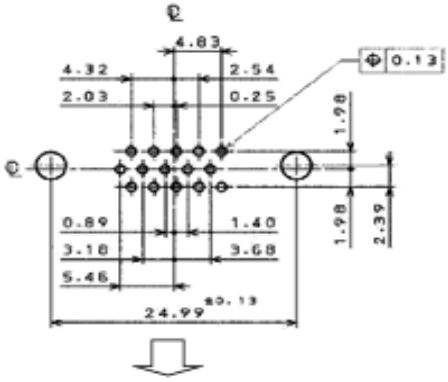
Unit: mm



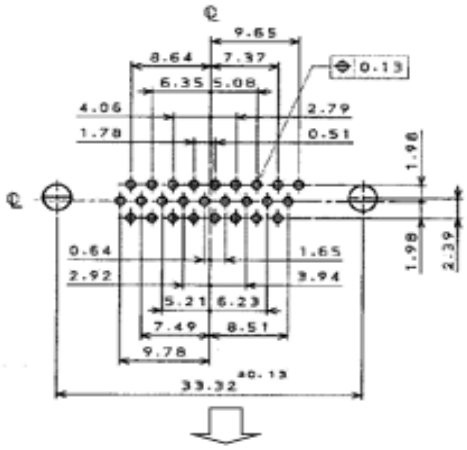
Right angle through hole contact connector

Supplementary Figure D-19. Test points for Contact Resistance

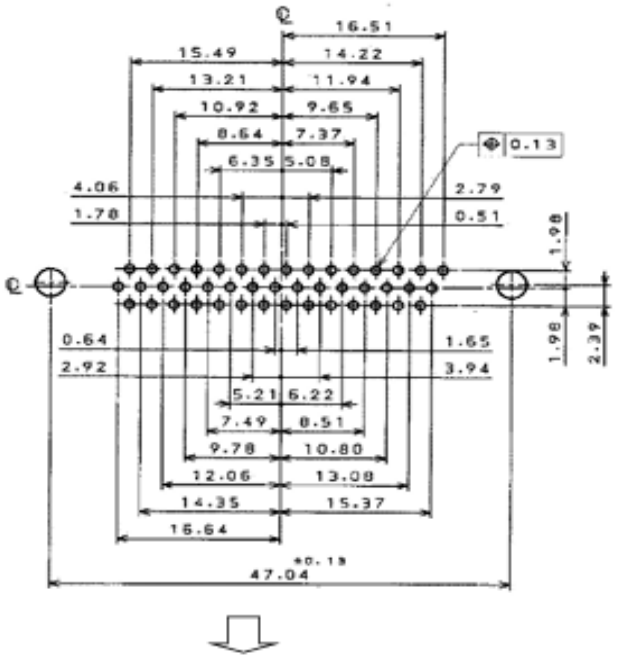
Unit: mm



15 contacts (PIN)



26 contacts (PIN)



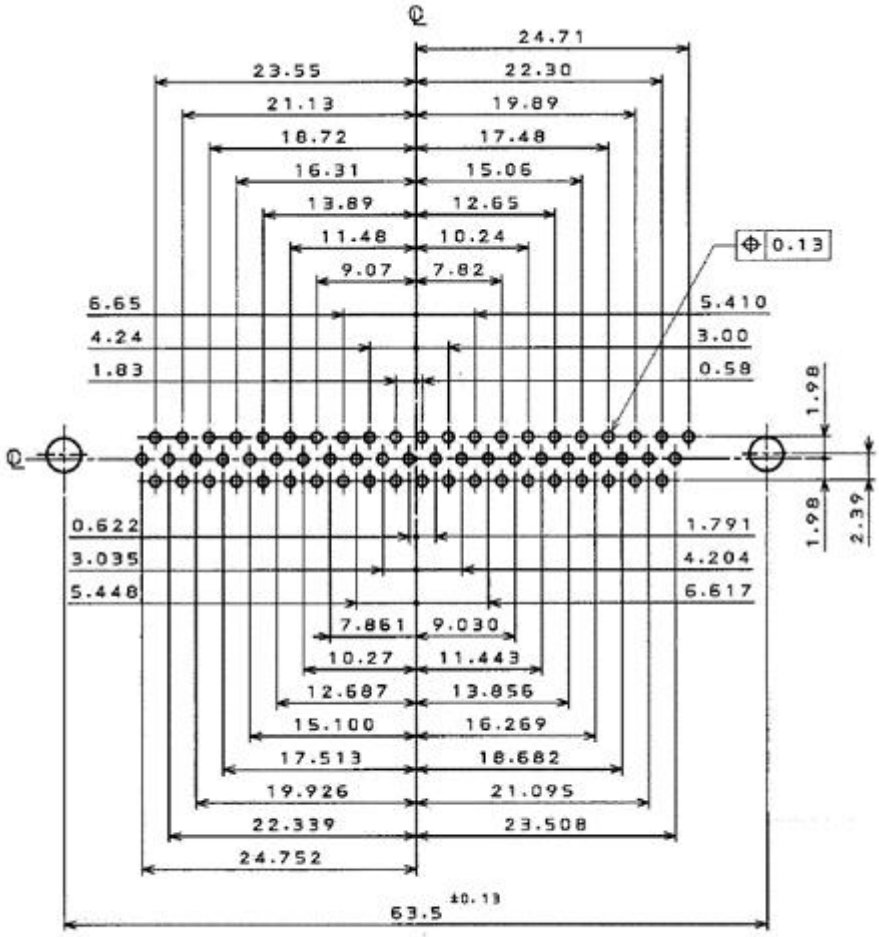
44 contacts (PIN)

Notes:

1. Hole diameters are not specified.
2. Arrow shows the mating direction.
3. Pin connector arrangement is viewed from the mounting surface.
4. Left and right positions of holes are reversed for socket contacts.

Supplementary Figure D-20. Dimensions of Mounting Holes on Printed Wiring Board (1/4)

Unit: mm



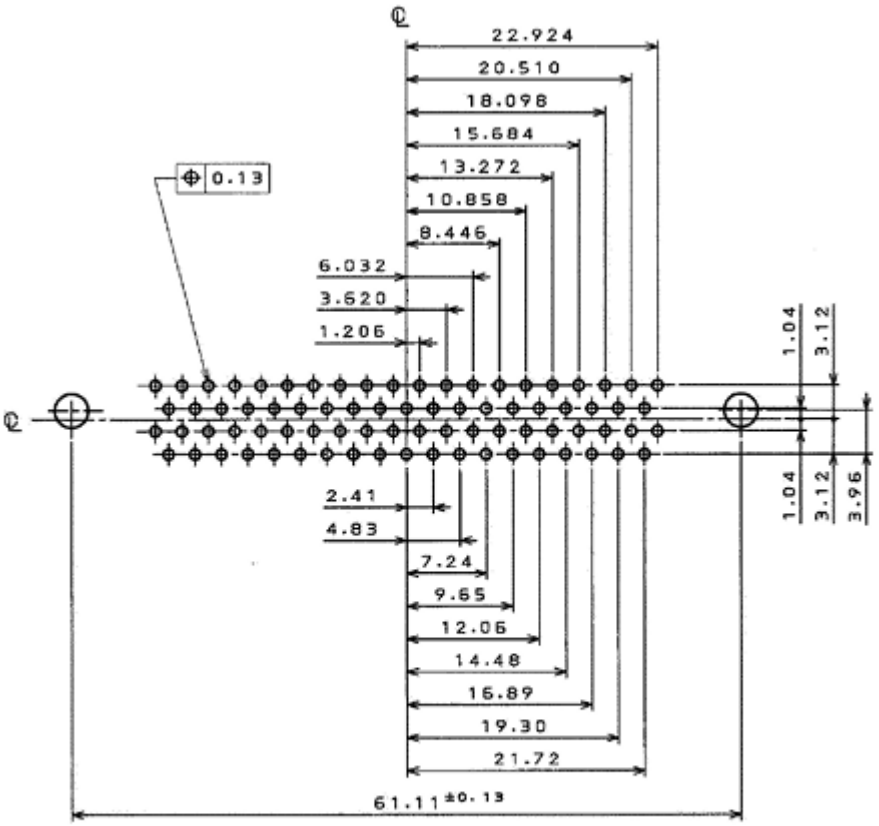
62 contacts (PIN)

Notes:

1. Hole diameters are not specified.
2. Arrow shows the mating direction.
3. Pin connector arrangement is viewed from the mounting surface.
4. Left and right positions of holes are reversed for socket contacts.

Supplementary Figure D-20. Dimensions of Mounting Holes on Printed Wiring Board (2/4)

Unit: mm

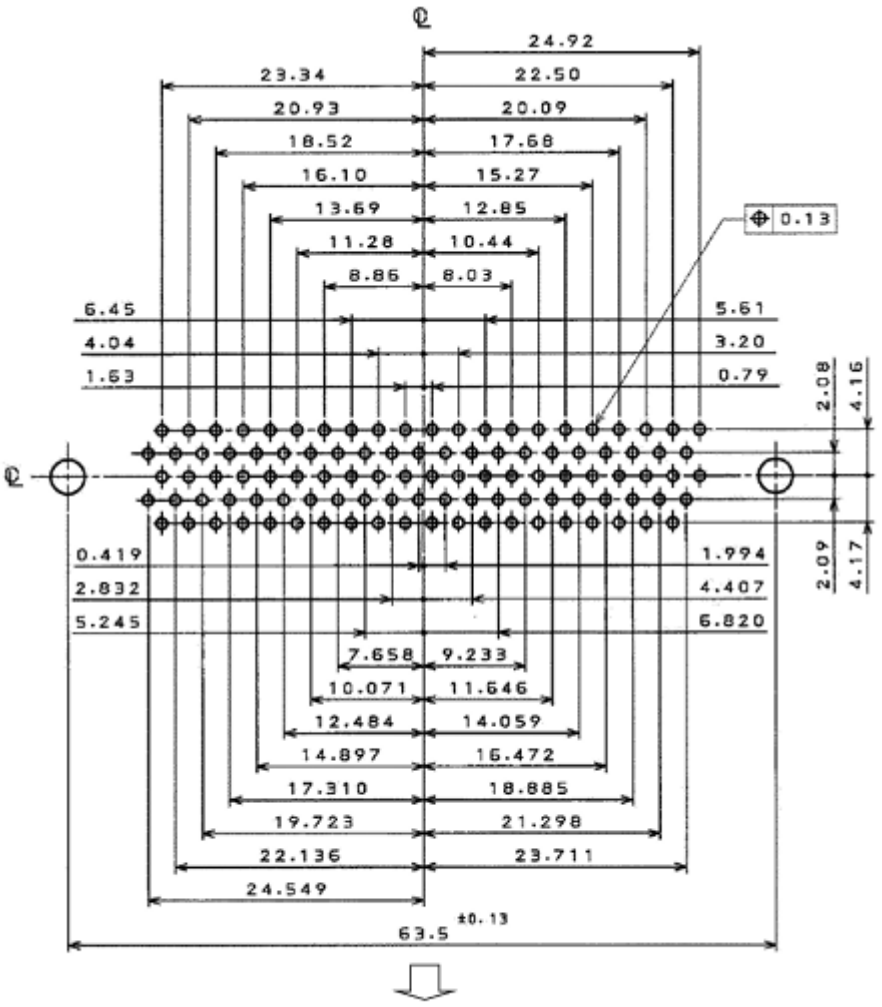


Notes:

1. Hole diameters are not specified.
2. Arrow shows the mating direction.
3. Pin connector arrangement is viewed from the mounting surface.
4. Left and right positions of holes are reversed for socket contacts.

Supplementary Figure D-20. Dimensions of Mounting Holes on Printed Wiring Board (3/4)

Unit: mm



104 contacts (PIN)

Notes:

1. Hole diameters are not specified.
2. Arrow shows the mating direction of connectors.
3. Pin connector arrangement is viewed from the mounting surface.
4. Left and right positions of holes are reversed for socket contacts.

Supplementary Figure D-20. Dimensions of Mounting Holes on Printed Wiring Board (4/4)

APPENDIX E

ACCESSORIES FOR RECTANGULAR CONNECTORS

This document is the English version of JAXA QTS/ADS which was originally written and authorized in Japanese and carefully translated into English for international users. If any question arises as to the context or detailed description, it is strongly recommended to verify against the latest official Japanese version.

The release date of the English version of this specification: 25 March 2026

APPENDIX E

ACCESSORIES FOR RECTANGULAR CONNECTORS

E.1 General

E.1.1 Scope

This appendix establishes the general requirements and quality assurance provisions for accessories for miniature, rectangular connectors, high density miniature rectangular connectors, and composite miniature rectangular connectors (hereinafter referred to as "accessories").

E.1.2 Part Number

The part number shall be as indicated as follows. The details shall be as specified in the detail specification.

(Example for Screw Lock)

N ([1]) D 102 SL M 1

- Size (E.1.2.5)
- Accessory style (E.1.2.4)
- Accessory type (E.1.2.3)
- Identification number (E.1.2.2)
- Connector type (E.1.2.1)

Note: ([1]) "N" indicates the part is for space use.

E.1.2.1 Connector Type

The connector type is identified by a single capital letter, “D”, denoting a “D-sub connector”.

E.1.2.2 Identification Number

The identification number is identified by a three-digit number, and indicated as follows.

(Example)

1 02

- 02: Series: “02” indicates that the connector conforms to this appendix.
- 1: Manufacturer

E.1.2.3 Accessory Type

The accessory type is identified by a two capital letters. “SL” denotes screw lock.

E.1.2.4 Accessory Style

The accessory style is identified by a capital single letter. “M” indicates male screw lock and “F” indicates female screw lock.

E.1.2.5 Size

The size of accessories is identified by one-digit number (Supplementary Figure E-1.)

E.2 Applicable Documents

E.2.1 Applicable Documents

The applicable documents of this appendix shall be as specified in paragraph 2.1 in this appendix.

E.2.2 Reference Documents

The following document is a reference document in this appendix.

a) MIL-DTL-24308K Connectors, Electric, Rectangular, Nonenvironmental, Miniature, Polarized Shell, Rack and Panel, General Specification For

E.3 Requirements

E.3.1 Certification

E.3.1.1 Qualification Coverage

The qualification coverage is limited to accessories produced by the manufacturing line that conforms to materials, designs, constructions, ratings, and performance specified in paragraphs E.3.2 thorough E.3.6. The qualification coverage shall be fully represented by samples that have passed the qualification test. Within this coverage, the manufacturer is allowed to supply qualified products in accordance with the detail specification.
If necessary, additional qualification coverage shall be specified in the detail specification.

E.3.2 Materials

The materials used for accessories shall be as follows and as specified in paragraph 3.3.

E.3.2.1 Dissimilar Metals

When dissimilar metals are used in contact generating an electrical potential, protection against galvanic corrosion shall be provided in accordance with Guideline 16 of MIL-HDBK-454.

E.3.2.2 Nonmagnetic Materials

When tested as specified in paragraph E.4.3.2.1, residual magnetization of all materials and surface treatments used for accessories shall be 200nT or less.

E.3.2.3 Sublimation

Zinc or cadmium alloys, or zinc- or cadmium-plating shall not be used to prevent hazardous gas release which occurs when these materials evaporate in high vacuum and high temperature environments.

E.3.2.4 Metallic Materials

Metallic materials used for accessories shall be mechanically high-quality brass or equivalent materials.

E.3.2.5 Surface Finish

Accessories shall be plated with a gold layer of a minimum of 0.5μm in thickness in accordance with ASTM B 488 or SAE-AMS 2422, over copper flash plating specified in SAE-AMS 2418. The applicable plating standard shall be specified in the detail specification.

E.3.3 Externals, Dimensions and Marking

Accessories shall have externals, construction, dimensions, and mass which are capable to withstand normal handlings such as those for mounting, operation, and maintenance. See Supplementary Figures E-1 and E-2 for details.

E.3.3.1 Externals

There shall be no dirt, crazing, chips, flaws, deformations, discolorations, corrosions, or other defects which will adversely affect the accessories' performance.

E.3.3.2 Construction, Dimensions and Mass

Construction, dimensions and mass shall satisfy the Supplementary Figures E-1 and E-2, and requirements of this appendix.

E.3.3.3 Interchangeability

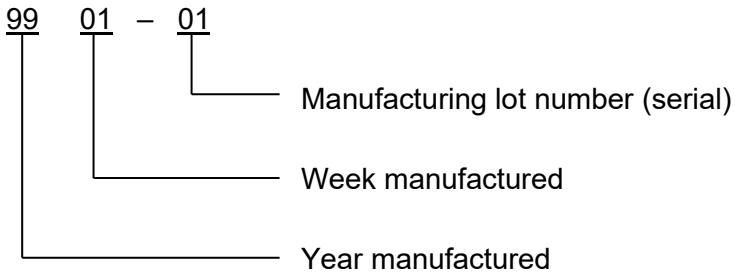
Accessories shall be interchangeable with any suitable connectors in any combination.

E.3.3.4 Marking

The following items shall be marked on a tag attached on a package bag.

a) Manufacturer's name or its abbreviation
b) Part number (paragraph E.1.2)
c) Year and week manufactured and production lot number

(Example)



Notes:

(1) Unless otherwise specified, year and week manufactured shall be the year and week when the final assembly is completed.

(2) Production lot number identifies the lots of the same part number manufactured in a week. When only one lot is manufactured in a week, the manufacturing lot number shall be “01”.

E.3.4 Workmanship

Accessories shall be based on a good design, manufactured and processed in a manner to assure a uniform quality as specified in the quality assurance program defined in paragraph 3.2.1. In addition, accessories shall be free of crazing, holes, chips, sharp edges, or burrs that will degrade electrical, mechanical, or physical performance.

E.3.5 Mechanical Performance

Accessories shall meet the following requirements.

E.3.5.1 Screw Tensil Strength

When tested as specified in paragraph E.4.3.4.1, accessories shall not be damaged with a tensile strength of 196N {20kgf}.

E.3.5.2 Torque Value for Screws

When tested as specified in paragraph E.4.3.4.2, accessories shall not be damaged with a torque of 49N·cm {5kgf·cm}.

E.3.6 Environmental Performance

Accessories shall meet the following requirements.

E.3.6.1 Vibration

When tested as specified in paragraph E.4.3.5.1, accessories shall not be detached, damaged, cracked, or loosened.

E.3.6.2 Shock

When tested as specified in paragraph E.4.3.5.1.2, accessories shall not be detached, damaged, cracked, or loosened.

E.3.6.3 Temperature Cycling

When tested as specified in paragraph E.4.3.5.3, accessories shall exhibit no defects which will adversely affect the accessories’ performance. Also, there shall be no failure modes identified in FMAT of the Quality Assurance Program Plan.

E.3.6.4 Salt Atmosphere (Corrosion)

When tested as specified in paragraph E.4.3.5.4, accessories shall exhibit no exposure of base metal due to corrosion which will adversely affect the performance. In addition, screws shall easily thread with the counterpart screws.

E.4 Quality Assurance Provisions

E.4.1 Qualification Test

E.4.1.1 Sample

Accessories for the qualification test shall meet the requirements for materials specified in paragraph E.3.2. Connectors compliant with appendixes C or D of JAXA-QTS-2060 shall also be prepared. This is not applicable when qualification tests of accessories are performed at the same time with the qualification tests per appendixes C or D of JAXA-QTS-2060.

E.4.1.1.1 Sample Size

Sample size for each test group shown in Table E-1 shall be as follows.

a) Test group 1
   6 units each of male and female screw locks. 3 units each of male and female screw locks shall be selected from them for the screw tensile strength test and torque value for screws test.
b) Test groups 2 and 3
   8 units each of male and female screw locks

E.4.1.2 Test Items

Test items shall be as specified in Table E-1. Each test shall be performed in the order listed in the table.

E.4.1.3 Determination of Pass or Fail

A failure of any test specified in Table E-1 shall constitute failure of the qualification test.

E.4.1.4 Desposition after Test

If failed in the qualification test, the manufacturer shall take corrective actions to assure the quality of materials, manufacturing processes, and/or processing methods. Corrective actions shall also be taken on other products that use the same materials, manufacturing processes, and/or processing methods to prevent the same defects.
After the corrective actions have been taken, qualification test in Table E-1 shall be repeated with additional samples. In this case, JAXA has the rights to determine whether all test items or failed test items shall be performed.
The additional samples shall be subjected to groups A and B of quality conformance inspection specified in Table E-2 before subjected to the qualification test.

Table E-1. Qualification Test and Quality Conformance Inspection (Group C)

Test item	Requirement paragraph	Test method paragraph	Test group (1)		
			1	2	3
Externals, dimensions mass and marking	E.3.3, E.3.4	E.4.3.3	×	×	×
Compatibility	E.3.3.3	E.4.3.3.1	×		
Residual magnetization	E.3.2.2	E.4.3.2.1	×		
Temperature cycling (I)	E.3.6.3	E.4.3.5.3.1	×		
High frequency vibration	E.3.6.1	E.4.3.5.1.1	×		
Random vibration	E.3.6.1	E.4.3.5.1.2		×	
Shock (I)	E.3.6.2	E.4.3.5.2.1	×		
Shock (II)	E.3.6.2	E.4.3.5.2.2			×
Temperature cycling (II)	E.3.6.3	E.4.3.5.3.2		×	
Salt atmosphere (corrosion)	E.3.6.4	E.4.3.5.4	×		
Screw tensile strength	E.3.5.1	E.4.3.4.1	×		
Torque value for screws	E.3.5.2	E.4.3.4.2	×		

Note: (1) The tests identified with the symbol “x” shall be performed.

E.4.2 Quality Conformance Inspection

The quality conformance inspection shall be as specified in Table E-2 for group A (group I) and group B (group II) inspections, and as specified in Table E-1 for group C inspection.

E.4.2.1 Inspection Items and Sample Size

Inspection items shall be as specified in group I and group II of Table E-2 and E-1, and each inspection shall be performed in the order listed in the table.
Sample size shall be shown in Table E-2 for groups A and B inspections and as specified in paragraph E.4.1.1.1 for group C inspection. Groups B and C inspections shall be performed for products that have passed group A inspection.

E.4.2.2 Determination of Pass or Fail

Determination of pass or fail shall be in accordance with paragraphs 4.5.1.3 and 4.5.2.3.

E.4.2.3 Disposition after Inspection

Disposition after inspection shall be in accordance with paragraphs 4.5.1.4 and 4.5.2.4, and as follows.

a) Samples rejected in group A and B inspections shall not be delivered.

b) If any lot failed to pass in group B inspection, 100% inspection shall be conducted for the failed inspection items and only products that have passed the inspections can be delivered.

Table E-2. Quality Conformance Inspection (Groups A and B)

Group	Inspection item	Requirement paragraph	Test method paragraph	Criteria for pass/fail (3)	
				Number of samples	Number of defectives permissible
I	Externals, dimensions, mass and marking (1)	E.3.3, E.3.4	E.4.3.3	100%	Less than 10%
II	Dimensions	E.3.3.2	E.4.3.2	AQL (2)	1%
	Compatibility	E.3.3.3	E.4.3.3.1	AQL (2)	1%
	Residual magnetization	E.3.2.2	E.4.3.2.1	AQL (2)	4%
	Screw tensile strength (4)	E.3.5.1	E.4.3.4.1	6	0
	Torque value for screws (4)	E.3.5.2	E.4.3.4.2	6	0

Notes:
(1) Visual inspection
(2) The acceptance quality level (AQL) is based on a single sampling plan for normal inspection, specified in JIS Z 9015-1, Attachment Table 2-A.
(3) It is permissible to enter pass/fail determinations such as “pass” or “good” in the test data form.
(4) For screw tensile strength test and torque value for screws test, samples shall be randomly selected from the same manufacturing lot. The samples used shall not be shipped as products.

E.4.3 Methods of Test and Inspection

E.4.3.1 Test Conditions

The tests and inspections shall be performed under the following environmental conditions.

a) Temperature: 15 to 35°C
b) Relative humidity: 25 to 75%
c) Air pressure: 73.3 to 106.7kPa {550 to 800mmHg}

E.4.3.2 Materials

Materials used for accessories shall be performed as follows.

E.4.3.2.1 Residual Magnetization

Individual accessory shall be tested as follows with a milliammeter (Figure E-1) or a gaussmeter (Figure E-2).

E.4.3.2.1.1 When Using a Milliammeter

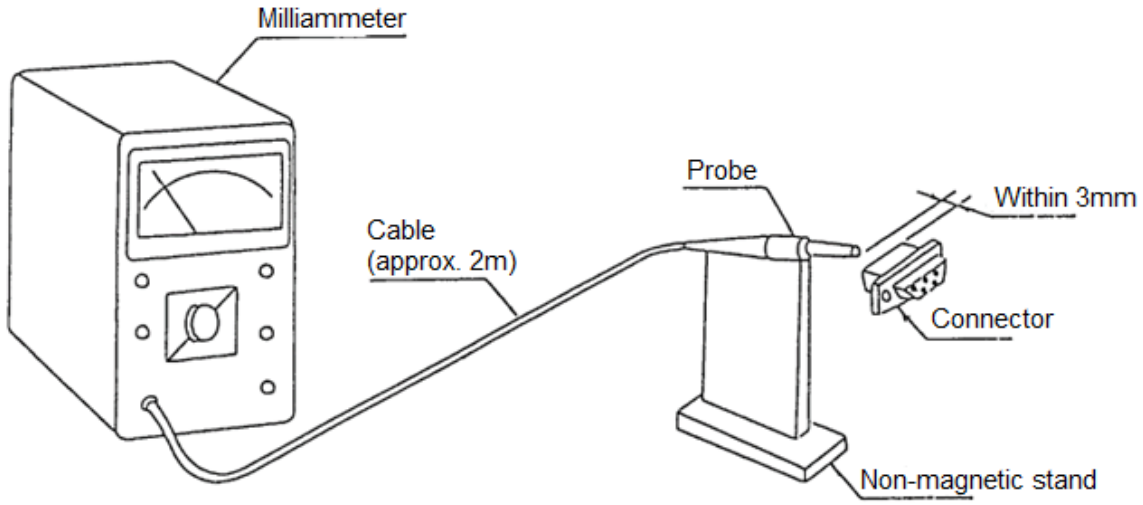


Figure E-1. Milliammeter

a) Warm up the milliammeter for a minimum of 15 minutes.
b) Mount the probe on the non-magnetic stand in a horizontal position with the cable fully extended from the meter.
c) Set the meter to the appropriate scale range, and orient the probe in the magnetically east-west direction so that the meter indicates as close as zero.
d) Move the accessories three times between magnetic poles that create a field strength of 0.5T {5000 Gauss} or greater. The accessories shall not contact the magnetic poles, and shall be moved in the same direction.
e) Immediately after the completion of step d), slowly move the accessories toward the probe tip and record the maximum reading while the distance between the accessories and the probe tip is less than 3.0mm.

Note: The test shall be performed in a magnetically quiet area; i.e., operations of mechanical and electrical devices, and vehicles and human traffic shall be restricted.

E.4.3.2.1.2 When Using a Gaussmeter

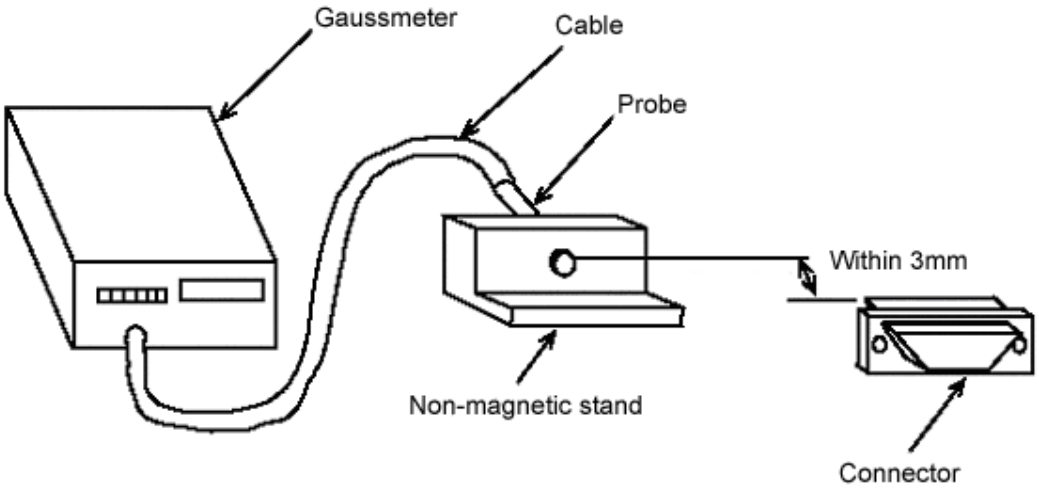


Figure E-2. Gaussmeter

a) Warm up the gaussmeter for a minimum of 30 minutes.
b) Mount the probe on the non-magnetic stand.
c) Set the meter to the appropriate scale range, and orient the probe in the magnetically east-west direction so that the meter indicates as close as zero.
d) Move the accessories three times between magnet poles that create a field strength of 0.5T {5000 Gauss} or greater. The accessories shall not contact the magnetic poles, and shall be moved in the same direction.
e) Immediately after the completion of step d), slowly move the accessories toward the probe tip and record the maximum reading while the distance between the accessories and the probe tip is less than 3.0mm.

Note: The test shall be performed in a magnetically quiet area; i.e., operations of mechanical and electrical devices, and vehicles and human traffic shall be restricted.

E.4.3.3 Externals, Physical Dimensions and Marking

Externals, dimensions, marking, and workmanship shall be examined as specified in following paragraphs.
Accessories shall be visually examined. Vernier calipers specified in JIS B 7507 etc. shall be used for dimensions and a weight scale shall be used for mass.

E.4.3.3.1 Interchangeability

Interchangeability shall be examined by assembling the accessories to applicable connectors. In the case of screw locks, it shall be examined by threading with the counterpart screw locks.

E.4.3.4 Mechanical Performance

Mechanical performance tests shall be performed as follows.

E.4.3.4.1 Screw Tensile Strength

A minimum of 196N {20kgf} tensile strength shall be applied at a rate of 20N/s (2kgf/s) as shown in Figures E-3 and E-4.

E.4.3.4.2 Torque Value for Screws

A minimum of 49N·cm {5kgf·cm} torque shall be applied as shown in Figures E-5 and E-6.

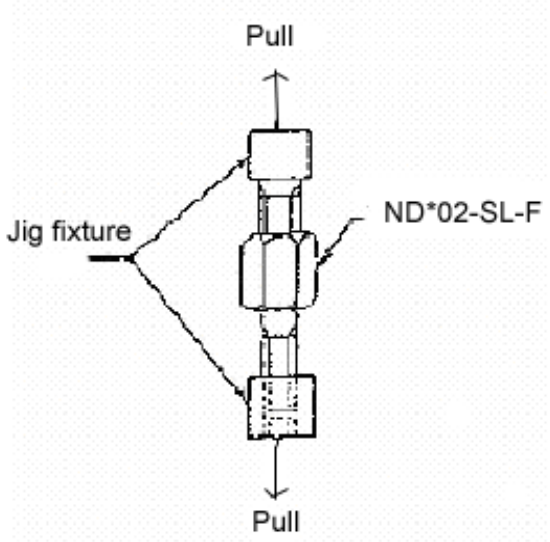


Figure E-3

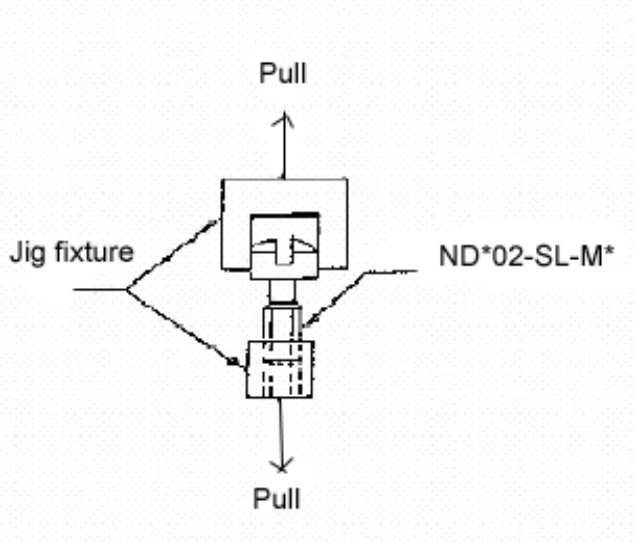


Figure E-4

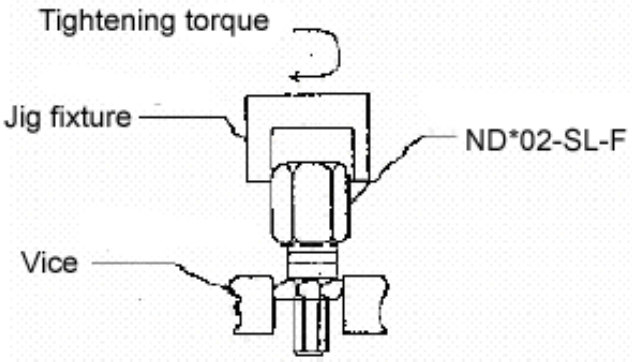


Figure E-5

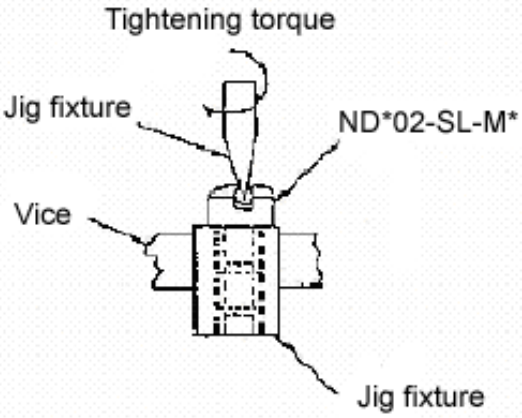


Figure E-6

E.4.3.5 Environmental Performance

Environmental performance tests shall be performed as follows.

E.4.3.5.1 Vibration

E.4.3.5.1.1 High Frequency Vibration

Accessories assembled to applicable connectors shall be tested in accordance with method 204 of MIL-STD-202. The following details shall apply.

a) Mounting method: The assembled connectors shall be secured on a vibration table by a jig in the normal manner.
b) Test condition: G (294m/s^2 {30G}p-p).

E.4.3.5.1.2 Random Vibration

Accessories assembled to applicable connectors shall be tested in accordance with test procedure EIA-364-28. The following details shall apply.

a) Mounting method: The assembled connectors shall be secured on a vibration table by a jig in the normal manner.
b) Test condition VI, symbol H (334m/s^{2}rms {34.02Grms}).
c) Duration of vibration: 15 minutes for each axis, 45 minutes in total.

E.4.3.5.2 Shock

Accessories assembled to applicable connectors shall be tested in accordance with test procedure EIA-364-27.

E.4.3.5.2.1 Shock (I)

The following details shall apply.

a) Test condition: D (2942m/s^2 {300G}), half-sine wave
b) The assembled connectors shall be mounted on a shock table using a jig.

E.4.3.5.2.2 Shock (II)

The following details shall apply.

a) Test condition
    1) Acceleration of gravity (A): 14710m/s^2 {1500G}±20%
    2) Duration of pulse (D): 0.5ms±15%
    3) Pulse waveform: Half-sine wave
    4) Velocity change (vi): 4.68m/s±10%
    5) Duration of shock application: ±X, ±Y and ±Z (3 shocks in each direction, 18 shocks in total)
b) Mounting method: As specified in item b) of paragraph E.4.3.5.2.1.

E.4.3.5.3 Temperature Cycling

Accessories assembled to applicable connectors shall be tested in accordance with test procedure EIA-364-32.
The following conditions shall apply.

a) Possible failure modes after test and pass/fail criteria:
In accordance with FMAT of the Quality Assurance Program Plan.

E.4.3.5.3.1 Temperature Cycling (I)

The following details shall apply.

a) The test shall be performed for 5 cycles at the temperatures specified in Table E-3.
b) After the completion of the last cycle, the samples shall be removed from the test chamber and visually examined for externals.

Table E-3. Temperature

Unit: °C

Low	-65^{0}_{-3}
High	$+125^{+3}_{0}$

E.4.3.5.3.2 Temperature Cycling (II)

The following details shall apply.

a) The temperature for step 1 shall be -30^{0}_{-5}°C.
b) The temperature for step 3 shall be $+100^{+3}_{0}$°C.
c) The number of cycles shall be 1,000.
d) Measurements and inspection during the test
   1) At 100^{+10}_{0}, 250^{+10}_{0}, and 500^{+10}_{0} cycles.
   2) All accessories shall be visually examined for cracks on the surface.

E.4.3.5.4 Salt Atmoshphere (Corrosion)

Accessories shall be tested in accordance with condition B (48 hours) of test procedure EIA-364-26.

E.4.4 Long-Term Storage

Long-term storage shall be as specified in paragraph 4.7.

E.4.5 Change and Optimization of Tests and Inspections

Change to tests and inspections shall be in accordance with paragraph 4.8.

E.5 Preparation for Delivery

Preparation for delivery shall be as specified in paragraph 5.

E.6 Notes

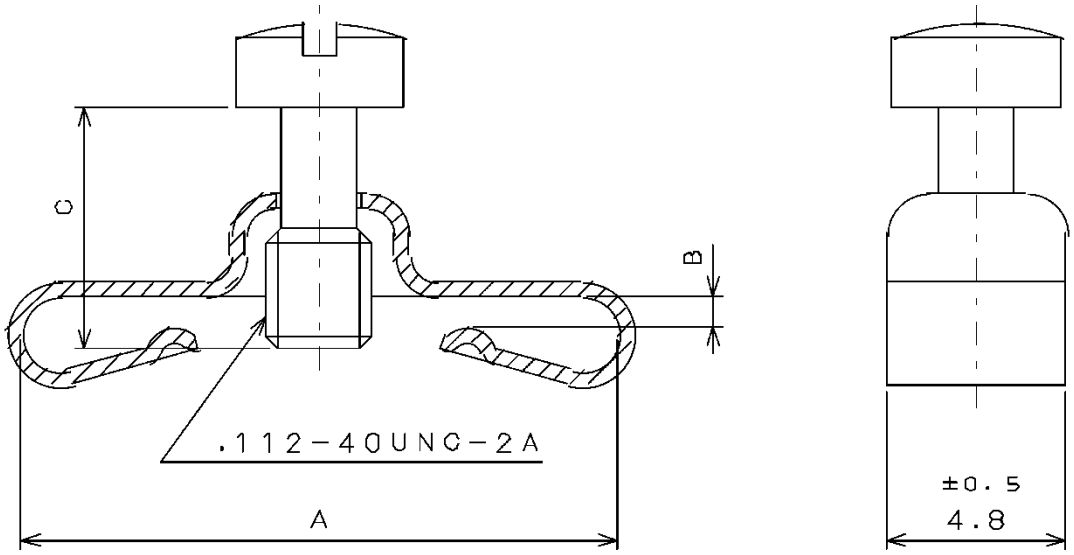
E.6.1 Notes for Manufacturer

Notes for manufacturer shall be in accordance with paragraph 6.1.

E.6.2 Notes for Purchaser

Notes for purchase shall be as specified in paragraph 6.2.

Unit: mm

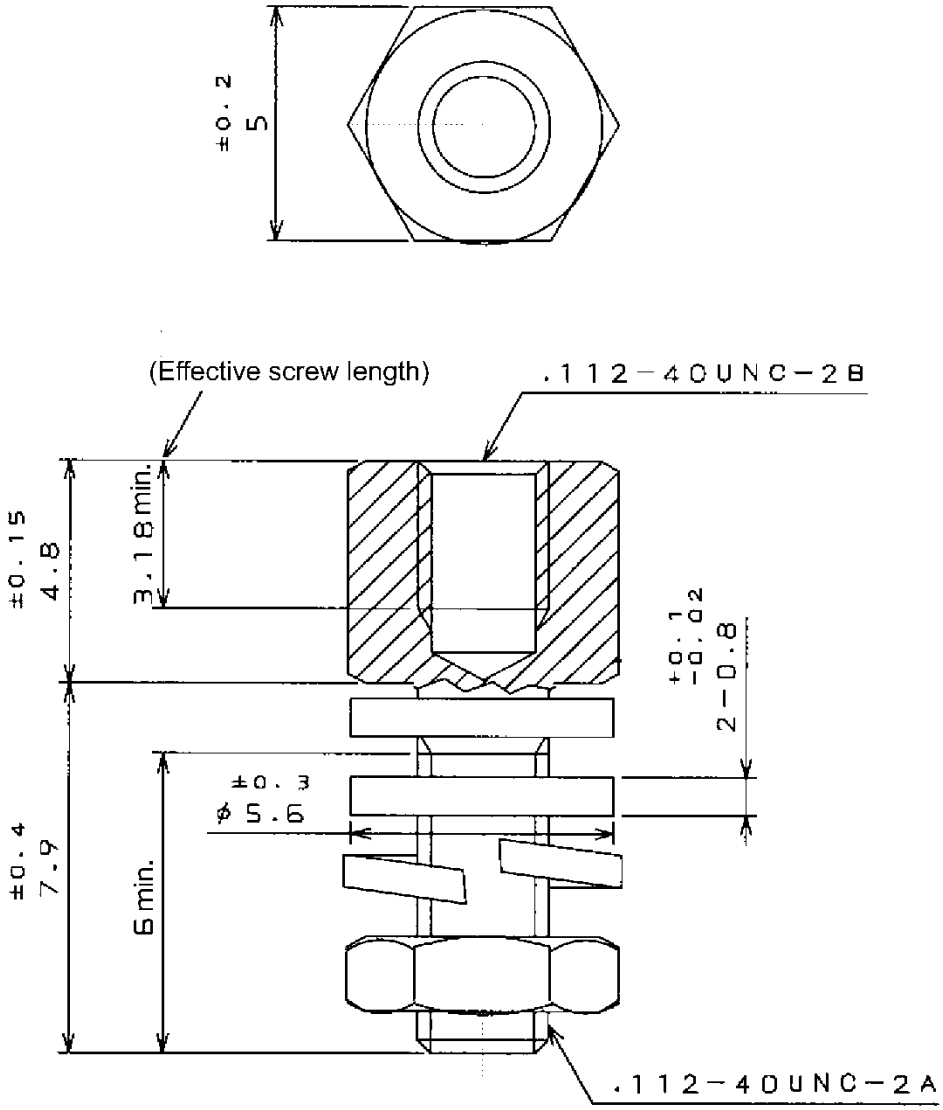


Part number	A±0.3	$B^{+0.2}_{-0.1}$	C±0.5	Application (1)			Mass (g) ±10%
				Appendix C		Appendix D	
				ND*01	ND*11	ND*14	
				Brass shell	Aluminum alloy shell	Aluminum alloy shell	
ND*02-SL-M1	13.3	0.8	6.4	9P, 15P, 9S, 15S, 25S, 37S	9P, 15P, 9S, 15S,	15P, 26P, 15S, 26S	0.79
ND*02-SL-M2	13.3	1.0	6.4	25P, 37P	25P, 37P, 25S, 37S	44P, 62P 44S, 62S	0.79
ND*02-SL-M3	15.9	0.8	6.4	50S	–	–	0.87
ND*02-SL-M4	15.9	1.0	6.4	50P	50P, 50S	78P, 78S	0.87
ND*02-SL-M5	17.5	1.0	6.4	–	–	104P, 104S	0.92

Note: (1) Applicable to crimp and solder contact connectors of types ND*01, ND*11, and ND*14. Brass and Aluminum alloy are indicated as a material of shell.

Supplementary Figure E-1. Male Screw Lock

Unit: mm



Part number	Compatibility	Mass (g) ±10%
ND*02-SL-F	All connector types of ND*01, ND*11, and ND*14	1.51

Supplementary Figure E-2. Female Screw Lock

APPENDIX F

CONNECTORS, RECTANGULAR, MICROMINIATURE

This document is the English version of JAXA QTS/ADS which was originally written and authorized in Japanese and carefully translated into English for international users. If any question arises as to the context or detailed description, it is strongly recommended to verify against the latest official Japanese version.

The release date of the English version of this specification: 25 March 2026

APPENDIX F

CONNECTORS, RECTANGULAR, MICROMINIATURE

F.1 General

F.1.1 Scope

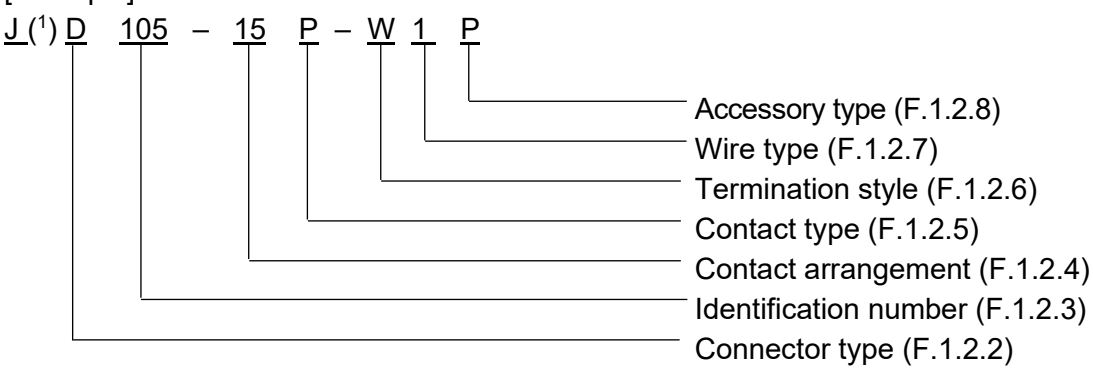
This appendix establishes the requirements and quality assurance provisions, among other things, for the microminiature rectangular connectors (hereinafter referred to as "connectors").

F.1.2 Part Number

F.1.2.1 Connectors

The part number of connectors identifies the connector type, identification number, contact arrangement, contact type, style of termination, and others as given in the following form. The detail information shall be as specified in the detail specification.

[Example]



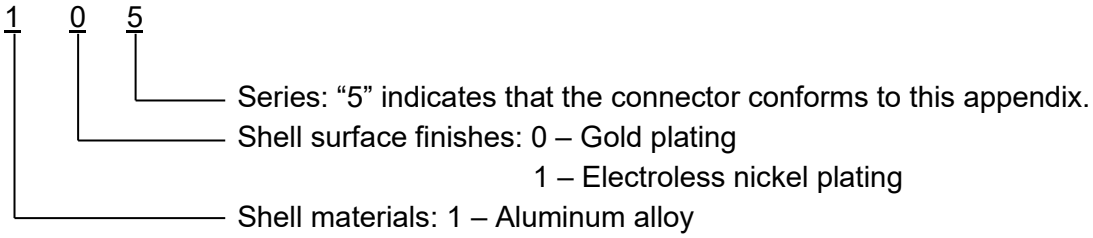
Note: (1) "J" indicates the part is for space use.

F.1.2.2 Connector Type

The connector type is identified by a single capital letter. “D” indicates a “D-sub connector.”

F.1.2.3 Identification Number

The identification number is identified by three digits as follows.



F.1.2.4 Contact Arrangement

The contact arrangement is identified by a single, two-digit or three-digit number, and indicates the number of contacts (see Supplementary Figure F-1).

F.1.2.5 Contact Type

The contact type is identified by a single capital letter, “P” or “S”, which indicates a pin contact (male) or socket contact (female), respectively.

F.1.2.6 Termination Style

The termination style is identified by a single capital letter as shown in Table F-1.

Table F-1. Termination Style

Symbol	Termination style
W	Wire
S	Soldering
R	Right angle (1)

Note: (1) Through hole type for printed boards.

F.1.2.7 Wire Type (for Termination Style “W”)

Wire type for the termination style “W” (refer to Table F-1) is identified by a single number or 2-digit number as shown in Table F-2.

Table F-2. Wire Type

Symbol	Wire type	Wire size (AWG)	Remarks
1	ESCC3901/012	26	-
2	M22759/33-26-9	26	Wire color: White
3	M22759/33-26-x	26	Wire color: repetition of 10 colors (MIL-STD-681 SYSTEM1)
X	Other wires (1)	As specified in detail specification	

Note: (1) Applicable standard or type of wire shall be specified in the detail specification. Standard value of wire (construction of conductor, insulator, conductor resistance and insulation resistance) shall be specified in applicable data sheet.

F.1.2.8 Accessory Type

Accessories for the microminiature connector (hereinafter referred to as “accessories”) are identified by a single letter as shown in Table F-3 and also specified in detail specification.

Table F-3. Accessory Type

Symbol	Type		Shape of screw	Shape of screw head
P	Jackpost assembly (1)	For 9 to 51 contacts	-	-
C	Jackpost assembly (for termination style "R") (1)		-	-
L	Jackscrew assembly		Low profile	Slot
R	Jackscrew assembly		Low profile	Hexagon
K	Jackscrew assembly		High profile	Slot
Q	Jackscrew assembly		High profile	Hexagon
S	Jackpost assembly (2)	For 100 contacts	-	-
E	Jackpost assembly (for termination style "R") (2)		-	-
J	Jackscrew assembly		Low profile	Slot
N	Jackscrew assembly		Low profile	Hexagon
H	Jackscrew assembly		High profile	Slot
T	Jackscrew assembly		High profile	Hexagon

Notes: (1) Applicable for all jackscrew assemblies for 9 to 51 contacts.
(2) Applicable for all jackscrew assemblies for 100 contacts.

F.2 Applicable Documents

F.2.1 Applicable Documents

The applicable documents shall be as follows and as specified in paragraph 2.1.

a) A-A-59551 WIRE, ELECTRICAL, COPPER (UNINSULATED)
b) A-A-59588 RUBBER, SILICONE
c) ASTM A240 STANDARD SPECIFICATION FOR CHROMIUM AND CHROMIUM-NICKEL STAINLESS STEEL PLATE, SHEET, AND STRIP FOR PRESSURE VESSELS AND FOR GENERAL APPLICATIONS
d) ASTM A484 STEEL, BARS, BILLETS AND FORGINGS, STAINLESS
e) ASTM A582 BARS, FREE-MACHINING STAINLESS STEEL
f) ASTM A693 PRECIPITATION-HARDENING STAINLESS AND HEAT-RESISTING STEEL PLATE, SHEET, AND STRIP
g) ASTM A967 CHEMICAL PASSIVATION TREATMENTS FOR STAINLESS STEEL PARTS

h)	ASTM D5927	THERMOPLASTIC POLYESTER(TYPES) INJECTION AND EXTRUSION MATERIALS BASED ON ISO TEST METHODS, STANDARD SPECIFICATION FOR
i)	ASTM D5948	COMPOUNDS, MOLDING, THERMOSETTING
j)	ESCC No.3901/012	EXTRUDED, CROSS-LINKED FLUOROPOLYMER INSULATED WIRES AND CABLES ON SILVER-PLATED COPPER CONDUCTOR, LOW FREQUENCY, 600V, -100 TO +200°C
k)	FED-STD-H28	SCREW-THREAD STANDARDS FOR FEDERAL SERVICES
l)	MIL-M-24519	MOLDING PLASTICS, ELECTRICAL, THERMOPLASTIC
m)	SAE-AS22759/33	WIRE, ELECTRICAL, FLUOROPOLYMER-INSULATED, CROSSLINKED MODIFIED ETFE, LIGHTWEIGHT, SILVER-COATED, HIGH-STRENGTH COPPER ALLOY, 200°C, 600 VOLT
n)	SAE-AMS 2404	NICKEL, ELECTROLESS, PLATING
o)	SAE-AMS-QQ-A-250/4	ALUMINUM ALLOY 2024, PLATE AND SHEET
p)	SAE-AMS-QQ-A-250/11	ALUMINUM ALLOY 6061, PLATE AND SHEET
q)	SAE-AMS-QQ-A-250/12	ALUMINUM ALLOY 7075, PLATE AND SHEET

F.2.2 Reference Documents

The following documents are the reference documents and as specified in paragraph 2.2.

a)	ESCC3401 issue 5	GENERIC SPECIFICATION FOR CONNECTORS ELECTRICAL NON-FILTERED CIRCULAR AND RECTANGULAR
b)	ESCC3401/029 Issue 19	CONNECTORS, ELECTRICAL, RECTANGULAR MICROMINIATURE, BASED ON TYPE MDM
c)	MIL-DTL-83513H	CONNECTORS, ELECTRICAL, RECTANGULAR, MICROMINIATURE, POLARIZED SHELL, GENERAL SPECIFICATION FOR

F.3 Requirements

F.3.1 Certification

F.3.1.1 Qualification Coverage

The qualification coverage shall be limited to connectors and accessories that are produced by the manufacturing line that conforms to materials, designs, constructions, ratings, and performance specified in paragraphs F.3.2 to F.3.8. The qualification coverage shall be fully represented by samples that have passed the qualification test. Within this coverage, the manufacturer is allowed to supply qualified products in accordance with the detail specification.

If necessary, additional definitions of qualification coverage shall be specified in the detail specification.

F.3.2 Materials

The materials used for connectors and accessories shall be as follows and as specified in paragraph 3.3.

F.3.2.1 Dissimilar Metals

Where dissimilar metals having a potential difference are used in direct contact, protection against galvanic corrosion shall be provided. For guidance on dissimilar metals, see guideline 16 of MIL-HDBK-454.

F.3.2.2 Nonmagnetic Materials

In principle, all materials and surface treatments used for connectors shall be non-magnetic. Residual magnetization of connectors shall be measured by the test shown in paragraph F.4.3.2.1, and the results shall be listed on applicable data sheet.

F.3.2.3 Sublimation

Zinc or cadmium alloys, or zinc- or cadmium-plated parts shall not be used to avoid evaporation at a high temperature under high vacuum which will produce hazardous gases.

F.3.2.4 Contacts

Contacts shall be made of conductive copper alloys and protected from corrosion.

F.3.2.5 Inserts

Inserts shall meet the requirements of type GDI-30F or type SDG-F in accordance with ASTM D5948, or shall be made of glass-containing thermoplastic material in accordance with ASTM D5927 or MIL-M-24519 (color optional), or equivalents. Applicable standard shall be defined in the detail specification.

F.3.2.6 Shell

Shells shall be made of 2024 aluminum alloy in accordance with SAE-AMS-QQ-A-250/4, 6061 aluminum alloy in accordance with SAE-AMS-QQ-A-250/11, 7075 aluminum alloy in accordance with SAE-AMS-QQ-A-250/12 or equivalents. Applicable standard shall be defined in the detail specification.

F.3.2.7 Filler Compounds

Filler compounds shall be made of environmentally high grade epoxy resins or equivalents.

F.3.2.8 Interfacial Seal

Interfacial seal shall be made of silicone rubbers or silicon rubbers fluoride specified in A-A-59588.

F.3.2.9 Wire

The wire applied to wire type connectors shall be selected from the list in Table F-2 and as specified in the detail specification. The wire applied to right angle type connectors shall be AWG 25 gold plated solid wire which is specified in A-A-59551.

F.3.2.10 Accessories

Accessories shall conform to ASTM A 693, ASTM A 967 and FED-STD-H28.

F.3.2.11 Bacteria Resistance

Materials of connectors shall be bacteria resistant.

F.3.2.12 Finish

F.3.2.12.1 Contact

F.3.2.12.1.1 Plating Thickness

Contacts shall be gold plated to a thickness of 1.27μm as a minimum in accordance with ASTM B 488 or SAE-AMS 2422 over suitable underplate. Applicable standard shall be defined in the detail specification.
Silver plating shall not be used.

F.3.2.12.1.2 Plating Porosity

No bubbles shall be observed for 30 seconds after completely Immerse unwired pins and socket contacts in nitric acid of 25°C±3°C (concentration: 70^{+3}_{-1} %).

F.3.2.12.2 Shell

F.3.2.12.2.1 Gold Plating

Shells shall be gold plated to a thickness of 12.7μm as a minimum in accordance with ASTM B 488 or SAE-AMS 2422 over suitable electroless nickel plating. Applicable standards shall be specified in the detail specification.

F.3.2.12.2.2 Electroless Nickel Plating

Shells shall be electroless nickel plated to a thickness of 25.4μm as a minimum in accordance with SAE-AMS-C-26074, SAE-AMS2404 or ASTM B 733. Applicable standards shall be specified in the detail specification.

F.3.2.13 Outgassing

When tested as specified in paragraph F.4.3.2.2, organic materials such as inserts, filler compounds, interfacial seals and marking inks shall meet the requirements of total mass loss (TML) and collected volatile condensable material (CVCM) as specified in paragraph 3.3.2.

F.3.3 Externals, Physical Dimensions and Marking

Externals, design, constructions, physical dimensions and mass of the connector and accessories shall be appropriate for normal handling during installation, usage and

maintenance. For details, see Supplementary Figures F-2 through F-14 and the detail specification.

F.3.3.1 Contacts

Contacts shall be reverse gender type. Pin contacts, located inside insulator, shall be able to engage with socket contacts which protrude from inserts. Outline drawing of pin contact is shown in Figure F-1.

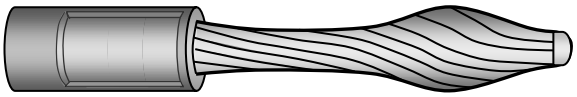


Figure F-1. Outline Drawing of Pin Contact

F.3.3.1.1 Wire Contacts

Wire Contacts shall not be able to remove from inserts.

F.3.3.1.2 Soldering Contacts

Soldering contacts shall not be able to remove from inserts.
Solder cup shall be designed not to damage constructional elements or spill liquid solder while soldering.

F.3.3.1.3 Wire Barrel Sizes

For wire or soldering contacts, wire barrel shall accommodate the wires specified in paragraph F.1.2.7.

F.3.3.2 Inserts

Inserts shall be designed with suitable section and radii such that they will not readily chip, crack, or break in assembly or in normal service. Inserts shall have a one-piece bounded construction. Inserts of pin contact side shall have a construction to keep pin contacts from touching socket contacts before the plug and the receptacle are aligned in the insertion position. The inserts shall be so designed that the inserts cannot be removed from the shell.

F.3.3.2.1 Contact Arrangement

Contact arrangement shall be as specified in Supplementary Figure F-1.

F.3.3.2.2 Contact Position

Inserts shall have a construction to enable mating regardless of the insert position with respect to the shell, contact distortions due to crimping, and differences in allowable dimensional tolerances.

F.3.3.3 Shell

Shells shall have a construction to retain inserts and not to allow removal of inserts.

F.3.3.3.1 Shell Polarization

Polarization shall be accomplished by a keystone shape shell design before pins Mounting

Connectors shall be provided with means for secure mounting such as fastening the shell on a mounting panel with screws.

F.3.3.4 Coupling

F.3.3.4.1 Ease of Coupling

Connector shall be easily coupled and uncoupled using a proper tool or by hand.

F.3.3.4.2 Fixing

Coupled connectors shall be securely mounted using jackscrew or jackpost accessories.

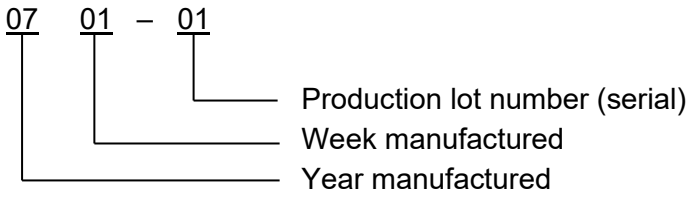
F.3.3.5 Interchangeablity

a) All plugs and receptacles having the same part number or contact arrangements shall be completely interchangeable in any combination and shall provide equal performance.
b) All wire, soldering, and right angle contact connectors having the same contact arrangement shall be intermatable in any combination.
c) All connectors having the same part number shall be completely mounted with specified mounting holes and printed wiring boards in any combination.

F.3.3.6 Marking

The following items (identification code) shall be marked in the locations specified in Supplementary Figures F-2 through F-7.
The marking shall remain clearly legible after completion of all tests specified in this appendix, and even after one-minute immersion in ethanol.

a) Manufacturer’s name and its abbreviation
b) Part number (paragraph F.1.2)
c) Identification code (paragraph F.3.3.7)



Notes:

(1) For the purpose of this appendix, “Year and week manufactured” denotes the year and week when the final assembly is completed.
(2) Production lot number is identification for lots when the products having the same part number are manufactured two or more lots within a week. When only one lot is manufactured in a week, the manufacturing lot number shall be “01”.

F.3.3.7 Traceability

An identification code shall be provided to identify the material lot and to trace the complete manufacturing process up to the final assembly even after the connectors are installed in electronic equipment including inventories.
Manufacturers shall retain records on identification codes for at least 8 years.

F.3.3.8 Mass

Mass of connectors and accessories shall meet the requirements in the detail specification.

F.3.3.9 Workmanship

Connectors shall be manufactured and processed based on a good design in a manner to maintain uniform quality in accordance with manufacturing specifications established in the quality assurance program (see paragraph 3.2.1). In addition, connectors shall be free of crazing, holes, chips that will affect its life and ease of use, or sharp cutting edges, burrs or other defects that will degrade electrical, mechanical, or physical performance.

F.3.4 Rating

a) Voltage: 200V_{AC} under sea level (barometric pressure)
   50V_{AC} under reduced pressure (4.4kPa {33.0mmHg})
b) Current: 3A/contact
c) Operating temperature range: -65 to +125°C

F.3.5 Electrical Performance

Connectors shall meet the following requirements.

F.3.5.1 Dielectric Withstanding Voltage

When tested as specified in paragraph F.4.3.4.1, unmated connectors shall exhibit no evidence of short circuit and dielectric breakdown.

F.3.5.2 Insulation Resistance

When tested as specified in paragraph F.4.3.4.2, insulation resistance between contacts and between the shell and any contact shall be as specified in Table F-4.

Table F-4. Insulation Resistance

Unit: MΩ

Humidity test		Other tests
Immediately after test	24 hours after test	
1 minimum.	1,000 minimum.	5,000 minimum.

F.3.5.3 Contact Resistance

When tested in accordance with paragraph F.4.3.4.3, contact resistance for inserted pair of pin and socket contacts shall be as specified in Table F-5.

Table F-5. Contact Resistance (Voltage Drop)

Unit: mV

Termination style	Contact size	Wire size (AWG)	Test current (A)	Voltage drop		Wire type
				Initial	After salt spray test	
Wire	24	24	3.0	52 maximum	57 maximum	ESCC 3901/012, SAE AS22759/33
		26	2.5	75 maximum	80 maximum	
		28	1.5	63 maximum	68 maximum	
Soldering	24	26	2.5	75 maximum	80 maximum	---
Right angle	24	25	2.5	60 maximum	65 maximum	A-A-59551

F.3.5.4 Low-Signal Level Contact Resistance

When tested as specified in paragraph エラー! 参照元が見つかりません。, low-signal level contact resistance shall be as specified in Table F-6.

Table F-6. Low-Signal Level Contact Resistance

Unit: mΩ

Termination style	Contact size	Wire size (AWG)	Contact resistance
Wire	24	24	20 maximum
		26	32 maximum
		28	50 maximum
Soldering	24	26	32 maximum
Right angle	24	25	25 maximum

F.3.6 Mechanical Performance

Connectors shall meet the following requirements.

F.3.6.1 Connector Mating and Unmating Forces

When tested as specified in paragraph F.4.3.5.1, the force for maximum mating, unmating, and minimum unmating of counterpart connectors shall be as specified in Table F-7.

Table F-7. Connector Mating and Unmating Forces

Unit: N {kgf}

Contact Arrangement	Maximum mating force	Unmating force	
		Maximum	Minimum
9	25.02 {2.55}	25.02 {2.55}	2.45 {0.25}
15	41.70 {4.25}	41.70 {4.25}	4.12 {0.42}
21	58.38 {5.95}	58.38 {5.95}	5.79 {0.59}
25	69.50 {7.09}	69.50 {7.09}	6.86 {0.70}
31	86.18 {8.79}	86.18 {8.79}	8.53 {0.87}
37	102.87 {10.49}	102.87 {10.49}	10.20 {1.04}
51	141.79 {14.46}	141.79 {14.46}	14.02 {1.43}
100	278.01 {28.35}	278.01 {28.35}	27.46 {2.80}

F.3.6.2 Contact Retention

When tested as specified in F.4.3.5.2, the axial displacement of contacts shall not exceed 1.27mm. In addition, there shall be no evidence of damages on contacts or inserts.

F.3.6.3 Contact Engagement and Separation Forces

When tested as specified in paragraph F.4.3.5.3, pin contact shall be as specified in Table F-8.

Table F-8. Contact Engagement and Separation Forces

Unit: N {gf}

Contact Size	Maximum engagement force	Minimum separation force
24	1.67 {0.17}	0.14 {0.01}

F.3.6.4 Durability

When tested as specified in paragraph F.4.3.5.4, connectors shall exhibit no defects detrimental to the connector operation and shall meet the requirements of paragraphs F.3.5.3 (contact resistance), F.3.6.3 (contact engagement and separation forces), and F.3.6.1 (Connector mating and unmating forces).

F.3.6.5 Insert Retention

When tested as specified in paragraph F.4.3.5.5, inserts shall be retained in proper positions in connector shells for at least 5 seconds with the prescribed loads. In addition, there shall be no cracks, breakage, or looseness detrimental to coupling and electrical continuity.

F.3.6.6 Crimp Tensile Strength

When tested as specified in paragraph F.4.3.5.6, wire shall not break or come off from the crimped part with .crimp tensile strength specified in Table F-9.

Table F-9. Crimp Tensile Strength

Unit: N {kgf}

Termination style	Contact size	Wire size (AWG)	Crimp tensile strength	Wire type
Wire	24	24	71.18 {7.26}	ESCC 3901/012, SAE AS22759/33
		26	44.48 {4.54}	
		28	26.68 {2.72}	
Right angle	24	25	22.24 {2.27}	A-A-59551

F.3.6.7 Resistance to Soldering Heat

When tested as specified in paragraph F.4.3.5.7, connectors shall exhibit no evidence of distortions, damages or other defects.
This provision shall not apply to connectors with "wire" termination style (see paragraph F.1.2.6).

F.3.6.8 Solderability

When tested as specified in paragraph F.4.3.5.8, solder surface shall be smooth, attached firmly to the whole inner surface of solder cup and slightly concave. A minimum of 95% of the immersed external surface shall be covered with solder.
This provision shall not apply to connectors with "wire" termination style (see paragraph F.1.2.6).

F.3.7 Environmental Performance

Connectors shall meet the following requirements.

F.3.7.1 Vibration

F.3.7.1.1 High Frequency Vibration

When tested as specified in paragraph F.4.3.6.1.1, there shall be no electrical discontinuity in excess of 1μs. Mated connectors and accessories shall not exhibit any separation, damage, crack, or loosening of parts.

F.3.7.1.2 Random Vibration

When tested as specified in paragraph F.4.3.6.1.2, there shall be no electrical discontinuity in excess of 1μs. Mated connectors and accessories shall not exhibit any separation, damage, crack, or loosening of parts In addition, connectors and accessories shall meet the requirements of paragraphs F.3.5.3 (contact resistance), F.3.5.1 (dielectric withstanding voltage at sea level), and F.3.5.2 (insulation resistance).

F.3.7.2 Shock

F.3.7.2.1 Shock (I)

When tested as specified in paragraph F.4.3.6.2.1, there shall be no electrical discontinuity in excess of 1μs. Mated connectors and accessories shall not exhibit any separation, damage, crack, or loosening of parts.

F.3.7.2.2 Shock (II)

When tested as specified in paragraph F.4.3.6.2.2, there shall be no electrical discontinuity in excess of 1μs. Mated connectors and accessories shall not exhibit any separation, damage, crack, or loosening of parts. In addition, connectors shall meet the requirements of paragraphs F.3.5.3 (contact resistance), F.3.5.1 (dielectric withstanding voltage at sea level), and F.3.5.2 (insulation resistance).

F.3.7.3 Temperature Cycling

F.3.7.3.1 Temperature Cycling (I)

When tested as specified in paragraph F.4.3.6.3.1, there shall be no visible evidence of any mechanical damages. Also, there shall be no failure modes identified in FMAT of the Quality Assurance Program Plan.

F.3.7.3.2 Temperature Cycling (II)

When tested in accordance with paragraph F.4.3.6.3.2, there shall be no visible evidence of any mechanical damages. Also, there shall be no failure modes identified in FMAT of the Quality Assurance Program Plan. In addition, connectors shall meet the requirements of paragraphs F.3.5.3 (contact resistance), F.3.5.1 (dielectric withstanding voltage at sea level), and F.3.5.2 (insulation resistance).

F.3.7.4 Humidity

When tested in accordance with paragraph F.4.3.6.4, connectors shall meet the requirements of paragraphs F.3.5.1 (dielectric withstanding voltage at sea level), and F.3.5.2 (insulation resistance).

F.3.7.5 Fluid Immersion

When tested as specified in paragraph F.4.3.6.5, connectors shall meet the requirements of paragraphs F.3.6.1 (Connector mating and unmating forces), and F.3.6.5 (insert retention).
This requirement shall apply when specified in the detail specifications or when ordered by the purchaser in accordance with paragraph 6.2.1 (Items to be ordered for procurement).

F.3.7.6 Resistance to Corrosive Gas

When tested as specified in paragraph F.4.3.6.6, contacts shall exhibit no defects detrimental to performance and shall meet the requirements of paragraph F.3.5.4 (low-signal level contact resistance).

F.3.7.7 Salt Spray (Corrosion)

When tested as specified in paragraph F.4.3.6.7, mated connectors shall not expose the base metal due to corrosion which will adversely affect connector performance. At the completion of the test, connectors and contacts shall meet the requirements of paragraphs F.3.5.4 (contact resistance at low-signal level), F.3.5.3 (contact resistance), F.3.6.1 (Connector mating and unmating forces), and F.3.6.2 (contact retention).

F.3.7.8 Radiation Hardness

When tested as specified in paragraph F.4.3.6.8, there shall be no significant visual damages such as discolorations, chips, deformations, peelings and crazing, and the marking shall remain legible. At the completion of the test, connectors shall meet the requirements of paragraphs F.3.5.3 (contact resistance), F.3.5.1 (dielectric withstanding voltage at sea level), and F.3.5.2 (insulation resistance).
If equivalent tests have been conducted on individual insulating materials used in connectors, the test data may be substituted.

F.3.8 Durability

Connectors shall meet the following requirements.

F.3.8.1 Temperature Life

When tested as specified in paragraph F.4.3.7.1, connectors shall exhibit no defects detrimental to performance and shall meet the requirements of paragraphs F.3.5.4 (low-signal level contact resistance), F.3.5.3 (contact resistance), and F.3.6.3 (contact engagement and separation forces).

F.4 Quality Assurance Provisions

F.4.1 Qualification Test

Qualification test shall be as follows and as specified in paragraph 4.4.

F.4.1.1 Samples

Qualification test samples shall meet the requirements for materials specified in paragraph F.3.2. Unless otherwise specified, connectors with the maximum number of contacts shall be selected.

F.4.1.1.1 Sample Size

The number of qualification test samples shall be as follows.

F.4.1.1.1.1 For Individual Qualification

When qualifying a single type connector among wire, soldering, and right angle type connectors, prepare specified number of plugs and receptacles as specified in Table F-10.

F.4.1.1.1.2 For Combination Qualification

When qualifying two or all types of wire, soldering, and right angle type connectors, prepare specified number of plugs and receptacles as specified in Table F-11.

F.4.1.1.2 Preparation of Samples and Sample Grouping

Connectors shall be prepared as follows and shall be grouped as specified in Tables F-10 and F-11.

a) The following wires shall be used.
   1) Wire and soldering type connectors
      Use the wire selected from Table F-2 and specified in the detail specification. If there are more than one applicable wire size for the selected wire, specified quantity of sample shall be tested for each of the maximum and minimum size wire. The wire length shall be 457mm.
   2) Right angle type connectors
      Use 25AWG solid wires specified in A-A-59551. The wire length shall be 40mm.
b) Right angle type connectors shall be mounted and soldered using proper printed wiring boards with through holes (see Supplementary Figure F-14).
c) Accessories shall be as specified in this specification, and it shall fit the connectors with the maximum number of contacts for the test.
   Test samples of jackscrew assembly shall have low profile screw.

Table F-10. Preparation of Samples and Sample Grouping (Individual Qualification) (1)

Unit: pair

Termination style	Test group										
	Table F-12						Table F-13				
	1	2	3	4	5	6	7	8	9	10	11
Wire	3	3	1	20 (2)			2	2	2	2	2
Soldering	3	3	1		1	1	2	2	2	2	2
Right angle	3	3	1	20 (2)	1	1	2	2	2	2	2

Notes:

(1) Specified number of connectors shall be tested on each shell finish (see paragraph F.3.2.12.2).

(2) Indicates number of contacts provided for tests. Pin and socket contacts shall be selected from the same lot used in paragraph F.4.1.1.1.1.

Table F-11. Preparation of Samples and Sample Grouping (Combination Qualification) (1) (2)

Unit: pair

Combination	Termination style	Test group										
		Table F-12						Table F-13				
		1	2	3	4	5	6	7	8	9	10	11
I	Wire	2	2	1	20 (3)			1	1	1	1	1
	Soldering	1	1			1	1	1	1	1	1	1
II	Wire	2	2	1	20 (3)			1	1	1	1	1
	Right angle	1	1		20 (3)	1	1	1	1	1	1	1
III	Soldering	1	1			1	1	1	1	1	1	1
	Right angle	2	2	1	20 (3)	1	1	1	1	1	1	1
IV	Wire	1	1	1	20 (3)			1	1	1	1	1
	Soldering	1	1			1	1	1	1	1	1	1
	Right angle	1	1		20 (3)	1	1					

Notes:

(1) When qualifying two types of connectors, prepare the number of samples specified at combination I, II, or III. When qualifying all types of connectors, prepare the number of samples specified at combination IV.

(2) Specified sample size shall be tested for each connector on each shell finish (see paragraph F.3.2.12.2).

(3) Indicates number of contacts provided for tests. Pin and socket contacts shall be selected from the same lot used in paragraph F.4.1.1.1.1.

F.4.1.2 Test Items and Order of Tests

Test items shall be as shown in Tables F-12 and F-13 and each test shall be conducted in the order listed in each table.

F.4.1.3 Determination of Pass or Fail

A failure of any test specified in Tables F-12 and F-13 shall constitute failure of the qualification test.

F.4.1.4 Disposition after Test

Disposition after test shall be in accordance with paragraph 4.4.5.

Table F-12. Qualification Test and Quality Conformance Inspection (Group C)

Test item	Requirement paragraph	Test method paragraph	Test group					
			1	2	3	4	5	6
Externals, physical dimensions and marking	F.3.3	F.4.3.3	×	×	×	×	×	×
Residual magnetization (2)	F.3.2.2	F.4.3.2.1	×	×				
Dielectric withstanding voltage (at sea level)	F.3.5.1	F.4.3.4.1.1	×	×				
Dielectric withstanding voltage (reduced pressure)	F.3.5.1	F.4.3.4.1.2	×	×				
Insulation resistance	F.3.5.2	F.4.3.4.2	×	×				
Contact resistance	F.3.5.3	F.4.3.4.3	×	×				
Contact engagement and separation forces	F.3.6.3	F.4.3.5.3	×	×				
Connector mating and unmating forces	F.3.6.1	F.4.3.5.1	×	×				
Temperature cycling (I)	F.3.7.3	F.4.3.6.3.1	×	×				
Humidity	F.3.7.4	F.4.3.6.4	×	×				
Dielectric withstanding voltage (at sea level)	F.3.5.1	F.4.3.4.1.1	×	×				
Insulation resistance	F.3.5.2	F.4.3.4.2	×	×				
High frequency vibration	F.3.7.1	F.4.3.6.1.1	×	×				
Shock (I)	F.3.7.2	F.4.3.6.2.1	×	×				
Durability	F.3.6.4	F.4.3.5.4	×	×				
Contact resistance	F.3.5.3	F.4.3.4.3	×	×				
Contact engagement and separation forces	F.3.6.3	F.4.3.5.3	×	×				
Connector mating and unmating forces	F.3.6.1	F.4.3.5.1	×	×				
Salt spray (corrosion)	F.3.7.7	F.4.3.6.7	×					
Low-signal level contact resistance	F.3.5.4	F.4.3.4.4	×					
Contact resistance	F.3.5.3	F.4.3.4.3	×					
Connector Mating and unmating forces	F.3.6.1	F.4.3.5.1	×					
Contact retention	F.3.6.2	F.4.3.5.2	×					
Externals, physical dimensions and marking	F.3.3	F.4.3.3	×					
Fluid immersion (3)	F.3.7.5	F.4.3.6.5		×				
Connector mating and unmating forces	F.3.6.1	F.4.3.5.1		×				
Insert retention	F.3.6.5	F.4.3.5.5		×				
Externals, physical dimensions and marking	F.3.3	F.4.3.3		×				
Outgassing (2)	F.3.2.12	F.4.3.2.2			×			
Crimp tensile strength (contact)	F.3.6.6	F.4.3.5.6				×		
Solderability	F.3.6.8	F.4.3.5.8					×	
Resistance to soldering heat	F.3.6.7	F.4.3.5.7						×
Contact retention	F.3.6.2	F.4.3.5.2					×	×

Notes:(1) The tests identified with the symbol “x” shall be performed.

(2) Apply for the qualification test only.

(3) Applicable when specified in detail specifications or when ordered by the purchaser in accordance with paragraph 6.2.1 (Items to be ordered for procurement).

Table F-13. Qualification Test and Quality Conformance Inspection (Group C)

Test item	Requirement paragraph	Test method paragraph	Test group				
			7	8	9	10	11
Externals, physical dimensions and marking	F.3.3	F.4.3.3	×	×	×	×	×
Low-signal level contact resistance	F.3.5.4	F.4.3.4.4				×	×
Contact resistance	F.3.5.3	F.4.3.4.3	×	×	×	×	
Contact engagement and separation forces	F.3.6.3	F.4.3.5.3				×	
Dielectric withstanding voltage (at sea level)	F.3.5.1	F.4.3.4.1.1	×	×	×		
Insulation resistance	F.3.5.2	F.4.3.4.2	×	×	×		
Random vibration	F.3.7.1.2	F.4.3.6.1.2	×				
Shock (II)	F.3.7.2.2	F.4.3.6.2.2		×			
Radiation hardness	F.3.7.8	F.4.3.6.8			×		
Externals and construction	F.3.2, F.3.3	F.4.3.3	×	×	×		
Contact resistance	F.3.5.3	F.4.3.4.3	×	×	×		
Dielectric withstanding voltage (at sea level)	F.3.5.1	F.4.3.4.1.1	×	×	×		
Insulation resistance	F.3.5.2	F.4.3.4.2	×	×	×		
Temperature cycling (II)	F.3.7.3.2	F.4.3.6.3.2	×				
Externals and construction	F.3.2, F.3.3	F.4.3.3	×				
Contact resistance	F.3.5.3	F.4.3.4.3	×				
Dielectric withstanding voltage (at sea level)	F.3.5.1	F.4.3.4.1.1	×				
Insulation resistance	F.3.5.2	F.4.3.4.2	×				
Temperature life	F.3.8.1	F.4.3.7.1				×	
Low-signal level contact resistance	F.3.5.4	F.4.3.4.4				×	
Contact resistance	F.3.5.3	F.4.3.4.3				×	
Contact engagement and separation forces	F.3.6.3	F.4.3.5.3				×	
Resistance to corrosive gas	F.3.7.6	F.4.3.6.6					×
Low-signal level contact resistance	F.3.5.4	F.4.3.4.4		×			×

Notes: (1) The tests identified with the symbol “x” shall be performed.

(2) If equivalent tests have been conducted on individual insulating materials used in connectors, the test data may be substituted for the results of qualification test.

F.4.2 Quality Conformance Inspection

The quality conformance inspection shall be as follows and as specified in paragraph 4.5.

F.4.2.1 Inspection Items and Sample Size

Inspection items shall be as specified in Tables F-14, F-15, and F-12 through F-13. Each inspection shall be conducted in the order listed in each table.
Sample size shall be as specified in Table F-14 for group A inspection, Table F-15 for group B inspection and paragraph F.4.1.1.1 for group C inspection.
Group B inspection shall be conducted for products that have passed group A inspection. However, sample contacts for the crimp tensile strength test in group B inspection shall be selected from the same manufacturing lot of the group A inspection samples before installed to connectors.

F.4.2.2 Determination of Pass or Fail

Determination of pass or fail shall be in accordance with paragraphs 4.5.1.3 and 4.5.2.3.

F.4.2.3 Disposition after Inspection

Disposition after inspection shall be in accordance with paragraphs 4.5.1.4 and 4.5.2.4.

Table F-14. Quality Conformance Inspection (Group A)

Inspection item	Requirement paragraph	Test method paragraph	Criteria for pass/fail	
			Number of samples	Number of defectives permissible
Externals, physical dimensions and marking (1)	F.3.3	F.4.3.3	100%	Less than 10%
Dielectric withstanding voltage (at sea level)	F.3.5.1	F.4.3.4.1.1		
Insulation resistance	F.3.5.2	F.4.3.4.2		
Contact resistance	F.3.5.3	F.4.3.4.3		
Connector Mating and unmating forces	F.3.6.1	F.4.3.5.1		

Note: (1) Visual inspection.

Table F-15. Quality Conformance Inspection (Group B)

Inspection item			Requirement paragraph	Test method paragraph	Criteria for pass/fail	
					Number of samples	Number of defectives permissible
Temperature cycling(I) (1)			F.3.7.3	F.4.3.6.3.1	2	0
Low-signal level contact resistance (1)			F.3.5.4	F.4.3.4.4	2	0
Crimp tensile strength (2)	Wire	AWG24	F.3.6.6	F.4.3.5.6	4	0
		AWG26			4	0
		AWG28			4	0
	Right angle	AWG25			4	0

Notes:

(1) Specified sample size of connectors shall be tested in temperature cycling (I) and low-signal level contact resistance test on each shell finish (see paragraph F.3.2.12.2).

(2) Samples for the crimp tensile strength test shall be randomly selected from the same manufacturing lot before installed to connectors. The samples shall not be delivered as products.

F.4.3 Methods of Test and Inspection

F.4.3.1 Test Conditions

The tests and inspections shall be performed under the following environmental conditions.

a) Temperature: 15 to 35°C
b) Relative humidity: 25 to 75%RH
c) Atmospheric pressure: 73.3 to 106.7kPa {550 to 800mmHg}

F.4.3.2 Materials

Materials shall be examined as specified in paragraph F.4.3.3. However, residual magnetization and outgassing shall be examined as follows.

F.4.3.2.1 Residual Magnetization

Unmated connectors shall be tested as following a) or b). Measuring apparatus shall be as shown in Figures F-2 and F-3.

a) When Using a Milliammeter

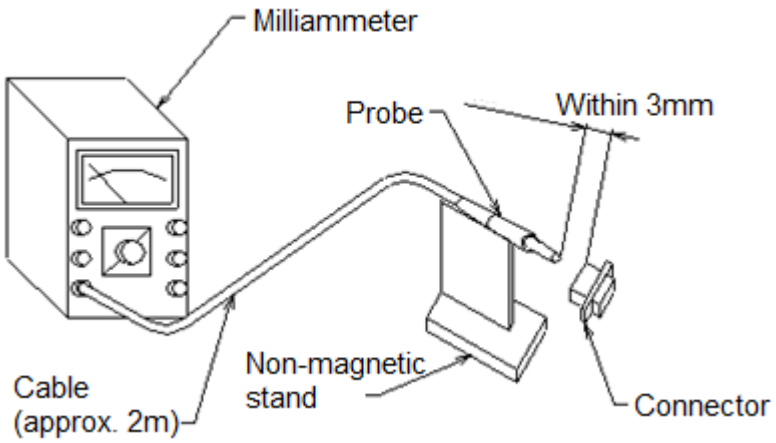


Figure F-2. Milliammeter

1) Warm up the milliammeter for a minimum of 15 minutes.
2) Mount the probe on the non-magnetic stand in a horizontal position extending the cable at full length from the milliammeter.
3) Set the meter in a proper scale range and orient the probe in the magnetic east-west direction so that the meter reading shall be as close as 0.
4) Move the connector in one direction three times between magnet poles that create a field strength of 0.5T {5000 Gauss} or greater without touching poles.
5) Immediately after that, bring the connector gradually to the area within 3mm of the probe tip and record the maximum residual magnetism.

Note: The test shall be performed in the area free from magnetic disturbance; operations of machines, electronic equipment and vehicles, and personnel traffic shall be restricted.

b) When Using a Gaussmeter

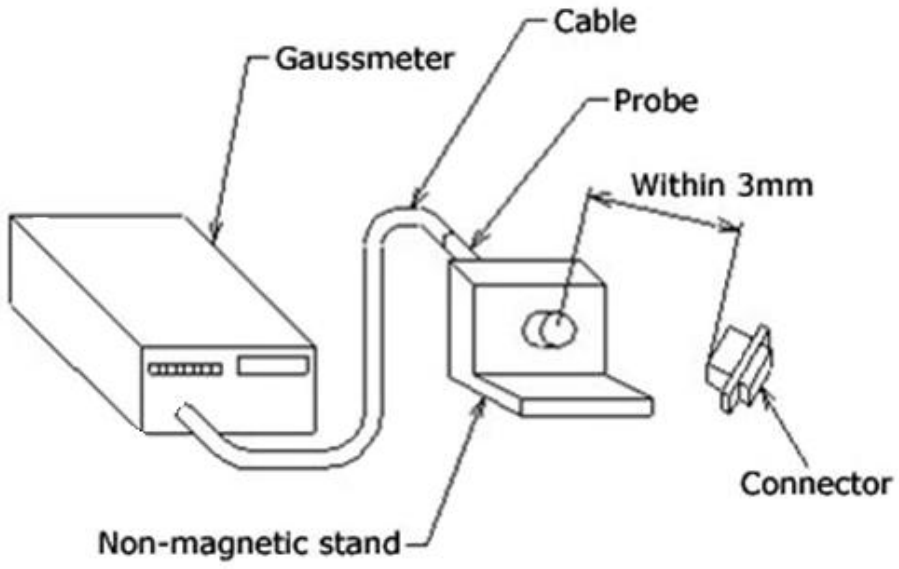


Figure F-3. Gaussmeter

1) Warm up the gaussmeter for a minimum of 30 minutes.
2) Mount the probe on the non-magnetic stand.
3) Set the meter in a proper scale range, and orient the probe in the magnetic east-west direction.
4) Move the connector three times between magnet poles that create a field strength of 0.5T {5000 Gauss} or greater.
5) The connector shall not contact the magnet poles, and shall be moved in the same direction
6) Immediately after that, bring the connector gradually to the area within 3mm of the probe tip and record the maximum residual magnetism.

Note: The test shall be performed in the area free from magnetic disturbance; operations of machines, electronic equipment and vehicles, and personnel traffic shall be restricted.

F.4.3.2.2 Outgassing

Organic materials of connector parts including inserts, filler compounds, interfacial seal and organic materials such as marking inks shall be tested in accordance with ASTM-E595. Outgassing from connectors shall be evaluated using the result in consideration of the weight allocation.

F.4.3.3 Externals, Physical Dimensions and Marking

Externals, physical dimensions, marking and workmanship shall be examined as specified in the following paragraphs.

F.4.3.3.1 Connectors and Accessories

Externals and markings of connectors and accessories shall be examined visually or examined using a 3x magnifier. Externals of contacts shall be examined using

a 3x magnifier or greater. Physical dimensions shall be inspected using a proper instrument such as vernier calipers compliant with JIS B 7507. Mass shall be measured using a proper instrument.

F.4.3.4 Electrical Performance

Electrical performance tests shall be performed as follows.

F.4.3.4.1 Dielectric Withstanding Voltage

F.4.3.4.1.1 At Sea Level

Connectors shall be tested in accordance with test procedure EIA-364-20. The following details shall apply.

a) Test condition: I
b) The test voltage shall be as specified in Table F-16.
c) The test shall be made between all adjacent contacts and between shell and adjacent contacts.
d) The leakage current shall be 5mA or less.
e) Duration of voltage application
   1) For qualification tests: 60 seconds
   2) For quality conformance inspection: 10 seconds or longer
f) For the quality conformance inspection, a proper test jig may be used.

Table F-16. Test Voltage

Unit: V_{AC} (commercial frequency)

Altitude	Initial	After humidity test
At sea level	600	360
Reduced pressure 21,340m (4.4kPa {33mmHg})	150	–

F.4.3.4.1.2 At Reduced Pressure

Connectors shall be tested in accordance with test procedure EIA-364-20. The following details shall apply.

a) Test condition: IV
b) The test voltage shall be as specified in Table F-16.
c) The test shall be made between all adjacent contacts and between shell and adjacent contacts.
d) The leakage current shall be 5mA or less.
e) Five minutes after the specified pressure has been reached, the test voltage shall be applied for 60 seconds.

F.4.3.4.2 Insulation Resistance

Connectors shall be tested in accordance with test procedure EIA-364-21. The following details shall apply.

a) The test voltage shall be 500V_{DC}±10%. After humidity test, the voltage shall be 100V_{DC}±10%.
b) The test shall be made between adjacent contacts for 50% of the contact pairs in the contact arrangement (at least 4 pairs), and between shell and adjacent contacts for 50% or more contacts in the contact arrangement (at least 6 contacts).
c) For quality conformance inspection, a proper test jig may be used.

F.4.3.4.3 Contact Resistance

Mated connectors shall be tested as follows. The test circuit for measuring contact resistance shall be as specified in Figure F-4.

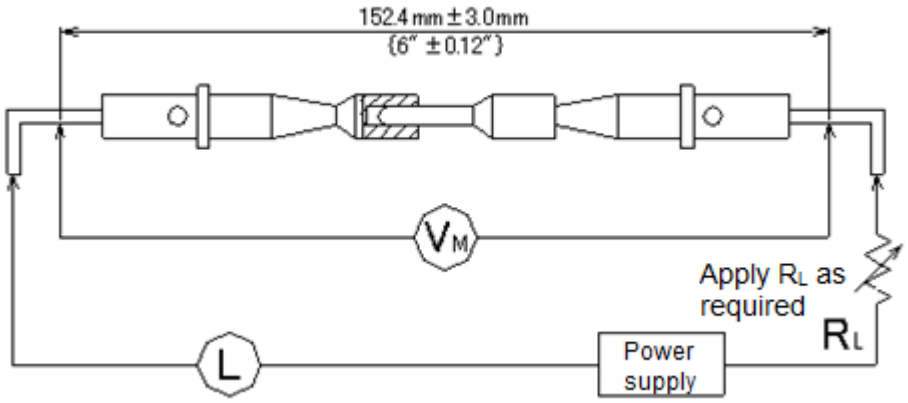


Figure F-4. Test Circuit for Measuring Contact Resistance

Note: (1) Measured point may be protected with potting.

a) Test current: As specified in Table F-5.
b) For mated connectors, the test shall be performed on 20% or more of the contact pairs in the contact arrangement (at least 7 pairs).
c) The test current shall be applied at ambient temperature of 25°C±3°C. After the voltage becomes stable, the voltage drop shall be measured across the specified test points (152.4±3mm) for each inserted contacts.
d) Contacts shall be inserted completely (see Figure F-5).
e) For right angle type contacts, measuring terminal shall be applied at the last edge of contacts (see Supplementary Figure F-15). For wire and soldering type contacts installed to the right angle type connectors, the measuring terminal shall connect to the nearest point of contacts on installed wires. However, the measuring terminal shall not touch the contacts.
f) The voltage drop can be evaluated by measuring beyond the specified test points and subtract resistance of excess wires.

g) For soldering type products, the measurement shall be performed at the tip of solder cup.

F.4.3.4.4 Low Signal Level Contact Resistance

Mated connectors shall be tested in accordance with test procedure EIA-364-23. The following details shall apply.

a) Connectors shall be mated as deeply as normally used. The voltage drop shall be measured across the specified test points (152.4±3mm).
b) For right angle type contacts, measuring terminal shall be applied at the last edge of contacts (see Supplementary Figure F-15). For wire and soldering type contacts installed to the right angle type connectors, the measuring terminal shall connect to the nearest point of contacts on installed wires. However, the measuring terminal shall not touch the contacts.
c) The voltage drop can be evaluated by measuring beyond the specified test points and subtract resistance of excess wires.

F.4.3.5 Mechanical Performance

Mechanical performance tests shall be performed as follows.

F.4.3.5.1 Connector Mating and Unmating forces

Connector Mating and unmating forces shall be tested as follows.

a) Connectors shall be securely mounted in the instrument which can measure prescribed force in the way that the connectors can be mated and unmated with counterpart connectors.
b) Apply load gradually toward axial direction until plugs and receptacles mate completely (see Figure F-5), and measure the applied load.
c) Then, apply load toward unmating direction and measure the load needed for unmating.
d) Pair connectors shall be mated and unmated 3 times each before the first measurement.
e) When using one side connectors as a test jig, it shall not be used more than 500 times in total of mating and unmating.

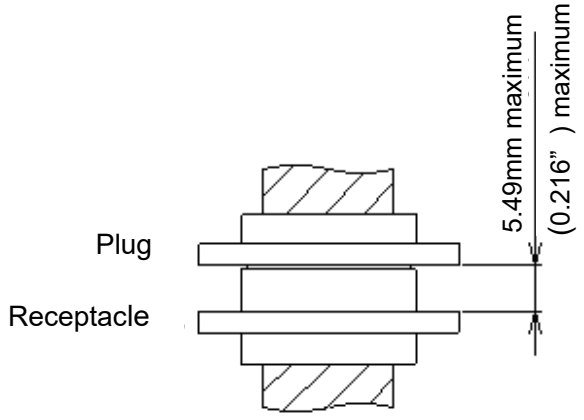


Figure F-5. Connector, fully mated

F.4.3.5.2 Contact Retention

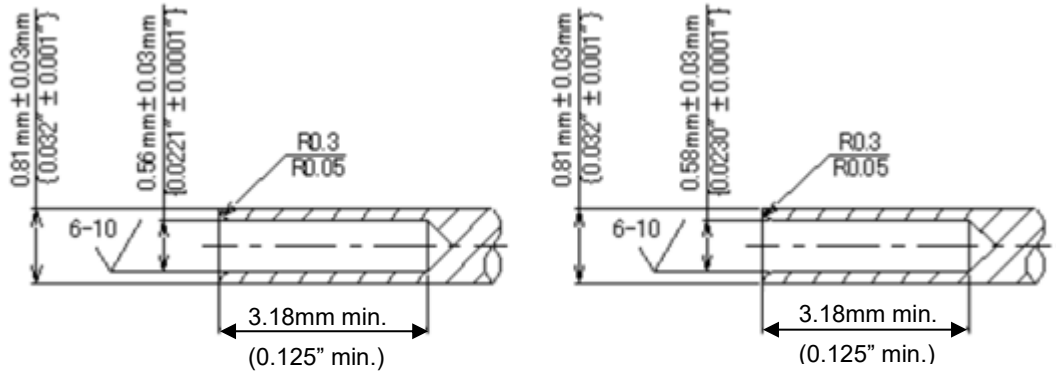
Contact retention shall be performed in accordance with test procedure EIA-364-29. The following details shall apply.

a) 20% of the contact arrangement (at least 7 contacts) shall be tested.
b) The rate to apply the load shall be approximately 4.4N/s {0.45kgf/s}.
c) After the applying load reaches 22.4N {2.27Kgf}, keep the value for 5 seconds minimum and measure the axial displacement of contacts. Also, measure the displacement of contact after the load is removed.
d) For testing pin or socket connectors, apply load by pulling wires. If wires broke outside connectors, it shall not be considered failures of the test and the test can be performed again for another contact.

F.4.3.5.3 Contact Engagement and Separation Forces

Contact engagement and separation forces shall be tested as follows.

a) 20% of the contact arrangement (at least 7 contacts) shall be tested.
b) Test sleeves shown in Figure F-6 shall be used.
c) Test sleeves shall be installed on the proper position of the jig.
d) Apply load gradually toward axial direction, and engage and separate a pin contact into and from the test sleeve.
e) After engage and separate the pin contact once into and from the minimum diameter test sleeve, engage the pin contact into the maximum diameter test sleeve and measure the separation force of the third round of separation. Then engage and separate twice into and from the minimum diameter test sleeve and measure the engagement force of the third round of engagement.
f) The pin contacts shall not be pressed on the bottom of the test sleeve hole.



Minimum diameter test sleeve **Maximum diameter test sleeve**

Figure F-6. Test Sleeves

F.4.3.5.4 Durability

Connectors shall be tested as follows.

a) The connectors shall be mated and unmated 500 times.
b) For manual testers, the repetition rate of mating and unmating shall be at a rate of 300 cycles per hour maximum.

For automatic testers, the repetition rate of mating and unmating shall be at a rate of 550 cycles per hour maximum.

c) After completion of the test, contact resistance, contact engagement and separation forces, and mating and unmating forces shall be measured.

F.4.3.5.5 Insert Retention

Insert retention shall be tested as follows.

a) Insert shall be tested for the both directions of the connector axis.
b) Put pressure gradually with air pressure or equivalent at 69.0kPa/s {0.70kgf/cm^2/s} until the pressure reaches 344.7kPa {3.51 kgf/cm^2}
c) Keep 5 seconds minimum after the load reaches the maximum.

F.4.3.5.6 Crimp Tensile Strength

Wire crimped socket contacts shall be tested as follows.

a) Contacts shall be mounted on the test jig of tensile test machine.
b) Apply load shown in Table F-9 toward axial direction.
c) The head movement speed of tensile test machine shall be 25.4mm per minute as a minimum.
d) Wire breakage occurred at outside the crimped area shall not be considered failures of the test.

F.4.3.5.7 Resistance to Soldering Heat

F.4.3.5.7.1 Soldering Type

Unmated connectors shall be tested as follows.

a) 20% of the contact arrangement (at least 7 contacts) shall be tested.
b) Copper wire of 50.8mm to 101.6mm shall be inserted into solder cup.
c) SN-63 solder shall be used. Flux may be used if necessary.
d) Unless otherwise specified, pencil type 25W soldering iron shall be used.
e) Apply SN-63 solder and soldering iron, which is heated to 360°C±10°C, to solder cup for 4 to 5 seconds until the solder melts.
f) After use, remove the soldering iron and perform visual inspection with a 10x magnifier.
g) After completion of the test, contact retention shall be measured.

F.4.3.5.7.2 Right Angle Type

Unmated connectors shall be tested in accordance with test method 210, condition A of MIL-STD-202. The following details shall apply.

a) Test shall be performed by immersing terminal in solder bath.
b) Connectors shall be immersed to a depth of 3mm as a maximum from the wire termination.
c) Flux shall not be used.
d) 20% of the contact arrangement (at least 7 contacts) shall be tested.

F.4.3.5.8 Solderability

F.4.3.5.8.1 Soldering Type

Unmated connectors shall be tested as follows.

a) Solder cup shall not be cleansed before soldering.
b) Solder cup shall be immersed in RMA flux or brush coated with RMA flux just before soldering.
c) Set a pencil type soldering iron to 300°C±10°C and heat the solder cup.
d) Solder with a proportion of 63/37 of tin and lead shall be used.
e) Solder cup shall be heated to the melting point of solder. Then the solder cup shall be filled with solder so that the surface of solder cup gets wet with solder and the opening becomes curved like lens.
f) 10x magnifier shall be used for inspection.
g) 20% of the contact arrangement (at least 7 contacts) shall be tested.

F.4.3.5.8.2 Right Angle Type

Unmated connectors shall be tested in accordance with test method 208 of MIL-STD-202. The following details shall apply.

a) Connectors shall be immersed to a depth of 3mm as a maximum from the wire termination.
b) 20% of the contact arrangement (at least 7 contacts) shall be tested.

F.4.3.6 Environmental Performance

Environmental performance tests shall be performed as follows.

F.4.3.6.1 Vibration

F.4.3.6.1.1 High Frequency Vibration

Mated connectors shall be tested in accordance with test procedure EIA-364-28. The following details shall apply.

a) Receptacles shall be mounted normally on a vibration table using jig. Plugs shall be engaged with the receptacles and secured by a proper accessory. A sensor shall be installed on receptacles or neighborhood, and the vibration of receptacles shall be monitored.
b) All contacts shall be crimped in series.
c) Currents of 100mA or more shall be applied to the contacts and the contacts shall be monitored for electrical continuity using a detector capable of detecting any discontinuity in excess of 1μs.
d) Test condition: IV (196.1m/s^2 {20G}p-p)
e) Wires installed in receptacles shall be secured to a non-vibrating table located more than 10cm from the rear side of the receptacles.
f) Wires installed in plugs shall be secured to a non-vibrating table located approximately 10cm from the rear side of the plugs.
g) Wire bundles shall be secured to prevent sympathetic vibration.

F.4.3.6.1.2 Random Vibration

Mated connectors shall be tested in accordance with test procedure EIA-364-28. The following details shall apply.

a) Connectors shall be mounted in accordance with item a) of paragraph F.4.3.6.1.1.
b) Currents of 100mA or more shall be applied to all contacts during the test. The contacts shall be monitored for electrical continuity using a detector capable of detecting any discontinuity in excess of 1μs.
c) Test condition VI, effective acceleration: 334m/s^{2}rms {34.02Grms}
d) Duration of vibration: 15 minutes for each axis, 45 minutes in total.
e) Wires installed in receptacles shall be secured to a non-vibrating table located more than 10cm from the rear side of the receptacles.
f) Wires installed in plugs shall be secured to a non-vibrating table located approximately 10cm from the rear side of the plugs.
g) Wire bundles shall be secured to prevent sympathetic vibration.

F.4.3.6.2 Shock

F.4.3.6.2.1 Shock (I)

Mated connectors shall be tested in accordance with test procedure EIA-364-27. The following details shall apply.

a) Connectors shall be mounted in accordance with item a) of paragraph F.4.3.6.1.1.
b) Shock shall be applied once for each axis, 6 times in total.
c) All contacts shall be crimped in series.
d) Currents of 100mA or more shall be applied to the contacts and the contacts shall be monitored for electrical continuity using a detector capable of detecting any discontinuity in excess of 1μs.
e) Test condition: D (2942m/s^2 {300G}), half-sine wave
f) Wires installed in receptacles shall be secured at more than 20cm from the rear side of the receptacles.
g) Wires installed in plugs shall be secured at approximately 10cm from the rear side of the plugs.
h) Wire bundles shall be secured to allow the bundles to move with connectors.

F.4.3.6.2.2 Shock (II)

Mated connectors shall be tested in accordance with test procedure EIA-364-27. The following details shall apply.

a) Test conditions
    1) Acceleration of gravity (A): 14710m/s^2 {1500G}±20%.
    2) Duration of pulse (D): 0.5ms±15%.
    3) Waveform: Half-sine wave.
    4) Velocity change (vi): 4.68m/s±10%.
    5) Direction of shock application: ±X, ±Y, and ±Z (3 shocks per each direction, 18 shocks in total).

b) Mounting method: As specified in item a) of paragraph F.4.3.6.1.1.
c) Wires: As specified in items f) and g) of paragraph F.4.3.6.2.1.
d) Monitoring during test: As specified in item d) of paragraph F.4.3.6.2.1.

F.4.3.6.3 Temperature Cycling

F.4.3.6.3.1 Temperature Cycling (I)

Unmated connectors shall be tested in accordance with test procedure EIA-364-32. The following details shall apply.

a) Test condition: A
b) The test shall be performed for 5 cycles at the temperatures specified in Table F-17. However, the test shall be performed for 10 cycles in group B of quality conformance inspection.
c) Measurements and Inspection
After completion of the last cycle, the connectors shall be removed from the chamber to ambient temperature and visual inspection shall be performed. In group B of quality conformance inspection, low-signal level contact resistance shall be measured after the visual inspection.
d) Possible failure modes after test and pass/fail criteria:
In accordance with FMAT in the Quality Assurance Program Plan.

Table F-17. Temperature Cycling

Unit: °C

Exposed temperature	Temperature
Low	-65^{0}_{-3}
High	$+125^{+3}_{0}$

F.4.3.6.3.2 Temperature Cycling (II)

Wired and mated connectors shall be tested in accordance with method EIA-364-32. The following details shall apply.

a) The temperature for step 1 shall be -30^{0}_{-5}°C.
b) The temperature for step 2 shall be $+100^{+3}_{0}$°C.
c) The number of cycles shall be 1,000.
d) Measurements and inspection
The following electrical measurement and visual inspection shall be performed at 100^{+10}_{0}, 250^{+10}_{0}, 500^{+10}_{0}, and $1{,}000^{+10}_{0}$ cycles.
1) Electrical characteristics
Contact resistance, withstanding voltage and insulation resistance.
2) Visual inspection
All connectors shall be visually examined for cracks on the surface.
e) Possible failure modes after test and pass/fail criteria:
In accordance with FMAT of the Quality Assurance Program Plan.

F.4.3.6.4 Humidity

Mated connectors installed with wired contacts shall be tested in accordance with test procedure EIA-364-31. The following details shall apply.

a) Test condition: II (except 7a and 7b)
b) Duration of test: 240 hours
c) Upon completion of step 6 of the final cycle, the connector shall be removed from the chamber and unmated, and moisture shall be removed from the insert surface. Dielectric withstanding voltage test (at sea level) and insulation resistance test shall be conducted within 1 to 2 hours after removal.
d) After 24-hour conditioning period at ambient temperature, the insulation resistance shall be re-measured.

F.4.3.6.5 Fluid Immersion

Unmated connectors shall be tested by the immersion test with the fluids specified in Table F-18. The following details shall apply.

a) Unmated connectors shall be completely-immersed in the fluids specified in Table F-18 for the specified period of time.
b) Connectors shall be removed from the fluids and maintained at ambient temperature and normal humidity for one hour. Then mating and unmating forces shall be measured. The measurement shall be performed using the same connector pairs as prior test.
c) Fluids on the connector surface shall be removed by the proper solvent and the surface shall be cleaned.

Table F-18. Test Fluids

Fluid	Immersion
Lubricating oil specified in MIL-PRF-23699	20 hours
Coolant (Nonconductive silica-ester based lubricating oil (COOLANOL25 or equivalent))	1 hour±1minute

F.4.3.6.6 Resistance to Corrosive Gas

Unmated connectors shall be placed on a noncorrosive rack in a sealed plastic or glass chamber ($0.057m^3$ {$2ft^3$}) which shall contain 10% solution of potassium sulfide in distilled water, and the connectors shall be exposed to the sulfide vapor for 100 hours. After completion of the test, low-signal level contact resistance shall be measured. Connectors shall not be immersed in the solution during the test.

F.4.3.6.7 Salt Spray (Corrosion)

Mated connectors shall be tested in accordance with test procedure EIA-364-26. The following details shall apply.

a) Test condition: B (48 hours)

b) After exposure, salinity on the connectors shall be rinsed off with tap water and dried by a drier at 38°C±3°C for 12 hours.
c) After drying, visual inspection shall be performed to see the evidence of corrosion, contact resistance, mating and unmating forces, and contact retention shall be measured.

F.4.3.6.8 Radiation Hardness

Mated connectors shall be tested under the following conditions.
a) Radiation type: ^{60}Co gamma ray
b) Total dose of radiation: 10^5Gy

F.4.3.7 Durability

Durability tests shall be performed as follows.

F.4.3.7.1 Temperature Life

Mated connectors shall be tested in accordance with test procedure EIA-364-17. The following details shall apply.
a) Test temperature condition: 5 (125±2°C)
b) Test time condition: D (1,000 hours)
c) Contacts shall be engaged as deeply as normally used (see Figure F-4). No electrical load shall be applied.
d) Upon completion of the test, low-signal level, contact resistance, and contact engagement and separation forces shall be measured.

F.4.4 Long-Term Storage

Long-term storage shall be as specified in paragraph 4.7. However, when storing connectors that have ETFE insulated wire crimped for a long time, measures specified in paragraph F.6.2.2 shall be adopted.

F.4.5 Change and Optimization of Tests and Inspections

Change to tests and inspections shall be in accordance with paragraph 4.8.

F.5 Preparation for Delivery

Preparation for delivery shall be as follows and as specified in paragraph 5.

F.5.1 Packaging

a) The mating area of the connectors shall be covered with a dust cap. Termination style “R” shall be applied with alignment board to prevent contacts from deformation or damages. Each product shall be placed in a transparent polyethylene bag and heat sealed.
b) Connectors wired with ETFE insulated wire shall be stored in unsealed package and the package shall be protected with air cup. Air vents shall be made on the protector.
Product name, required marking items and notes shall be marked on tags and attached to connectors where the tags can be easily confirmed.

c) Sealed packaged connectors shall be packaged individually with a tag indicating product name, required marking items and notes (example: Care shall be taken when handling as the product has been cleaned for space use).

F.6 Notes

F.6.1 Notes for Manufacturer

Notes for manufacturer shall be as specified in paragraph 6.1.

F.6.2 Notes for Purchaser

Notes for purchaser shall be as follows and as specified in paragraph 6.2.

F.6.2.1 Items to be ordered for Procurement

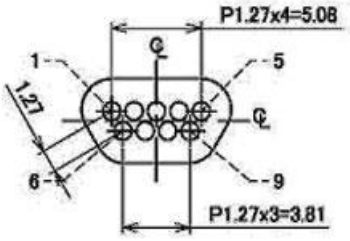
To purchase right angle type connectors connected with wires manufactured in compliance with this appendix, the purchaser shall specify the length of wire and solid wire.

F.6.2.2 Handling Method for Connectors with ETFE Insulated Wires

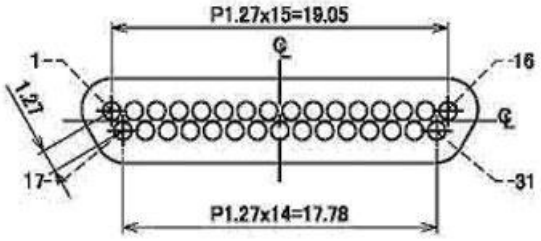
The fluorine series insulating materials such as ETFE insulated wires may produce small amount of gas with time. If storing the insulating materials in sealed package, the produced fluorinated gas reacts with moisture and forms high corrosive hydrofluoric acid. Consequently, if storing connectors with ETFE insulated wires in sealed package, corrosion may occur on connector surface or contacts in several months. To avoid the corrosion, the following measures shall be taken when storing “W” type wire connectors with ETFE insulated wires.

a) All products shall be inspected with a proper magnifier to confirm that there is no corrosion or darkening on shiny metal surface of the connectors on receipt and before use.
b) Terminals of all connectors shall be protected with dust covers.
c) For storage, terminated connectors shall be removed from container (packing) to prevent fluorine contamination and stored in the humidity controlled environment. It is desirable to store in dry nitrogen atmosphere.

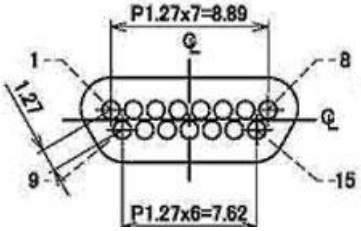
Unit: mm



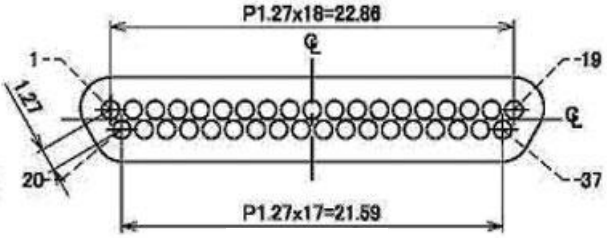
9 contacts



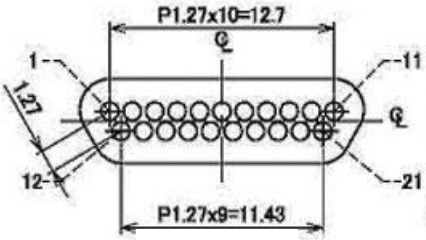
31 contacts



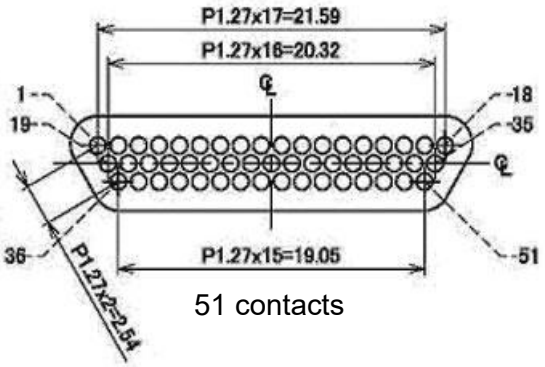
15 contacts



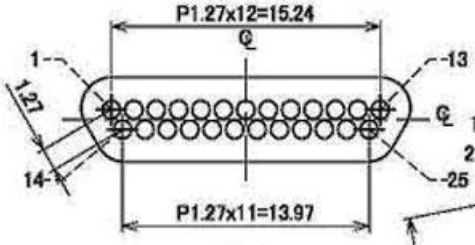
37 contacts



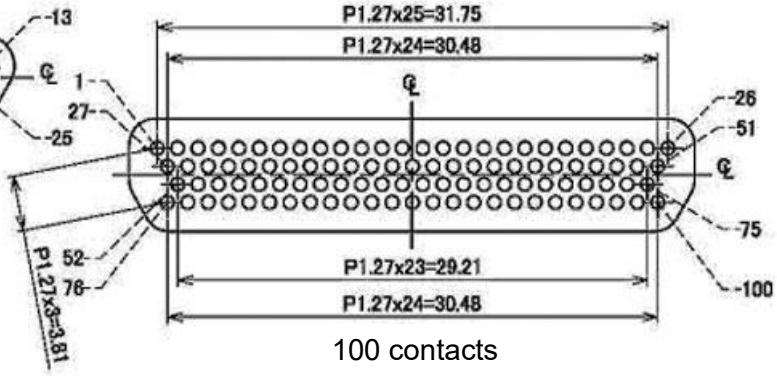
21 contacts



51 contacts



25 contacts



100 contacts

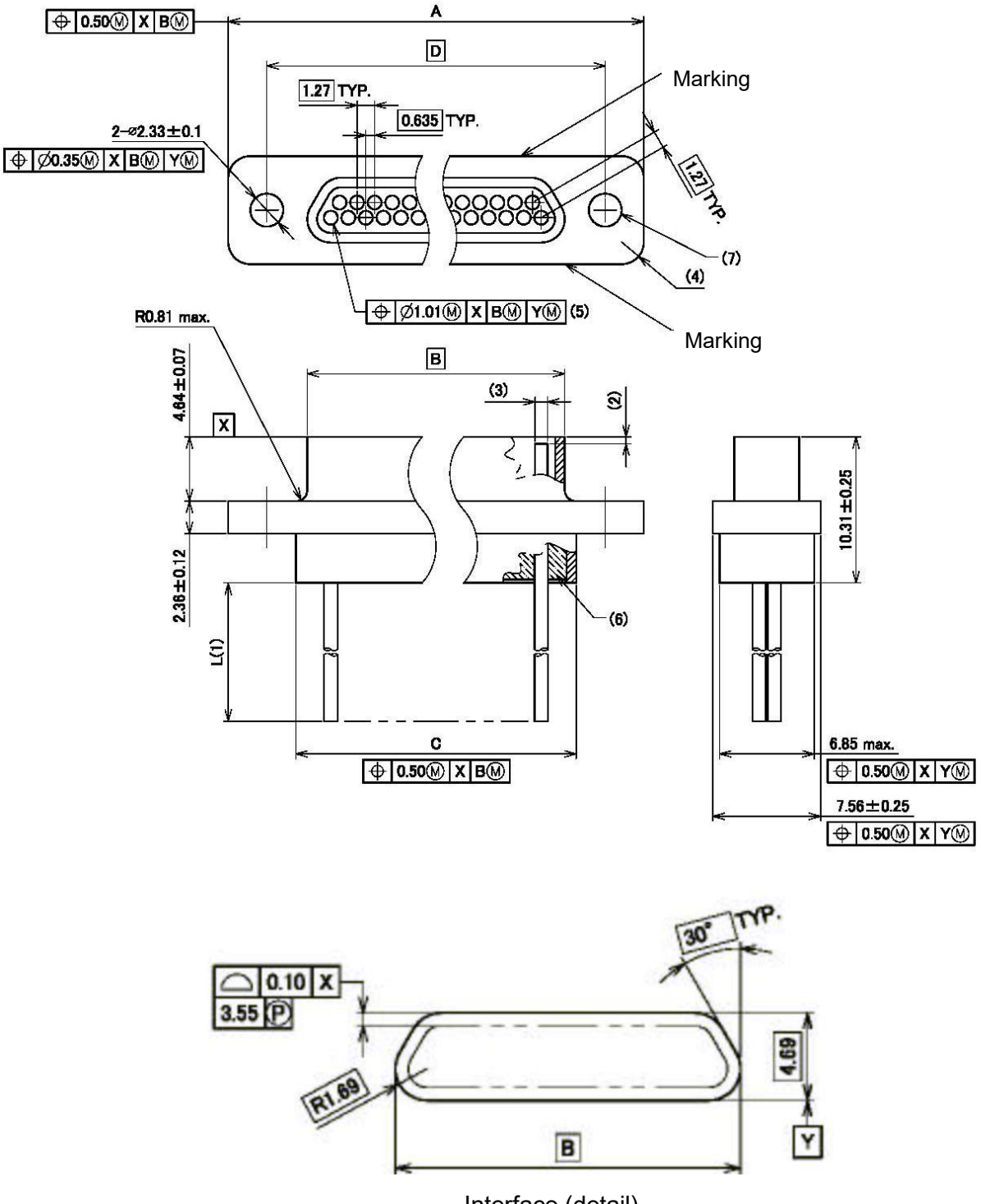
Notes:

(1) Pin connectors (front view)

(2) Left and right of contact position numbers are reversed for socket connectors.

Supplementary Figure F-1. Contact Arrangement

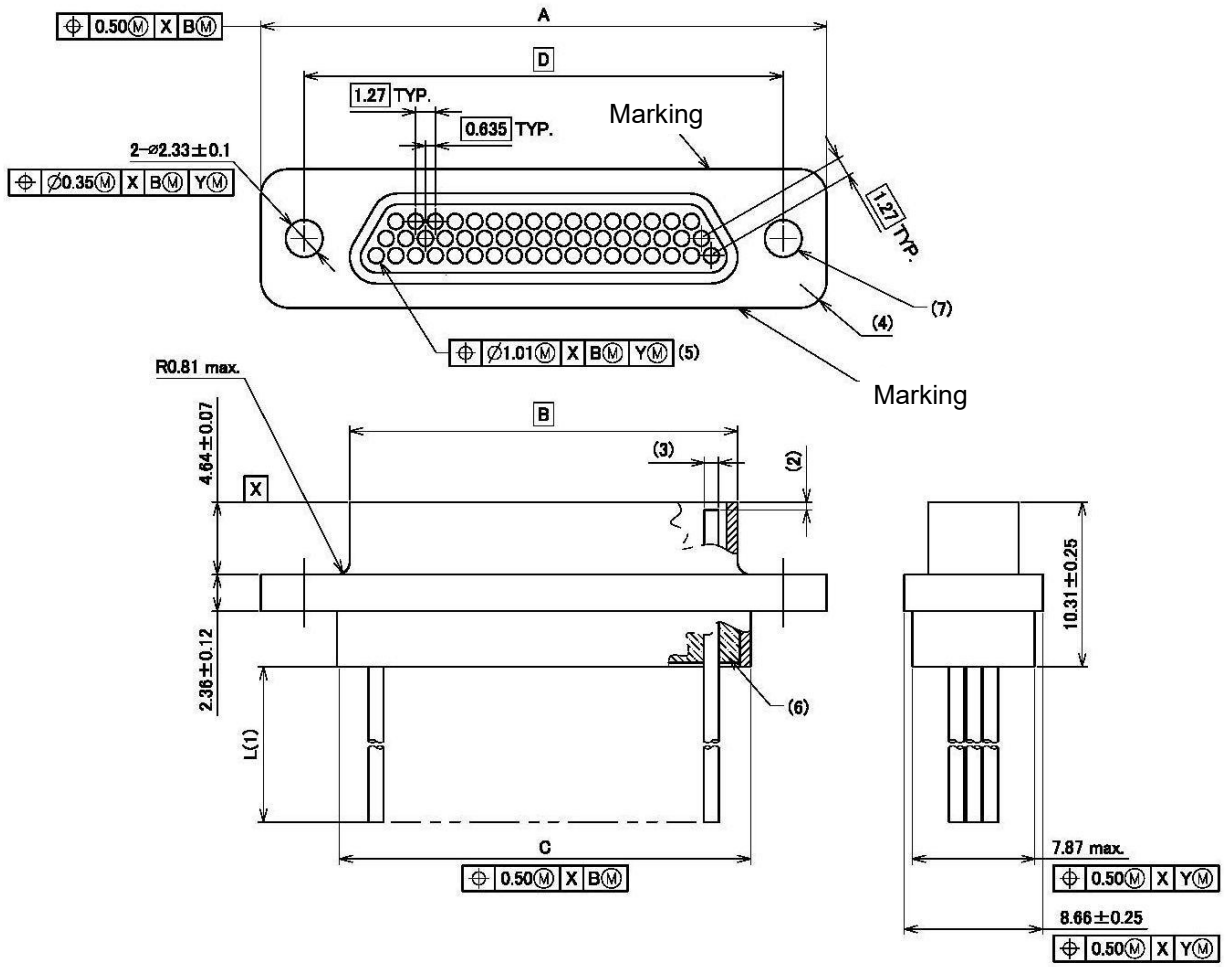
Unit: mm

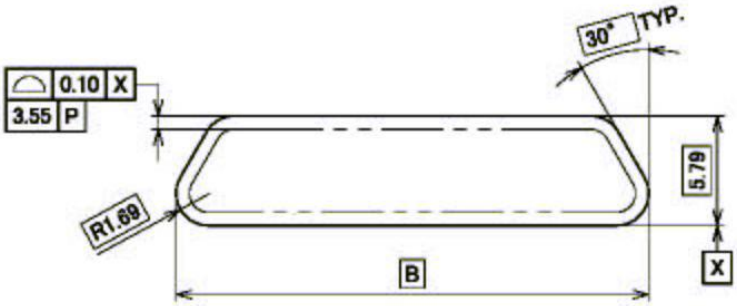


Interface (detail)

Supplementary Figure F-2. Wire Type Pin Connectors (9 to 37 contacts) (1/4)

Unit: mm

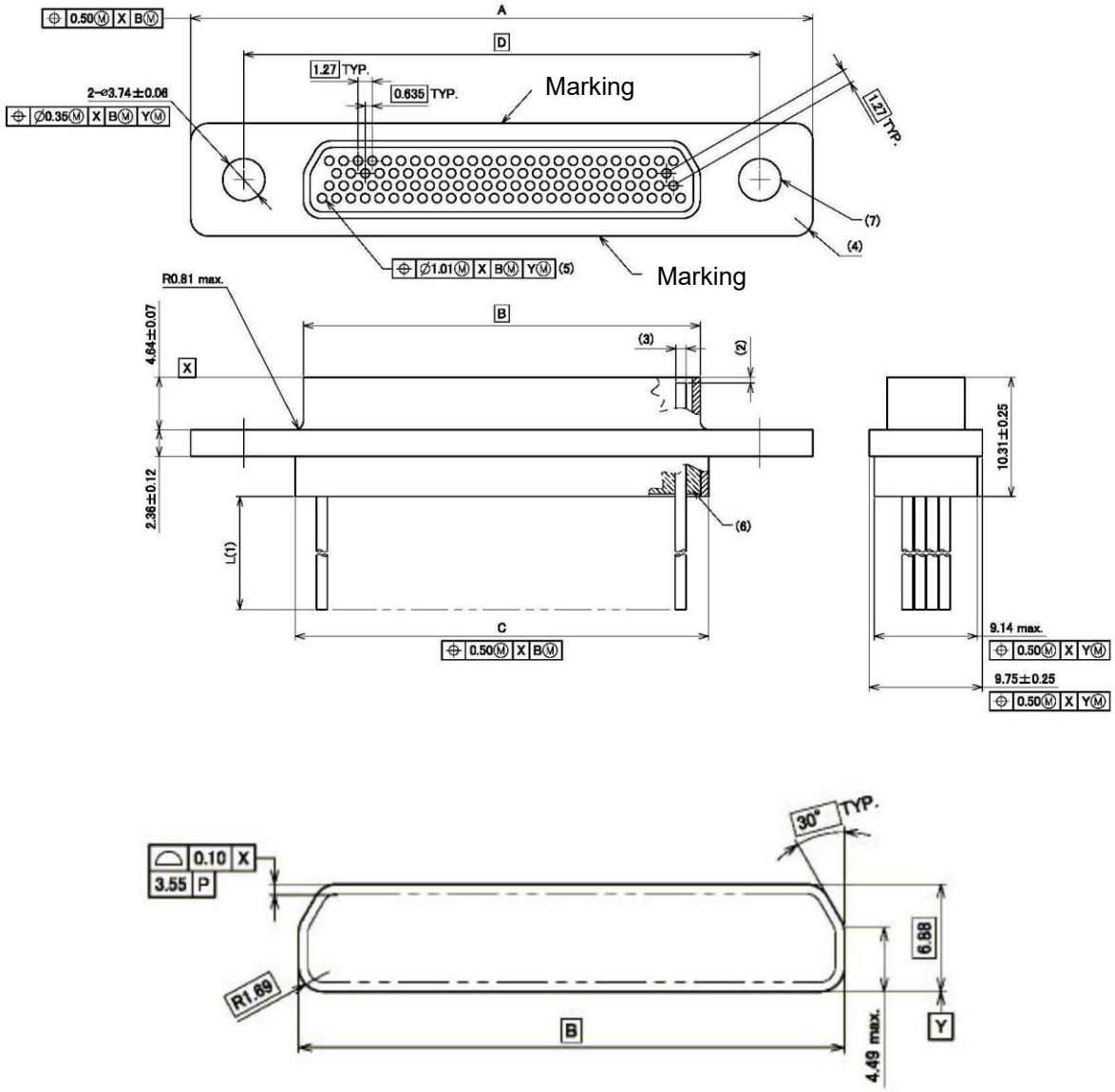




Interface (detail)

Supplementary Figure F-2. Wire Type Pin Connectors (51 contacts) (2/4)

Unit: mm



Interface (detail)

Supplementary Figure F-2. Wire Type Pin Connectors (100 contacts) (3/4)

Unit: mm

Part number ([9])	Contact arrangement	Physical dimensions ([8])			
		A	B	C	D
		±0.25		+0.25 -0.46	
JD1*5-9P-C**	9	19.68	8.48	9.91	14.35
JD1*5-15P-C**	15	23.50	12.29	13.72	18.16
JD1*5-21P-C**	21	27.30	16.10	17.53	21.97
JD1*5-25P-C**	25	29.84	18.64	20.07	24.51
JD1*5-31P-C**	31	33.66	22.45	23.88	28.32
JD1*5-37P-C**	37	37.46	26.26	27.69	32.13
JD1*5-51P-C**	51	36.20	24.99	26.42	30.86
JD1*5-100P-C**	100	54.86	35.15	36.37	45.72

Notes:

([1]) Tolerance of cable length: +25.4mm, -0mm

([2]) Difference from the front surface of insert shall be 0.51mm±0.39mm.

([3]) Hole diameter of insert shall be Φ0.91mm±0.05mm.

([4]) Shells shall be reasonably rounded.

([5]) Geometric tolerance of insert.

([6]) Wiring shall be fixed with filler.

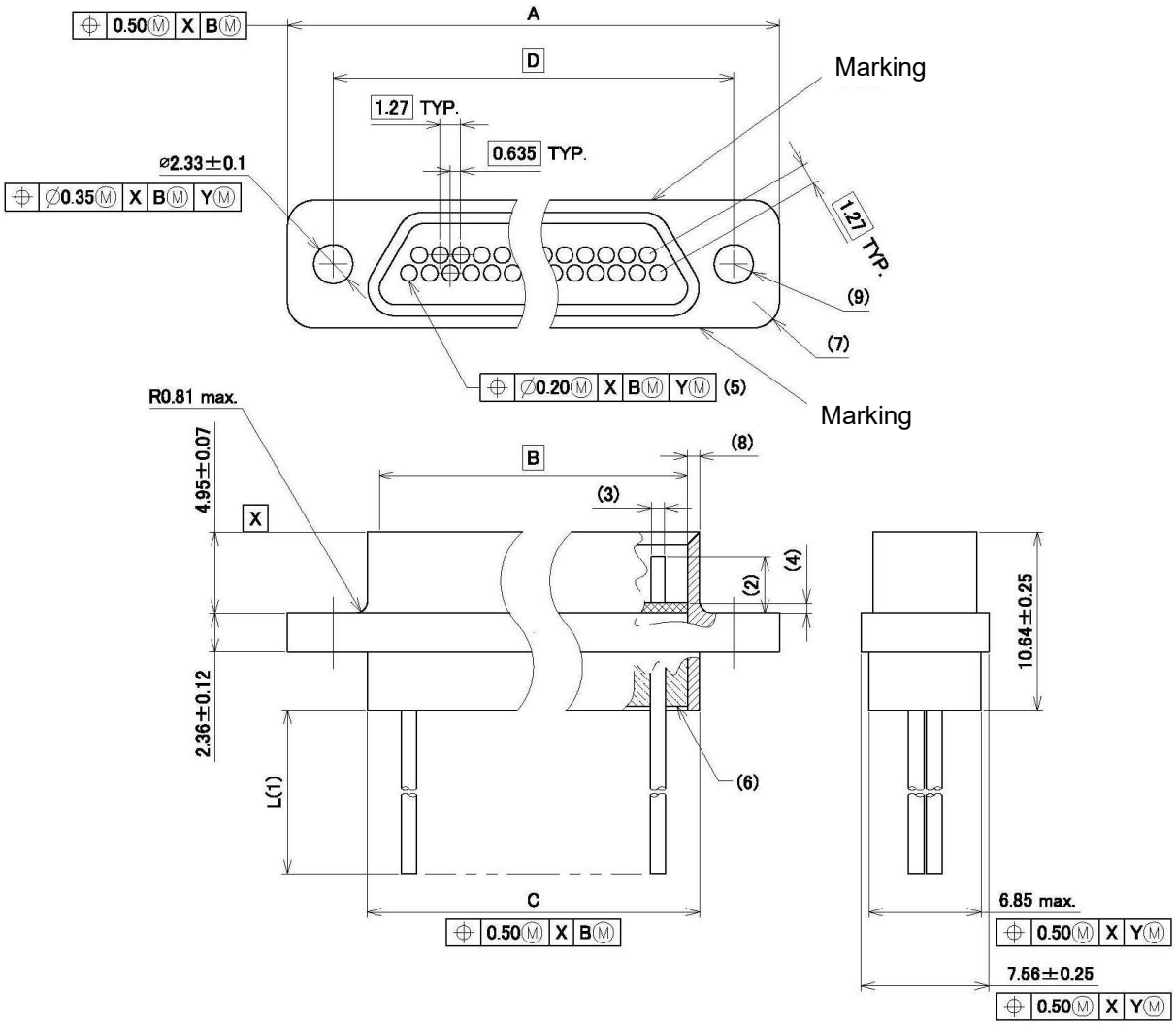
([7]) Designated accessories shall be attachable.

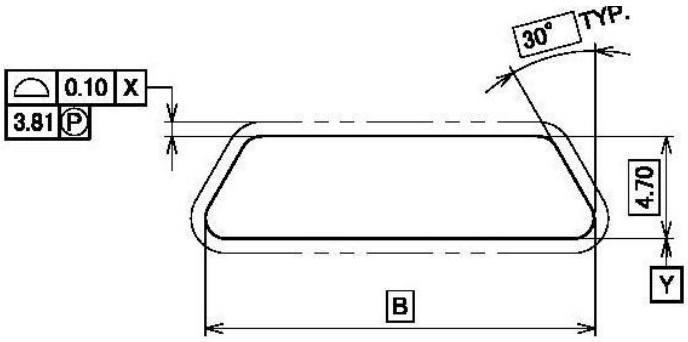
([8]) Unspecified tolerance: ±0.13

([9]) Part number shall be in accordance with paragraph F.1.2.1.

Supplementary Figure F-2. Wire Type Pin Connectors (4/4)

Unit: mm

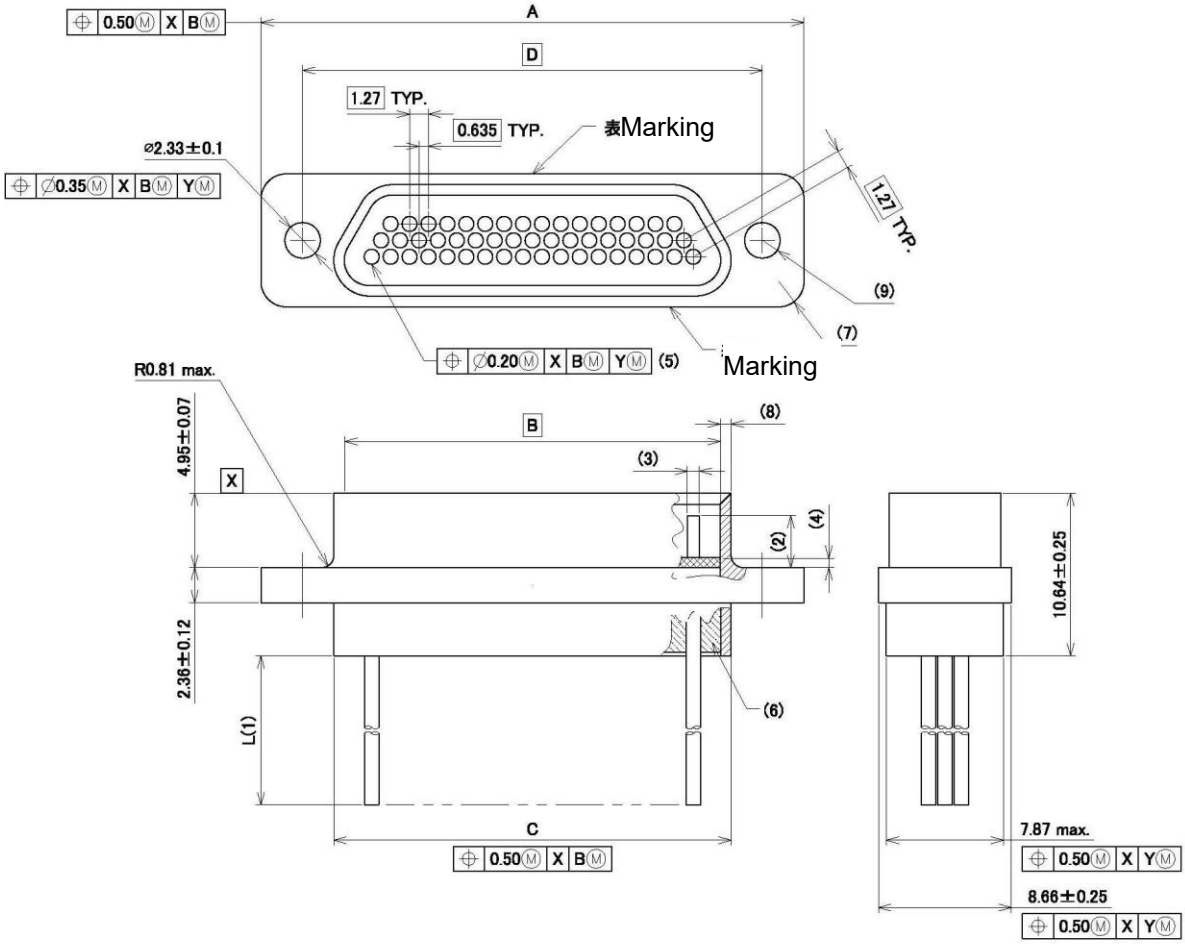


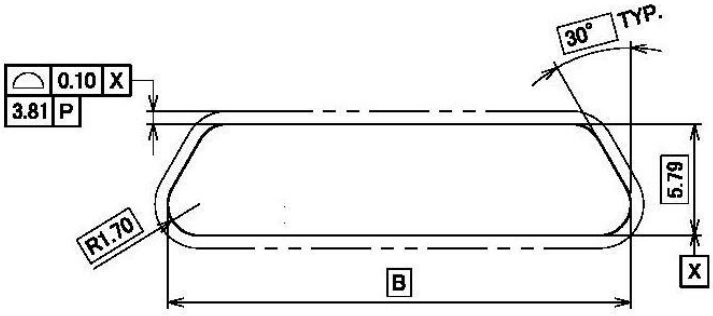


Interface (detail)

Supplementary Figure F-3. Wire Type Socket Connectors (9 to 37contacts) (1/4)

Unit: mm

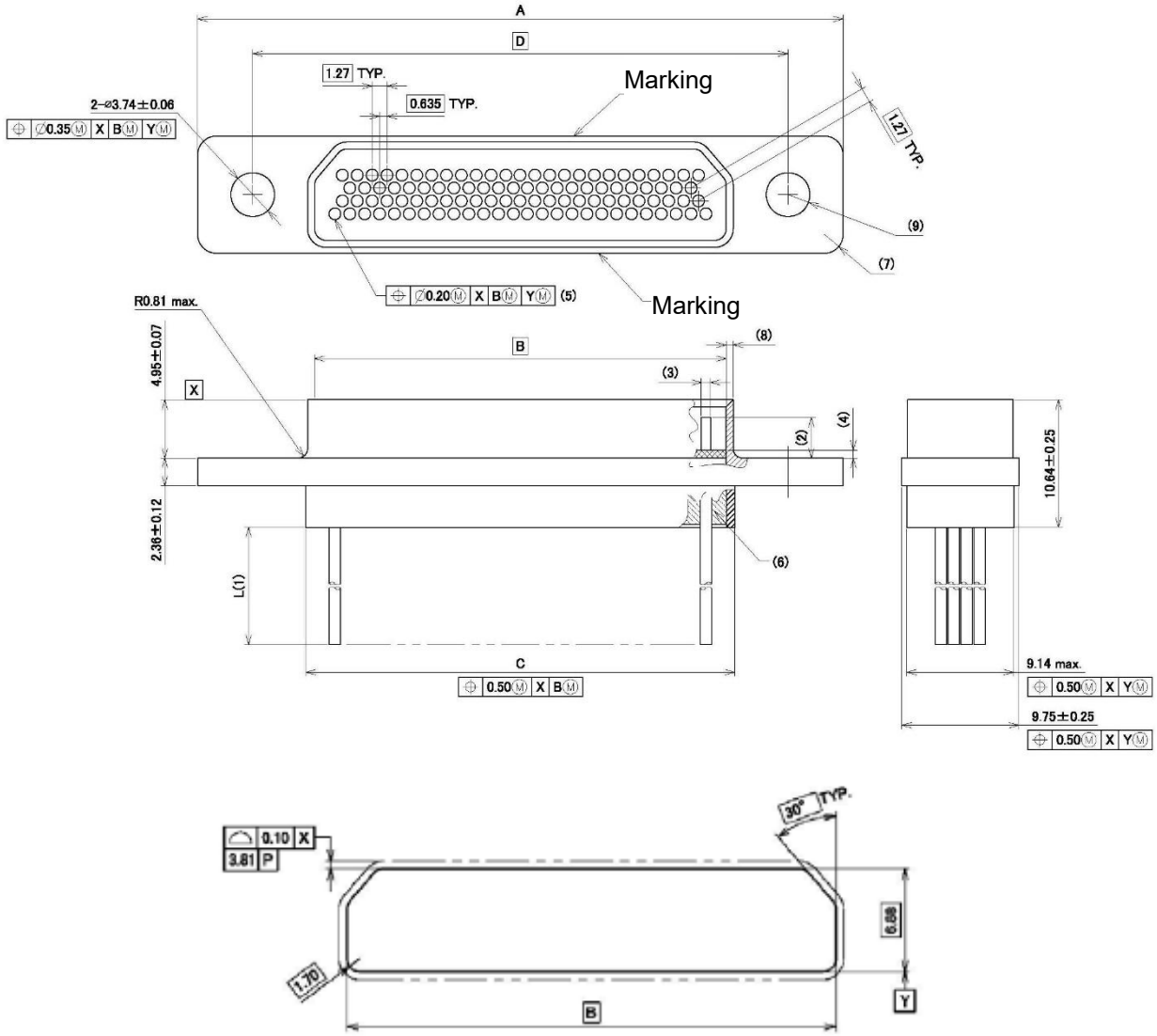




Interface (detail)

Supplementary Figure F-3. Wire Type Socket Connectors (51 contacts) (2/4)

Unit: mm



Interface (detail)

Supplementary Figure F-3. Wire Type Socket Connectors (100 contacts) (3/4)

Unit: mm

Part number (11)	Contact arrangement	Physical dimensions (10)			
		A ±0.25	B	C +0.25 -0.46	D
JD1*5-9S-C**	9	19.68	8.48	9.91	14.35
JD1*5-15S-C**	15	23.50	12.29	13.72	18.16
JD1*5-21S-C**	21	27.30	16.10	17.53	21.97
JD1*5-25S-C**	25	29.84	18.64	20.07	24.51
JD1*5-31S-C**	31	33.66	22.45	23.88	28.32
JD1*5-37S-C**	37	37.46	26.26	27.69	32.13
JD1*5-51S-C**	51	36.20	25.00	26.42	30.86
JD1*5-100S-C**	100	54.86	35.15	36.37	45.72

Notes:

(1) Tolerance of cable length: +25.4mm, -0mm

(2) Difference from the front surface of insert shall be 3.47mm±0.17mm.

(3) Hole diameter of socket shall be Φ0.81mm±0.03mm.

(4) The thickness of interfacial seal shall be 0.66mm±0.1mm.

(5) Geometric tolerance of insert.

(6) Wiring shall be fixed with filler.

(7) Shells shall be reasonably rounded.

(8) The thickness of all circumferences shall be 0.63mm±0.12mm.

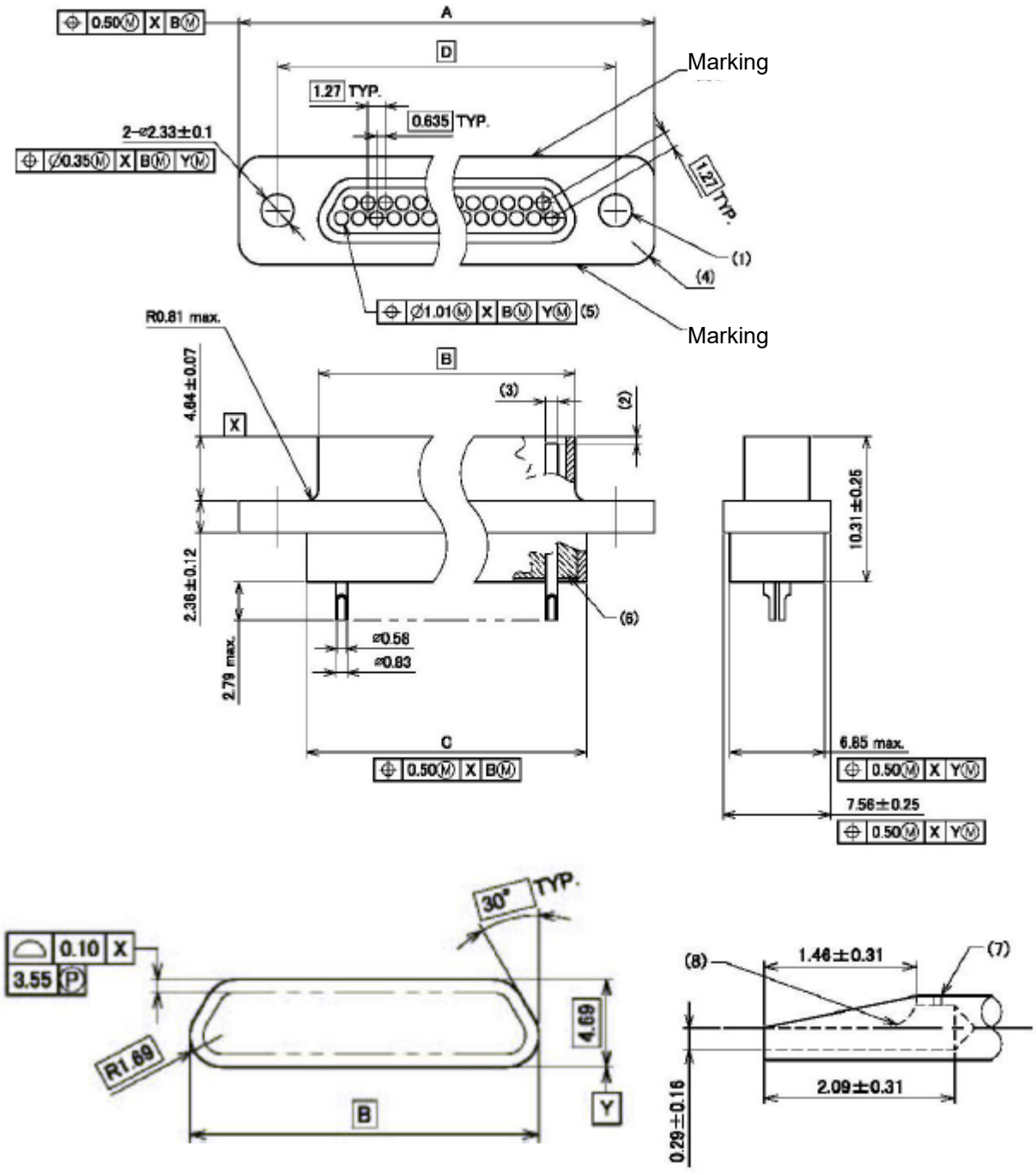
(9) Designated accessories shall be attachable.

(10) Unspecified tolerance: ±0.13

(11) Part number shall be in accordance with paragraph F.1.2.1.

Supplementary Figure F-3. Wire Type Socket Connectors (4/4)

Unit: mm

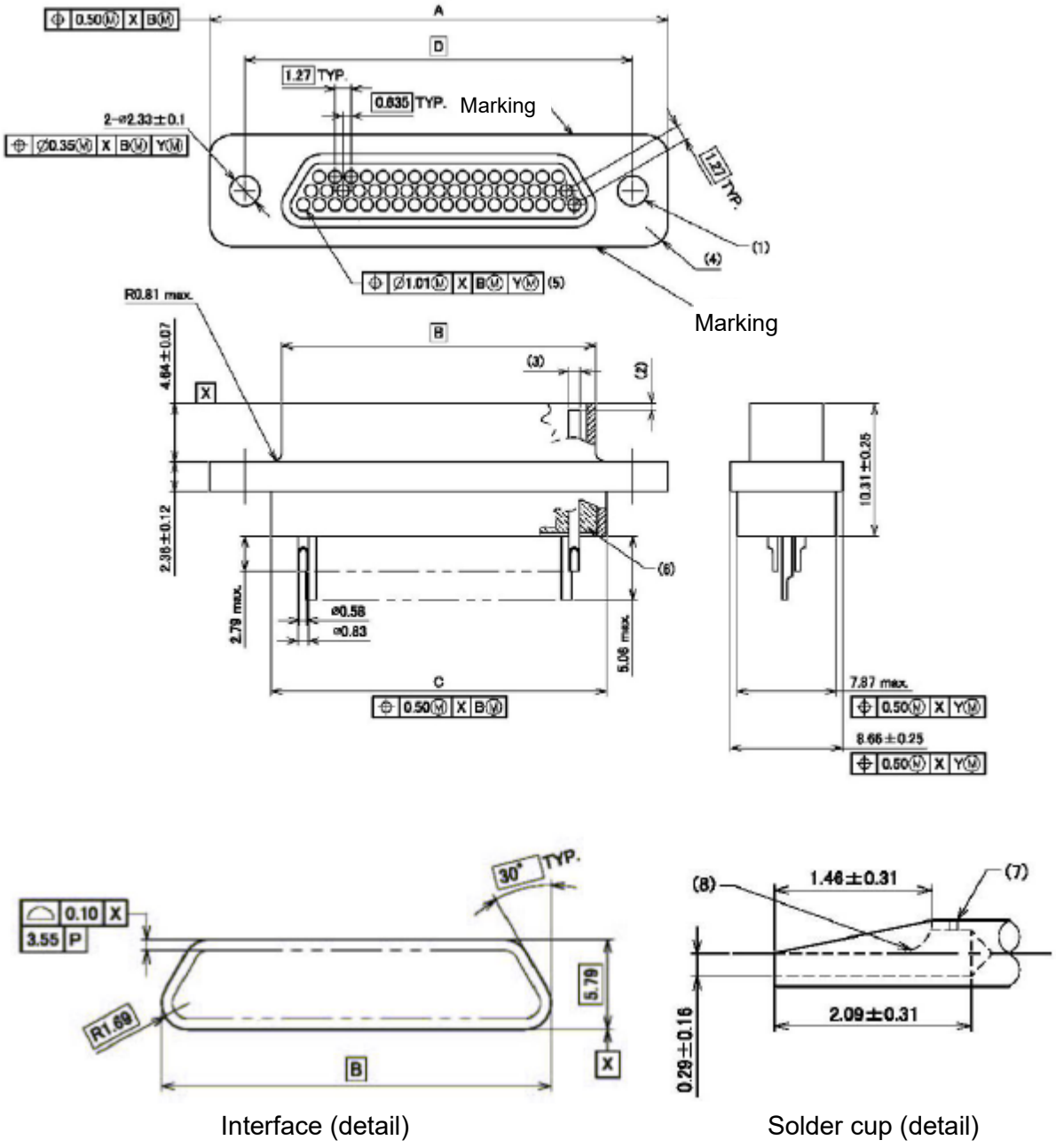


Interface (detail)

Solder cup (detail)

Supplementary Figure F-4. Soldering Type Pin Connectors (9 to 37 contacts) (1/4)

Unit: mm

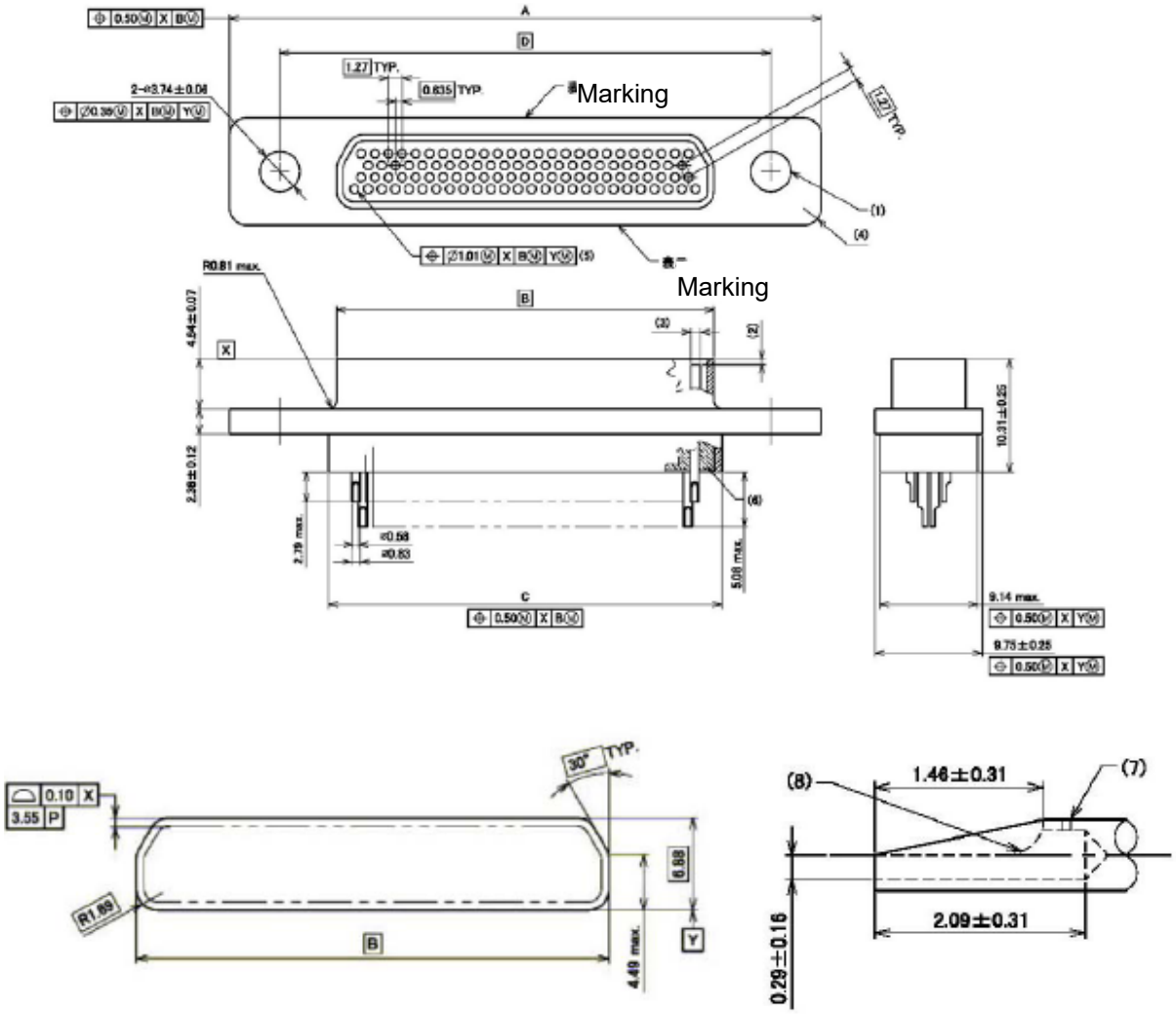


Interface (detail)

Solder cup (detail)

Supplementary Figure F-4. Soldering Type Pin Connectors (51 contacts) (2/4)

Unit: mm



Interface (detail)

Solder cup (detail)

Supplementary Figure F-4. Soldering Type Pin Connectors (100 contacts) (3/4)

Unit: mm

Part number (10)	Contact arrangement	Physical dimensions (9)			
		A	B	C	D
		±0.25		+0.25 -0.46	
JD1*5-9P-S**	9	19.68	8.48	9.91	14.35
JD1*5-15P-S**	15	23.50	12.29	13.72	18.16
JD1*5-21P-S**	21	27.30	16.10	17.53	21.97
JD1*5-25P-S**	25	29.84	18.64	20.07	24.51
JD1*5-31P-S**	31	33.66	22.45	23.88	28.32
JD1*5-37P-S**	37	37.46	26.26	27.69	32.13
JD1*5-51P-S**	51	36.20	24.99	26.42	30.86
JD1*5-100P-S**	100	54.86	35.15	36.37	45.72

Notes:

(1) Designated accessories shall be attachable.

(2) Difference from the front surface of insert shall be 0.51mm±0.39mm.

(3) Hole diameter of insert shall be Φ0.91mm±0.05mm.

(4) Shells shall be reasonably rounded.

(5) Geometric tolerance of insert.

(6) Contact shall be fixed with filler.

(7) Air vents may be made at user's potion.

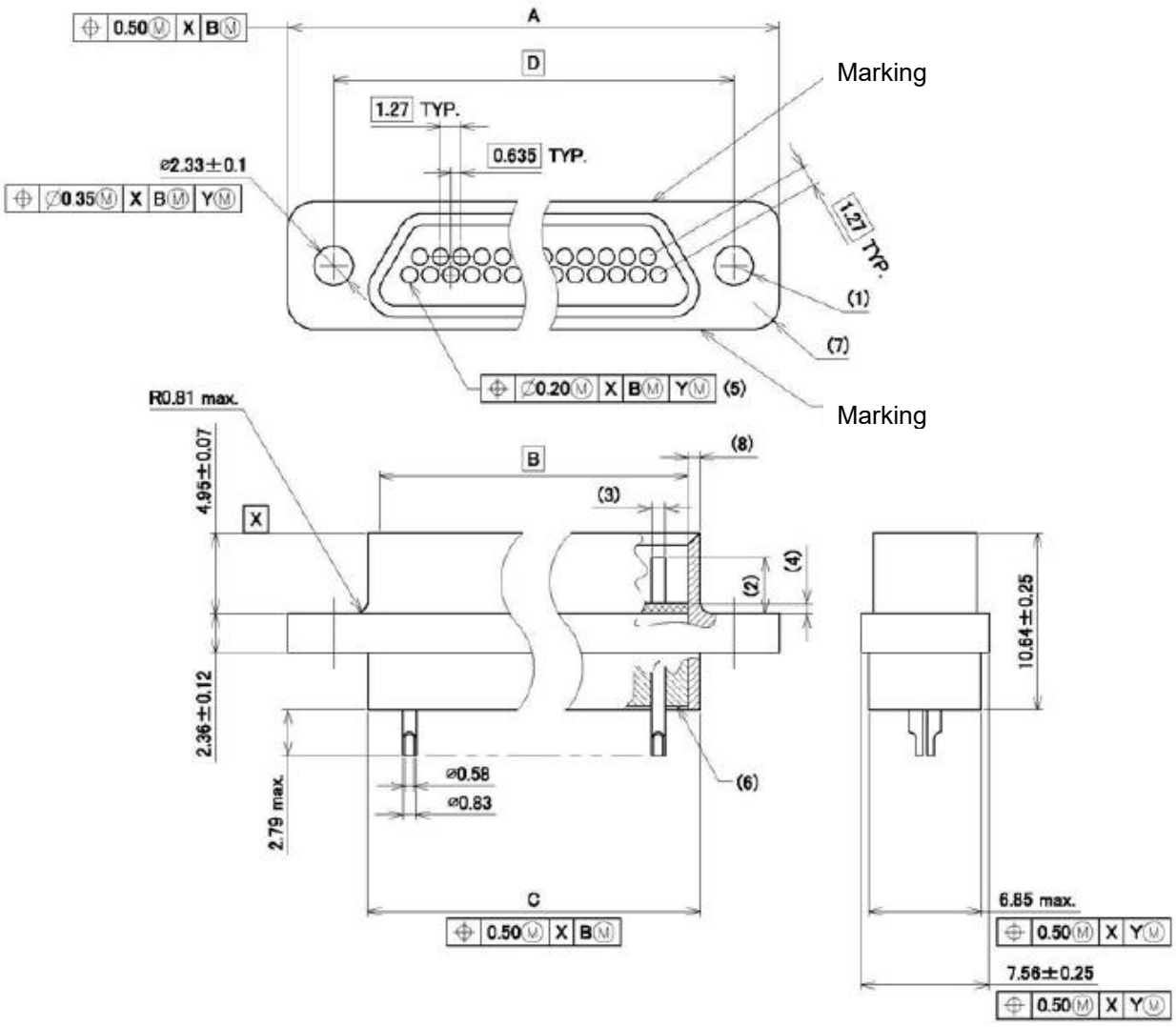
(8) Rounded shape or straight shape.

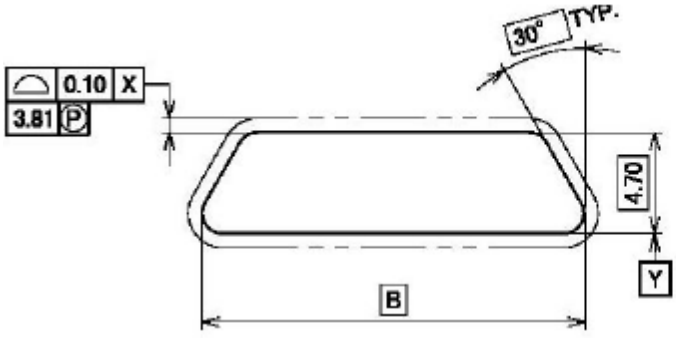
(9) Unspecified tolerance: ±0.13

(10) Part number shall be in accordance with paragraph F.1.2.1.

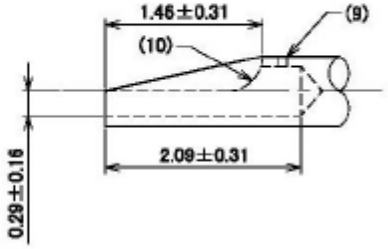
Supplementary Figure F-4. Soldering Type Pin Connectors (4/4)

Unit: mm





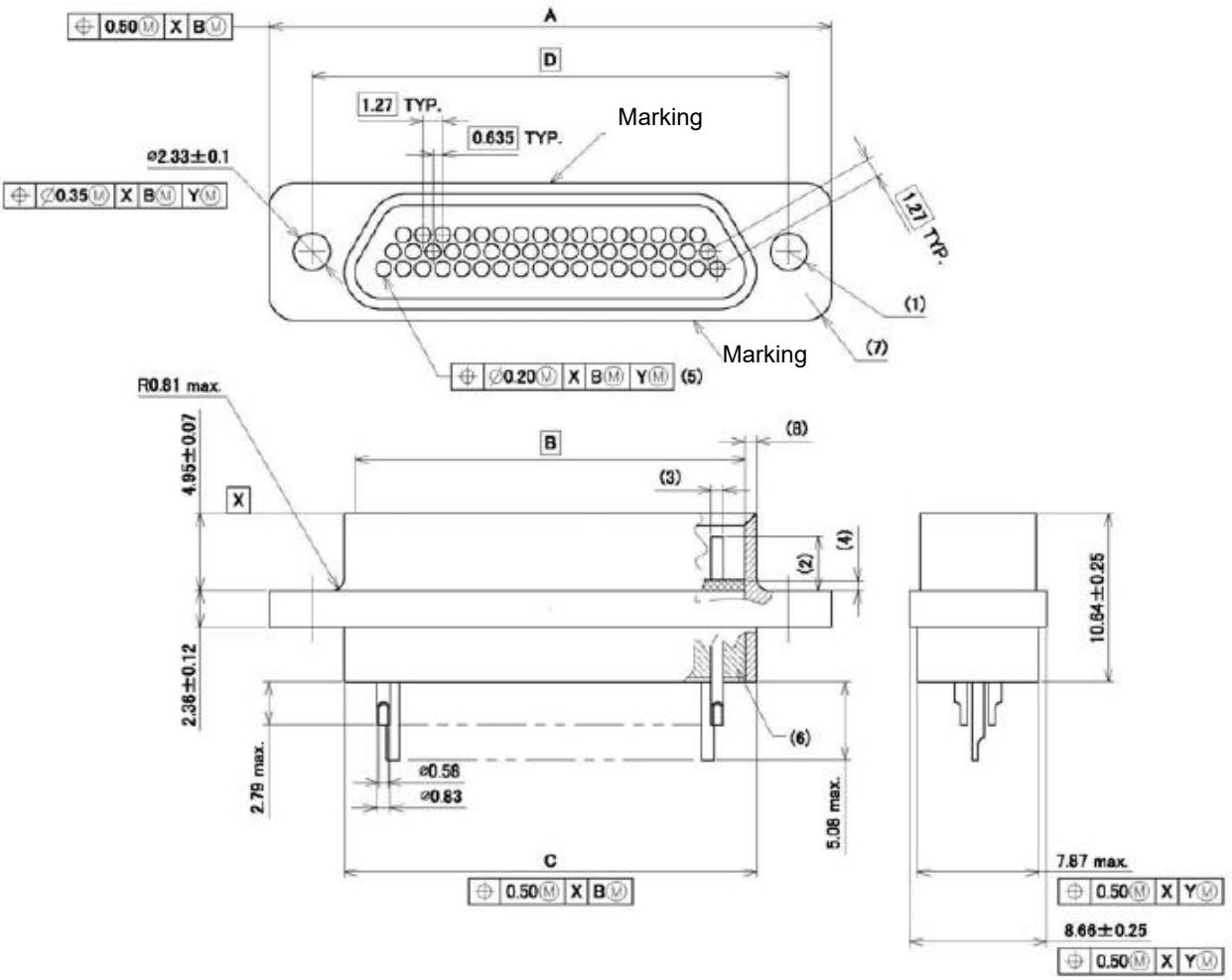
Interface (detail)

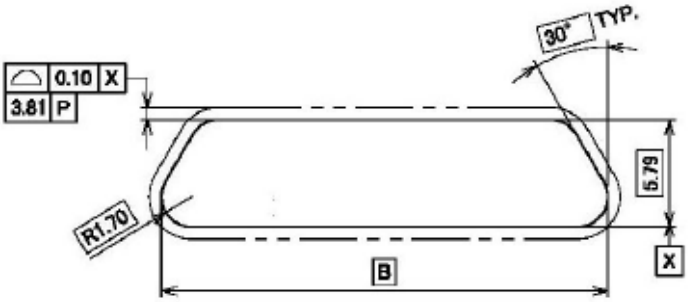


Solder cup (detail)

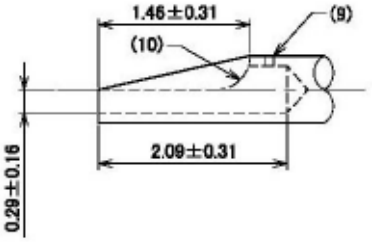
Supplementary Figure F-5. Soldering Type Socket Connectors (9 to 37 contacts) (1/4)

Unit: mm





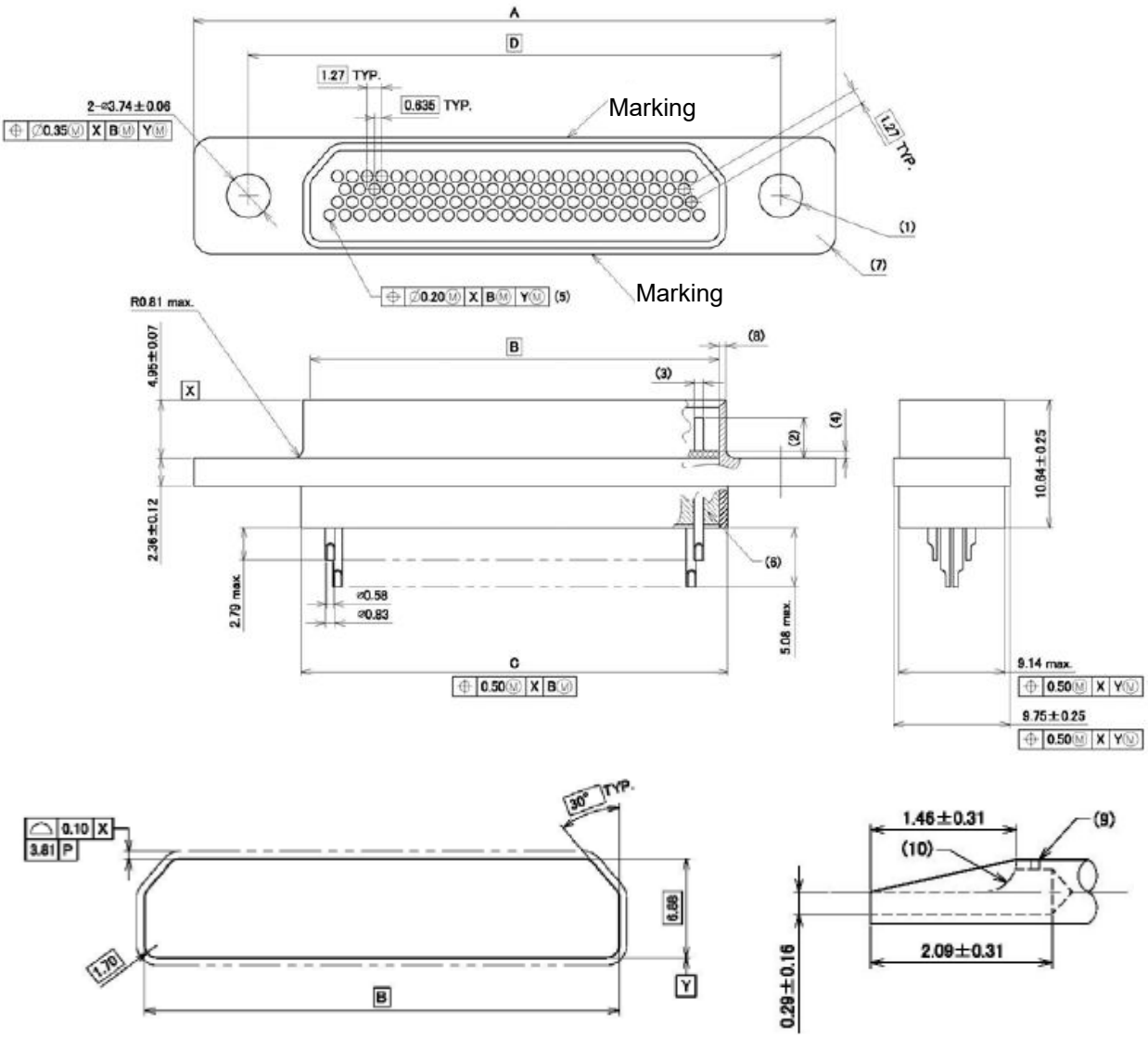
Interface (detail)



Solder cup (detail)

Supplementary Figure F-5. Soldering Type Socket Connectors (51 contacts) (2/4)

Unit: mm



Interface (detail)

Solder cup (detail)

Supplementary Figure F-5. Soldering Type Socket Connectors (100 contacts) (3/4)

Unit: mm

Part number (12)	Contact arrangement	Physical dimensions (11)			
		A	B	C	D
		±0.25		+0.25 -0.46	
JD1*5-9S-S**	9	19.68	8.48	9.91	14.35
JD1*5-15S-S**	15	23.50	12.29	13.72	18.16
JD1*5-21S-S**	21	27.30	16.10	17.53	21.97
JD1*5-25S-S**	25	29.84	18.64	20.07	24.51
JD1*5-31S-S**	31	33.66	22.45	23.88	28.32
JD1*5-37S-S**	37	37.46	26.26	27.69	32.13
JD1*5-51S-S**	51	36.20	25.00	26.42	30.86
JD1*5-100S-S**	100	54.86	35.15	36.37	45.72

Notes:

(1) Designated accessories shall be attachable.

(2) Difference from the front surface of insert shall be 3.47mm±0.17mm.

(3) Hole diameter of socket shall be Φ0.81mm±0.03mm.

(4) The thickness of interfacial seal shall be 0.66mm±0.1mm

(5) Geometric tolerance of insert.

(6) Contact shall be fixed with filler.

(7) Shells shall be reasonably rounded.

(8) The thickness of all circumferences shall be 0.63mm±0.12mm.

(9) Air vents may be made at user's potion.

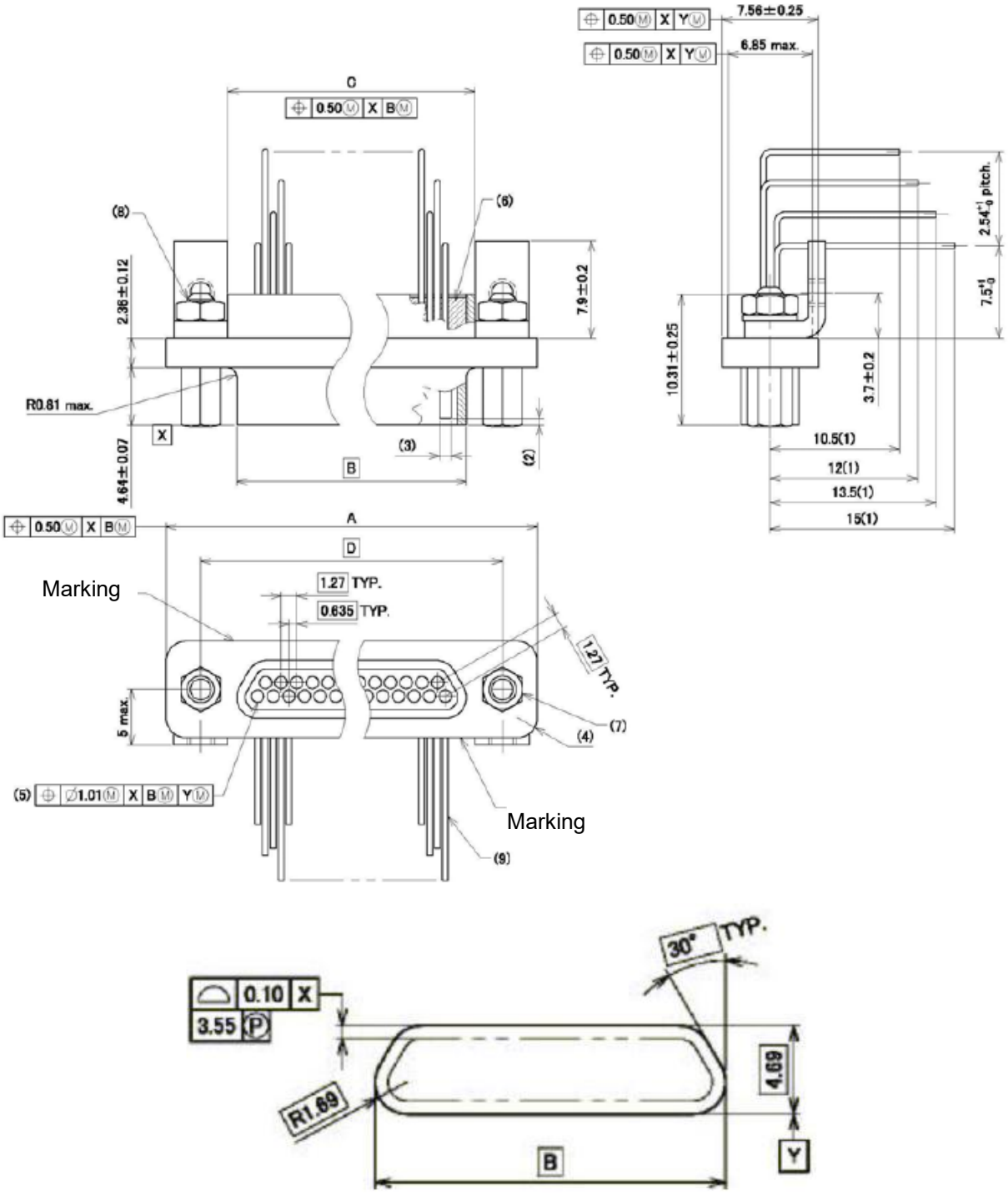
(10) Rounded shape or straight shape.

(11) Unspecified tolerance: ±0.13

(12) Part number shall be in accordance with paragraph F.1.2.1.

Supplementary Figure F-5. Soldering Type Socket Connectors (4/4)

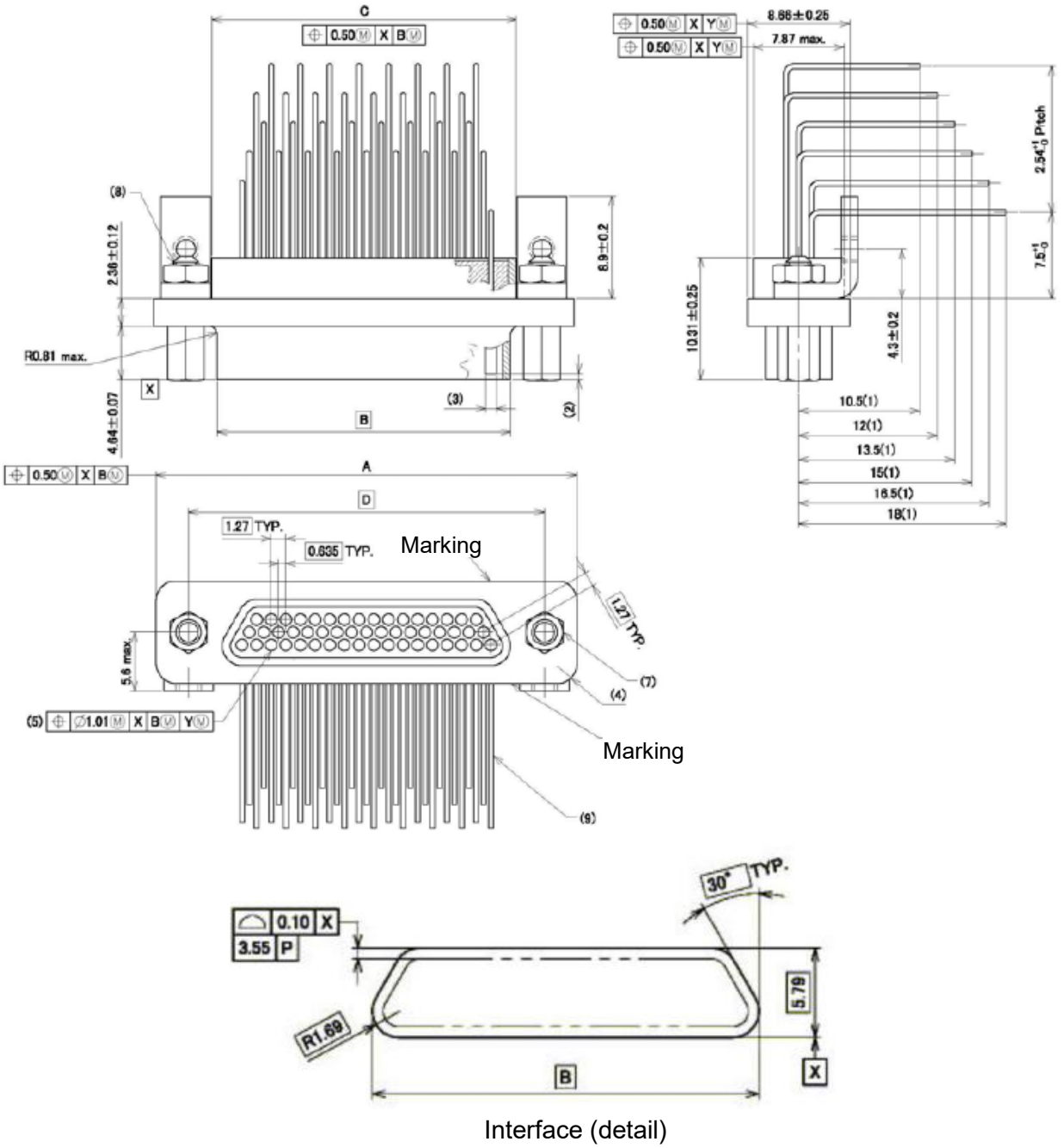
Unit: mm



Interface (detail)

Supplementary Figure F-6. Right Angle Type Pin Connectors (9 to 37 contacts) (1/4)

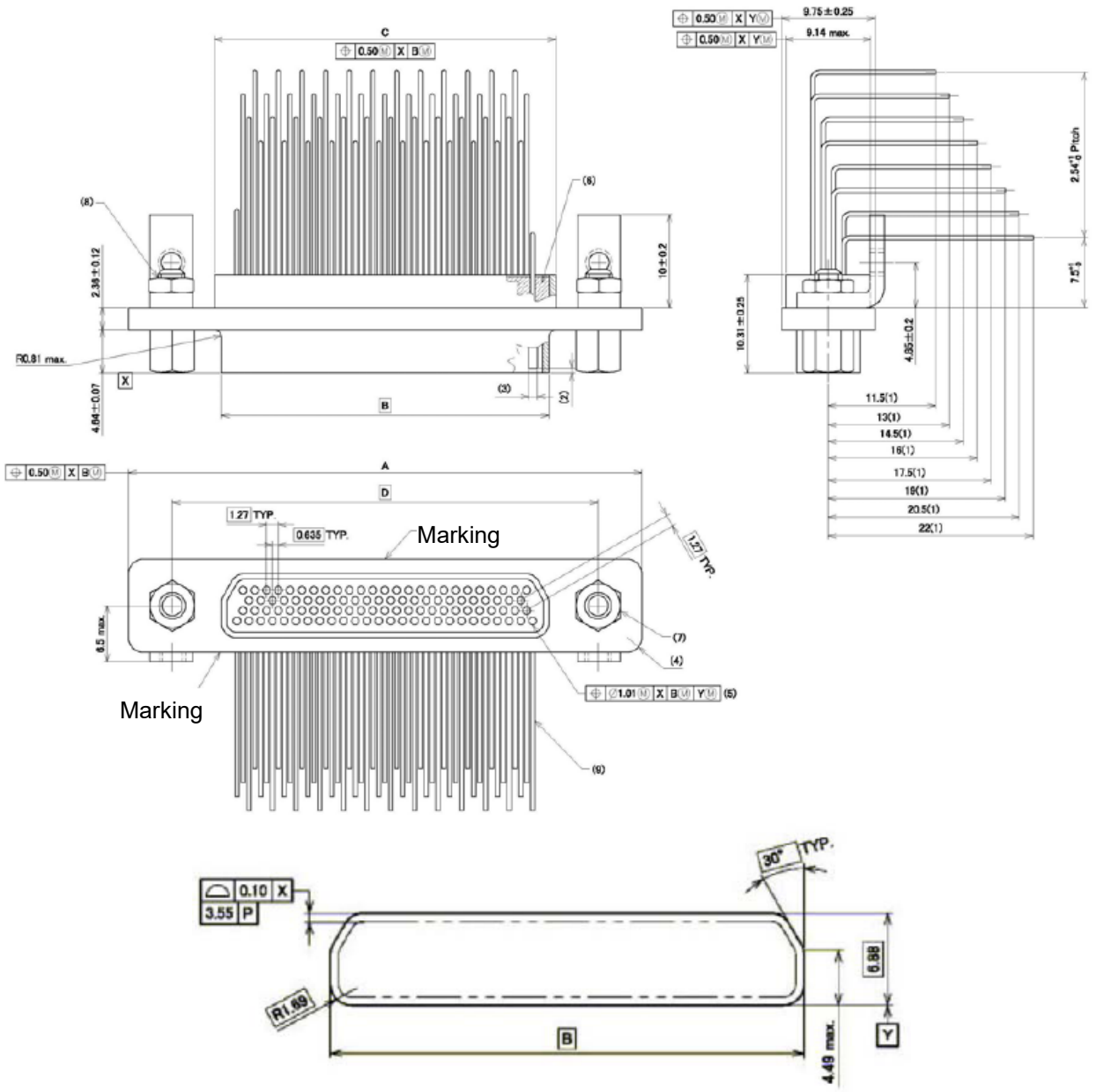
Unit: mm



Interface (detail)

Supplementary Figure F-6. Right Angle Type Pin Connectors (51 contacts) (2/4)

Unit: mm



Supplementary Figure F-6. Right Angle Type Pin Connectors (100 contacts) (3/4)

Unit: mm

Part number (11)	Contact arrangement	Physical dimensions (10)			
		A	B	C	D
		±0.25		+0.25 -0.46	
JD1*5-9P-R**	9	19.68	8.48	9.91	14.35
JD1*5-15P-R**	15	23.50	12.29	13.72	18.16
JD1*5-21P-R**	21	27.30	16.10	17.53	21.97
JD1*5-25P-R**	25	29.84	18.64	20.07	24.51
JD1*5-31P-R**	31	33.66	22.45	23.88	28.32
JD1*5-37P-R**	37	37.46	26.26	27.69	32.13
JD1*5-51P-R**	51	36.20	24.99	26.42	30.86
JD1*5-100P-R**	100	54.86	35.15	36.37	45.72

Notes:

(1) Tolerance of cable length: +5.08mm, -0mm

(2) Difference from the front surface of insert shall be 0.51mm±0.39mm.

(3) Hole diameter of insert shall be Φ0.91mm±0.05mm.

(4) Shells shall be reasonably rounded.

(5) Geometric tolerance of insert.

(6) Contact shall be fixed with filler.

(7) Designated accessories shall be attachable.

(8) Screw lock may be applied.

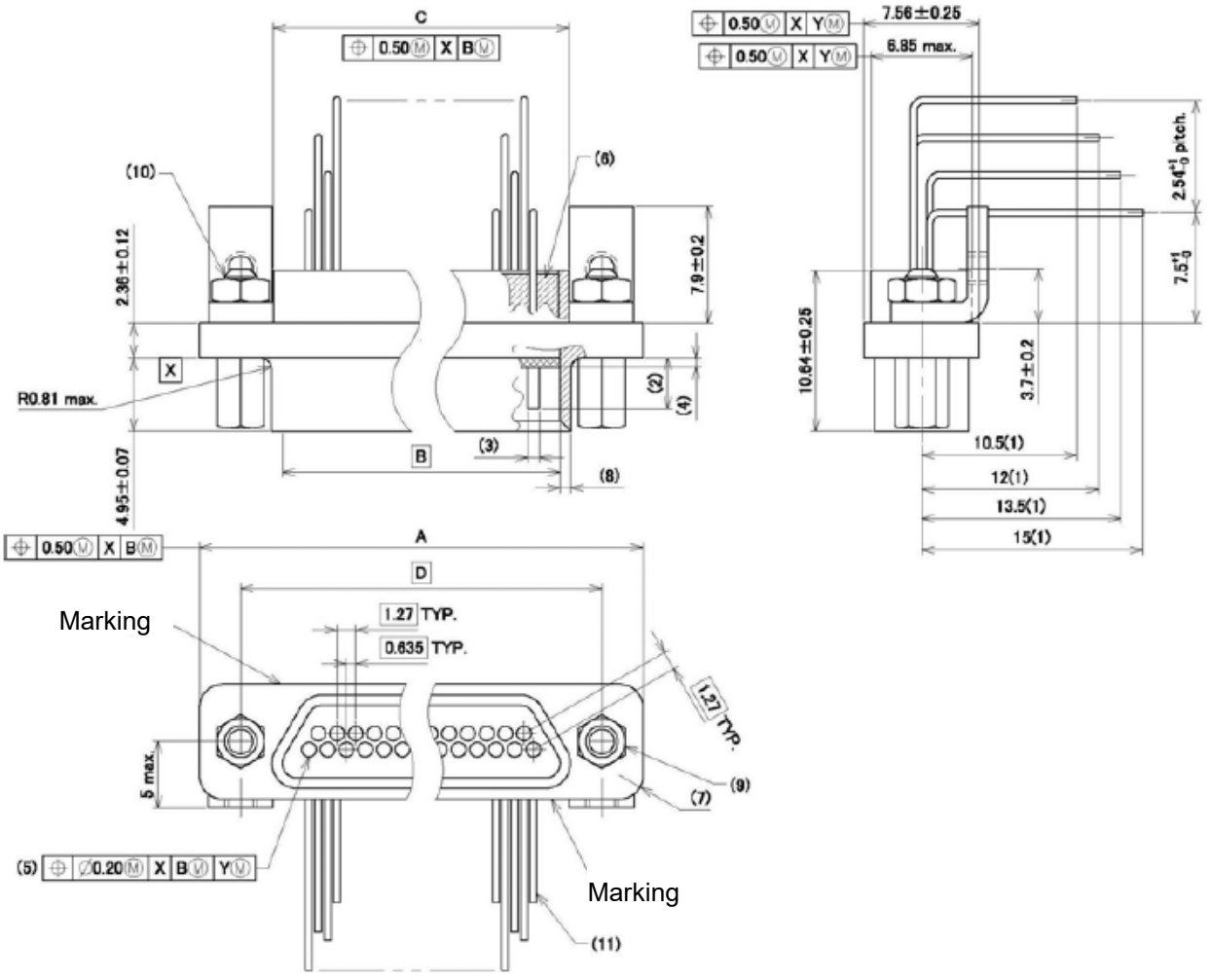
(9) Substrate arrangement shall be as specified in Supplementary Figure F-14.

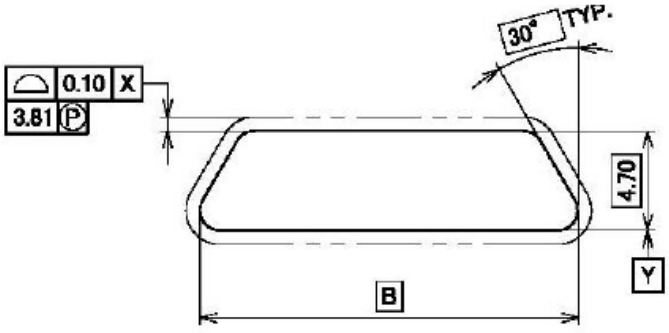
(10) Unspecified tolerance: ±0.13

(11) Part number shall be in accordance with paragraph F.1.2.1.

Supplementary Figure F-6. Right Angle Type Pin Connectors (4/4)

Unit: mm

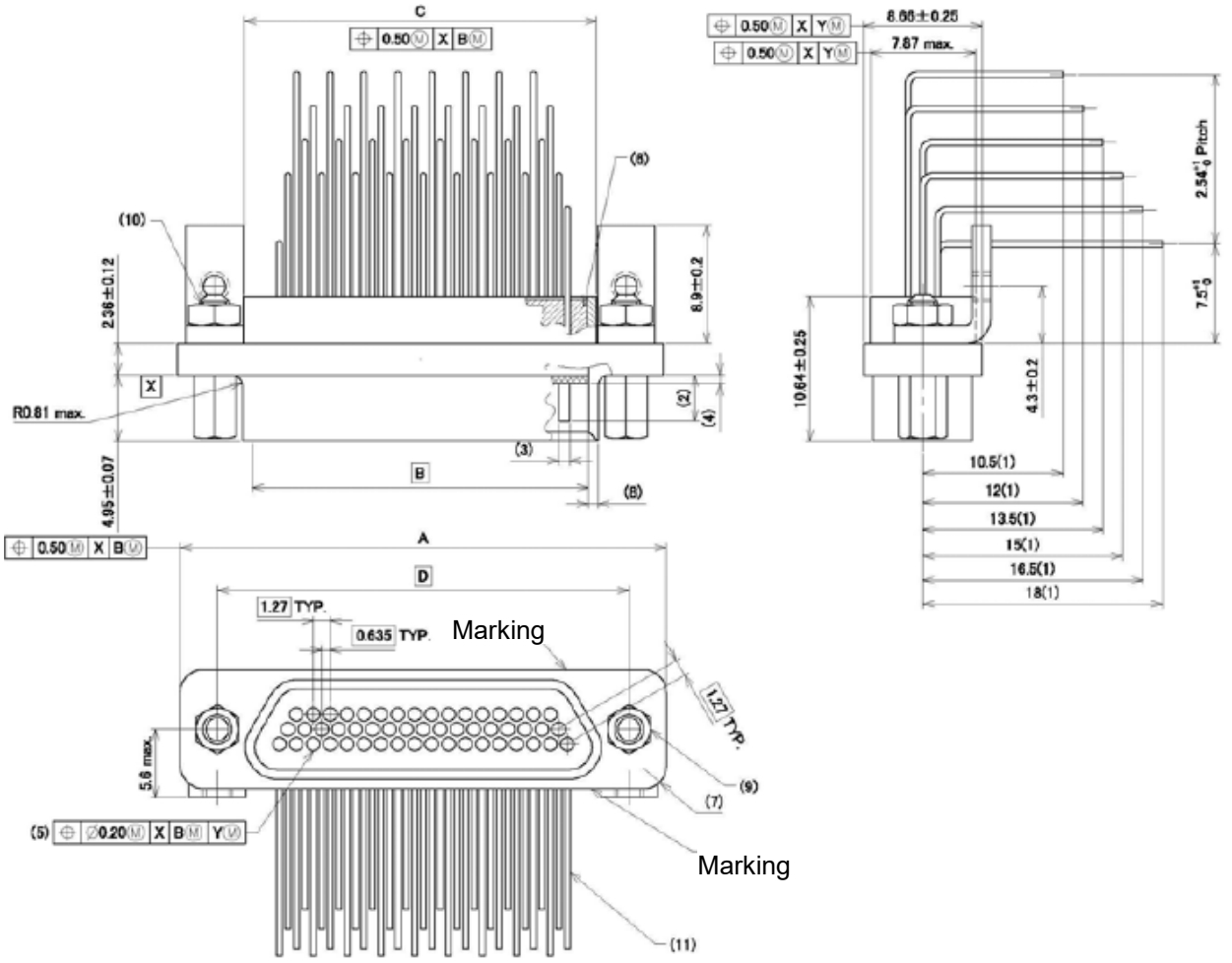


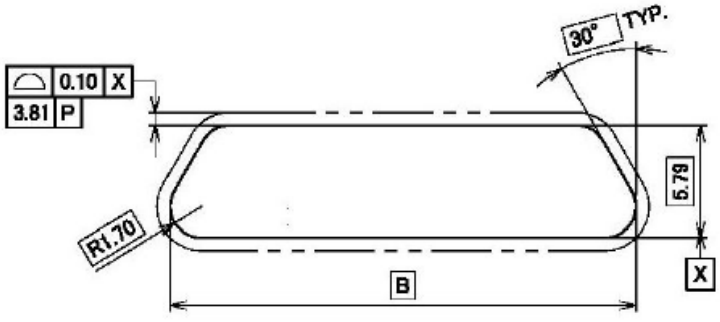


Interface (detail)

Supplementary Figure F-7. Right Angle Type Socket Connectors (9 to 37 contacts) (1/4)

Unit: mm

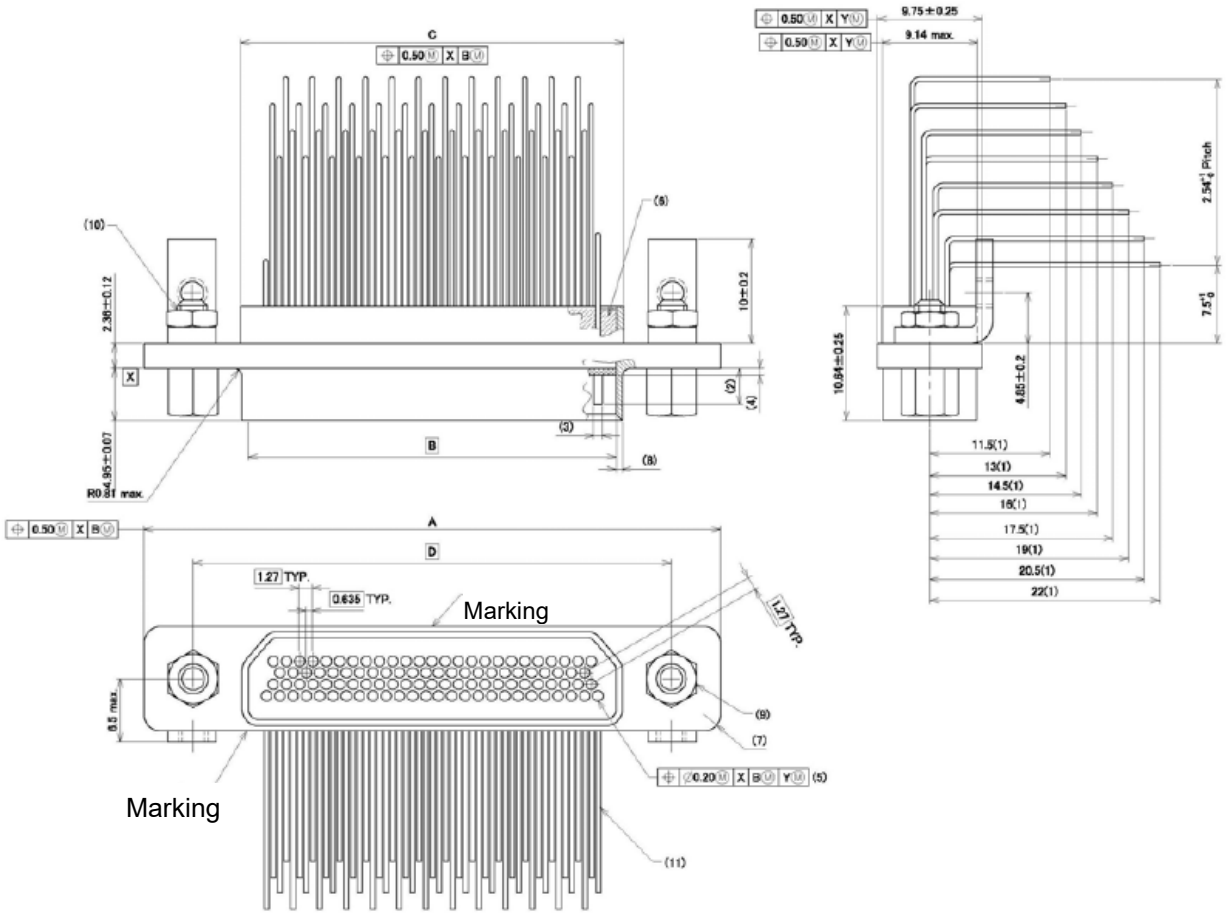




Interface (detail)

Supplementary Figure F-7. Right Angle Type Socket Connectors (51 contacts) (2/4)

Unit: mm



Interface (detail)

Supplementary Figure F-7. Right Angle Type Socket Connectors (100 contacts) (3/4)

Unit: mm

Part number (13)	Contact arrangement	Physical dimensions (12)			
		A	B	C	D
		±0.25		+0.25 -0.46	
JD1*5-9S-R**	9	19.68	8.48	9.91	14.35
JD1*5-15S-R**	15	23.50	12.29	13.72	18.16
JD1*5-21S-R**	21	27.30	16.10	17.53	21.97
JD1*5-25S-R**	25	29.84	18.64	20.07	24.51
JD1*5-31S-R**	31	33.66	22.45	23.88	28.32
JD1*5-37S-R**	37	37.46	26.26	27.69	32.13
JD1*5-51S-R**	51	36.20	25.00	26.42	30.86
JD1*5-100S-R**	100	54.86	35.15	36.37	45.72

Notes:

(1) Tolerance of cable length: +5.08mm, -0mm

(2) Difference from the front surface of insert shall be 3.47mm±0.17mm.

(3) Hole diameter of socket shall be Φ0.81mm±0.03mm.

(4) The thickness of interfacial seal shall be 0.66mm±0.1mm

(5) Geometric tolerance of insert.

(6) Contact shall be fixed with filler.

(7) Shells shall be reasonably rounded.

(8) The thickness of all circumferences shall be 0.63mm±0.12mm.

(9) Designated accessories shall be attachable.

(10) Screw lock may be applied.

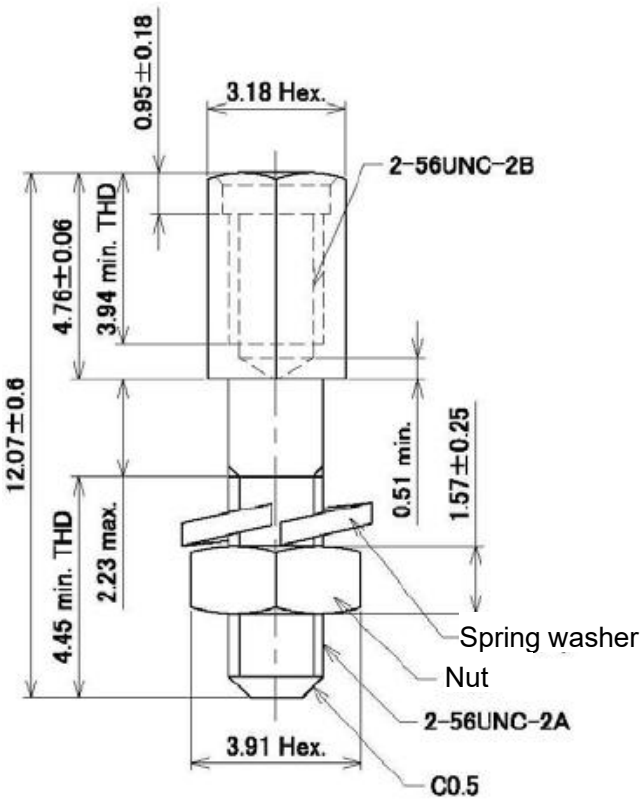
(11) Substrate arrangement shall be as specified in Supplementary Figure F-14.

(12) Unspecified tolerance: ±0.13

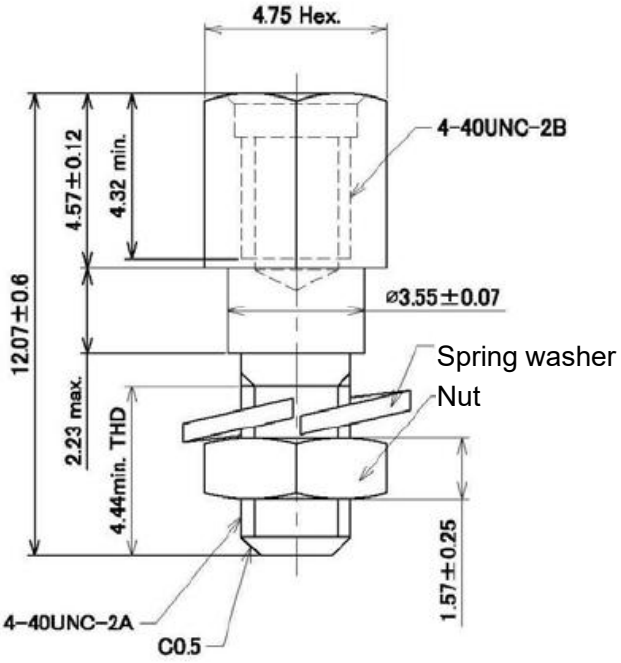
(13) Part number shall be in accordance with paragraph F.1.2.1.

Supplementary Figure F-7. Right Angle Type Socket Connectors (4/4)

Unit: mm



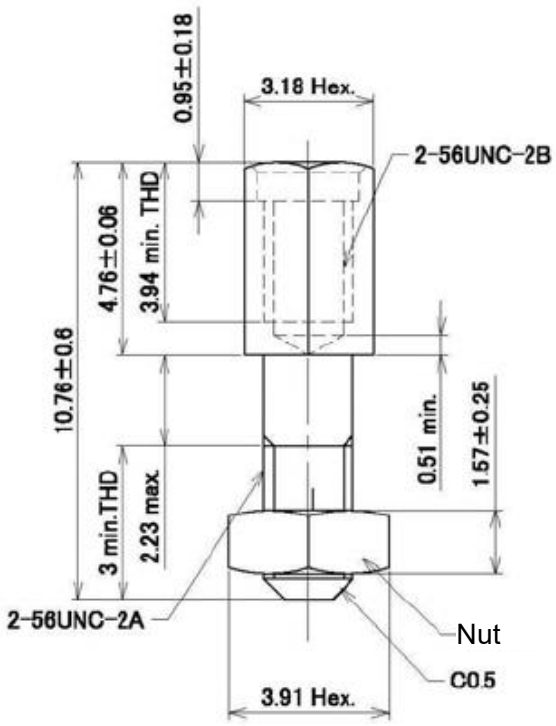
For 9 to 51 contacts (symbol: “P”)



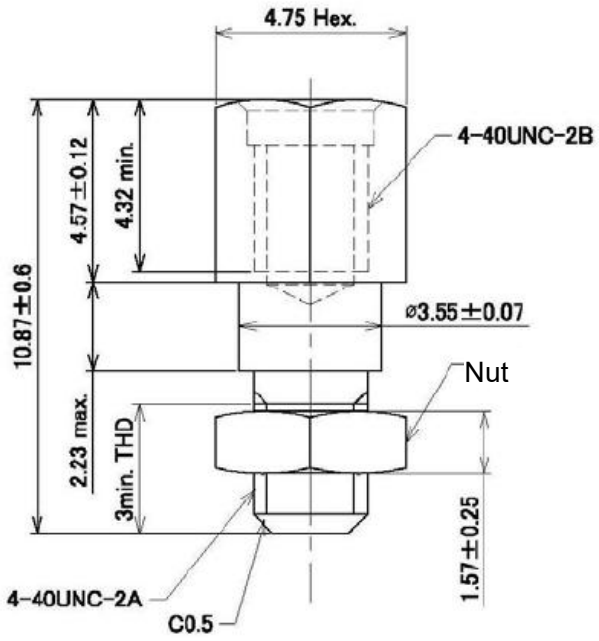
For 100 contacts (symbol: “S”)

Supplementary Figure F-8. Accessories (Jackpost Assembly) (1/2)

Unit: mm



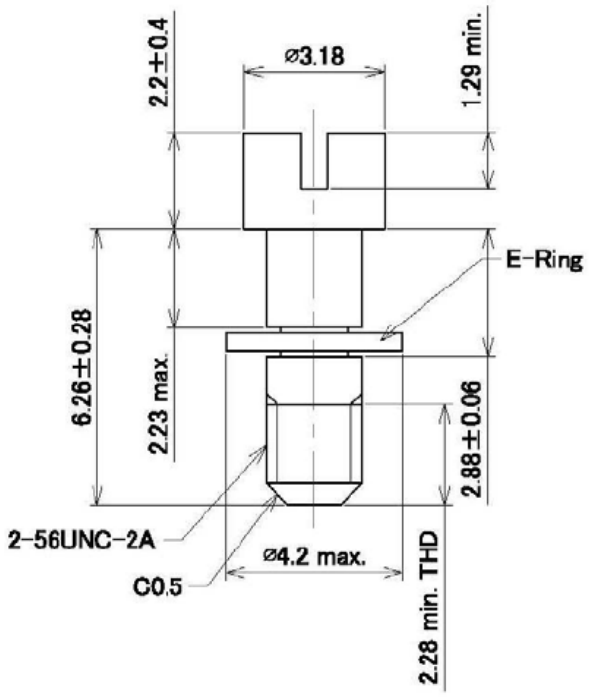
Termination style “R”, for 9 to 51 contacts (symbol: “C”)



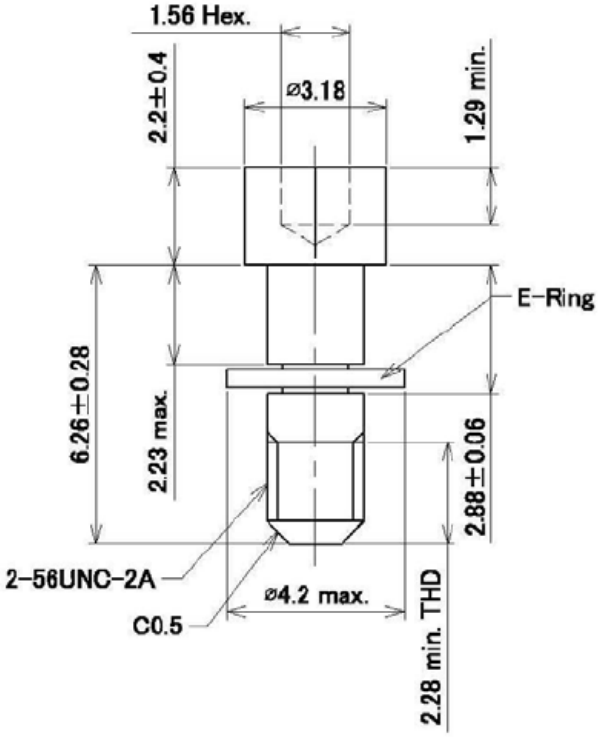
Termination style “R”, for 100 contacts (symbol: “E”)

Supplementary Figure F-8. Accessories (Jackpost Assembly) (2/2)

Unit: mm



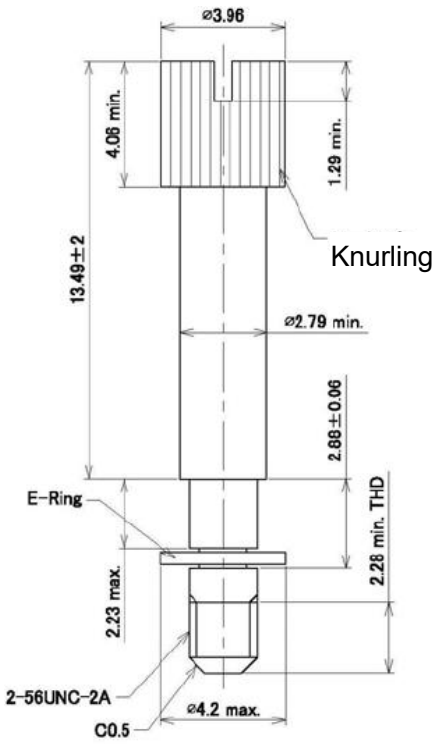
Low profile, slot, for 9 to 51 contacts (symbol: “L”)



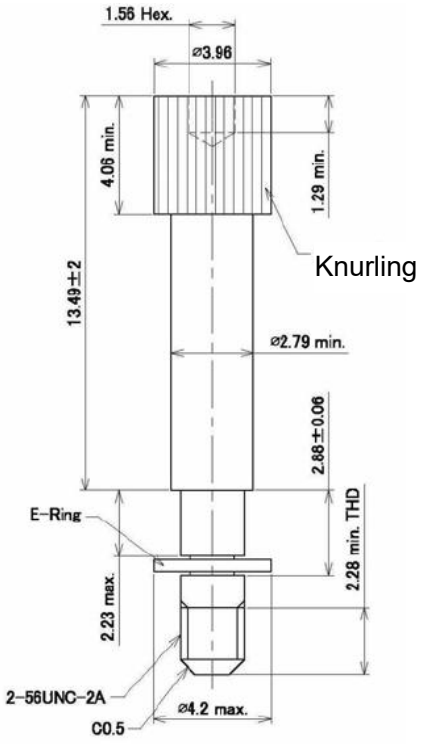
Low profile, hexagon, for 9 to 51 contacts (symbol: “R”)

Supplementary Figure F-9. Accessories (Jackscrew Assembly) (1/4)

Unit: mm



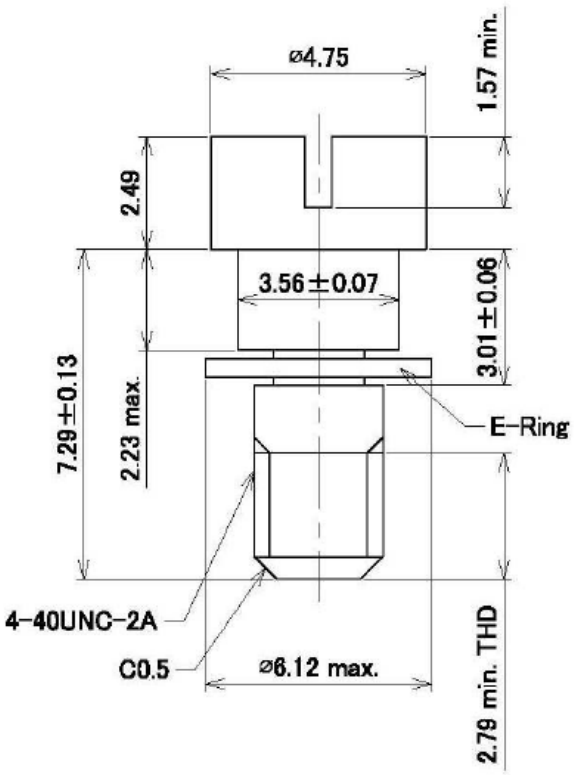
High profile, slot, for 9 to 51 contacts (symbol: “K”)



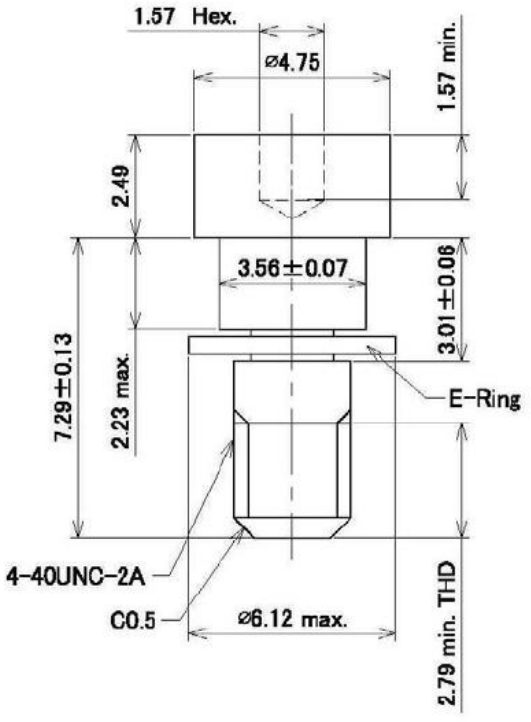
High profile, hexagon, for 9 to 51 contacts (symbol: “Q”)

Supplementary Figure F-9. Accessories (Jackscrew Assembly) (2/4)

Unit: mm



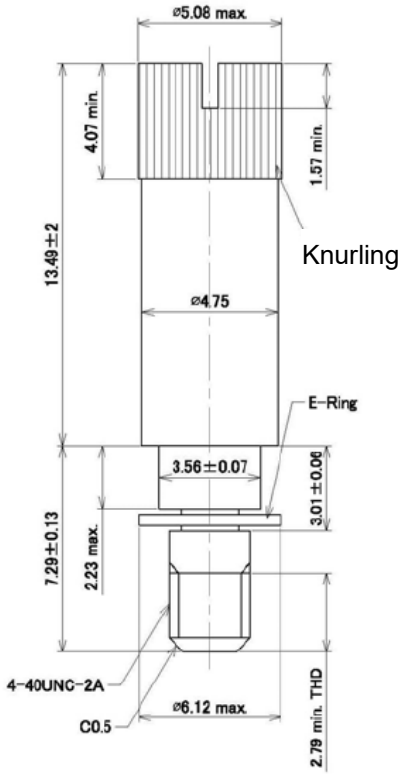
Low profile, slot, for 100 contacts (symbol: “J”)



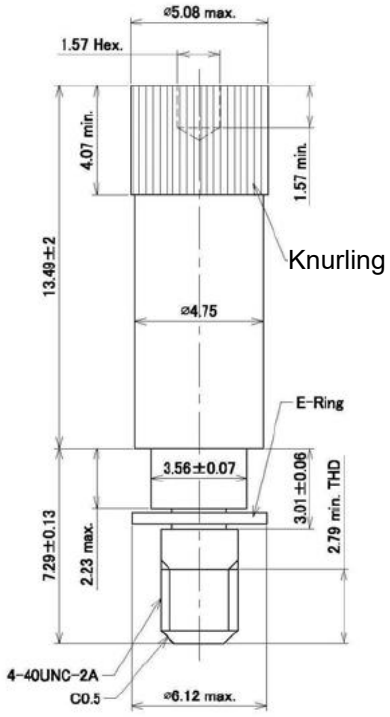
Low profile, hexagon, for 100 contacts (symbol: “N”)

Supplementary Figure F-9. Accessories (Jackscrew Assembly) (3/4)

Unit: mm



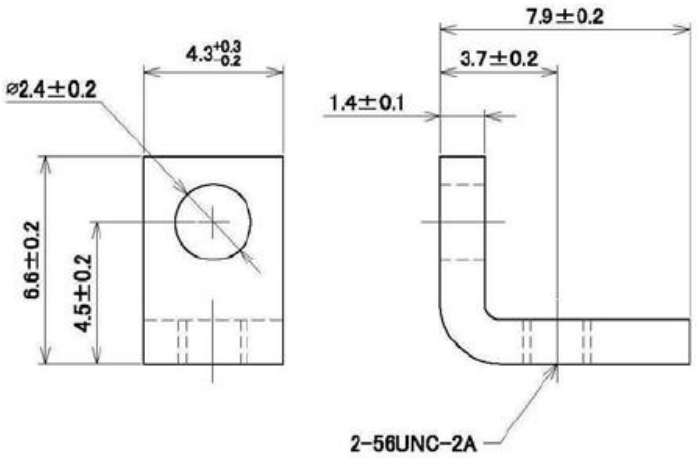
High profile, slot, for 100 contacts (symbol: “H”)



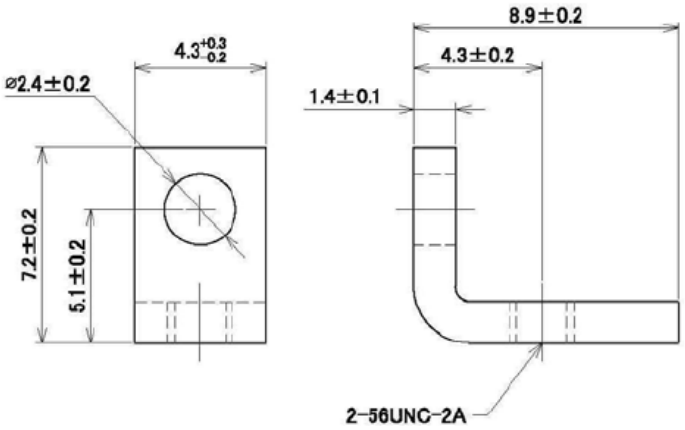
High profile, hexagon, for 100 contacts (symbol: “T”)

Supplementary Figure F-9. Accessories (Jackscrew Assembly) (4/4)

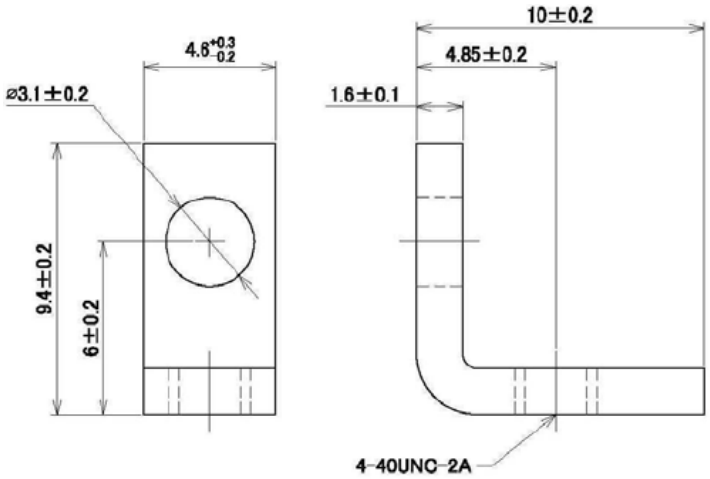
Unit: mm



For 9 to 37 contacts



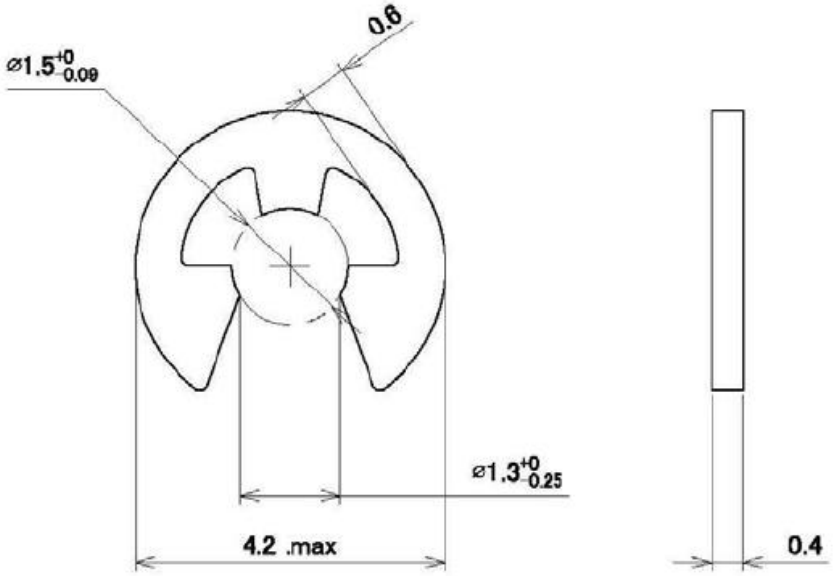
For 51 contacts



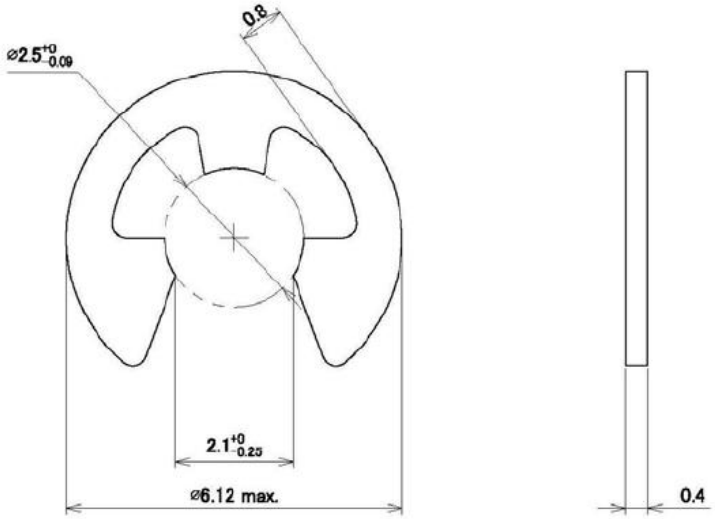
For 100 contacts

Supplementary Figure F-10. Accessories (L Angle for Termination Style "R")

Unit: mm



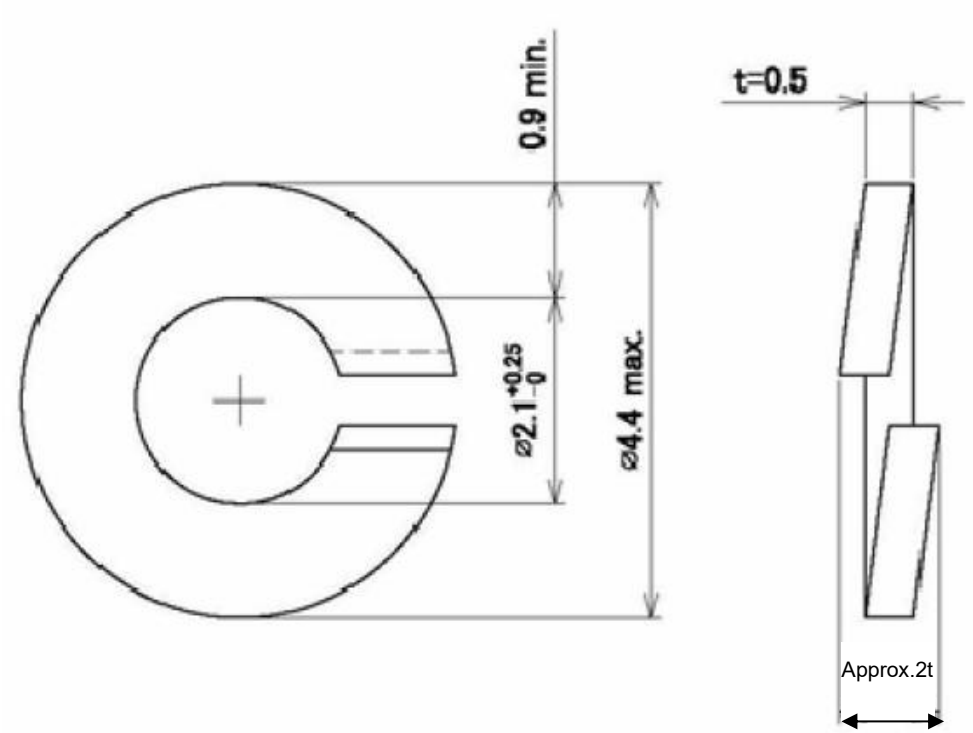
For 9 to 51 contacts



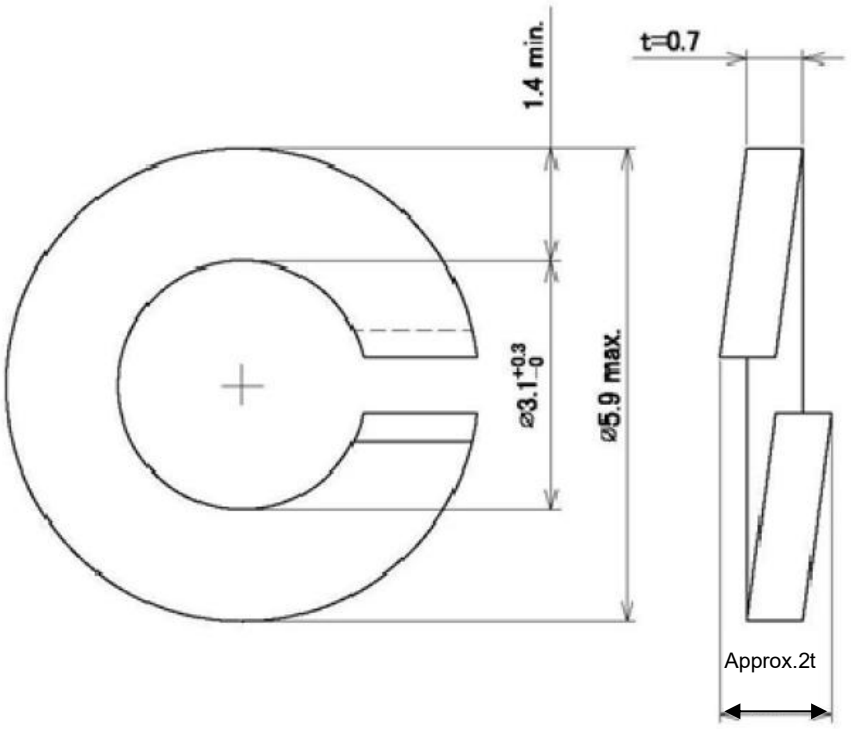
For 100 contacts

Supplementary Figure F-11. Accessories (E-Ring for Jackscrew Assembly)

Unit: mm



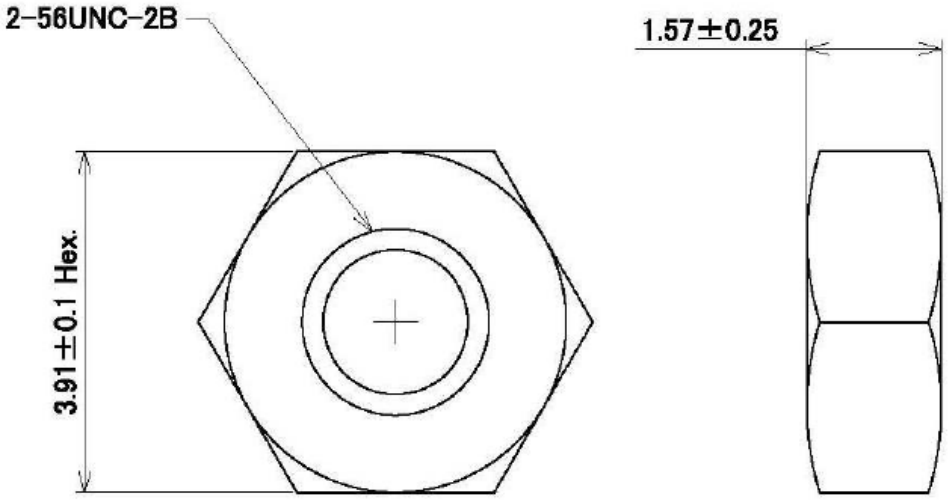
For 9 to 51 contacts



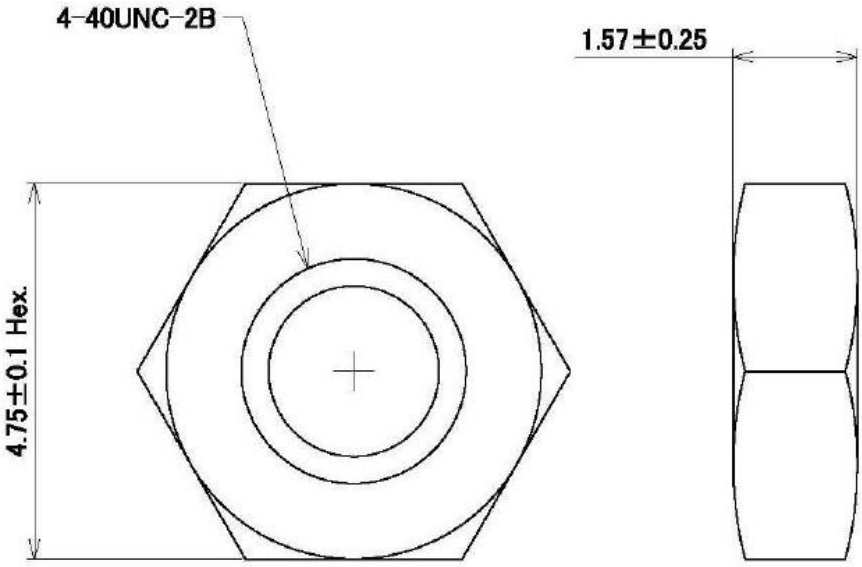
For 100 contacts

Supplementary Figure F-12. Accessories (Spring Washers for Jackpost Assembly)

Unit: mm



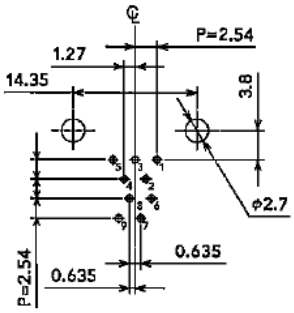
For 9 to 51 contacts



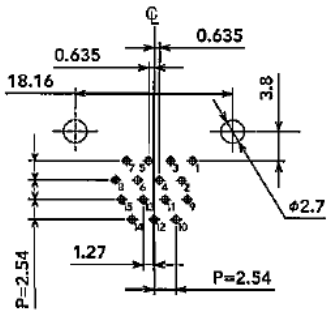
For 100 contacts

Supplementary Figure F-13. Accessories (Nuts for Jackpost Assembly)

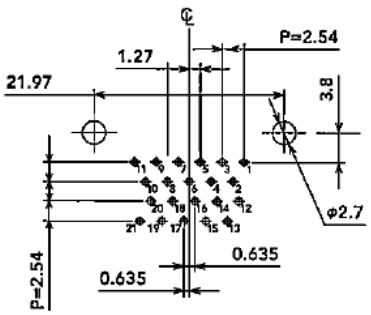
Unit: mm



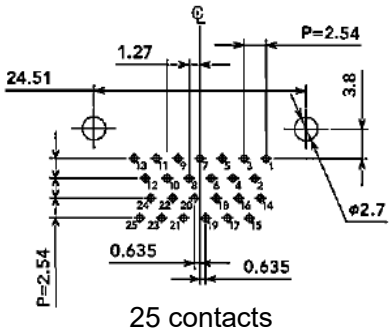
9 contacts



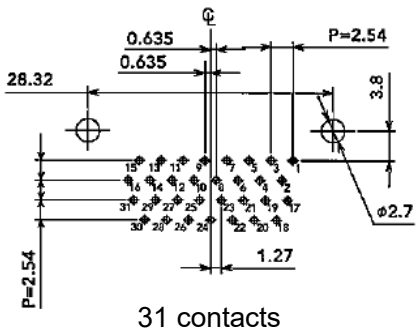
15 contacts



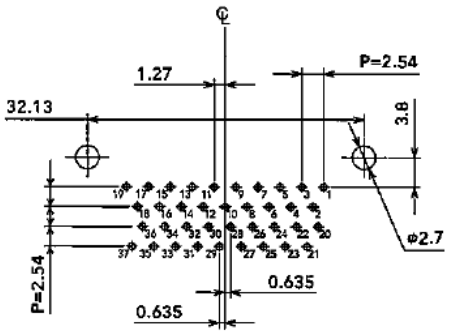
21 contacts



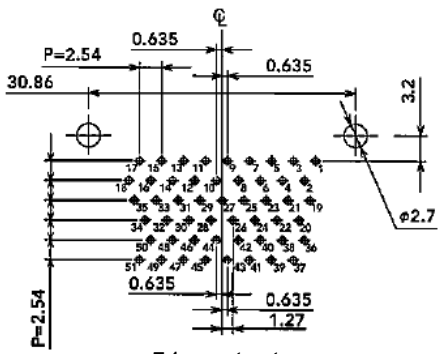
25 contacts



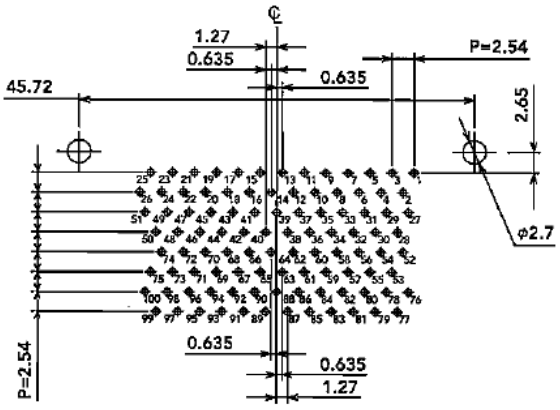
31 contacts



37 contacts



51 contacts



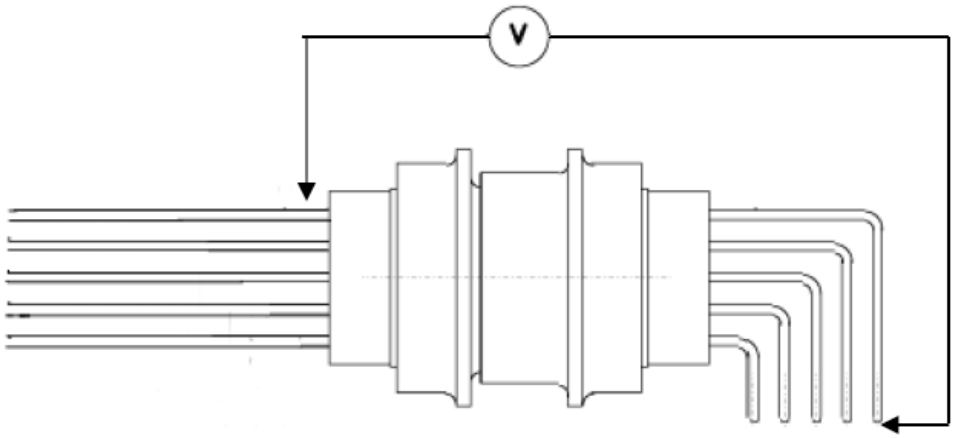
100 contacts

Notes:

(1) Pin connector arrangement is viewed from the soldering surface.

(2) Left and right positions of contacts are reversed for socket connectors.

Supplementary Figure F-14. Layout Arrangement



Supplementary Figure F-15. Contact Resistance Measuring Point of Right Angle Type Connectors

APPENDIX G

CONNECTORS, RECTANGULAR, MINIATURE, COMPOSITE

This document is the English version of JAXA QTS/ADS which was originally written and authorized in Japanese and carefully translated into English for international users. If any question arises as to the context or detailed description, it is strongly recommended to verify against the latest official Japanese version.

The release date of the English version of this specification: 25 March 2026

APPENDIX G

CONNECTORS, RECTANGULAR, MINIATURE, COMPOSITE

G.1. General

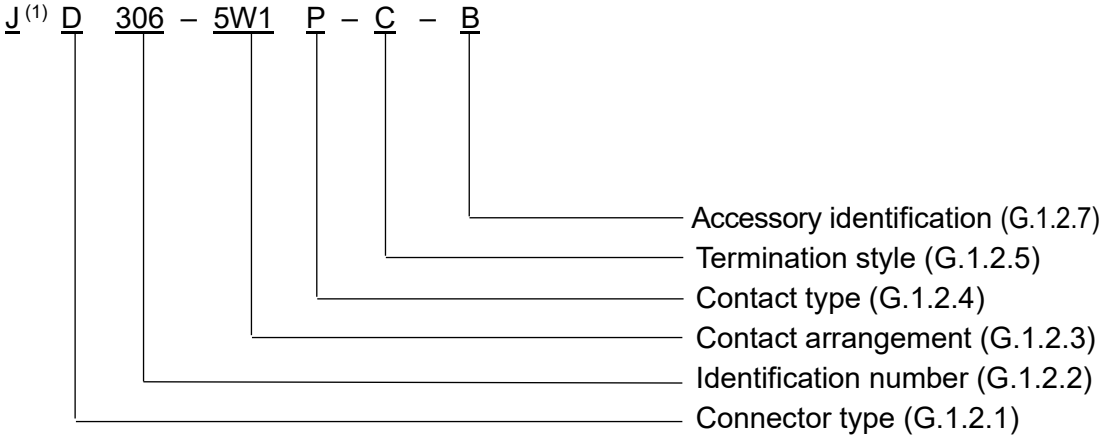
G.1.1 Scope

This appendix establishes the general requirements and quality assurance provisions for the composite miniature rectangular connectors (hereinafter referred to as "connectors").

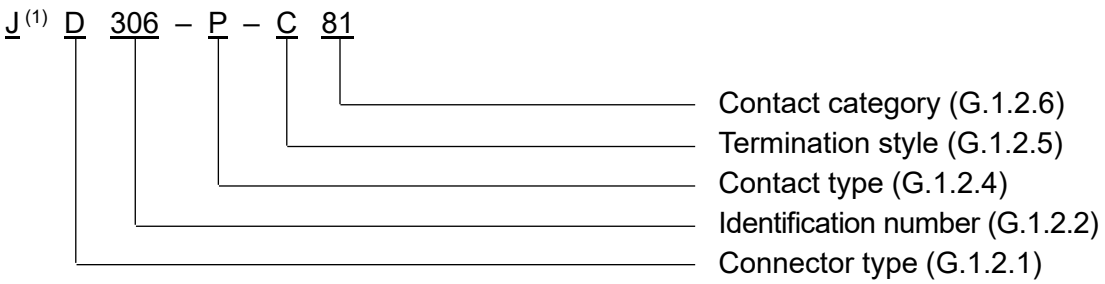
G.1.2 Part Number

The part number identifies the connector type, identification number, contact arrangement, contact type, style of termination, and others as given in the following form. The detail information shall be as specified in the detail specification.

(Connectors)
[Example]



(Individual Contacts)
[Example]



Note: (1) "J" indicates the part is for space use.

G.1.2.1 Connector Type

The connector type is identified by a single capital letter. “D” indicates a “D-sub connector.”

G.1.2.2 Identification Number

The identification number is identified by three digits as follows.

3 0 6

- 6 — Series: “6” indicates that the connector conforms to this appendix.
- 0 — Material:
  - Connector shell: 0 – brass
  - Individual contacts: 0 – copper alloys
- 3 — Manufacturer

G.1.2.3 Contact Arrangement

The contact arrangement is identified by a combination of a single or two-digit number and a single capital letter or two capital letters, and indicates the number of contacts as shown in Table G-1. (See Supplementary Figure G-1).

Table G-1. Contact Arrangement

Contact arrangement code	Contact size		Shell size	Contact arrangement code	Contact size		Shell size
	20	8			20	8	
5W1	4	1	E	8W8	0	8	C
3W3	0	3	A	17W5	12	5	C
7W2	5	2	A	21WA4	17	4	C
11W1	10	1	A	25W3	22	3	C
5W5	0	5	B	27W2	25	2	C
9W4	5	4	B	24W7	17	7	D
12W3	10	3	B	36W4	32	4	D
17W2	15	2	B				

Note: ([1]) The figures in above table indicate the number of contacts in each size.

G.1.2.4 Contact Type

The contact type is identified by a single capital letter, “P” or “S”, which indicates a pin contact (male) or socket contact (female), respectively.

G.1.2.5 Termination Style

The termination style is identified by a single capital letter as shown in Table G-2.

Table G-2. Termination Style

Symbol	Termination style
C	Crimp
S	Solder
A	90° Right angle through hole

G.1.2.6 Contact Category

Contact category shall be provided to the crimp contacts, solder contacts and right angle through hole contacts of size 8 and denotes the following.

a) 81: Crimp contact of size 8-8
b) 82: Crimp contact of size 8-10
c) 83: Crimp contact of size 8-12
d) 84: Solder contact of size 8-8
e) 85: Solder contact of size 8-12
f) 86: Solder contact of size 8-16
g) 8A: Right angle through hole contact of size 8

G.1.2.7 Accessory Identification

Blank denotes that the connector does not have any accessory and “B” denotes that the connector has an accessory.

G.2. Applicable Documents

G.2.1 Applicable Documents

Applicable documents in this appendix shall be as specified in paragraph 2.1.

G.2.2 Reference Documents

The following documents are the reference documents in this appendix.

a) ESCC No. 3401 Issue 5	CONNECTORS, ELECTRICAL, NON-FILTERED CIRCULAR AND RECTANGULAR
b) ESCC No. 3401/001 Issue 11	CONNECTORS, ELECTRICAL, RECTANGULAR NON-REMOVABLE SOLDER BUCKET, PCB AND WIRE-WRAP CONTACTS AND REMOVABLE
c) ESCC No. 3401/040 Issue 6	CONTACTS, POWER CRIMP-TYPE AND SOLDER TYPE FOR 3401/001 AND 3401/002 CONNECTORS
d) S-311-P-10D	CONNECTORS, ELECTRICAL, RECTANGULAR, MINIATURE, POLARIZED SHELL, RACK AND PANEL, FOR SPACE FLIGHT USE
e) S-311-P-4/06A	CONTACTS, ELECTRICAL, COAXIAL, AND HIGH VOLTAGE FOR ELECTRICAL CONNECTORS

G.3. Requirements

G.3.1 Certification

G.3.1.1 Qualification Coverage

The qualification coverage shall be limited to connectors that are produced by the manufacturing line that conforms to materials, designs, constructions, ratings, and performance specified in paragraphs G.3.2 to G.3.9. The qualification coverage shall be fully represented by samples that have passed the qualification test. Within this coverage, the manufacturer is allowed to supply qualified products in accordance with the detail specification.
If necessary, additional definitions of qualification coverage shall be specified in the detail specification.

G.3.2 Materials

The material shall be specified in the following paragraphs and in paragraph 3.3.

G.3.2.1 Dissimilar Metals

Where dissimilar metals having a potential difference are used in direct contact, protection against galvanic corrosion shall be provided. For guidance on dissimilar metals, see guideline 16 of MIL-HDBK-454.

G.3.2.2 Nonmagnetic Materials

When tested as specified in paragraph G.4.3.2.1, residual magnetization of all parts and surface treatments used for connectors shall be 200nT or less.

G.3.2.3 Sublimation

Zinc or cadmium alloys, or zinc- or cadmium-plated parts shall not be used to avoid evaporation at a high temperature under high vacuum which will produce hazardous gases.

G.3.2.4 Contacts

Contacts shall be made of conductive copper alloys. Sleeves, if required on socket contacts, shall be made of copper alloys.

G.3.2.5 Inserts

Inserts shall be made of mechanically, electrically, and environmentally high grade diallyl phthalate resins or equivalents.

G.3.2.6 Shell

Shells shall be made of mechanically high grade brass alloys or equivalents. If lightweight is required, shells shall be made of mechanically high grade aluminum alloys or equivalents. The material selection criteria shall be defined in the detail specification. Shells shall be designed to be compatible with accessories which comply with ESCC No. 3401/022.

G.3.2.7 Finish

G.3.2.7.1 Contacts

Contacts shall be gold plated to a thickness of 1.27μm as a minimum in accordance with ASTM B488 or SAE-AMS 2422 over a copper plating whose thickness is 1.0μm as a minimum in accordance with SAE-AMS 2418. Contact sleeves shall be gold plated to a thickness of 1.27μm as a minimum in accordance with ASTM B488 or SAE-AMS 2422 over copper flash plating in accordance with SAE-AMS 2418. Applicable plating standards shall be specified in the detail specification.

G.3.2.7.2 Shells

Shells made of brass alloys or equivalents shall be gold plated to a thickness of1.27μm as a minimum in accordance with ASTM B488 or SAE-AMS 2422 over copper flash plating in accordance with SAE-AMS 2418.
Shells made of aluminum alloys or equivalents shall be gold plated to a thickness of 1.27μm as a minimum in accordance with ASTM B488 or SAE-AMS 2422 over an electroless nickel plating whose thickness is 25.4μm as a minimum in accordance with ASTM B733 or SAE-AMS-C-26074. Applicable plating standards shall be specified in the detail specification.

G.3.2.8 Outgassing

When tested as specified in paragraph G.4.3.2.2, inserts, marking inks and adhesives shall meet the requirements of total mass loss (TML) and collected volatile condensable material (CVCM) as specified in paragraph 3.3.2.

G.3.3 Externals, Physical Dimensions and Marking

Externals, constructions, physical dimensions and mass of the connector shall be appropriate for normal handling during installation, usage, and maintenance. For details, see Supplementary Figures G-1 through G-9.

G.3.3.1 Contacts

Contacts shall be designed to be connected with wires, installed into and removed from inserts. However, size 20 contacts shall be non-removable from inserts. Contacts shall have physical dimensions and mass as shown in Supplementary Figures G-10 through G-19.

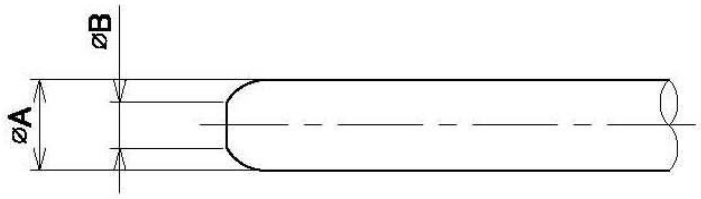
G.3.3.1.1 Pin Engagement End

The engagement end of pin contacts shall be formed with an approximate hemisphere whose diameter is equal to the pin diameter. The flat diameter on the engagement end of the pin contacts shall be as specified in Table G-3.

Table G-3. Pin Dimensions at Engagement End

Unit: mm

Contact size	Engagement end diameter (ΦA)	Flat tip diameter (ΦB)
20	1.016±0.025	0.51 Maximum
8	3.590±0.090	-



G.3.3.1.2 Socket Mating End

When contact sleeves are applied to socket contacts, engagement end of the socket contact shall be rounded or chamfered to direct a pin contact in the center of the engagement path. Socket contacts shall provide the spring action for maintaining the contact pressure between mated pins and sockets. Socket contacts shall have a closed entry design to exclude engagement of pins whose diameters exceed the maximum allowable pin diameter by 0.127 mm or larger.

G.3.3.1.3 Roughness of Surface

The engagement surface shall be smooth without any tool mark.

G.3.3.1.4 Wire Barrel Sizes

For crimp or solder contacts, wire barrels shall accommodate the wires specified in Table G-4.

Table G-4. Wire Barrel Size

Termination style	Contact size	Wire gauge (AWG)
Crimp	8–8	8
	8–10	10
	8–12	12, 14
Solder	8–8	8
	8–10	10
	8–16	16
	20	20, 22, 24, 26

G.3.3.2 Inserts

Inserts shall be molded or bonded of one-piece construction. Pin entry opening on the socket inserts shall be as small as practicable. Socket inserts shall provide

adequate protection against a pin contacting a socket before the mating pair of connectors has been polarized. The inserts shall be so designed that the inserts cannot be removed from the shells.
The contact retaining system shall be free of foreign material, adhesive, or any obstruction that would prevent smooth contact insertion and positive retention.
The contact retention mechanism of #8 cavity shall be designed to accommodate the size 8 contacts which conform to ESCC No. 3401/040.

G.3.3.2.1 Contact Arrangement

Contact arrangement shall be as specified in Supplementary Figure G-1.

G.3.3.2.2 Contact Position

Inserts shall have a construction to enable mating regardless of the insert position with respect to the shell, contact distortions due to crimping, and differences in allowable dimensional tolerances.

G.3.3.3 Shell Design

Shells shall be designed to positively retain the insert and shall be constructed so that the insert cannot be removed.

G.3.3.3.1 Shell Polarization

Polarization shall be accomplished by a keystone shape shell design before pins and sockets are inserted.

G.3.3.3.2 Mounting

Connectors shall be provided with means for secure mounting such as fastening the shell on a mounting panel with screws.

G.3.3.4 Coupling

When the plug and receptacle are mated as shown in Supplementary Figure G-20, the applicable requirements specified in this appendix shall be met.

G.3.3.4.1 Ease of Coupling

Connector shall be easily mated and unmated using a proper tool or by hand.

G.3.3.4.2 Fixing

Mated connectors shall be securely fixed using screw lock accessories.

G.3.3.5 Interchangeability

G.3.3.5.1 Interchangeablity of Connectors

a) Plugs and receptacles having the same part number shall be completely mated in any combination and shall provide equal performance.
b) Crimp, solder, and right angle through hole type contact connectors having the same contact arrangement shall be intermatable in any combination.
c) Connectors having the same part number shall be completely mounted with specified mounting holes and printed wiring boards in any combination.

G.3.3.5.2 Interchangealbity of Contacts

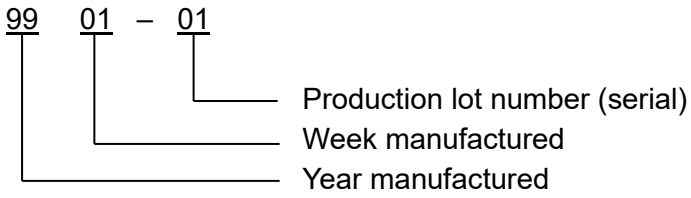
a) Crimp, solder, right angle through hole contacts shall be completely installed with any insert.
b) Crimp and solder contacts shall be completely removed with specified removal tools in any combination.

G.3.3.6 Marking

G.3.3.6.1 Shells

The following items shall be marked in the locations shown in Supplementary Figures G-2 through G-9. The marking shall remain clearly legible after completion of all tests specified in this appendix, and even after one-minute immersion in ethanol.

a) Manufacturer's name and its abbreviation
b) Part number (paragraph G.1.2)
c) Identification code (year and week manufactured and production lot number) (paragraph G.3.3.7)



Notes:

(1) For the purpose of this specification, "Year and week manufactured" denotes the year and week when the final assembly is completed.
(2) Production lot number identifies the lots, which include products of the same part number, manufactured within a week. When only one lot is manufactured in the week, the manufacturing lot number shall be "01."

G.3.3.6.2 Inserts

Contact position markings shall be provided on both sides of the insert in accordance with Supplementary Figure G-1. Contact position markings shall be as close to the corresponding contact holes as possible.

G.3.3.6.3 Contacts

When providing a marking of manufacturer's trademark and Basic Identification Number (BIN) code color bands on crimp type contacts, they shall be clearly marked as follows.
The marking shall remain legible after completion of all tests specified in this appendix.
If markings in crimped areas are peeled off and still remain identifiable, the markings shall not be rejected.

a) Trademark
The trademark shall be marked on the location shown in Supplementary Figures G-10 and G-11 or on the shoulder of wire

barrel. The marking location shall be specified in detail specification.

b) BIN code color bands
The BIN code color band shall be marked on the wire barrel end in accordance with Supplementary Figures G-10 and G-11. Details shall be specified in detail specification.

G.3.3.7 Traceability

An identification code (year and week manufactured and production lot number) shall be marked on the connectors in accordance with paragraph G.3.3.6.1.
The identification code shall be provided to identify the material lot and to trace the complete manufacturing process up to the final assembly even after the connectors are installed in electronic equipment including inventories.
Manufacturers shall retain records on identification codes for at least 8 years.

G.3.3.8 Workmanship

Connectors shall be manufactured and processed based on a good design in a manner to maintain uniform quality in accordance with manufacturing specifications established in the quality assurance program (see paragraph 3.2). In addition, connectors shall be free of crazing, holes, chips, sharp cutting edges, burrs or other defects that will degrade electrical, mechanical, or physical performance.

G.3.4 Plating

G.3.4.1 Plating Porosity

When tested as specified in paragraph G.4.3.4.1, there shall be no bubbling on the gold-finished contacts during a 30-second observation period.

G.3.4.2 Plating Thickness

When tested as specified in paragraph G.4.3.4.2, the thickness of gold plating shall be not less than 1.27μm, except for corners.

G.3.5 Rating

a) Voltage: 330V_{AC} under sea level
100V_{AC} under reduced pressure (4.4kPa {33.0mmHg})
b) Operating temperature range: -65 to +125°C

G.3.6 Electrical Performance

Connectors shall satisfy the following requirements.

G.3.6.1 Dielectric Withstanding Voltage

When tested as specified in paragraph G.4.3.5.1.1 or G.4.3.5.1.2, unmated connectors shall exhibit no evidence of short circuit and dielectric breakdown.

G.3.6.2 Insulation Resistance

When tested as specified in paragraph G.4.3.5.2, insulation resistance between contacts and between the shell and any contact shall be as specified in Table G-5.

Table G-5. Insulation Resistance

Unit: MΩ

Initial	After humidity test		After fluid immersion
	Immediately after test	After 24 hours	
5,000 Minimum	1 Minimum	1,000 Minimum	1,000 Minimum

G.3.6.3 Contact Resistance

When tested as specified in paragraph G.4.3.5.3, the resistance of inserting pairs of pin contacts and socket contacts shall be as specified in Table G-6.

Table G-6. Contact Resistance (Voltage Drop)

Unit: mV

Style of termination	Contact size	Wire size (AWG)	Test current (A)	Initial		After test	
				Maximum	Maximum average	Maximum	Maximum average
Crimp	8-8	8	46.0	26	24	32	28
	8-10	10	33.0	33	30	40	37
	8-12	12	23.0	42	38	51	43
		14	17.0	40	36	48	41
Solder	8-8	8	46.0	26	24	32	28
	8-10	10	33.0	33	30	40	37
	8-16	16	13.0	49	45	59	51
	20	20	7.5	20	15	30	20
		22	5.0	17	12	27	17
		24	3.0	15	10	25	15
		26	2.0	14	9	24	14
Right angle through hole	8	-	30.0	28	25	35	32
	20	-	3.0	15	10	25	15

G.3.6.4 Low-Signal Level Contact Resistance

When tested as specified in paragraph G.4.3.5.4, low-signal level contact resistance shall be as specified in Table G-7.

Table G-7. Low-Signal Level Contact Resistance

Unit: mΩ

Contact size	Wire size (AWG)	Initial	After test
		Maximum	Maximum
8	8	2.5	2.5
20	20	9	11

G.3.7 Mechanical Performance

Connectors shall meet the following requirements.

G.3.7.1 Maintenance Aging

When tested as specified in paragraph G.4.3.6.1, connectors shall meet the requirements of paragraphs G.3.7.2 (contact insertion and removal forces) and G.3.7.3 (Connector mating and unmating forces).

G.3.7.2 Contact Insertion and Removal Forces

When tested as specified in paragraph G.4.3.6.2, the axial forces required to insert and remove an individual removable contact shall meet the requirements specified in Table G-8.

Table G-8. Contact Insertion and Removal Forces

Unit: N {kgf}

Contact Size	Maximum insertion	Maximum removal
8	65 {6.63}	65 {6.63}

G.3.7.3 Connector Mating and Unmating Forces

When tested as specified in paragraph G.4.3.6.3, the force for mating and unmating of counterpart connectors shall meet the requirements specified in Table G-9.
If size 8 contact is included in contact arrangement, the force for mating and removal shall meet the value calculated by the following formulas.

Mating force = (mating force specified in Table G-9)
+ (no. of size 8 contact x 0.75)

Unmating force = (unmating force specified in Table G-9)
+ (no. of size 8 contact x 0.5)

Table G-9. Connector Mating and Unmating Forces

Unit: N {kgf}

Contact Arrangement	Mating force	Unmating force	
	Maximum	Maximum	Minimum
E	44.48 {4.54}	26.69 {2.72}	3.34 {0.34}
A	75.62 {7.71}	44.48 {4.54}	4.45 {0.45}
B	124.55 {12.70}	75.62 {7.71}	7.78 {0.79}
C	173.48 {17.69}	106.75 {10.89}	11.12 {1.13}
D	217.96 {22.23}	133.45 {13.61}	14.46 {1.47}

G.3.7.4 Contact Retention

When tested as specified in paragraph G.4.3.6.4, the axial displacement of contacts shall not exceed 0.3mm. In addition, there shall be no evidence of damages on contacts or inserts.

G.3.7.5 Contact Engagement and Separation Forces

G.3.7.5.1 Qualification Test

When tested as specified in paragraph G.4.3.6.5.1, contact engagement and separation forces shall meet the requirements specified in Table G-10.

Table G-10. Contact Engagement and Separation Forces

Unit: N {gf}

Contact size	Initial			After test		
	Engagement force		Separation force	Engagement force		Separation force
	Maximum	Maximum average	Minimum	Maximum	Maximum average	Minimum
8	6.86 {700}	-	0.83 {85}	6.86 {700}	-	0.83 {85}
20	5 {510}	3.3 {340}	0.2 {20}	6.12 {624}	3.9 {397}	0.17 {17}

G.3.7.5.2 Quality Conformance Inspection

When tested as specified in paragraph G.4.3.6.5.2, contact shall be capable to hold or drop off the specified weight.

G.3.7.6 Durability

When tested as specified in paragraph G.4.3.6.6, connectors shall exhibit no defects detrimental to the connector operation and shall satisfy the requirements of paragraphs G.3.7.3 (Connector mating and unmating forces), and G.3.6.3 (contact resistance).

G.3.7.7 Oversize Pin Exclusion

When tested as specified in paragraph G.4.3.6.7, socket contacts shall exclude oversized test pin insertion and shall meet the requirements of paragraph G.3.6.3 (contact resistance).

G.3.7.8 Probe Damage

When tested as specified in paragraph G.4.3.6.8, socket contacts shall exhibit no defects which will adversely affect connector's performance and shall meet the requirements of paragraph G.3.7.3 (Connector mating and unmating forces). Individual contacts shall meet the requirements of paragraphs G.3.7.5 (contact engagement and separation forces), and G.3.6.3 (contact resistance).

G.3.7.9 Insert Retention

When tested as specified in paragraph G.4.3.6.9, inserts shall be retained in proper positions in shells and shall not exhibit any crack or breakage. There shall be no looseness detrimental to coupling and electrical continuity.

G.3.7.10 Contact Axial Concentricity

When tested as specified in paragraph G.4.3.6.10, the axial concentricity shall meet the following requirements.

G.3.7.10.1 Unwired Contacts

The total indicator reading (T.I.R) (1) shall be as specified in Table G-11.
Note: (1) T.I.R: Total Indicator Reading

Table G-11. Contact Axial Concentricity

Unit: mm

Contact size	Unwired	Wired
	Maxi mum	Maxi mum
8	0.15	0.31
20	0.13	0.28

G.3.7.10.2 Wired Contacts

The total indicator reading (TIR) shall be as specified in Table G-11.

G.3.7.11 Pin Contact Strength

When tested as specified in paragraph G.4.3.6.11, pin contacts shall not exhibit any permanent bending greater than 0.13mm at the insertion end.
This provision shall not apply to the contact size 8 contacts.

G.3.7.12 Crimp Tensile Strength

When tested as specified in paragraph G.4.3.6.12, the crimp tensile strength shall be as specified in Table G-12.

Table G-12. Crimp Tensile Strength

Unit: N {kgf}

Contact size	Wire size (AWG)	Tensile strength
8-8	8	500 {50.99}
8-10	10	
8-12	12	
	14	

G.3.7.13 Resistance to Soldering Heat

When tested as specified in paragraph G.4.3.6.13, connectors shall exhibit no evidence of distortions, damages or other defects.
This provision shall not apply to crimp-contact connectors.

G.3.7.14 Solderability

When tested as specified in paragraph G.4.3.6.14, a minimum of 95% of the immersed external surface shall be covered with solder.
This provision shall not apply to crimp-contact connectors.

G.3.8 Environmental Performance

Connectors shall meet the following requirements.

G.3.8.1 Vibration

G.3.8.1.1 High Frequency Vibration

When tested as specified in paragraph G.4.3.7.1.1, there shall be no electrical discontinuity in excess of 1μs. Mated connectors shall not exhibit any separation, damage, crack, or loosening of parts.

G.3.8.1.2 Random Vibration

When tested as specified in paragraph G.4.3.7.1.2, there shall be no electrical discontinuity in excess of 1μs.
There shall be no significant visual damages such as discolorations, chips, deformations, peelings and crazing. Marking shall remain legible. In addition, connectors shall meet the requirements of paragraphs G.3.6.3 (contact resistance), G.3.6.1 (dielectric withstanding voltage at sea level), and G.3.6.2 (insulation resistance).

G.3.8.2 Shock

G.3.8.2.1 Shock (I)

When tested as specified in paragraph G.4.3.7.2.1, there shall be no electrical discontinuity in excess of 1μs. Mated connectors shall not exhibit any separation, damage, crack, or loosening of parts.

G.3.8.2.2 Shock (II)

When tested as specified in paragraph G.4.3.7.2.2, there shall be no electrical discontinuity in excess of 1μs. In addition, connectors shall meet the requirements of paragraphs G.3.6.3 (contact resistance), G.3.6.1 (dielectric withstanding voltage at sea level), and G.3.6.2 (insulation resistance).

G.3.8.3 Temperature Cycling

G.3.8.3.1 Temperature Cycling (I)

When tested as specified in paragraph G.4.3.7.3.1, there shall be no visible evidence of any mechanical damages. Also, there shall be no failure modes identified in FMAT of the Quality Assurance Program Plan. Individual contacts shall meet the requirements of paragraphs G.3.7.5 (contact engagement and separation forces), and G.3.6.3 (contact resistance).

G.3.8.3.2 Temperature Cycling (II)

When tested as specified in paragraph G.4.3.7.3.2, there shall be no visible evidence of any mechanical damages. Also, there shall be no failure modes identified in FMAT of the Quality Assurance Program Plan. In addition, connectors shall meet the requirements of paragraphs G.3.6.3 (contact resistance), G.3.6.1 (dielectric withstanding voltage at sea level), and G.3.6.2 (insulation resistance).

G.3.8.4 Humidity

When tested as specified in paragraph G.4.3.7.4, connectors shall meet the requirements of paragraphs G.3.6.1 (dielectric withstanding voltage at sea level), and G.3.6.2 (insulation resistance).

G.3.8.5 Fluid Immersion

When tested as specified in paragraph G.4.3.7.5, connectors shall meet the requirements of paragraphs G.3.7.3 (Connector mating and unmating forces), G.3.6.1 (dielectric withstanding voltage at sea level), and G.3.6.2 (insulation resistance).
This requirement shall apply when specified in the detail specification or when ordered by the purchaser in accordance with paragraph 6.2.1 (Items to be ordered for procurement).

G.3.8.6 Resistance to Corrosive Gas

When tested as specified in paragraph G.4.3.7.6, contacts shall exhibit no defects detrimental to performance and shall meet the requirements of paragraph G.3.6.4 (low-signal level contact resistance).

G.3.8.7 Salt Spray (Corrosion)

When tested as specified in paragraph G.4.3.7.7, connectors shall not expose the base metal due to corrosion which will adversely affect connector performance.
At the completion of the test, connectors shall meet the requirements of paragraphs G.3.7.3 (Connector mating and unmating forces), and G.3.6.3 (contact resistance).

Individual contacts shall satisfy the requirements of paragraphs G.3.6.4 (low-signal level contact resistance), G.3.6.3 (contact resistance), and G.3.7.5 (contact engagement and separation forces).

G.3.8.8 Radiation Hardness

When tested as specified in paragraph G.4.3.7.8, there shall be no significant visual damages such as discolorations, chips, deformations, peelings and crazing, and the marking shall remain legible. At the completion of the test, connectors shall meet the requirements of paragraphs G.3.6.3 (contact resistance), G.3.6.1 (dielectric withstanding voltage at sea level), and G.3.6.2 (insulation resistance).
If equivalent tests have been conducted on individual insulating materials used in connectors, the test data may be substituted.

G.3.9 Durability

Connectors shall meet the following requirements.

G.3.9.1 Temperature Life

When tested as specified in paragraph G.4.3.8.1, contacts shall exhibit no defects detrimental to performance and shall meet the requirements of paragraphs G.3.6.4 (low-signal level contact resistance), G.3.6.3 (contact resistance), and G.3.7.5 (contact engagement and separation forces).

G.4. Quality Assurance Provisions

G.4.1 Qualification Test

G.4.1.1 Samples

Qualification test samples shall meet the requirements for materials specified in paragraph G.3.2. Unless otherwise specified, sample connector shall be arbitrarily selected one each from contact size 8 connectors with the maximum number of contacts and other sized connectors with the maximum shell size. The sample size for each sample connector shall be as specified in paragraph G.4.1.1.1.

G.4.1.1.1 Sample Size

The number of samples shall be as specified below.

a) Crimp contacts and connectors
   1) 12 of each of plugs and receptacles.
   2) 48 pin and socket contacts from the same manufacturing lot as item 1) of a) above.
   3) Additional 48 pin and socket contacts with size 8-10 and 8-12 if contacts of size 8-8, 8-10 and 8-12 are to be qualified at the same time.

b) Solder contacts and connectors
   1) 12 of each of plugs and receptacles.
   2) 48 pin and socket contacts from the same manufacturing lot as item 1) of a) above.
   3) Additional 12 pin and socket contacts with size 8-10 and 8-16 if contacts of size 8-8, 8-10 and 8-16 are to be qualified at the same time

c) Right angle through hole contacts and connectors
   1) 3 plugs and receptacles when connectors/contacts of crimp termination and/or solder termination and right angle through hole termination are to be qualified at the same time.
   2) 12 pin and socket contacts from the same manufacturing lot as item 1) of c) above.

G.4.1.1.2 Preparation of Samples and Sample Grouping

Connectors shall be prepared as follows and shall be grouped as specified in Tables G-13 and G-14.

a) The following wires shall be used.
   1) JAXA-QTS-2120, Wires, electric, fluorinated ethylene propylene (FEP) insulated, polyimide, covering
      - KT-20 (19) U-H-*
      - KT-24 (19) U-H-*
   2) GSFC S-311-P-13 (1) Wire and Cable, Electrical, Insulated, for Space Flight Use, General Specification for Silver plated tensile strength copper alloy, AWG 26
      Note: (1) GSFC: Goddard Space Flight Center
   3) M22759/16-8
   4) Other wires
      Wires shall have sufficient performance required for the tests. Applicable standards, types and manufacturer names shall be specified in the detail specification. Wire specifications including conductor construction, insulator, conductor resistance and insulation resistance shall be specified in the application data sheet.
b) Wire crimping tools shall have a sufficient performance for crimping.
c) Contact removal tools shall have a sufficient performance for removal.
d) Right angle through hole contact connectors shall be wired using proper printed wiring boards (see Supplementary Figure G-22).
e) Wire connection and running shall be performed after completion of the residual magnetization test.

Table G-13. Preparation of Samples and Sample Grouping (Connectors)

Unit: pair

Termination style	Test group							Wires used	
	Table G-12			Table G-13				wire size (AWG)	Applicable standard
	1	2	3	4	5	6	7		
Crimp	1	1	1		2	2	2	8, 20	JAXA-QTS-2120 or wires with sufficient performance
	1	1						8, 16	
				1				-	
Solder	1	1	1		2	2	2	8, 20	
	1	1						8, 24	
				1				-	
	1	1	1		2	2	2	8	
	1	1						16	
				1				-	
Right angle through hole		3						-	

Table G-14. Preparation of Samples and Sample Grouping (Individual Contacts)

Unit: pair

Termination style		Test group								Wires used	
		Table G-14					Table G-15			wire size (AWG)	Applicable standard
		8	9	10	11	12	13	14	15		
Crimp	8-8	8	8	8	8	8				8	Wires with sufficient performance
							4	4		-	
	8-10	8	8	8	8	8				10	
							4	4		-	
	8-12	4	4	4	4	4				12	
		4	4	4	4	4				14	
							4	4		-	
Solder	8-8						4	4	4	-	
	8-10						4	4	4	-	
	8-16						4	4	4	-	
	20						4	4	4	-	
Right angle through hole	8						4	4	4	-	
	20						4	4	4	-	

G.4.1.2 Test Items and Order of Tests

Test items shall be as shown in Tables G-15 through G-18, and each test shall be conducted in the order listed in each table.
Sample size shall be as specified in paragraph G.4.1.1.1.

G.4.1.3 Determination of Pass or Fail

A failure of any test specified in Tables G-15 through G-18 shall constitute failure of the qualification test.

G.4.1.4 Disposition after Test

If failed to pass qualification test, the manufacturer shall take corrective action to assure quality of the materials, manufacturing processes and processing methods. Corrective actions shall also be taken on other products manufactured using the same materials and processes that may have the similar defects.
After the corrective action has been taken, the qualification tests in Tables G-15 through G-18 shall be repeated on additional sample units. In this case, JAXA shall have the rights to determine whether all test items or failed test items shall be performed. After completion of the group A inspection of the quality conformance inspection shown in Table G-19, the additional samples shall be submitted for the qualification test.

Table G-15. Qualification Test and Quality Conformance Inspection (Group C) (Connectors)

Test item	Requirement paragraph	Test method paragraph	Test group (1)		
			1	2	3
Externals, physical dimensions and marking	G.3.3	G.4.3.3	×	×	×
Residual magnetization	G.3.2.2	G.4.3.2.1	×	×	×
Resistance to soldering heat (2)	G.3.7.13	G.4.3.6.13	×	×	
Maintenance aging	G.3.7.1	G.4.3.6.1	×		
Contact insertion and removal forces	G.3.7.2	G.4.3.6.2	×		
Connector mating and unmating forces	G.3.7.3	G.4.3.6.3	×		
Contact retention	G.3.7.4	G.4.3.6.4	×	×	
Dielectric withstanding voltage (at sea level)	G.3.6.1	G.4.3.5.1.1	×	×	×
Dielectric withstanding voltage (reduced pressure)	G.3.6.1	G.4.3.5.1.2	×	×	×
Insulation resistance	G.3.6.2	G.4.3.5.2	×	×	×
Contact resistance	G.3.6.3	G.4.3.5.3	×	×	×
Contact engagement and separation forces	G.3.7.5	G.4.3.6.5	×	×	×
Connector mating and unmating forces	G.3.7.3	G.4.3.6.3	×	×	×
Temperature cycling (I)	G.3.8.3.1	G.4.3.7.3.1	×	×	×
Humidity	G.3.8.4	G.4.3.7.4	×	×	×
Dielectric withstanding voltage (at sea level)	G.3.6.1	G.4.3.5.1.1	×	×	×
Insulation resistance	G.3.6.2	G.4.3.5.2	×	×	×
High frequency vibration	G.3.8.1.1	G.4.3.7.1.1	×	×	×
Shock (I)	G.3.8.2.1	G.4.3.7.2.1	×	×	×
Durability	G.3.7.6	G.4.3.6.6	×	×	×
Connector mating and unmating forces	G.3.7.3	G.4.3.6.3	×	×	×
Contact resistance	G.3.6.3	G.4.3.5.3	×	×	×
Salt spray (corrosion)	G.3.8.7	G.4.3.7.7	×	×	×
Connector mating and unmating forces	G.3.7.3	G.4.3.6.3	×	×	×
Contact resistance	G.3.6.3	G.4.3.5.3	×	×	×
Oversize pin exclusion	G.3.7.7	G.4.3.6.7	×	×	×
Contact resistance	G.3.6.3	G.4.3.5.3	×	×	×
Probe damage	G.3.7.8	G.4.3.6.8	×	×	×
Contact engagement and separation forces	G.3.7.5	G.4.3.6.5.1	×	×	×
Fluid immersion	C.3.8.5	C.4.3.7.5	×	×	×
Mating and removal forces	C.3.7.3	C.4.3.6.3	×	×	×
Dielectric withstanding voltage (at sea level)	C.3.6.1	C.4.3.5.1.1	×	×	×
Insulation resistance	C.3.6.2	C.4.3.5.2	×	×	×
Insert retention	C.3.7.9	C.4.3.6.9	×	×	×
Externals, physical dimensions and marking	C.3.3	C.4.3.3	×	×	×

Notes: (1) The tests identified with the symbol “x” shall be performed.

(2) Applies when specified in the detail specification or when ordered by the purchaser in

accordance with paragraph 6.2.1 (Items to be ordered for procurement).

Table G-16. Qualification Test and Quality Conformance Inspection (Group C) (Connectors)

Test item	Requirement paragraph	Test method paragraph	Test group (1)			
			4	5	6	7
Externals, physical dimensions and marking	G.3.3	G.4.3.3	×	×	×	×
Outgassing	3.3.3, G.3.2.8	G.4.3.2.2	×			
Contact resistance	G.3.6.3	G.4.3.5.3		×	×	×
Dielectric withstanding voltage (at sea level)	G.3.6.1	G.4.3.5.1.1		×	×	×
Insulation resistance	G.3.6.2	G.4.3.5.2		×	×	×
Random vibration	G.3.8.1.2	G.4.3.7.1.2		×		
Shock (II)	G.3.8.2.2	G.4.3.7.2.2			×	
Radiation hardness (2)	G.3.8.8	G.4.3.7.8				×
Externals and construction	G.3.3	G.4.3.3		×	×	×
Contact resistance	G.3.6.3	G.4.3.5.3		×	×	×
Dielectric withstanding voltage (at sea level)	G.3.6.1	G.4.3.5.1.1		×	×	×
Insulation resistance	G.3.6.2	G.4.3.5.2		×	×	×
Temperature cycling (II)	G.3.8.3.2	G.4.3.7.3.2		×		
Externals and construction	G.3.3	G.4.3.3		×		
Contact resistance	G.3.6.3	G.4.3.5.3		×		
Dielectric withstanding voltage (at sea level)	G.3.6.1	G.4.3.5.1.1		×		
Insulation resistance	G.3.6.2	G.4.3.5.2		×		

Notes: (1) The tests identified with the symbol “x” shall be performed.

(2) If equivalent tests have been conducted on individual insulating materials used in connectors, the test data may be substituted.

Table G-17. Qualification Test and Quality Conformance Inspection (Group C) (Contacts)

Test item	Requirement paragraph	Test method paragraph	Test group (1)				
			8	9	10	11	12
Externals, physical dimensions and marking	G.3.3	G.4.3.3	×	×	×	×	×
Residual magnetization	G.3.2.2	G.4.3.2.1	×	×	×	×	×
Contact axial concentricity	G.3.7.10	G.4.3.6.10	×	×	×	×	
Low-signal level contact resistance	G.3.6.4	G.4.3.5.4	×	×	×	×	
Contact resistance	G.3.6.3	G.4.3.5.3	×	×	×		
Contact engagement and separation forces	G.3.7.5	G.4.3.6.5	×	×	×		
Thermal cycling (I)	G.3.8.3.1	G.4.3.7.3.1	×				
Contact engagement and separation forces	G.3.7.5	G.4.3.6.5	×				
Contact resistance	G.3.6.3	G.4.3.5.3	×				
Probe damage	G.3.7.8	G.4.3.6.8	×				
Contact engagement and separation forces	G.3.7.5	G.4.3.6.5	×				
Contact resistance	G.3.6.3	G.4.3.5.3	×				
Salt spray (corrosion)	G.3.8.7	G.4.3.7.7		×			
Low-signal level contact resistance	G.3.6.4	G.4.3.5.4		×			
Contact resistance	G.3.6.3	G.4.3.5.3		×			
Contact engagement and separation forces	G.3.7.5	G.4.3.6.5		×			
Temperature life	G.3.9.1	G.4.3.8.1			×		
Low-signal level contact resistance	G.3.6.4	G.4.3.5.4			×		
Contact resistance	G.3.6.3	G.4.3.5.3			×		
Contact engagement and separation forces	G.3.7.5	G.4.3.6.5			×		
Resistance to corrosive gas	G.3.8.6	G.4.3.7.6				×	
Low-signal level contact resistance	G.3.6.4	G.4.3.5.4				×	
Contact pin strength	G.3.7.11	G.4.3.6.11				×	
Crimp tensile strength	G.3.7.12	G.4.3.6.12	×		×		×

Note: (1) The tests identified with the symbol “x” shall be performed.

Table G-18. Qualification Test and Quality Conformance Inspection (Group C) (Contacts)

Test item	Requirement paragraph	Test method paragraph	Test group (1)		
			13	14	15
Externals, physical dimensions and marking	G.3.3	G.4.3.3	×	×	×
Plating porosity	G.3.4.1	G.4.3.4.1	×		
Plating thickness	G.3.4.2	G.4.3.4.2		×	
Solderability	G.3.7.14	G.4.3.6.14			×

Note: (1) The tests identified with the symbol “x” shall be performed.

G.4.2 Quality Conformance Inspection

The quality conformance inspection shall be as specified in Table G-19 for group A inspection, Table G-20 for group B inspection, and Tables G-15 through G-18 for group C inspection.

G.4.2.1 Inspection Items and Sample Size

Inspection items shall be as specified in Tables G-19, G-20 and G-15 through G-18. Each inspection shall be conducted in the order listed in each table.
Sample size shall be as specified in Table G-19 for group A inspection, Table G-20 for group B inspection and paragraph G.4.1.1.1 for group C inspection. Group B or C inspection shall be conducted for products that have passed group A inspection.

G.4.2.2 Determination of Pass or Fail

Determination of pass or fail shall be in accordance with paragraphs 4.5.1.3 and 4.5.2.3.

G.4.2.3 Disposition after Inspection

Disposition after inspection shall be in accordance with paragraphs 4.5.1.4 and 4.5.2.4, and as follows.

a) Samples rejected in groups A and B inspections shall not be delivered.
b) If a lot is rejected due to non-compliance with physical dimension and residual magnetization requirements of group B inspection, the failed inspection items shall be repeated on all products and only products that have passed the inspections can be delivered.

Table G-19. Quality Conformance Inspection (Group A)

Inspection item	Requirement paragraph	Test method paragraph	Criteria for pass/fail (2)	
			No. of samples	No. of allowable defects
Externals, physical dimensions and marking (1)	G.3.2	G.4.3.3	100%	Less than 10%
Dielectric withstanding voltage (at sea level)	G.3.6.1	G.4.3.5.1.1		
Insulation resistance	G.3.6.2	G.4.3.5.2		
Contact separation forces	G.3.7.5	G.4.3.6.5.2		

Notes:

(1) Visual inspection.

(2) It is permissible to enter pass/fail determinations such as “pass” or “good” in the test data form.

Table G-20. Quality Conformance Inspection (Group B)

Inspection item			Requirement paragraph	Test method paragraph	Criteria for pass/fail (3)	
					No. of samples	No. of allowable defects
Dimensions (1)	Connectors		G.3.3	G.4.3.3.1	13	0
	Individual contacts		G.3.3	G.4.3.3.2	30	0
Residual magnetization			G.3.2.2	G.4.3.2.1	AQL 4% (4)	
Plating thickness (for individual contacts) (2)			G.3.4.2	G.4.3.4.2	4	0
Crimp tensile strength	8-8	8AWG wire	G.3.7.12	G.4.3.6.12	4	0
	8-10	10AWG wire	G.3.7.12	G.4.3.6.12	4	0
	8-12	12AWG wire	G.3.7.12	G.4.3.6.12	4	0
		14AWG wire	G.3.7.12	G.4.3.6.12	4	0

Notes:

(1) When the number of inspection lots is less than the specified sample size for the test, 100% inspection shall be performed.

(2) Samples for the plating thickness test and crimp tensile strength test shall be randomly selected from the same manufacturing lot. The samples shall not be delivered as products.

(3) It is permissible to enter pass/fail determinations such as “pass” or “good” in the test data form.

(4) The acceptance quality level (AQL) is based on a single sampling plan for normal inspection, specified in JIS Z 9015-1, Attachment Table 2-A.

G.4.3 Methods of Test and Inspection

G.4.3.1 Test Conditions

The tests and inspections shall be performed under the following environmental conditions.

a) Temperature: 15 to 35°C
b) Relative humidity: 25 to 75%RH
c) Atmospheric pressure: 75.3 to 106.7kPa {550 to 800mmHg}

G.4.3.2 Materials

Materials shall be tested as specified in the following paragraphs.

G.4.3.2.1 Residual Magnetization

Unmated connectors shall be tested as follows and shall meet the requirements specified in paragraph G.3.2.2. Measuring apparatus shall be as shown in Figures G-1 and G-2.

G.4.3.2.1.1 When Using a Milliammeter

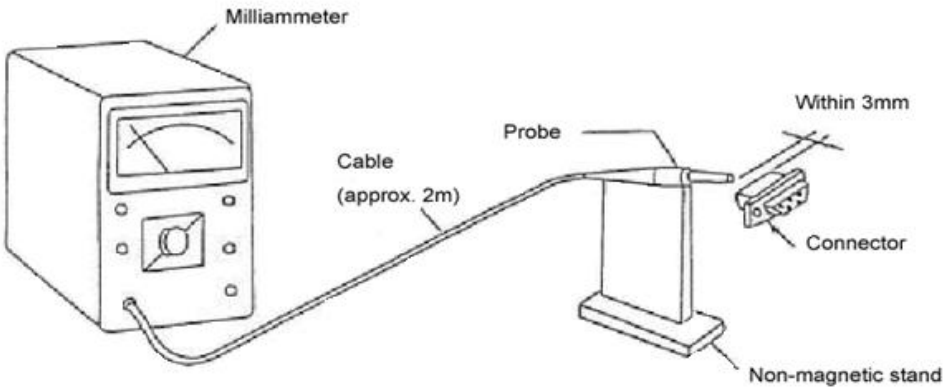


Figure G-1. Milliammeter

a) All contacts shall be installed in the connectors before testing.
b) Worm up the milliammeter for a minimum of 15 minutes.
c) Mount the probe on the non-magnetic stand in a horizontal position extending the cable at full length from the meter.
d) Set the meter in a proper scale range, and orient the probe in the magnetic east-west direction.
e) Pass the connector three times between magnet poles that create a field strength of 0.5T {5000 Gauss} or greater. The connector shall not contact the magnet pole piece, and shall be moved in the same direction.
f) Immediately after passing, bring the connector gradually within 3.0mm of the probe tip to record the maximum meter reading.
g) For the quality conformance inspection, the residual magnetization test shall be performed as follows.
    1) Non-contact connectors shall be tested without installing contacts.

2) To test individual contacts, 50 contacts shall be selected at random from an inspection lot, and installed to a test jig which shall be a connector with the maximum number of contacts among those passed the residual magnetization test.

Note: The test shall be performed in a magnetically quiet area, i.e. where operations of machines, electronic equipment and vehicles, and personnel traffic shall be restricted.

G.4.3.2.1.2 When Using a Gaussmeter

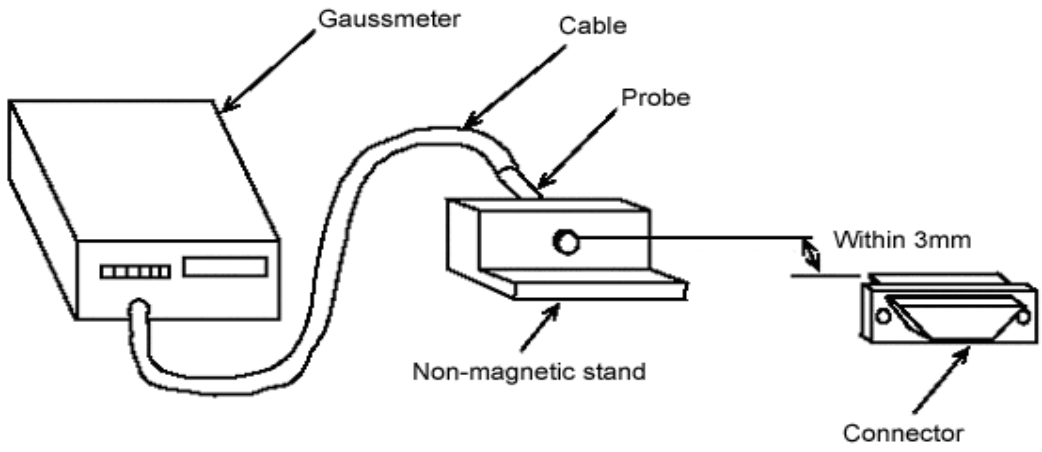


Figure G-2. Gaussmeter

a) All contacts shall be installed in the connectors before testing.
b) Warm up the gaussmeter for a minimum of 30 minutes
c) Mount the probe on the non-magnetic stand.
d) Set the meter in a proper scale range, and orient the probe in the magnetic east-west direction.
e) Pass the connector three times between magnet poles that create a field strength of 0.5T {5000 Gauss} or greater.
f) The connector shall not contact the magnet pole piece, and shall be moved in the same direction
g) Immediately after passing, bring the connector gradually within 3.0mm of the probe tip to record the maximum meter reading.
h) For the quality conformance inspection, the residual magnetization test shall be performed as follows.
   1) Non-contact connectors shall be tested without installing contacts.
   2) To test individual contacts, 50 contacts shall be selected at random from an inspection lot, and installed to a test jig which shall be a connector with the maximum number of contacts among those passed the residual magnetization test.

Note: The test shall be performed in a magnetically quiet area, i.e. where operations of machines, electronic equipment and vehicles, and personnel traffic shall be restricted.

G.4.3.2.2 Outgassing

Connector parts of inserts, sealing plug, grommets, marking inks and adhesives shall be tested in accordance with ASTM-E595. The result shall be evaluated in consideration of the weight allocation.

G.4.3.3 Externals, Physical Dimensions and Marking

Externals, physical dimensions, marking and workmanship shall be examined as specified in following paragraphs.

G.4.3.3.1 Connectors

Connectors shall be visually examined. Physical dimensions shall be inspected using a proper instrument such as vernier calipers compliant with JIS B 7507. Mass shall be measured using a weight scale.

G.4.3.3.2 Contacts

Contacts shall be examined using an approximate 3x magnifier. Physical dimensions shall be examined using vernier calipers compliant with JIS B 7507. For mass measurements, a weight scale shall be used.

G.4.3.4 Plating

G.4.3.4.1 Plating Porosity

Unwired pin and socket contacts shall be soaked in nitric acid (concentration: 70^{+3}_{-1} %) at 25±3°C and shall be monitored for 30 seconds.

G.4.3.4.2 Plating Thickness

Gold-plating thickness of unwired pin and socket contacts shall be measured as follows.

a) Thickness of gold-plating shall be measured by a proper method such as microscopic test method, beta backscatter radiation method and X-ray fluorescence method.
b) Measuring points shall be in the range specified below and at least three points shall be measured for each area.
    1) Pin contact: 2.54 to 3.81mm from insertion end
    2) Socket contact: 2.54 to 3.81mm on outside diameter from termination end

G.4.3.5 Electrical Performance

Electrical performance tests shall be performed as follows.

G.4.3.5.1 Dielectric Withstanding Voltage

G.4.3.5.1.1 At Sea Level

Connectors shall be tested in accordance with test procedure EIA-364-20. The following details shall apply.

a) Test condition: I
b) The test voltage shall be as specified in Table G-21.

c) The test shall be made between adjacent contacts for 50% of the contact pairs in the contact arrangement (at least 4 pairs), and between contact and shell for 50% or more contacts in the contact arrangement (at least 6 contacts).
d) The leakage current shall be 5mA or less.
e) For qualification test, the voltage shall be applied for one minute. For the quality conformance inspection, the application duration shall be 10 seconds or longer.
f) For quality conformance inspection, a proper test jig may be used.

Table G-21. Test Voltage

Unit: V_{AC} (Commercial frequency)

Altitude	Contact size	Initial	After humidity test or fluid immersion test
Sea level	20 (1)	1,250	600
	8 (2)	1,000	
Reduced pressure (21,340m) (4.4kPa {33mmHg})	20	325	–
	8		

Notes: (1) Apply between the size 20 contacts, between the size 20 or 8 contact and shell, or between the size 20 contact and size 8 contact.
(2) Apply between the size 8 contacts.

G.4.3.5.1.2 At Reduced Pressure

Connectors shall be tested in accordance with test procedure EIA-364-20. The following details shall apply.
a) Test condition: IV
b) The test voltage shall be as specified in Table G-21.
c) The test shall be made between adjacent contacts for 50% of the contacts in the contact arrangement (at least 4 pairs), and between contact and shell for 50% or more contacts in the contact arrangement (at least 6 contacts).
d) The leakage current shall be 5mA or less.
e) Five minutes after the specified pressure has been reached, the test voltage shall be applied for one minute.

G.4.3.5.2 Insulation Resistance

Connectors shall be tested in accordance with test procedure EIA-364-21. The following details shall apply.
a) The test voltage applied shall be $500V_{DC}$. After humidity test or fluid immersion test, the voltage shall be $100V_{DC}$.
b) The test shall be made between adjacent contacts for 50% of the contact pairs in the contact arrangement (at least 4 pairs), and between contact and shell for 50% or more contacts in the contact arrangement (at least 6 contacts).

c) For quality conformance inspection, a proper test jig may be used.

G.4.3.5.3 Contact Resistance

Connectors mated or inserted contacts shall be tested in accordance with test procedure EIA-364-06. The following details shall apply.

a) The test current shall be as specified in Table G-6.
b) The test current shall be applied and measurement shall be made after the temperature becomes stable.
c) For mated connectors, the test shall be performed on 20% of the contact pairs in the contact arrangement (at least 4 pairs) by measuring a voltage drop across the specified test points (152.4±3mm).
d) For individual contacts, the contact shall be inserted as deeply as normally used. The voltage drop shall be measured across the specified test points (152.4±3mm).
e) For solder contact and right angle through hole contact connectors, the voltage drop shall be measured at the points specified in Supplementary Figure G-21.

G.4.3.5.4 Low-Signal Level Contact Resistance

Mated pairs of contacts shall be tested in accordance with test procedure EIA-364-23. The following conditions shall apply.

a) For size 20 contacts, the contact shall be inserted as deeply as normally used. The voltage drop shall be measured across the specified test points (152.4±3mm).
b) For size 8 contacts, the contact shall be inserted as deeply as normally used. The voltage drop shall be calculated less the wire resistance. The maximum voltage and current applied during the measurement shall be 20mV and 10mA.
c) For solder contact and right angle through hole contact connectors, the voltage drop shall be measured at the points specified in Supplementary Figure G-21.

G.4.3.6 Mechanical Performance

Mechanical performance tests shall be performed as follows.

G.4.3.6.1 Maintenance Aging

Connectors shall be tested in accordance with test procedure EIA-364-24. The following conditions shall apply.

a) 20% of the contact arrangement (at least 4 contacts) shall be tested.
b) Contact insertion and removal shall be performed with proper tools in accordance with item c) of paragraph G.4.1.1.2.
c) The force required for contact insertion and removal shall be measured during the 1st and 10th maintenance aging cycles.
d) After completion of the test, the connector mating and unmating forces shall be measured.

G.4.3.6.2 Contact Insertion and Removal Forces

Connectors shall be tested during the maintenance aging test in accordance with test procedure EIA-364-05. The following conditions shall apply.

a) 20% of the contact arrangement (at least 4 contacts) shall be tested.
b) Contact insertion and removal shall be performed with proper tools in accordance with item c) of paragraph G.4.1.1.2.
c) The rate of inserting and removing each contact shall be approximately 20mm per minute.

G.4.3.6.3 Connector Mating and Unmating Forces

Connectors shall be performed in accordance with test procedure EIA-364-13. However, the test procedures specified in paragraphs 1.2.1, 1.2.2 and 2.1.2 of EIA-364-13 shall be the test procedures of the manufacturer.

G.4.3.6.4 Contact Retention

Connectors shall be performed in accordance with test procedure EIA-364-29. The following conditions shall apply.

a) 20% of the contact arrangement (at least 4 contacts) shall be tested.
b) The contact shall be preloaded with a maximum of 13.7N {1.4kgf} before measuring the axial displacement of contacts.
c) Apply an axial load to the contact from the insertion face and wait until the load reaches the value as specified in Table G-22. After maintained the specified load for 5 seconds, axial displacement of the contact shall be measured.
d) The rate to apply the load shall be approximately 4.4N/s {0.45kgf/s}.

Table G-22. Contact Retention

Unit: N {kgf}

Contact size	Load
8	66.72 {6.80} Minimum
20	40.2 {4.1} Minimum

G.4.3.6.5 Contact Engagement and Separation Forces

G.4.3.6.5.1 Qualification Test

Socket contacts shall be tested in accordance with test procedure EIA-364-37. The following conditions shall apply.

a) Test pins shall be as specified in Table G-23.
b) 20% of the contact arrangement (at least 4 contacts) shall be tested.
c) Insert and remove a test pin of the maximum diameter, and a force required to remove a test pin of the minimum diameter from the same socket contact shall be measured. Then insert and remove a test pin of the maximum diameter two times, and a force required to insert the test pin in the same socket contact shall be measured.
d) The test pin shall be inserted to a depth of 3.6mm as a minimum from the mating cavity of the socket contact.

e) The rate of engagement and separation shall be approximately 20mm per minute.

Table G-23. Test Pin

Unit: mm

Contact size	Maximum pin diameter or pin diameter	Maximum pin diameter or pin diameter
8	$3.632^{+0}_{-0.0025}$	$3.581^{+0.0025}_{-0}$
20	0.99 to 0.993	1.039 to 1.04

G.4.3.6.5.2 Quality Conformance Inspection

For quality conformance inspection, the contact separation force shall meet the requirements specified in paragraph G.3.7.5.2 when tested by the weight retention method specified below or by an equivalent method.

a) A socket contact shall be inserted with a test pin specified in Table G-23 to the specified depth as shown in Figure G-3. The test pin shall be mounted on a specified weight. The weight and insertion depth shall be as specified in Table G-24.

b) Lift test:
The socket contact shall be slowly lifted up in the vertical direction, and the weight shall remain engaged.

c) Fall test:
The socket contact shall be slowly lifted up in the vertical direction, and the weight shall fall from the socket contact.

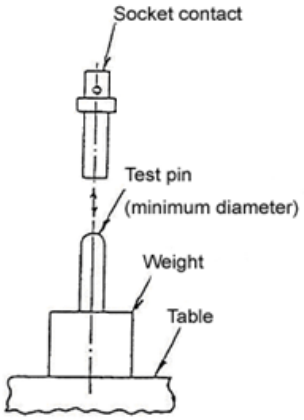


Figure G-3. Weight Retention

Table G-24. Weight and Insertion Depth

Unit: g

Contact size	Lift		Fall		Insertion depth (mm)
	Weight	Test pin	Weight	Test pin	
8	85	Minimum diameter	567	Maximum diameter	3.17
20	28.35		226.8		4.0

G.4.3.6.6 Durability

Connectors shall be tested in accordance with test procedure EIA-364-09. The following conditions shall apply.

a) The connectors shall be mated and unmated 500 times.
b) For manual testers, the repetition rate of mating and unmating shall be at a rate of 300 cycles per hour maximum.
   For automatic testers, the repetition rate of mating and unmating shall be at a rate of 550 cycles per hour maximum.
c) After completion of the test, mating and unmating forces, and contact resistance shall be measured.

G.4.3.6.7 Oversize Pin Exclusion

A hardened steel oversize pin shown in Table G-25 shall be placed at the insertion end of socket contact. A 5N {510gf} axial force shall be applied to force the test pin into the socket contact. After completion of the test, the contact resistance shall be measured. This test shall be performed on 20% of the contact arrangement (at least 4 contacts).

Table G-25. Oversize Pin Exclusion

Unit: mm

Contact size	Pin diameter
8	Not applicable
20	$1.168_{-0.003}^{+0}$

G.4.3.6.8 Probe Damage

Socket contacts shall be tested in accordance with test procedure EIA-364-25. The following conditions shall apply.

a) The test shall be performed on 20% of the contact arrangement (at least 4 contacts).
b) Contact support fixture shall be of type 1 or 2.
c) A test probe shall be inserted into the socket contact to the depth as specified in Table G-26. At completion of the test, the following measurements shall be performed.
   1) Connectors: mating and unmating forces
   2) Individual contacts: contact engagement and separation forces, and contact resistance

Table G-26. Insertion Depth of Probe Damage Tool

Unit: mm

Contact size	Contact retention system	
	Type I	Type II
8	Not applicable	
20	5.13±0.13, 1.96±0.13	6.35±0.13, 3.18±0.18

G.4.3.6.9 Insert Retention

Unmated connectors shall be tested in accordance with test procedure EIA-364-35. The following details shall apply.

a) The test load shall be 414kPa {4.22kgf/cm^2}.
b) The contacts may be removed.

G.4.3.6.10 Contact Axial Concentricity

Contacts before crimping and after crimping shall be tested in accordance with test procedure EIA-364-07.

a) Unwired Contacts
While the contact is being rotated, measurements shall be made at the points A and B specified in Figure G-4. For socket contacts, the measurement shall not be made at point B.

b) Wired Contacts
While the contact is being rotated, measurements shall be made at points A and B specified in Figure G-4. For socket contacts, the measurement shall not be made at point B. Wiring shall be made with the crimping tools specified in item b) of paragraph G.4.1.1.2.

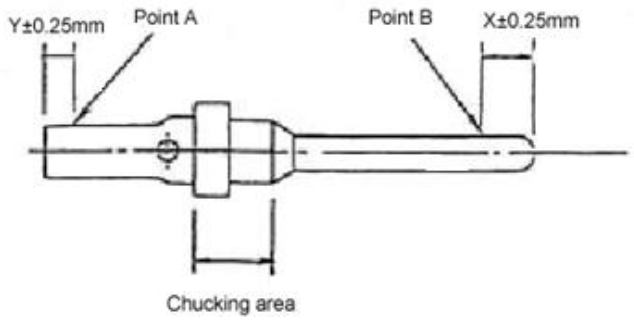
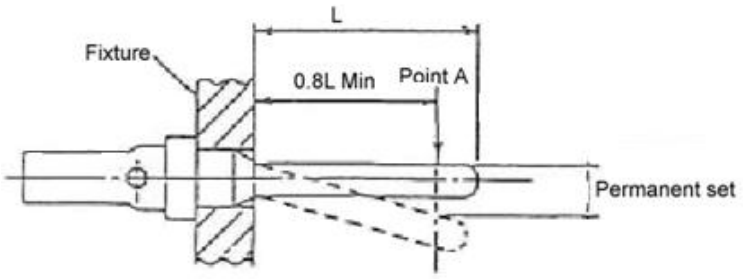


Figure G-4**. Axial Concentricity Measurement**

G.4.3.6.11 Contact Pin Strength

A pin contact shall be mounted on a proper fixture. A moment of 5.98N·cm {0.61kgf·cm} shall be applied at the point A specified in Figure G-5 at a rate of 25.4mm per minute as a minimum for 60^{+15}_{-0} seconds. After completion of the test, the pin contact shall meet the requirements specified in paragraph G.3.7.11.



L = Overall length of pin insertion end

Figure G-5. Contact Pin Strength

G.4.3.6.12 Crimp Tensile Strength

Wire crimped pin and socket contacts shall be tested in accordance with test procedure EIA-364-37. The following details shall apply.

a) The wire crimping tools shall be as specified in item b) of paragraph G.4.1.1.2.
b) Failures to meet the crimp tensile strength due to reasons unrelated to crimping such as wire scratches shall not be considered failures of the test.

G.4.3.6.13 Resistance to Soldering Heat

Unmated connectors shall be tested in accordance with test method 210, condition A of MIL-STD-202. The following details shall apply.

a) Connectors shall be immersed to a depth of at least 3mm from the wire termination.
b) Flux shall not be used.
c) For solder-contact connectors, a minimum of 20% of the contact arrangement (at least 4 contacts) shall be in contact with a solder iron of 350±10°C for 3 seconds or longer.

G.4.3.6.14 Solderability

Contacts shall be tested in accordance with method 208 of MIL-STD-202. Contacts shall be immersed to a depth of at least 3mm from the wire termination.

G.4.3.7 Environmental Performace

Environmental performance tests shall be performed as follows.

G.4.3.7.1 Vibration

G.4.3.7.1.1 High Frequency Vibration

Mated connectors installed with wired contacts shall be tested in accordance with method 204 of MIL-STD-202. The following details shall apply.

a) Mounting method: Connectors shall be mounted normally on a vibration table using jig.
b) Currents of 100mA or more shall be applied to all contacts during the test. The contacts shall be monitored for electrical continuity using a detector capable of detecting any discontinuity in excess of 1μs.
c) Test condition: G (294m/s^2 {30G}p-p).

d) Wire bundles shall be secured to a non-vibrating table located approximately 203mm from the rear side of the connector.

G.4.3.7.1.2 Random Vibration

Mated connectors installed with wired contacts shall be tested in accordance with test procedure EIA-364-28. The following conditions shall apply.

a) Mounting method: Connectors shall be mounted normally on a vibration table using jig.
b) Currents of 100mA or more shall be applied to all contacts during the test. The contacts shall be monitored for electrical continuity using a detector capable of detecting any discontinuity in excess of 1μs.
c) Test condition VI, effective acceleration: 334m/s^{2}rms {34.02Grms}.
d) Duration of vibration: 15 minutes for each axis, 45 minutes in total.
e) The wire bundles shall be secured to a non-vibrating table located approximately 203mm from the rear side of the connector.

G.4.3.7.2 Shock

Mated connectors shall be tested in accordance with test procedure EIA-364-27.

G.4.3.7.2.1 Shock (I)

The following details shall apply.

a) Test condition: D (2942m/s^2 {300G}), half-sine wave
b) Receptacles shall be mounted on a shock table using test jig. Plugs shall be engaged with receptacles and secured by a proper holding device.
c) Wires shall be bundled at approximately 10cm behind the rear of the connector, and secured to a no-shock table located at least 20cm apart from the rear side of the connector.
d) Currents of 100mA or more shall be applied to all contacts crimped in series during the test. The contacts shall be monitored for electrical continuity using a detector capable of detecting any discontinuity in excess of 1μs.

G.4.3.7.2.2 Shock (II)

The following details shall apply.

a) Test conditions
    1) Acceleration of gravity (A): 4,903m/s^2 {500G}±20%
    2) Duration of pulse (D): 1.0ms±15%
    3) Waveform: Half-sine wave
    4) Velocity change (vi): 3.11m/s±10%
    5) Direction of shock application: ±X, ±Y, and ±Z (3 shocks per each direction, 18 shocks in total)
b) Mounting method: As specified in item b) of paragraph G.4.3.7.2.1.
c) Wires: As specified in item c) of paragraph G.4.3.7.2.1.
d) Monitoring during test: As specified in item d) of paragraph G.4.3.7.2.1.

G.4.3.7.3 Temperature Cycling

Mated connectors installed with wired contacts shall be tested in accordance with test procedure EIA-364-32.

The following conditions shall apply.

a) Possible post-test failure modes and pass/fail criteria:
In accordance with FMAT of the Quality Assurance Program Plan.

G.4.3.7.3.1 Temperature Cycling (I)

The following details shall apply.

a) The test shall be performed for 5 cycles at the temperatures specified in Table G-27.
b) At the completion of the last cycle, the connectors shall be removed from the chamber and examined for the following items.
   1) Connectors: Externals
   2) Individual contacts: Contact engagement and separation forces and contact resistance.

Table G-27. Temperature Extremes

Unit: °C

Low	-65^{+0}_{-3}
High	$+125^{+3}_{-0}$

G.4.3.7.3.2 Temperature Cycling (II)

The following details shall apply.

a) The temperature for step 1 shall be -30^{0}_{-5}°C.
b) The temperature for step 3 shall be $+100^{+3}_{0}$°C.
c) The number of cycles shall be 1,000.
d) Measurements during the test and visual inspection
   At 100^{+10}_{0}, 250^{+10}_{0}, and 500^{+10}_{0} cycles.
   All connectors shall be visually examined for cracks on the surface.

G.4.3.7.4 Humidity Resistance

Unmated connectors shall be tested in accordance with test procedure EIA-364-31. The following details shall apply.

a) Test condition: Method IV
b) Duration of test: 240 hours
c) Upon completion of the final cycle, the connector shall be removed from the chamber and moisture shall be removed from the surface. Upon removal, dielectric withstanding voltage test (at sea level) and insulation resistance test shall be conducted.
d) After 24-hour conditioning period at ambient temperature, insulation resistance shall be re-measured.

G.4.3.7.5 Fluid Immersion

Unmated connectors shall be tested in accordance with Table G-28 which is equivalent to fluid (a) and fluid (d) of test procedure EIA-364-10. The following details shall apply.

a) Connectors shall be removed from the fluids and maintained at ambient temperature and normal humidity for one hour. Then mating and unmating forces shall be measured.
b) Fluids on the connector surface shall be removed by solvent and the surface shall be cleaned. Then mating and unmating forces shall be re-measured.
c) Twenty-four hours after the cleaning specified in item b) above, dielectric withstanding voltage (at sea level) and insulation resistance shall be measured.

Table G-28. Test Fluids and Duration of Immersion

Fluid	Duration of immersion	Sample (See Table G-13)
Hydraulic fluid in MIL-PRF-5606	20 hours	One pair for each test group of 1 through 3.
Lubricating oil in MIL-PRF-23699	20 hours	One pair for each test group of 1 and 2.

Note: Samples shall be crimp-contact connectors.

G.4.3.7.6 Resistance to Corrosive Gas

10% solution of potassium sulfide in distilled water shall be placed on a noncorrosive rack in a sealed plastic or glass chamber ($0.057m^3$ {$2ft^3$}) and uninserted connectors shall be exposed to the sulfide vapor for 100 hours. After completion of the test, low-signal level contact resistance shall be measured. Contacts shall not be immersed in the solution during the test.

G.4.3.7.7 Salt Spray (Corrosion)

Mated connectors and individual engaged contacts shall be tested in accordance with test procedure EIA-364-26. The following details shall apply.

a) Test condition: B (48 hours)
b) Individual contacts shall be inserted as deeply as normally used.
c) At completion of the test, the following measurements shall be made.
    1) Connectors: Mating and unmating forces, and contact resistance
    2) Individual contacts: Contact resistance, and contact engagement and separation forces

G.4.3.7.8 Radiation Hardness

Mated connectors installed with wired contacts shall be tested under the following conditions.

a) Radiation type: ^{60}Co gamma ray
b) Total dose of radiation: 10^5Gy

G.4.3.8 Durability

Durability tests shall be performed as follows.

G.4.3.8.1 Temperature Life

Engaged contacts shall be tested in accordance with test procedure EIA-364-17. The following details shall apply.

a) Test temperature: 5 (125±2°C)
b) Test time: D (1000 hours)
c) Contacts shall be engaged as deeply as normally used. No electrical load shall be applied.
d) After completion of the test, low-signal level, contact resistance, and contact engagement and separation forces shall be measured.

G.4.4 Long-Term Storage

Long-term storage shall be as specified in paragraph 4.7.

G.4.5 Change and Optimization of Tests and Inspections

Change to tests and inspections shall be in accordance with paragraph 4.8.

G.5. Preparation for Delivery

Preparation for delivery shall be as follows and as specified in paragraph 5.

G.6. Notes

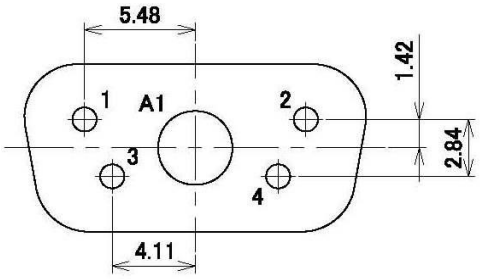
G.6.1 Notes for Manufacturer

Notes for manufacturer shall be in accordance with paragraph 6.1.

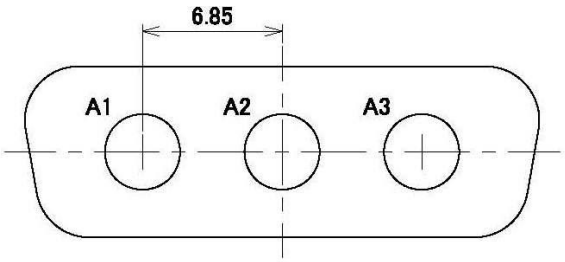
G.6.2 Notes for Purchaser

Notes for purchaser shall be as specified in paragraph 6.2.

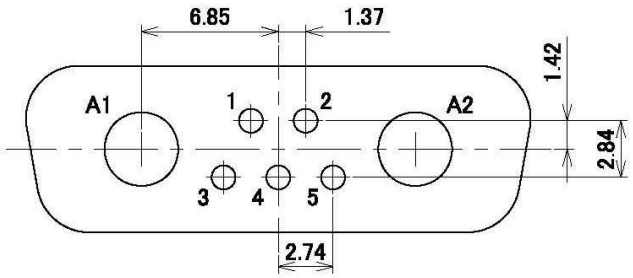
Unit: mm



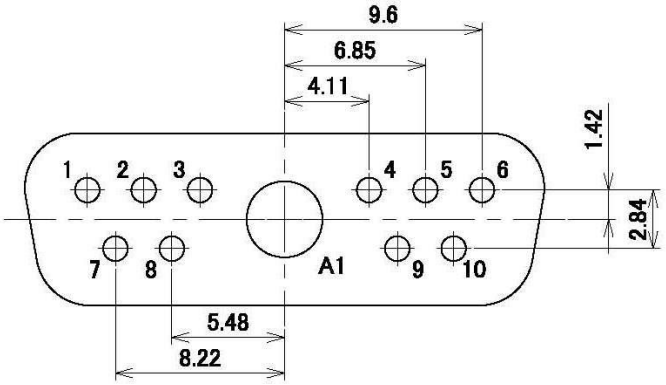
5W1 (PIN)



3W3(PIN)



7W2(PIN)



11W1(PIN)

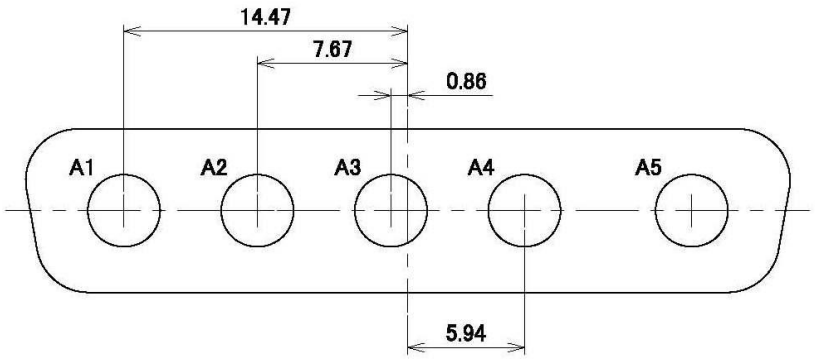
Notes:

(1) Pin connectors (front view)

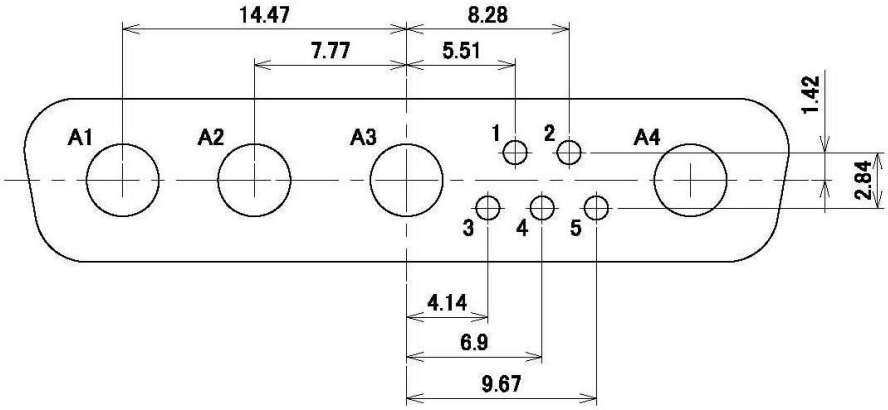
(2) Left and right of contact position numbers are reversed for socket insert.

Supplementary Figure G-1. Contact Arrangement (1/7)

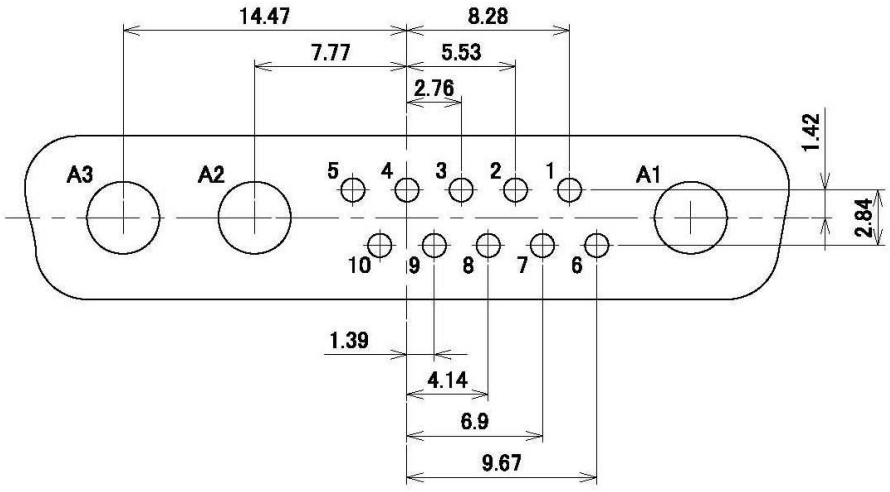
Unit: mm



5W5(PIN)



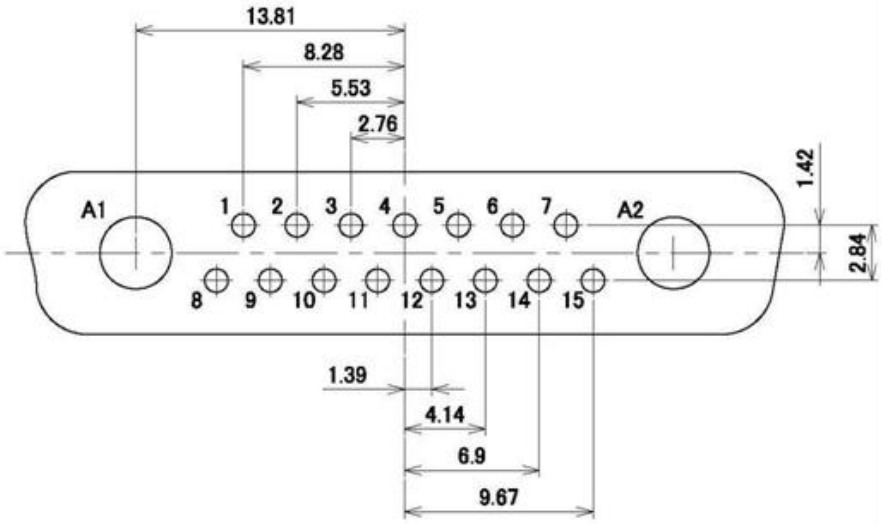
9W4(PIN)



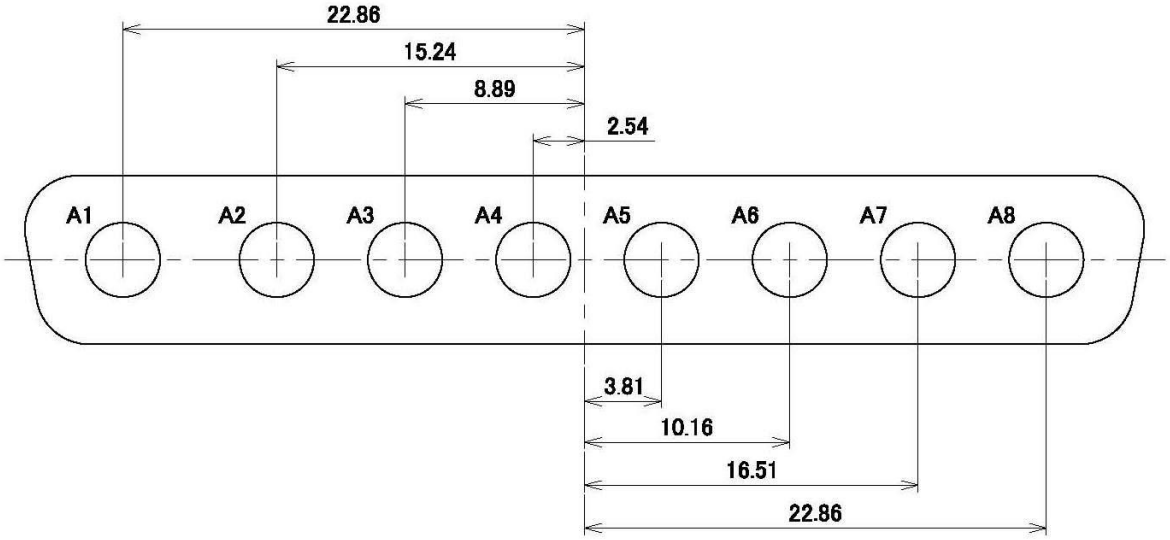
13W3(PIN)

Supplementary Figure G-1. Contact Arrangement (2/7)

Unit: mm



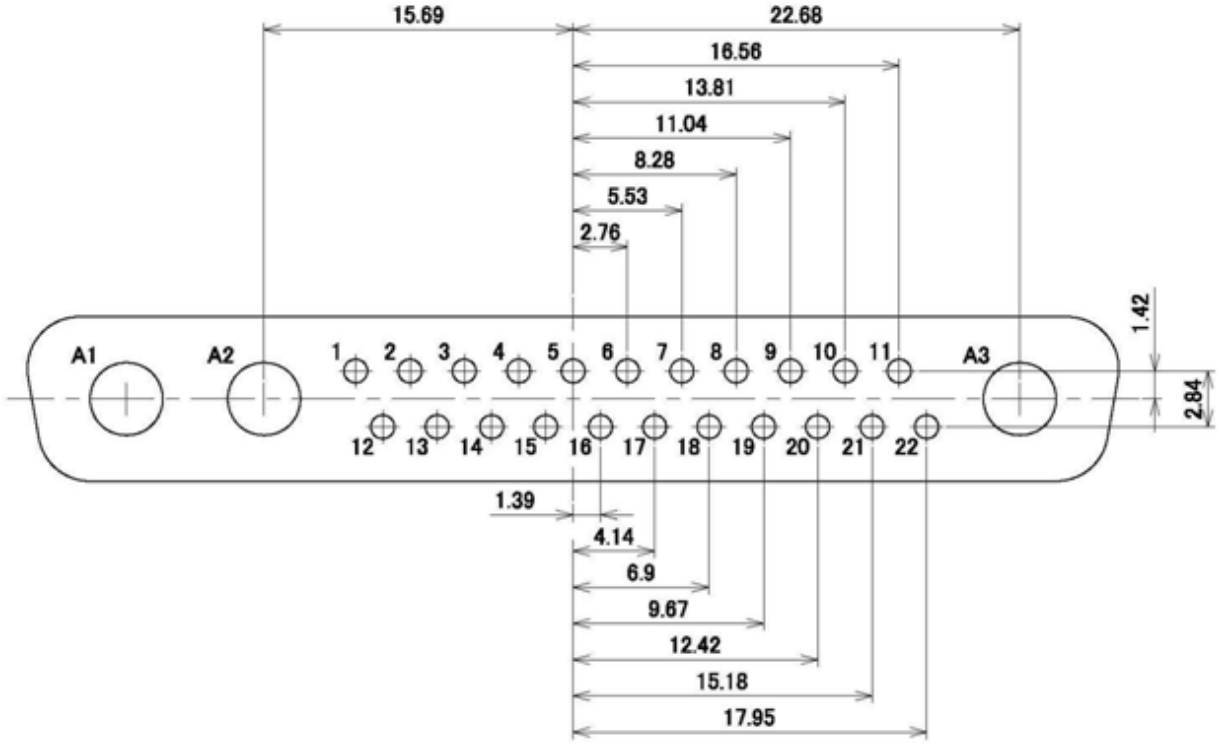
17W2(PIN)



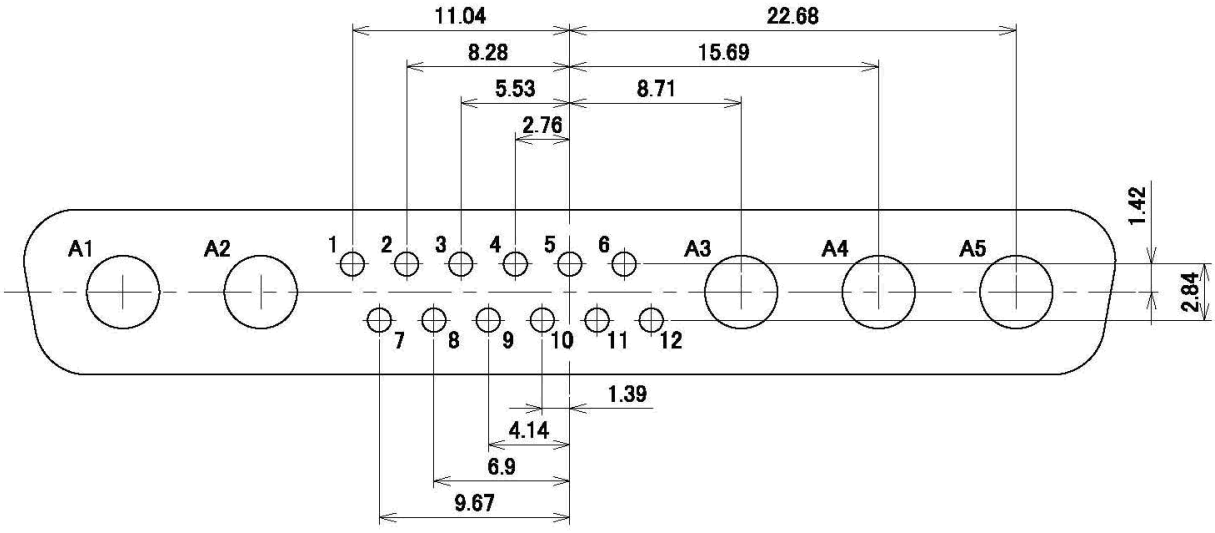
8W8(PIN)

Supplementary Figure G-1. Contact Arrangement (3/7)

Unit: mm



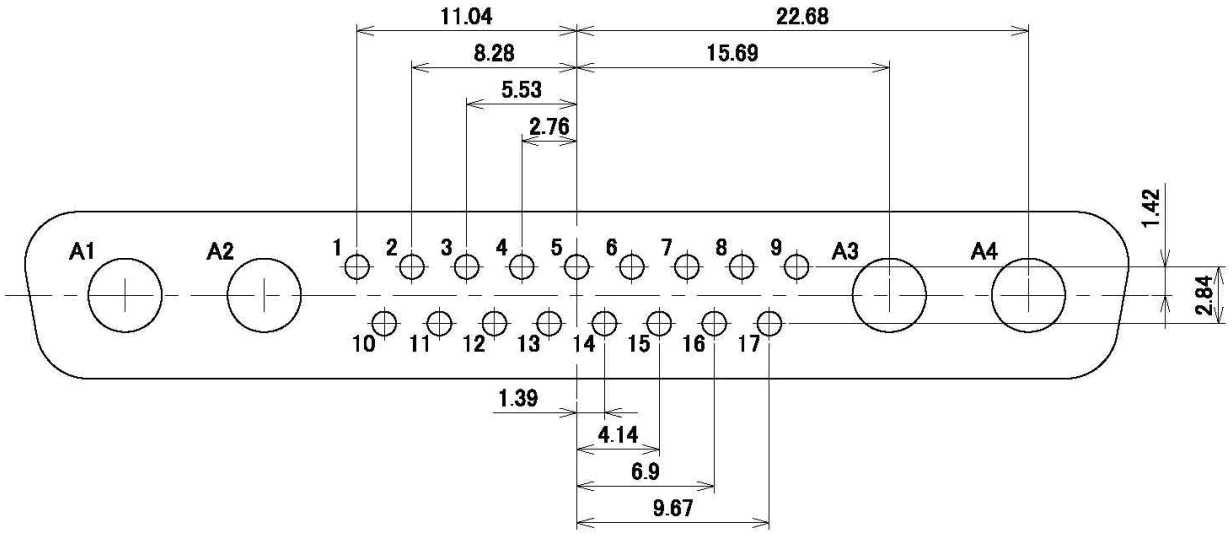
25W3(PIN)



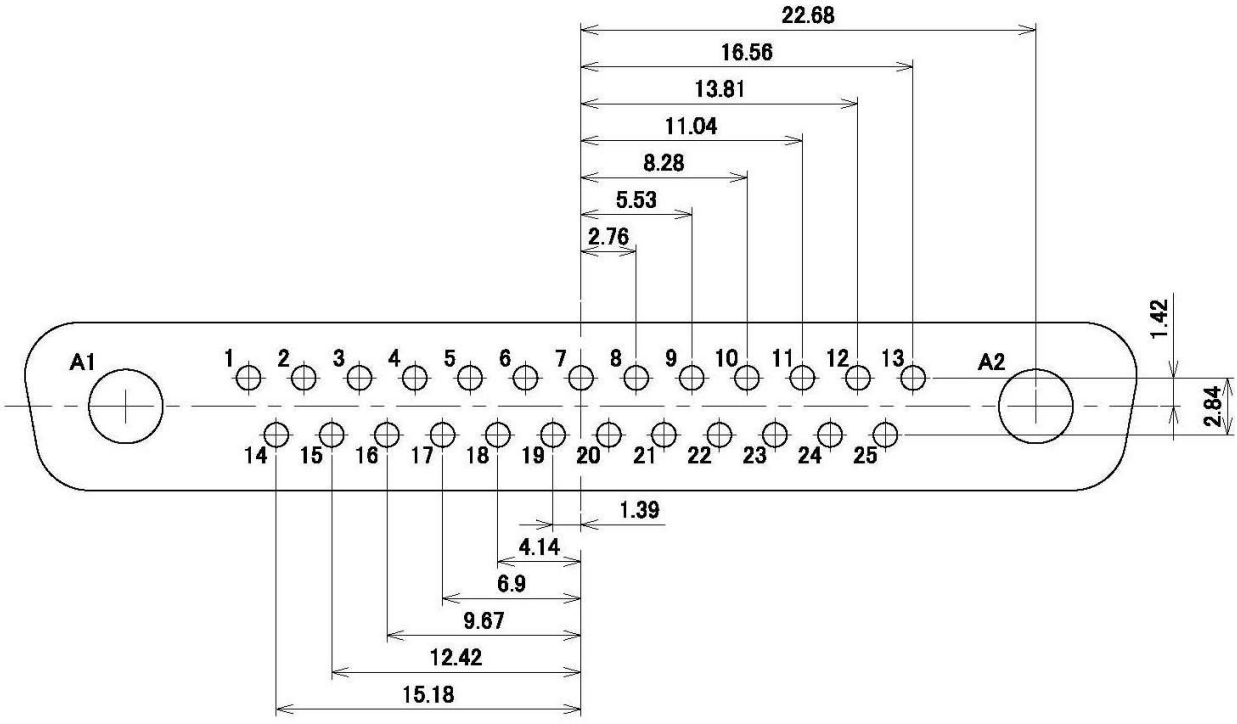
17W5(PIN)

Supplementary Figure G-1. Contact Arrangement (4/7)

Unit: mm



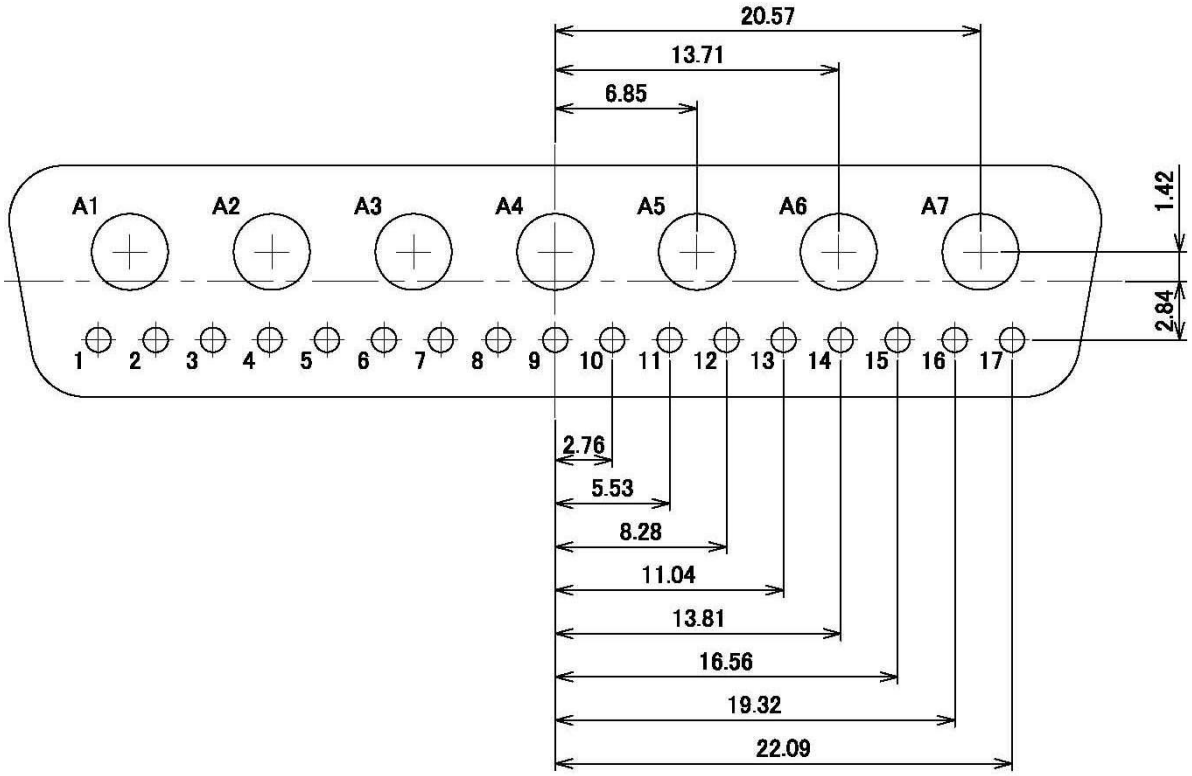
21WA4(PIN)



27W2(PIN)

Supplementary Figure G-1. Contact Arrangement (5/7)

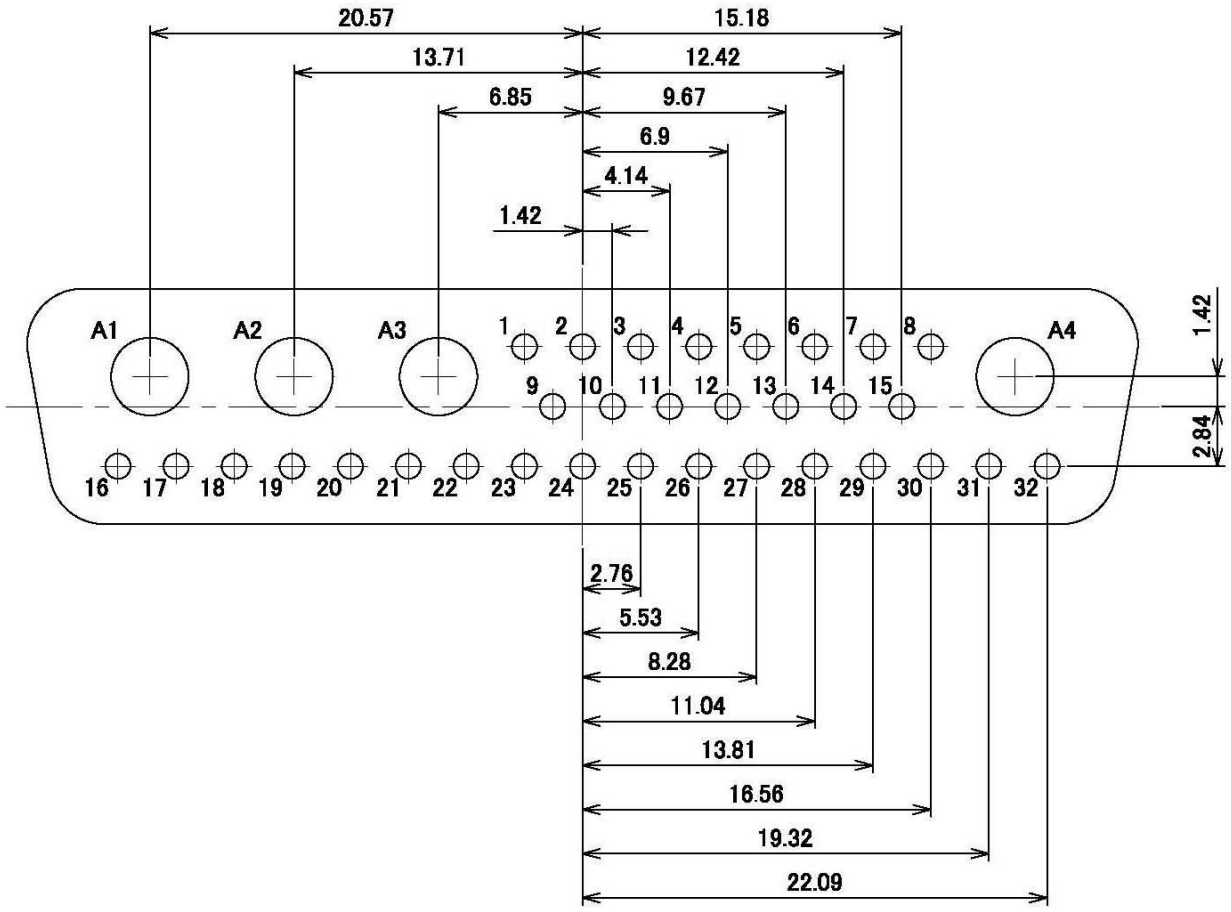
Unit: mm



24W7(PIN)

Supplementary Figure G-1. Contact Arrangement (6/7)

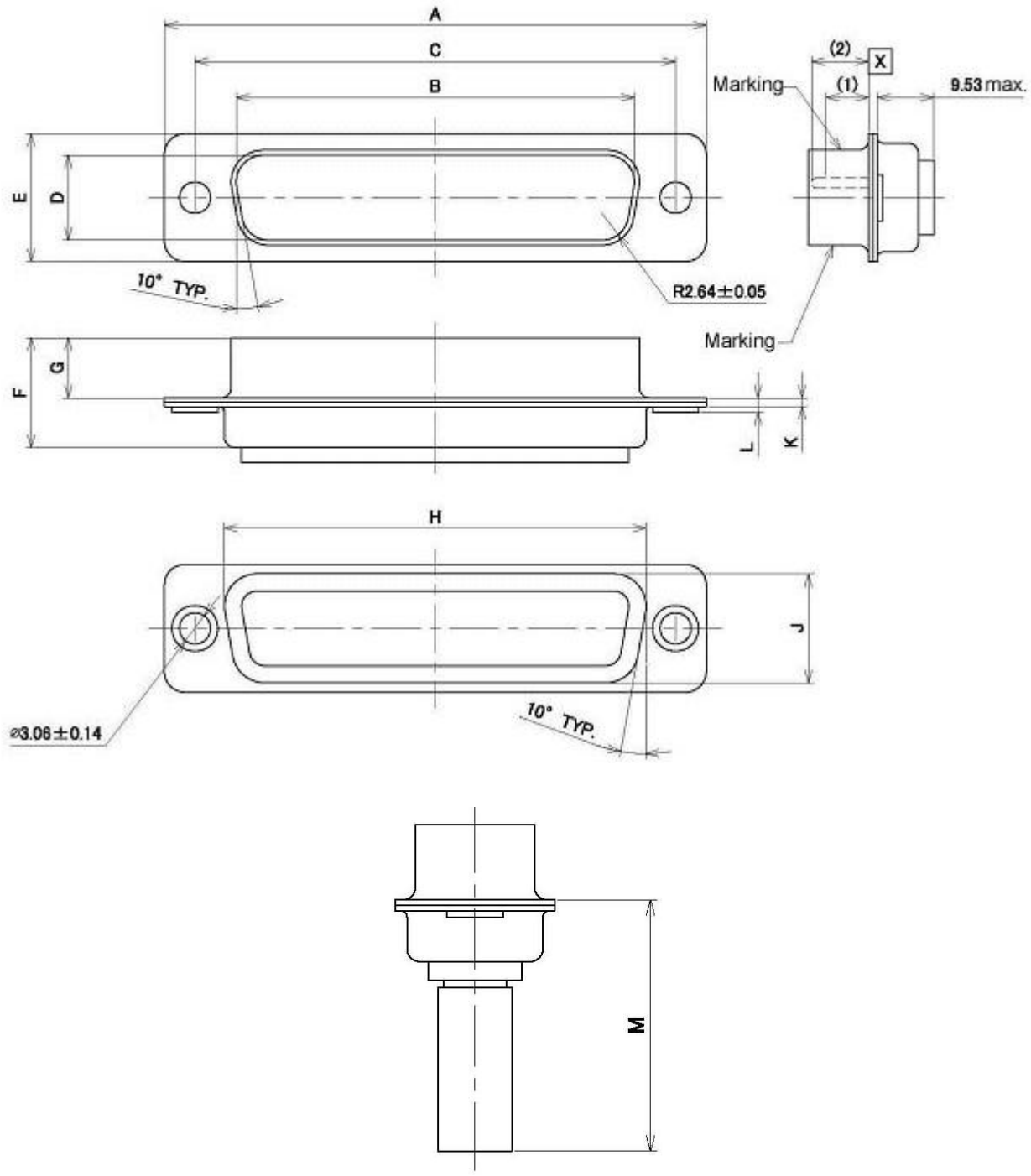
Unit: mm



36W4(PIN)

Supplementary Figure G-1. Contact Arrangement (7/7)

Unit: mm



Mounting size 8 contact

Supplementary Figure G-2. Physical Dimensions for Crimp Pin Contact Connectors (1/2)

Unit: mm

Part number	Shell size	Physical dimensions						
		A	B	C	D	E	F	G
		-	±0.13	±0.13	-	±0.38	Maximum	-
JD*06-*P-C	E	30.84±0.42	16.91	24.99	8.35 ±0.13	12.55	13.39	5.97 ±0.16
JD*06-*P-C	A	39.14±0.38	25.24	33.32				
JD*06-*P-C	B	53.03±0.38	38.96	47.04				5.91 ±0.22
JD*06-*P-C	C	69.32±0.38	55.42	63.5				
JD*06-*P-C	D	66.93±0.38	52.8	61.11	11.14 ±0.19	15.37		

Part number	Shell size	Physical dimensions					Mass (6)
		H	J	K	L	M	
		±0.26	±0.26	-	-	Maximum	Maximum
JD*06-*P-C	E	19.27	10.71	0.76 ±0.26	1.2 ±0.32	19.8	4.5
JD*06-*P-C	A	27.5					5.5
JD*06-*P-C	B	41.27		0.87 ±0.37	1.41 ±0.37	20	9.0
JD*06-*P-C	C	57.7					12.5
JD*06-*P-C	D	55.32	13.56				13.5

Notes:

(1) Length between the X plane and the engagement tip minus the spherical radius shall be a minimum of 4.17mm for 9- or 15-contact connectors and a minimum of 3.94mm for 25-, 37-, or 50-contact connectors.

(2) Length between the X plane and the engagement tip shall be a maximum of 5.59mm.

(3) Contact arrangement shall be as shown in Supplementary Figure G-1.

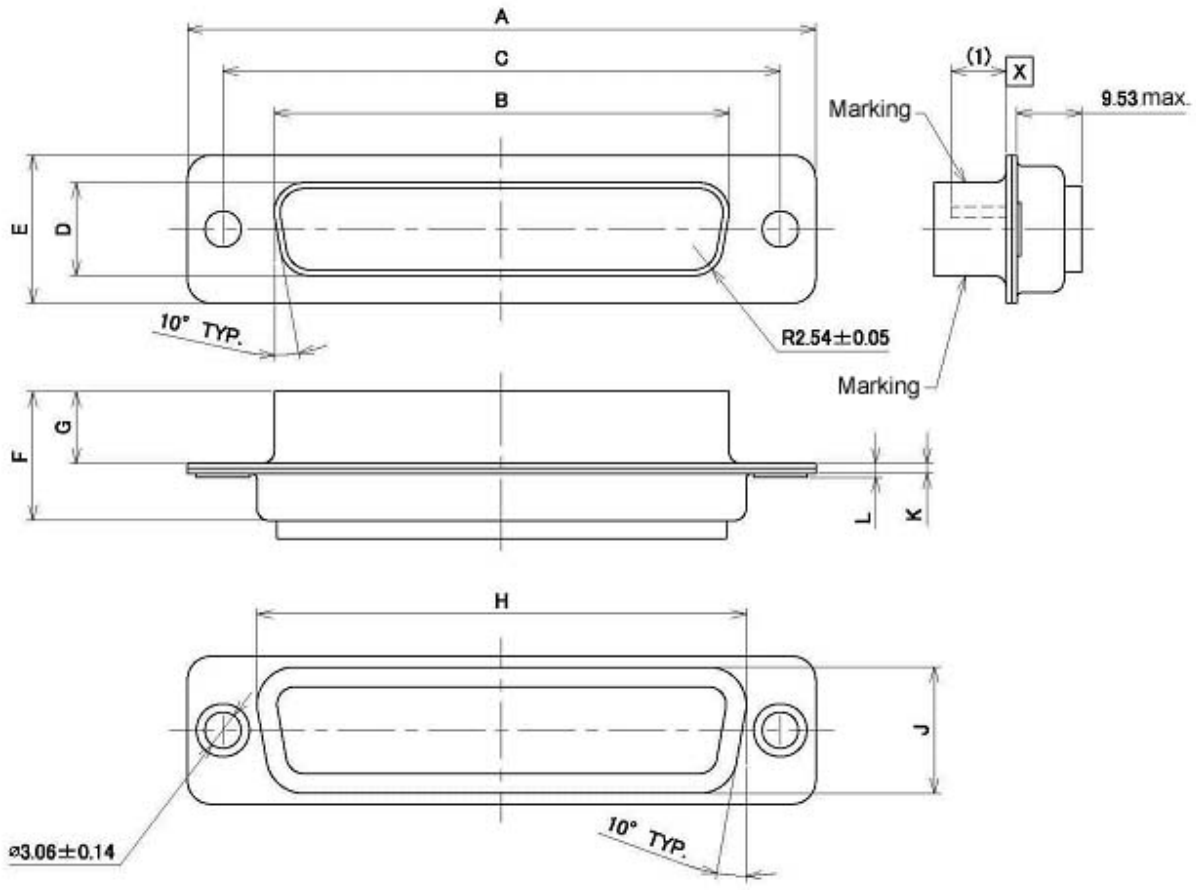
(4) Physical dimensions of a crimp pin contact shall be as shown in Supplementary Figure G-10.

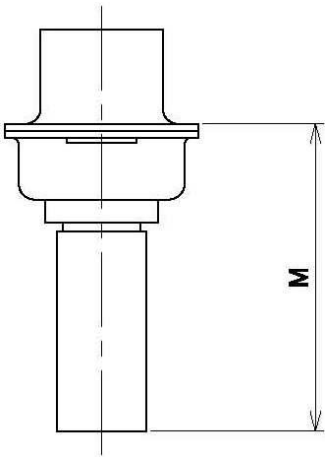
(5) Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.

(6) The mass of contact is not included.

Supplementary Figure G-2. Physical Dimensions for Crimp Pin Contact Connectors (2/2)

Unit: mm





Mounting size 8 contact

Supplementary Figure G-3. Physical Dimensions for Crimp Socket Contact Connectors (1/2)

Unit: mm

Part number	Shell size	Physical dimensions						
		A	B	C	D	E	F	G
		-	±0.13	±0.13	±0.13	±0.38	Maximum	-
JD*06-*S-C	E	30.84±0.42	16.33	24.99	7.9	12.55	16.63	6.08 ±0.22
JD*06-*S-C	A	39.14±0.38	24.66	33.32				
JD*06-*S-C	B	53.03±0.38	38.38	47.04				
JD*06-*S-C	C	69.32±0.38	54.84	63.5				
JD*06-*S-C	D	66.93±0.38	52.42	61.11	10.74	15.37		

Part number	Shell size	Physical dimensions					Mass (5)
		H	J	K	L	M	
		±0.26	±0.26	±0.26	±0.32	Maximum	Maximum
JD*06-*S-C	E	19.27	10.71	0.76	1.2	19.8	5.0
JD*06-*S-C	A	27.5					7.0
JD*06-*S-C	B	41.27					10.0
JD*06-*S-C	C	57.7					13.5
JD*06-*S-C	D	55.32	13.56				15.0

Notes:

(1) When a square ended test pin of Φ0.99 to 1.04mm makes contact with the tip of a socket insertion end, the mating depth from the X plane shall be a minimum of 3.63mm.

(2) Contact arrangement shall be as shown in Supplementary Figure G-1.

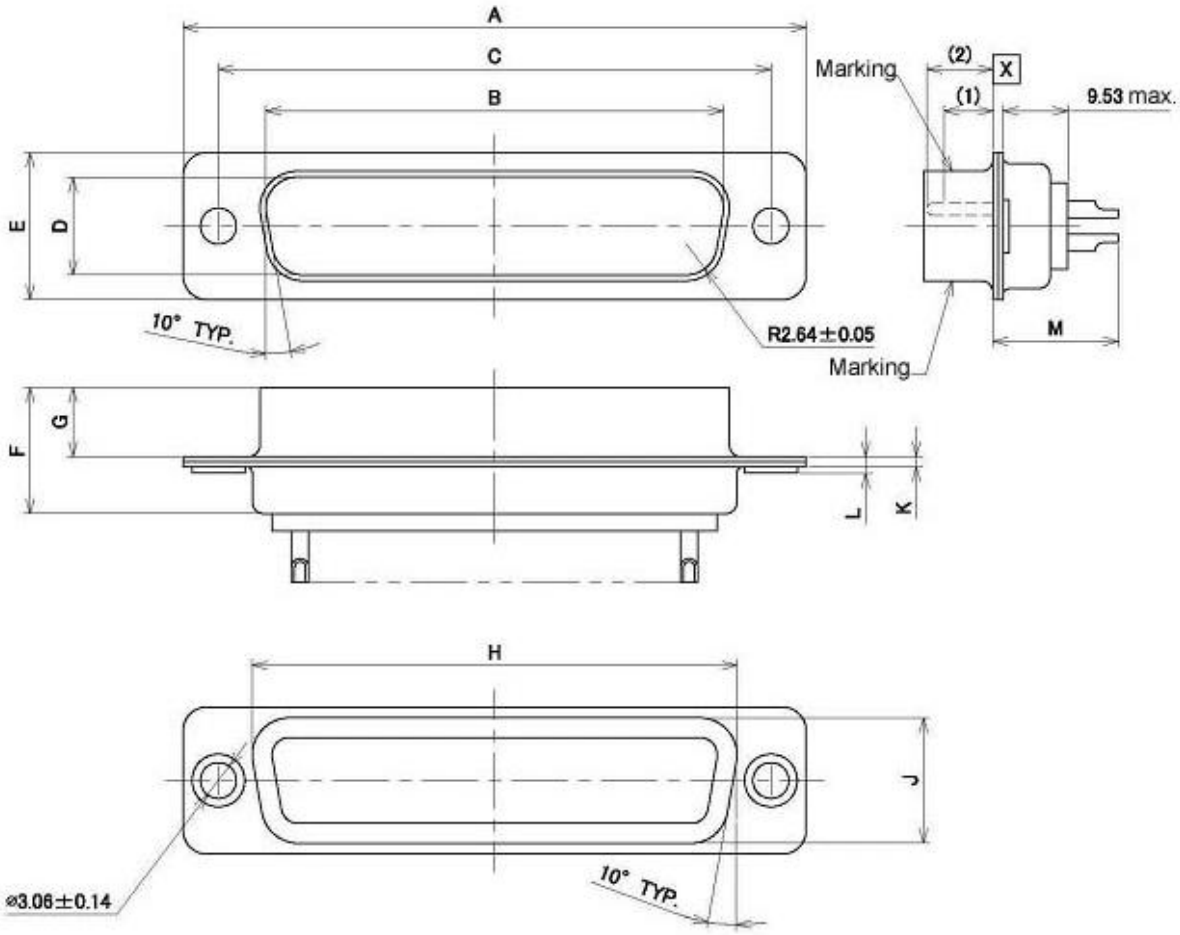
(3) Physical dimensions of a crimp socket contact shall be as shown in Supplementary Figure G-11.

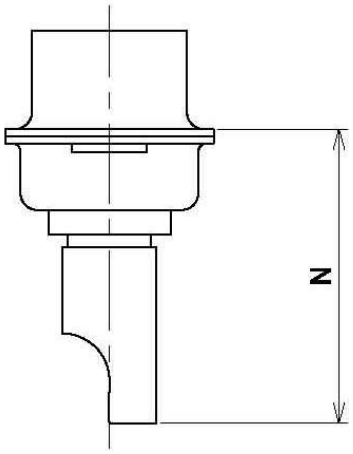
(4) Looseness of the socket contact shall be within ±0.5mm in the radial and lateral directions.

(5) The mass of contact is not included.

Supplementary Figure G-3. Physical Dimensions for Crimp Socket Contact Connectors (2/2)

Unit: mm





Mounting size 8 contact

Supplementary Figure G-4. Physical Dimensions for Solder Pin Contact Connectors (1/2)

Unit: mm

Part number	Shell size	Physical dimensions						
		A	B	C	D	E	F	G
		-	±0.13	±0.13	-	±0.38	Maximum	-
JD*06-*P-S	E	30.84±0.42	16.91	24.99	8.35 ±0.13	12.55	13.39	5.97 ±0.16
JD*06-*P-S	A	39.14±0.38	25.24	33.32				
JD*06-*P-S	B	53.03±0.38	38.96	47.04				5.91 ±0.22
JD*06-*P-S	C	69.32±0.38	55.42	63.5				
JD*06-*P-S	D	66.93±0.38	52.8	61.11	11.14 ±0.19	15.37		

Part number	Shell size	Physical dimensions						Mass (6)
		H	J	K	L	M	N	
		±0.26	±0.26	-	-	Maximum	Maximum	Maximum
JD*06-*P-S	E	19.27	10.71	0.76 ±0.26	1.2 ±0.32	10.71	17.7	4.5
JD*06-*P-S	A	27.5						5.5
JD*06-*P-S	B	41.27		0.87 ±0.37	1.41 ±0.37	10.91	17.9	9.0
JD*06-*P-S	C	57.7						12.5
JD*06-*P-S	D	55.32	13.56					13.5

Notes:

(1) Length between the X plane and the engagement tip minus the spherical radius shall be a minimum of 4.17mm for 9- or 15-contact connectors and a minimum of 3.94mm for 25-, 37-, or 50-contact connectors.

(2) Length between the X plane and the engagement tip shall be a maximum of 5.59mm.

(3) Contact arrangement shall be as shown in Supplementary Figure G-1.

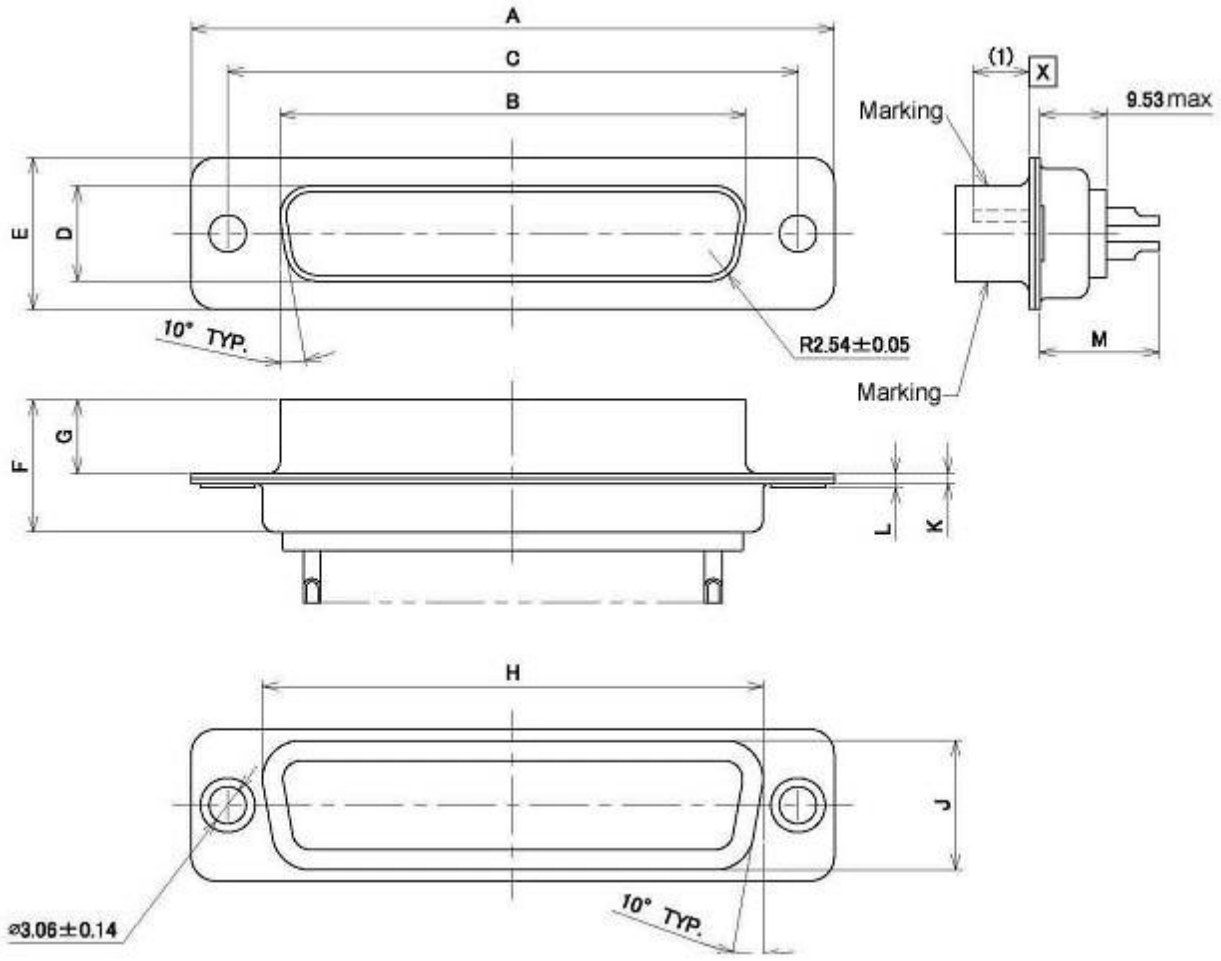
(4) Physical dimensions of a solder pin contact shall be as shown in Supplementary Figures G-12 and G-14.

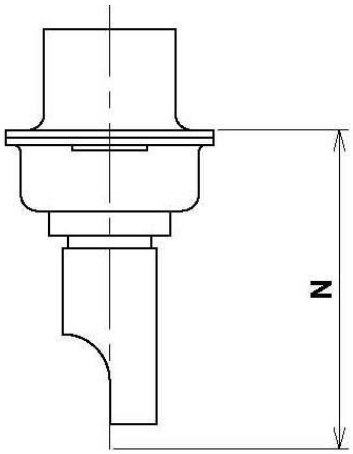
(5) Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.

(6) The mass of contact is not included.

Supplementary Figure G-4. Physical Dimensions for Solder Pin Contact Connectors (2/2)

Unit: mm





Mounting size 8 contact

Supplementary Figure G-5. Physical Dimensions for Solder Socket Contact Connectors (1/2)

Unit: mm

Part number	Shell size	Physical dimensions						
		A	B	C	D	E	F	G
		-	±0.13	±0.13	±0.13	±0.38	Maximum	±0.22
JD*06-*S-S	E	30.84±0.42	16.33	24.99	7.9	12.55	16.63	6.08
JD*06-*S-S	A	39.14±0.38	24.66	33.32				
JD*06-*S-S	B	53.03±0.38	38.38	47.04				
JD*06-*S-S	C	69.32±0.38	54.84	63.5				
JD*06-*S-S	D	66.93±0.38	52.42	61.11	10.74	15.37		

Part number	Shell size	Physical dimensions						Mass (5)
		H	J	K	L	M	N	
		±0.26	±0.26	±0.26	±0.32	Maximum	Maximum	Maximum
JD*06-*S-S	E	19.27	10.71	0.76	1.2	10.71	17.7	5.0
JD*06-*S-S	A	27.5						7.0
JD*06-*S-S	B	41.27						10.0
JD*06-*S-S	C	57.7						13.5
JD*06-*S-S	D	55.32	13.56					15.0

Notes:

(1) When a square ended test pin of Φ0.99 to 1.04mm makes contact with the tip of a socket engagement end, the insertion depth from the X plane shall be a minimum of 3.63mm.

(2) Contact arrangement shall be as shown in Supplementary Figure G-1.

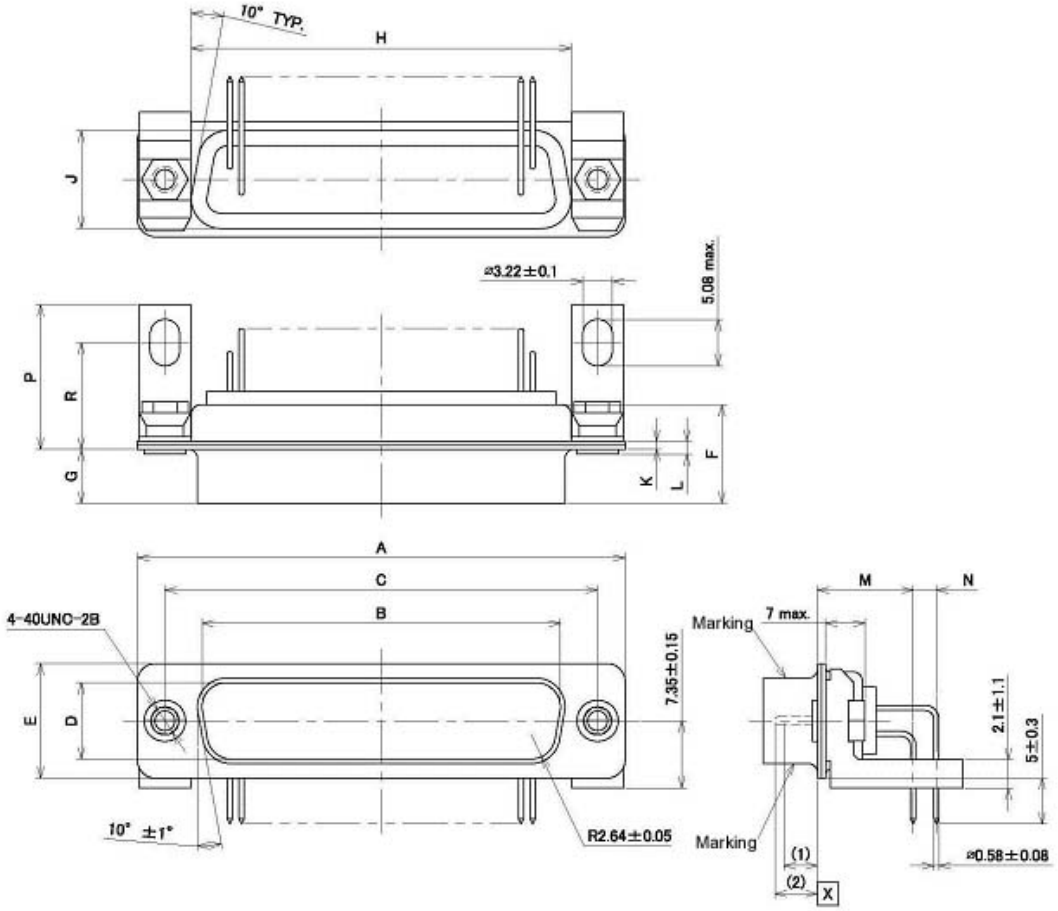
(3) Physical dimensions of a solder socket contact shall be as shown in Supplementary Figures G-13 and G-15.

(4) Looseness of the socket contact shall be within ±0.5mm in the radial and lateral directions.

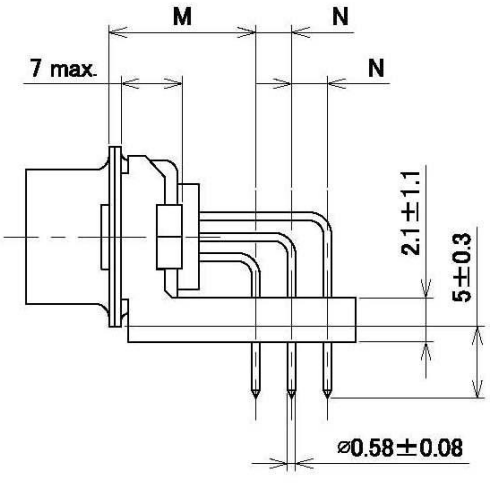
(5) The mass of contact is not included.

Supplementary Figure G-5. Physical Dimensions for Solder Socket Contact Connectors (2/2)

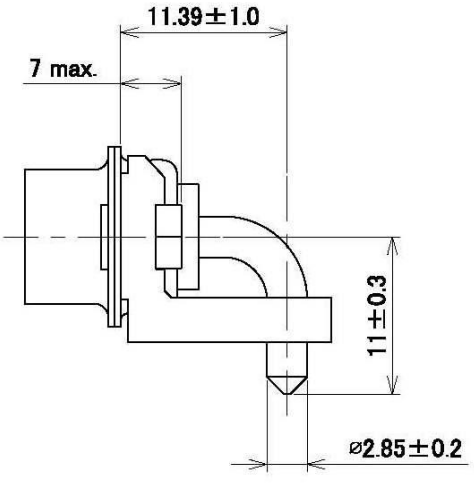
Unit: mm



Shell size “E” to “C”, terminal configuration



Shell size “D”, terminal configuration



Mounting size 8 contact

Supplementary Figure G-6. Physical Dimensions for Right Angle Pin Contact Connectors with Accessory (1/2)

Unit: mm

Part number	Shell size	Physical dimensions						
		A	B	C	D	E	F	G
		-	±0.13	±0.13	-	±0.38	Maximum	-
JD*06-*P-A	E	30.84±0.42	16.91	24.99	8.35 ±0.13	12.55	13.39	5.97 ±0.16
JD*06-*P-A	A	39.14±0.38	25.24	33.32				
JD*06-*P-A	B	53.03±0.38	38.96	47.04				5.91 ±0.22
JD*06-*P-A	C	69.32±0.38	55.42	63.5				
JD*06-*P-A	D	66.93±0.38	52.8	61.11	11.14 ±0.19	15.37		

Part number	Shell size	Physical dimensions								Mass (8)
		H	J	K	L	M	N	P	R	
		±0.26	±0.26	-	-	±0.25	±0.05	Maximum	±0.1	Maximum
JD*06-*P-A	E	19.27	10.71	0.76 ±0.26	1.2 ±0.32	9.44	2.54	15.6	11.47	11.5
JD*06-*P-A	A	27.5								12.5
JD*06-*P-A	B	41.27		0.87 ±0.37	1.41 ±0.37	9.53		15.8	11.67	16.0
JD*06-*P-A	C	57.7								19.5
JD*06-*P-A	D	55.32	13.56					17.7	12.94	20.5

Notes:

(1) Length between the X plane and the engagement tip minus the spherical radius shall be a minimum of 4.17mm for 9- or 15-contact connectors and a minimum of 3.94mm for 25-, 37-, or 50-contact connectors.

(2) Length between the X plane and the engagement tip shall be a maximum of 5.59mm.

(3) Contact arrangement shall be as shown in Supplementary Figure G-1.

(4) Physical dimensions of a right angle pin contact shall be as shown in Supplementary Figures G-16 and G-18.

(5) Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.

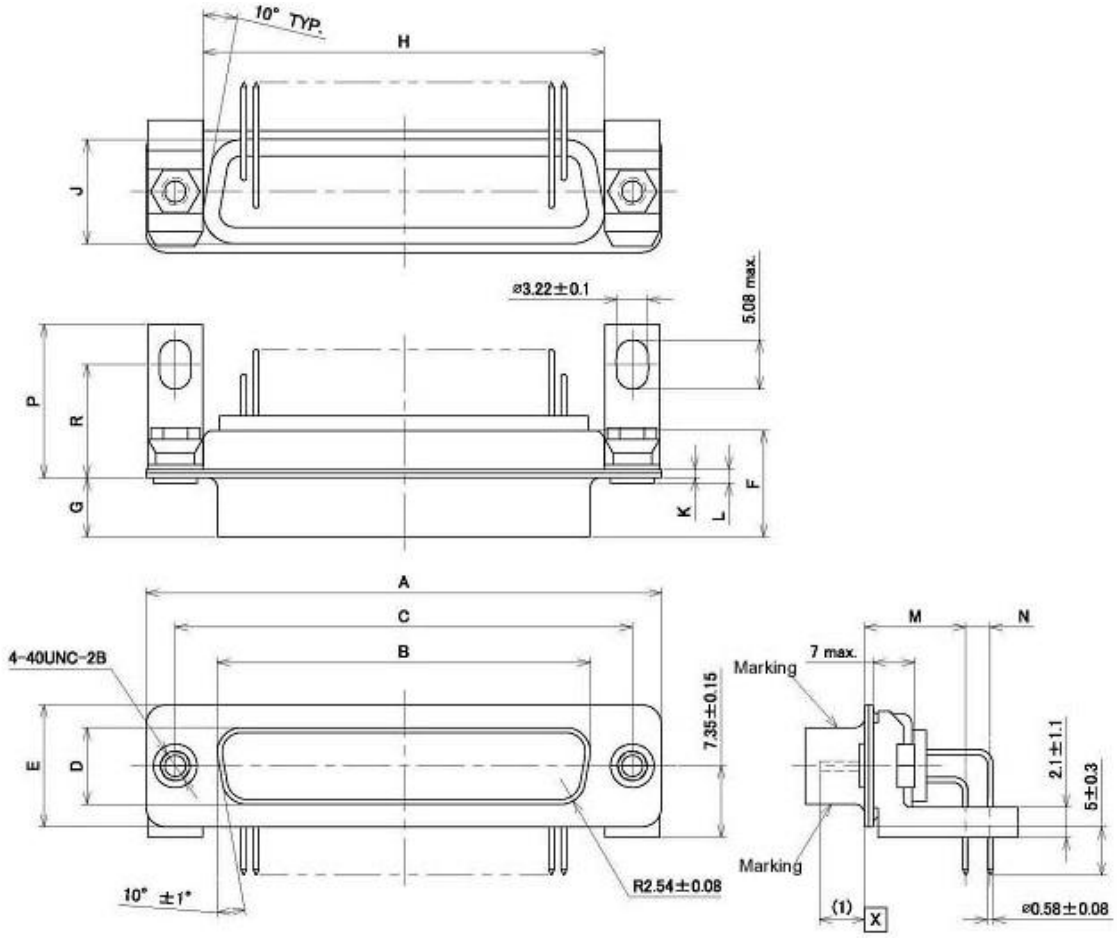
(6) Accessory configuration is not specified.

(7) Mounting hole dimensions on a printed wiring board shall be as specified in Supplementary Figure G-22.

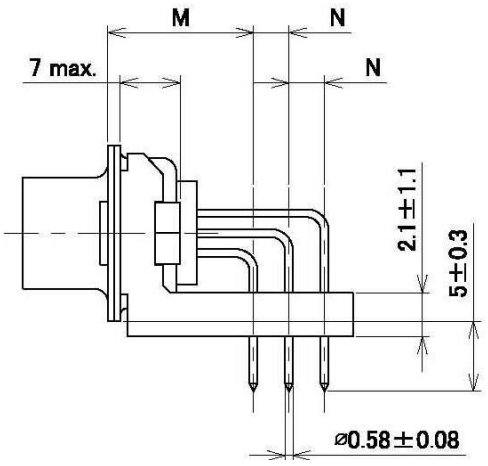
(8) The mass of contact is not included.

Supplementary Figure G-6. Physical Dimensions for Right Angle Pin Contact Connectors with Accessory (2/2)

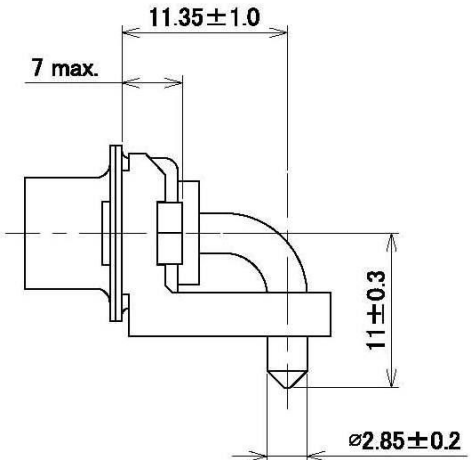
Unit: mm



Shell size “E” to “C”, terminal configuration



Shell size “D”, terminal configuration



Mounting size 8 contact

Supplementary Figure G-7. Physical Dimensions for Right Angle Socket Contact Connectors with Accessory (1/2)

Unit: mm

Part number	Shell size	Physical dimensions						
		A	B	C	D	E	F	G
		-	±0.13	±0.13	±0.13	±0.38	Maximum	±0.22
JD*06-*S-A	E	30.84±0.42	16.33	24.99	7.9	12.55	16.63	6.08
JD*06-*S-A	A	39.14±0.38	24.66	33.32				
JD*06-*S-A	B	53.03±0.38	38.38	47.04				
JD*06-*S-A	C	69.32±0.38	54.84	63.5				
JD*06-*S-A	D	66.93±0.38	52.42	61.11	10.74	15.37		

Part number	Shell size	Physical dimensions								Mass (7)
		H	J	K	L	M	N	P	R	
		±0.26	±0.26	±0.26	±0.32	±0.25	±0.05	Maximum	±0.1	Maximum
JD*06-*S-A	E	19.27	10.71	0.76	1.2	9.44	2.54	15.6	11.47	12.0
JD*06-*S-A	A	27.5								14.0
JD*06-*S-A	B	41.27								17.0
JD*06-*S-A	C	57.7								20.5
JD*06-*S-A	D	55.32	13.56					17.5	12.74	22.0

Notes:

(1) When a square ended test pin of Φ0.99 to 1.04mm makes contact with the tip of a socket insertion end, the engagement depth from the X plane shall be a minimum of 3.63mm.

(2) Contact arrangement shall be as shown in Supplementary Figure G-1.

(3) Physical dimensions of a right angle socket contact shall be as shown in Supplementary Figures G-17and G-18.

(4) Looseness of the socket contact shall be within ±0.5mm in the radial and lateral directions.

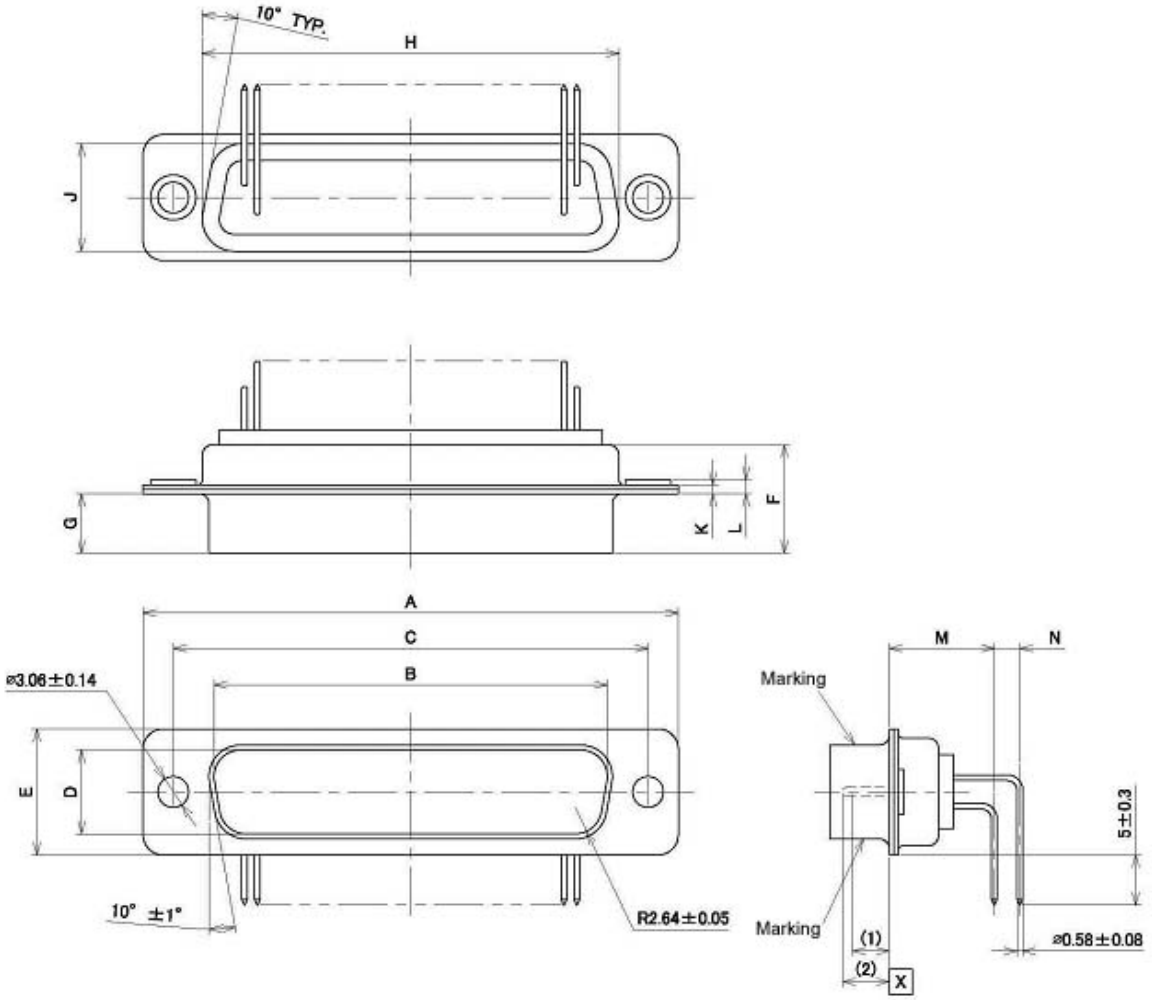
(5) Accessory configuration is not specified.

(6) Mounting hole dimensions on a printed wiring board shall be as specified in Supplementary Figure G-22.

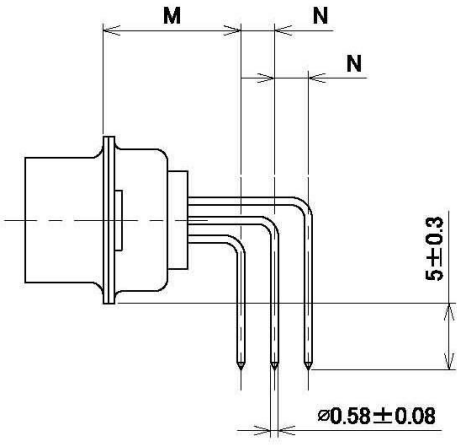
(7) The mass of contact is not included.

Supplementary Figure G-7. Physical Dimensions for Right Angle Socket Contact Connectors with Accessory (2/2)

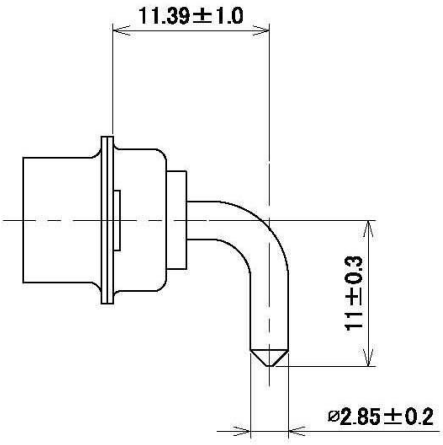
Unit: mm



Shell size “E” to “C”, terminal configuration



Shell size “D”, terminal configuration



Mounting size 8 contact

Supplementary Figure G-8. Physical Dimensions for Right Angle Socket Contact Connectors without Accessory (1/2)

Unit: mm

Part number	Shell size	Physical dimensions						
		A	B	C	D	E	F	G
		-	±0.13	±0.13	-	±0.38	Maximum	-
JD*06-*P-AB	E	30.84±0.42	16.91	24.99	8.35 ±0.13	12.55	13.39	5.97 ±0.16
JD*06-*P-AB	A	39.14±0.38	25.24	33.32				
JD*06-*P-AB	B	53.03±0.38	38.96	47.04				5.91 ±0.22
JD*06-*P-AB	C	69.32±0.38	55.42	63.5				
JD*06-*P-AB	D	66.93±0.38	52.8	61.11	11.14 ±0.19	15.37		

Part number	Shell size	Physical dimensions						Mass (8)
		H	J	K	L	M	N	
		±0.26	±0.26	-	-	±0.25	±0.05	Maximum
JD*06-*P-AB	E	19.27	10.71	0.76 ±0.26	1.2 ±0.32	9.44	2.54	4.5
JD*06-*P-AB	A	27.5						5.5
JD*06-*P-AB	B	41.27		0.87 ±0.37	1.41 ±0.37	9.53		9.0
JD*06-*P-AB	C	57.7						12.5
JD*06-*P-AB	D	55.32	13.56					13.5

Notes:

(1) Length between the X plane and the engagement tip minus the spherical radius shall be a minimum of 4.17mm for 9- or 15-contact connectors and a minimum of 3.94mm for 25-, 37-, or 50-contact connectors.

(2) Length between the X plane and the engagement tip shall be a maximum of 5.59mm.

(3) Contact arrangement shall be as shown in Supplementary Figure G-1.

(4) Physical dimensions of a right angle pin contact shall be as shown in Supplementary Figures G-16 and G-18.

(5) Looseness of the pin contact shall be within ±0.5mm in the radial and lateral directions.

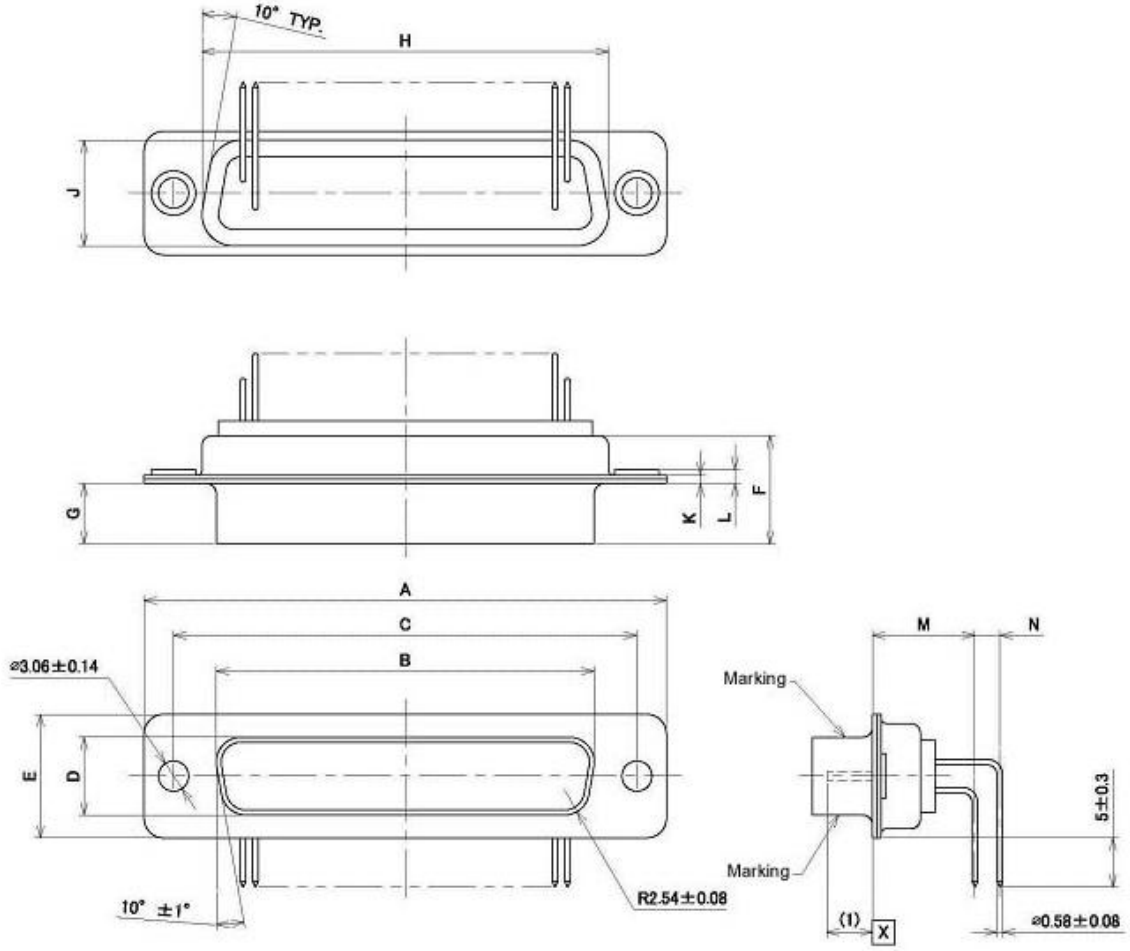
(6) Accessory configuration is not specified.

(7) Mounting hole dimensions on a printed wiring board shall be as specified in Supplementary Figure G-22.

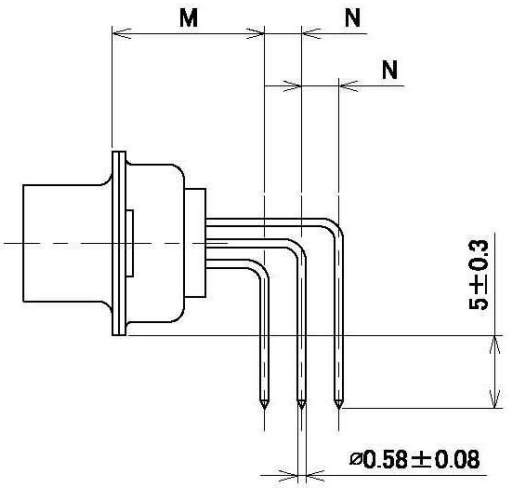
(8) The mass of contact is not included.

Supplementary Figure G-8. Physical Dimensions for Right Angle Socket Contact Connectors without Accessory (2/2)

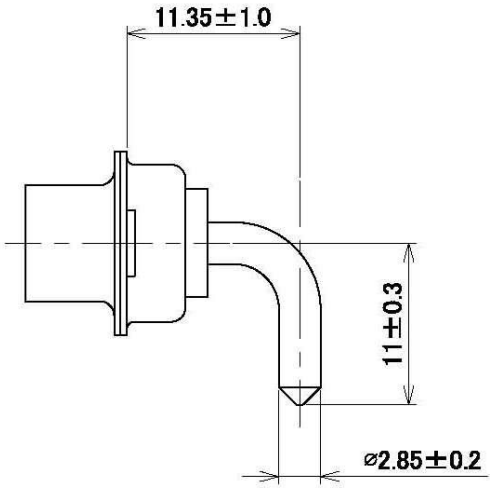
Unit: mm



Shell size “E” to “C”, terminal configuration



Shell size “D”, terminal configuration



Mounting size 8 contact

Supplementary Figure G-9. Physical Dimensions for Right Angle Socket Contact Connectors without Accessory (1/2)

Unit: mm

Part number	Shell size	Physical dimensions						
		A	B	C	D	E	F	G
		-	±0.13	±0.13	±0.13	±0.38	Maximum	±0.22
JD*06-*S-AB	E	30.84±0.42	16.33	24.99	7.9	12.55	16.63	6.08
JD*06-*S-AB	A	39.14±0.38	24.66	33.32				
JD*06-*S-AB	B	53.03±0.38	38.38	47.04				
JD*06-*S-AB	C	69.32±0.38	54.84	63.5				
JD*06-*S-AB	D	66.93±0.38	52.42	61.11	10.74	15.37		

Part number	Shell size	Physical dimensions						Mass (7)
		H	J	K	L	M	N	
		±0.26	±0.26	±0.26	±0.32	±0.25	±0.05	Maximum
JD*06-*S-AB	E	19.27	10.71	0.76	1.2	9.44	2.54	5.0
JD*06-*S-AB	A	27.5						7.0
JD*06-*S-AB	B	41.27						10.0
JD*06-*S-AB	C	57.7						13.5
JD*06-*S-AB	D	55.32	13.56					15.0

Notes:

(1) When a square ended test pin of Φ0.99 to 1.04mm makes contact with the tip of a socket insertion end, the mating depth from the X plane shall be a minimum of 3.63mm.

(2) Contact arrangement shall be as shown in Supplementary Figure G-1.

(3) Physical dimensions of a right angle socket contact shall be as shown in Supplementary Figures G-17and G-19.

(4) Looseness of the socket contact shall be within ±0.5mm in the radial and lateral directions.

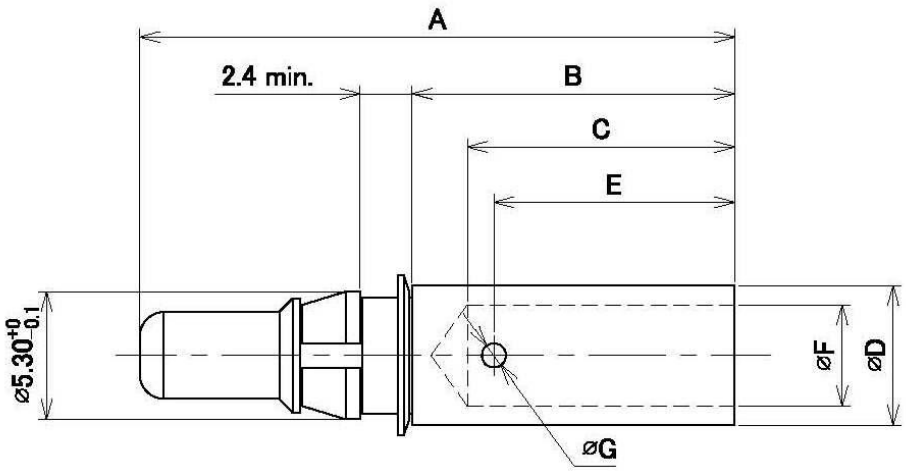
(5) Accessory configuration is not specified.

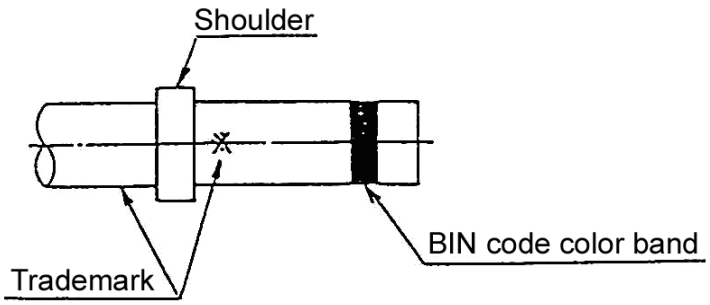
(6) Mounting hole dimensions on a printed wiring board shall be as specified in Supplementary Figure G-22.

(7) The mass of contact is not included.

Supplementary Figure G-9. Physical Dimensions for Right Angle Socket Contact Connectors without Accessory (2/2)

Unit: mm

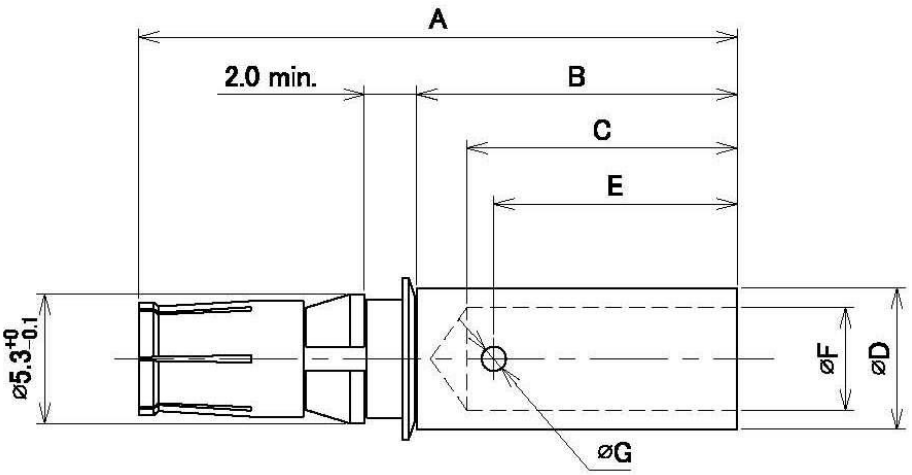


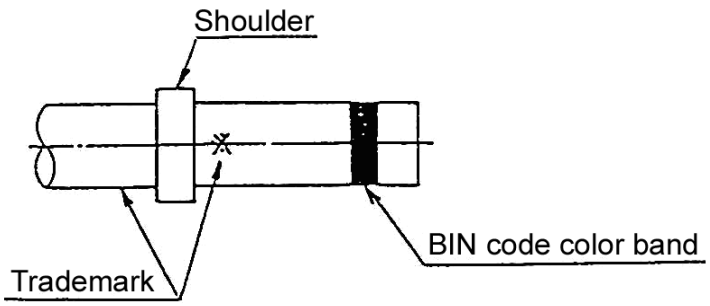


Part number	Contact size	A	B	C	ΦD	E	ΦF	ΦG	Mass
		Maximum	Maximum	Minimum	Maximum	Reference	Minimum	Reference	Maximum
JD*06-PC81	8-8	24.7	12.9	11.1	5.8	10	4.2	1.7	2.8
JD*06-PC82	8-10	21.6	10	8.4	4.7	7.5	3.25	1.3	2.25
JD*06-PC83	8-12	19.3	7.7	6.35	3.8	6	2.5	1	2.0

Supplementary Figure G-10. Physical Dimensions for Crimp Pin Contact

Unit: mm

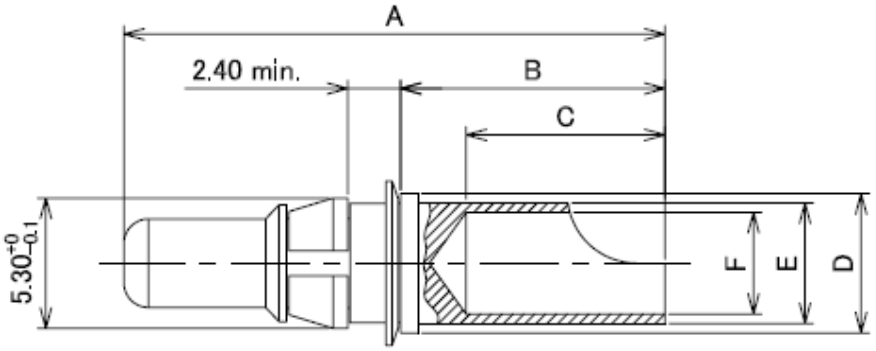




Part number	Contact size	A	B	C	ΦD	E	ΦF	ΦG	Mass
		Maximum	Maximum	Minimum	Maximum	Reference	Minimum	Reference	Maximum
JD*06-SC81	8-8	24.6	12.9	11.1	5.8	10	4.2	1.7	2.45
JD*06-SC82	8-10	21.5	10	8.4	4.7	7.5	3.25	1.3	2.0
JD*06-SC83	8-12	19.2	7.7	6.35	3.8	6	2.5	1	1.65

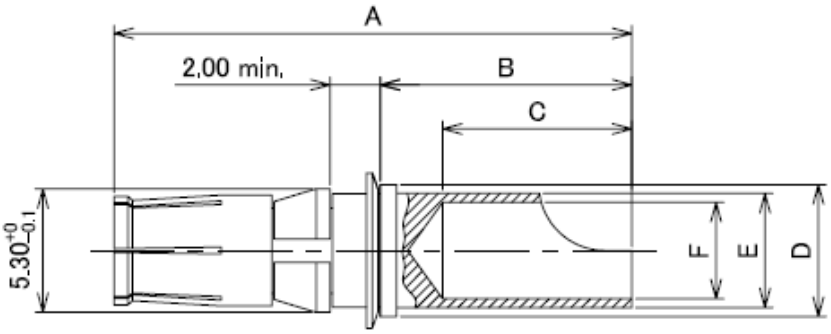
Supplementary Figure G-11. Physical Dimensions for Crimp Socket Contact

Unit: mm



Part number	Contact size	A	B	C	D	E	F	Mass
		Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
JD*06-PS84	8-8	22.1	10.8	8.13	5.66	4.9	4.9	2.2
JD*06-PS85	8-12	22.1	10.8	8.13	5.66	3.76	3	2.15
JD*06-PS86	8-16	22.1	10.8	8.13	5.66	2.67	1.9	2.05

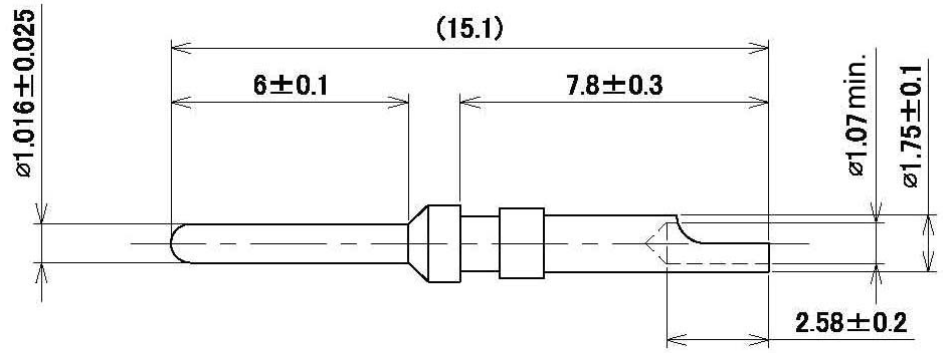
Supplementary Figure G-12. Physical Dimensions for Solder Pin Contact (Size 8)



Part number	Contact size	A	B	C	D	E	F	Mass
		Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
JD*06-SS84	8-8	21.8	10.8	8.13	5.66	4.9	4.9	1.9
JD*06-SS85	8-12	21.8	10.8	8.13	5.66	3.76	3	1.9
JD*06-SS86	8-16	21.8	10.8	8.13	5.66	2.67	1.9	1.75

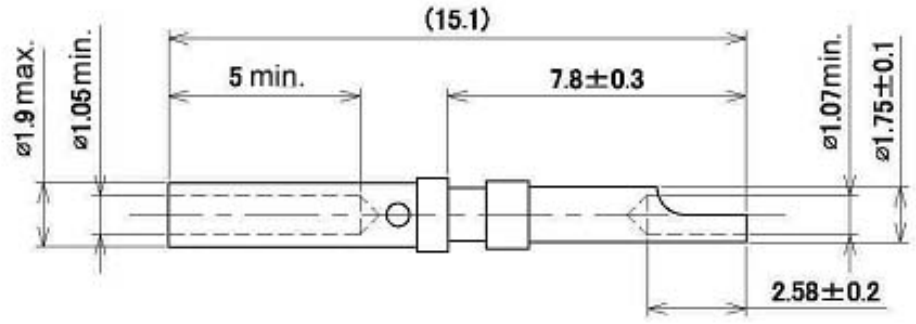
Supplementary Figure G-13. Physical Dimensions for Solder Socket Contact (Size 8)

Unit: mm



Mass (Reference)
0.19g

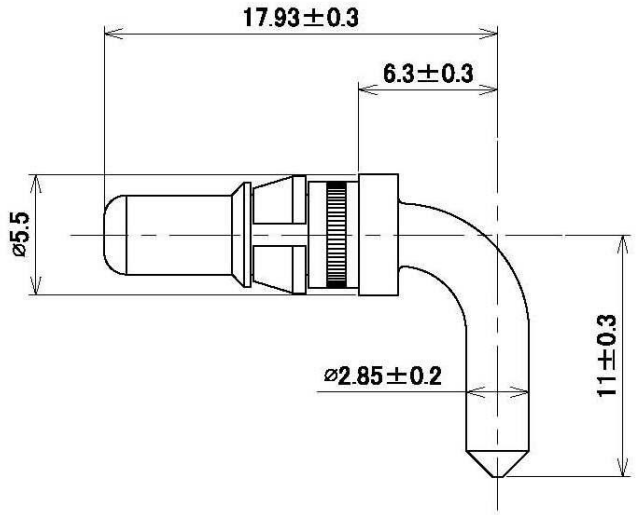
Supplementary Figure G-14. Physical Dimensions for Solder Pin Contact (Size 20)



Mass (Reference)
0.22g

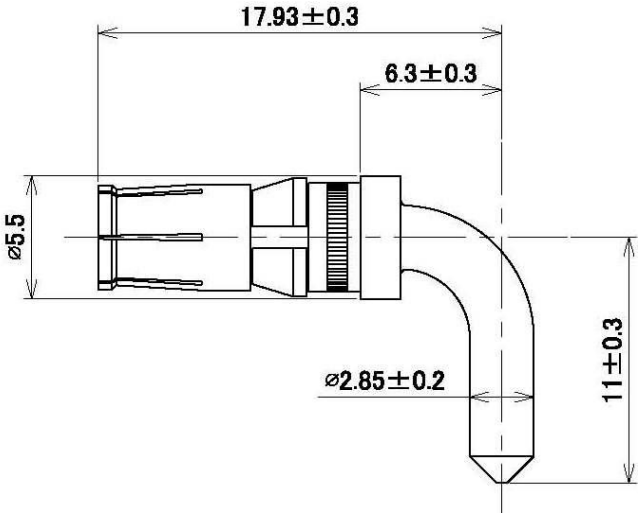
Supplementary Figure G-15. Physical Dimensions for Solder Socket Contact (Size 20)

Unit: mm



Part number	Mass (Reference)
JD*06-PA8A	24.0g

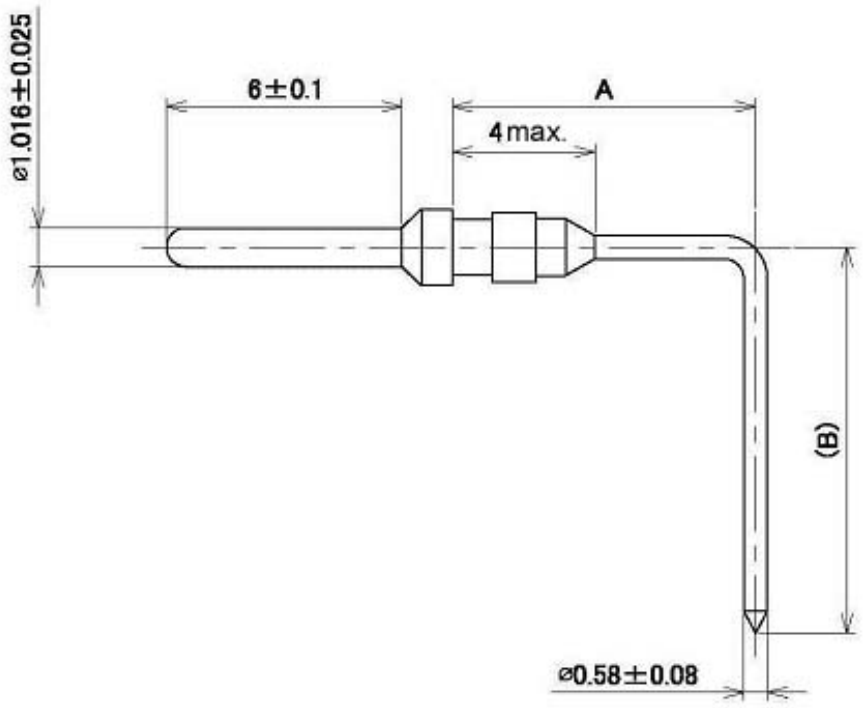
Supplementary Figure G-16. Physical Dimensions for Right Angle Pin Contact (Size 8)



Part number	Mass (Reference)
JD*06-SA8A	24.0g

Supplementary Figure G-17. Physical Dimensions for Right Angle Socket Contact (Size 8)

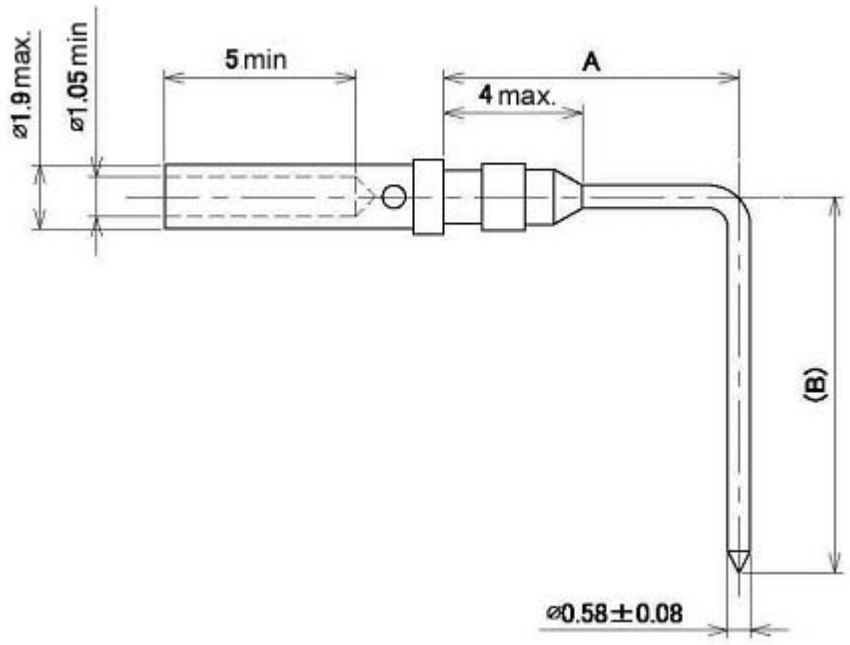
Unit: mm



Line	Physical dimensions		Mass (g) (Reference)
	A±0.8	B (Reference)	
First line	7.73	9.86	0.24
Second line	10.27	12.7	0.28
Third line	12.81	15.54	0.32

Supplementary Figure G-18. Physical Dimensions for Right Angle Pin Contact (Size 20)

Unit: mm



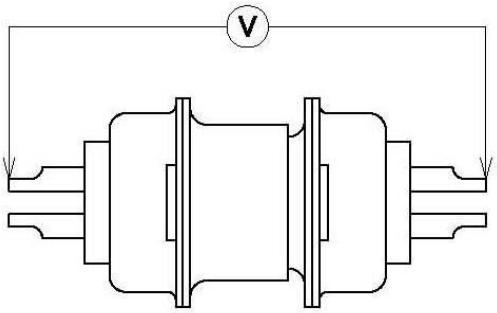
Part number	Physical dimensions		Mass (g) (Reference)
	A±0.8	B (Reference)	
First line	7.73	9.86	0.23
Second line	10.27	12.7	0.34
Third line	12.81	15.54	0.67

Supplementary Figure G-19. Physical Dimensions for Right Angle Socket Contact (Size 20)

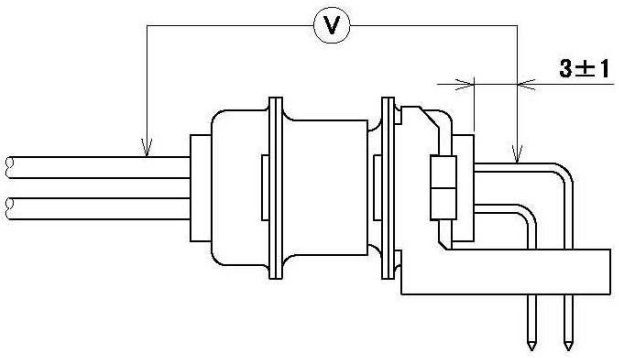
Unit: mm

The distance “A” between flanges of the mated plug and receptacle shall be as follows.
Shell size E and A: 6.73±0.38mm
Shell size B, C, and D: 6.50±0.38mm

Supplementary Figure G-20. Distance between Flanges



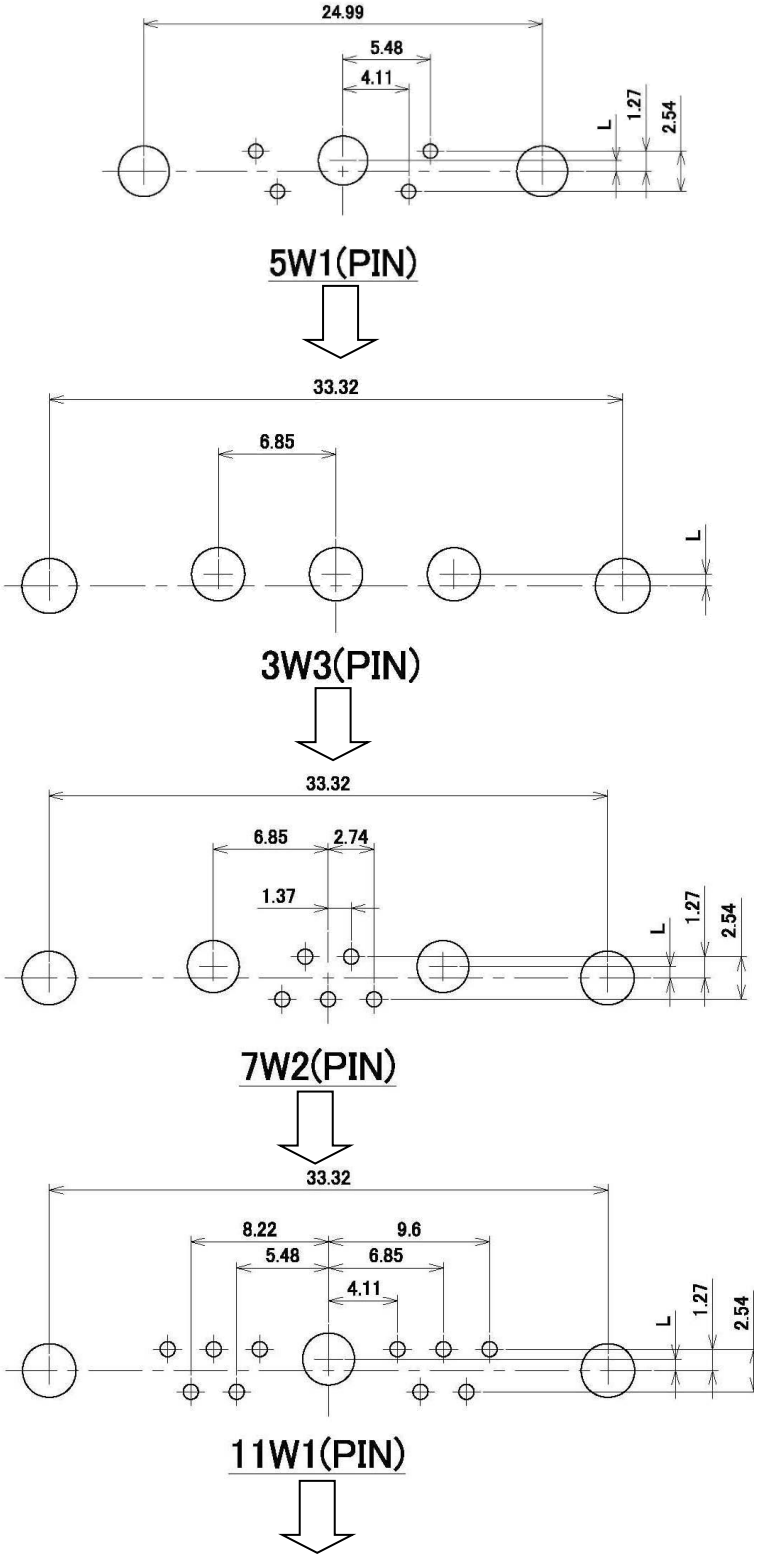
Solder contact connector



Right angle through hole contact connector

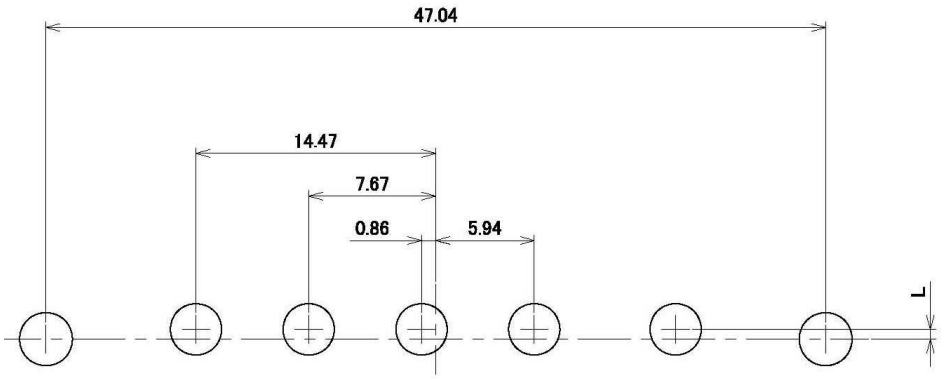
Supplementary Figure G-21. Contact Resistance Measurement Points

Unit: mm

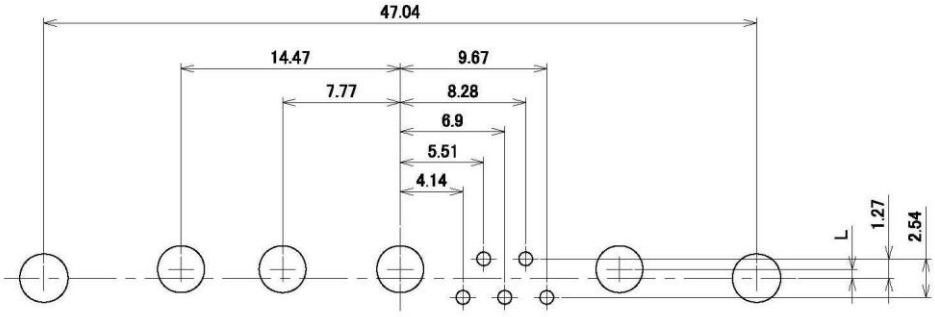


Supplementary Figure G-22. Dimensions of Mounting Holes on Printed Wiring Board (1/5)

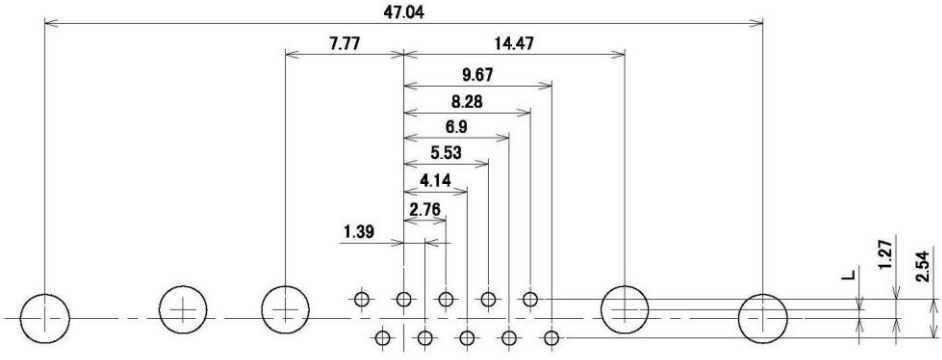
Unit: mm



5W5(PIN)



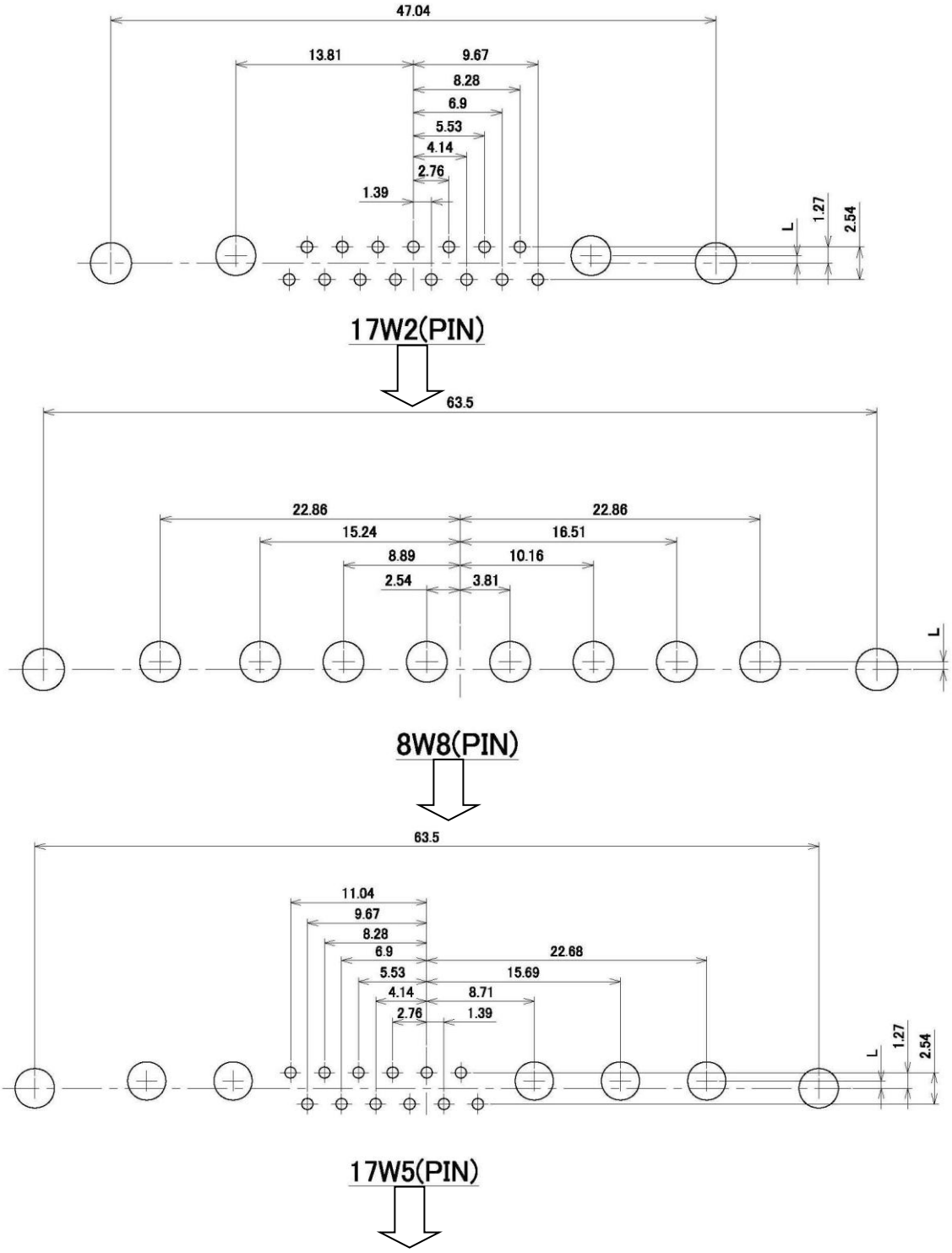
9W4(PIN)



13W3(PIN)

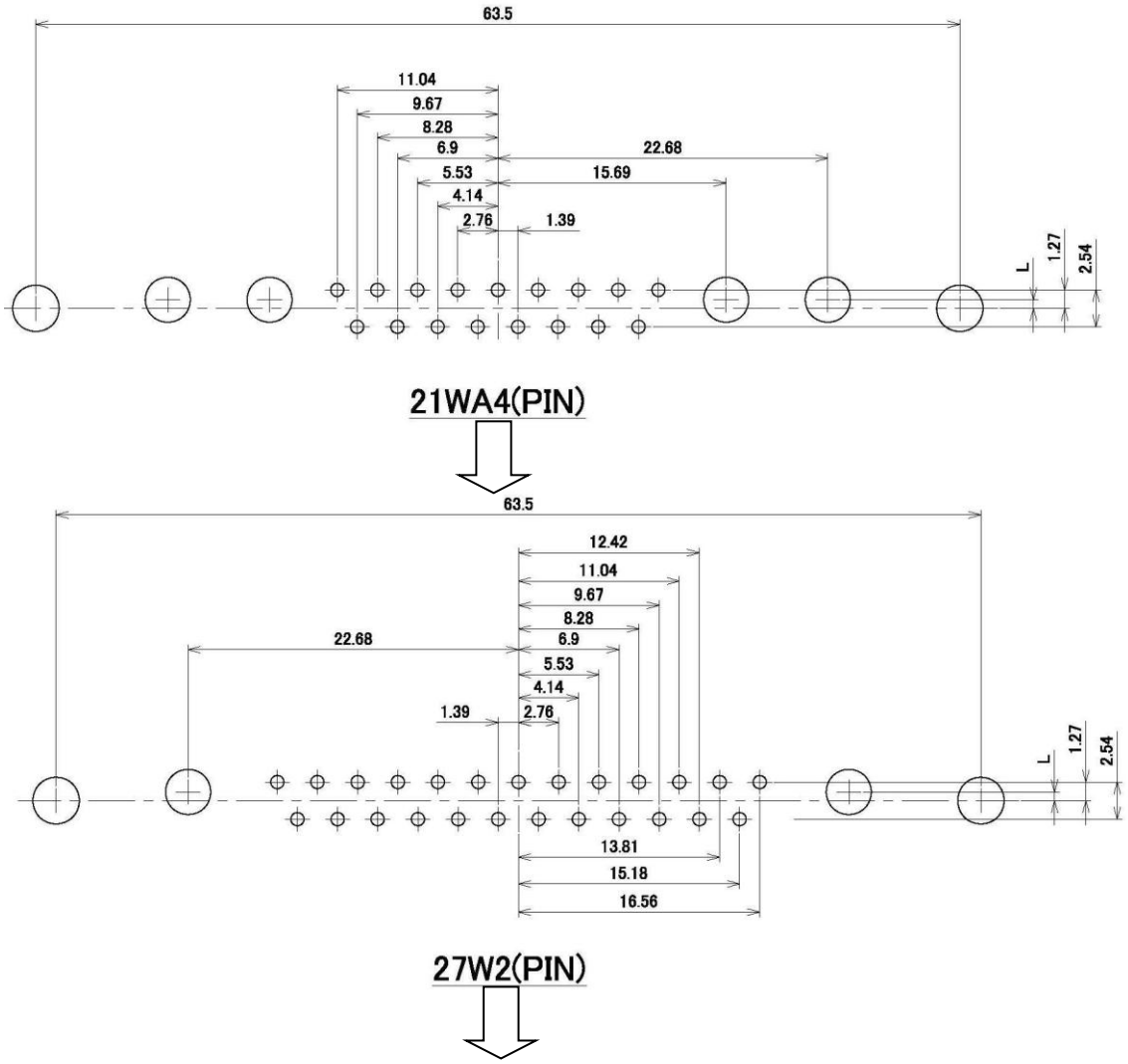
Supplementary Figure G-22. Dimensions of Mounting Holes on Printed Wiring Board (2/5)

Unit: mm



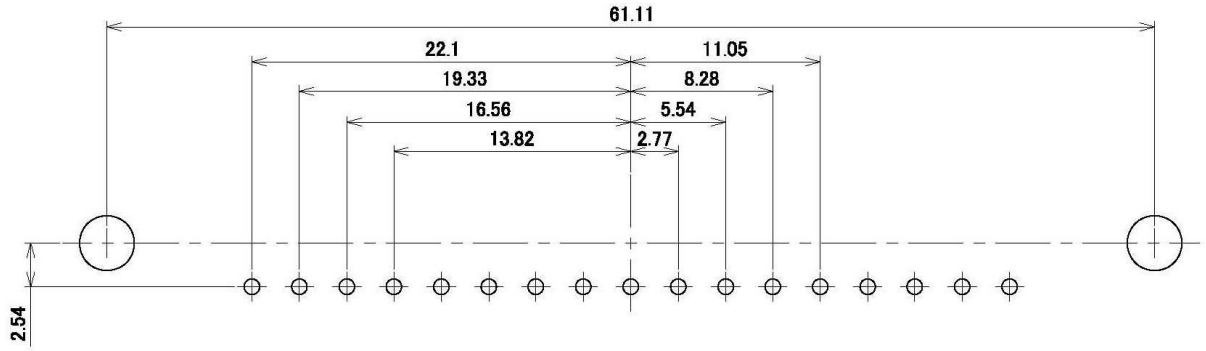
Supplementary Figure G-22. Dimensions of Mounting Holes on Printed Wiring Board (3/5)

Unit: mm

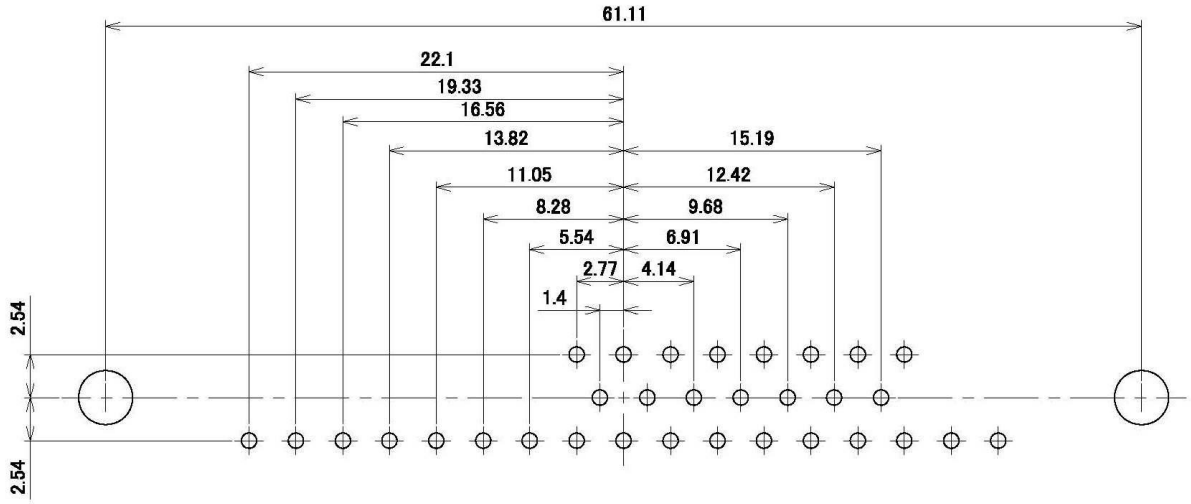


Supplementary Figure G-22. Dimensions of Mounting Holes on Printed Wiring Board (4/5)

Unit: mm



24W7(PIN)



36W4(PIN)

Notes:

(1). Hole diameters are not specified.

(2). Arrow shows the mating direction.

(3). Pin connector arrangement is viewed from the mounting surface,

(4). Left and right positions of holes are reversed for socket contacts.

(5). The dimension of L shall be as specified below.

Pin contact connectors: contact arrangement 5W1, 3W3, 7W2 and 11W1----0.68

Pin contact connectors: other contact arrangement than above----0.59

Socket contact connectors: all contact arrangements----0.64

(6). The right angle pin and size 8 socket contacts shall not be used for contact arrangements 24W7 and 36W4.

Supplementary Figure G-22. Dimensions of Mounting Holes on Printed Wiring Board (5/5)

APPENDIX H

CONNECTORS, COAXIAL, RADIO FREQUENCY

This document is the English version of JAXA QTS/ADS which was originally written and authorized in Japanese and carefully translated into English for international users. If any question arises as to the context or detailed description, it is strongly recommended to verify against the latest official Japanese version.

The release date of the English version of this specification: 25 March 2026

APPENDIX H

CONNECTORS, COAXIAL, RADIO FREQUENCY

H.1 General

H.1.1 Scope

This appendix establishes the requirements and quality assurance provisions, among other things, for the radio frequency coaxial connectors (hereinafter referred to as "connectors").

H.1.2 Part Number

The part number identifies the series, shape, identification number, contact type, termination style, and others as given in the following form. The detail information shall be as specified in the detail specification.

[Example]

JAXA ([1]) 2060 / HA 14 – 33A3 – 01

- 33A3 – 01: Identification number (H.1.2.3)
- 14: Style (H.1.2.2)
- HA: Series (H.1.2.1)

Note: ([1]) "JAXA" indicates the part is for space use and may be abbreviated “J”.

H.1.2.1 Series

The series is identified by two capital letters and as shown in Table H-1.

Table H-1. Series

Series		Size	Terminal style	Rated voltage	Actual frequency range (MHz)
Symbol	Name				
HA	SMA	Microminiature	Screw	As specified in the detail specification	0 to 12,400 ([1])

Note: (1) Values for connector with flexible cable

H.1.2.2 Style

The style is identified by 2-digit number. The first number indicates connector type and the second number indicates connector style and mounting style. The specifics are shown in Table H-2.

Table H-2. Style

1st number	Connector type	2nd number	Connector configuration/Attachment
1	Cable plug	1	Straight/4-point attachment
2	Cable jack	2	Straight/2-point attachment
3	Receptacle plug	3	Straight/Jam nut
4	Receptacle jack	4	Straight
5	Receptacle hermetic	5	Angle/4-point attachment
6	Adapter plug to plug	6	Angle/2-point attachment
7	Adapter plug to jack	7	Angle/Jam nut
8	Adapter jack to jack	8	Angle
9	Other	9	Other

H.1.2.3 Identification Number

The identification number is identified by numbers and a letter as shown in the example below. The specifics for materials, finish, cable connection method and applicable cable are shown in Tables H-3, H-4, H-5, and H-6, respectively. The last 2-digit number indicates the performance.

[Example]

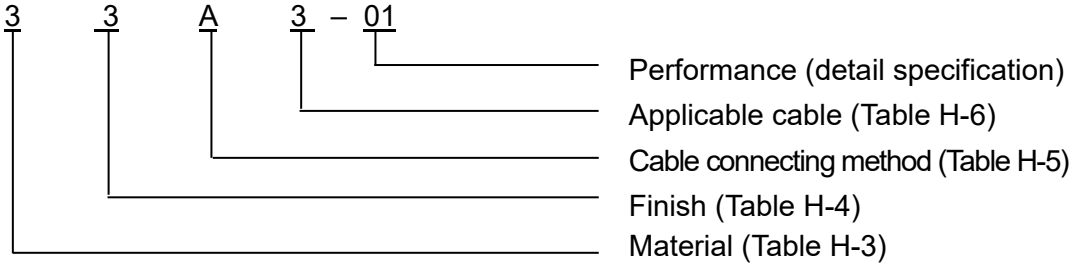


Table H-3. Material

Number	Material
1	Brass
2	Aluminum
3	Stainless steel
4	Beryllium steel
5	Other

Table H-4. Finish

Number	Finish
1	Gold plate
2	Nickel plate
3	Passivation
4	Other

Table H-5. Cable Connecting Method

Symbol	Center contact	Outer conductor	Captivation
A	Solder	Solder	No
B	Solder	Solder	Yes
C	Solder	Crimp	No
D	Solder	Crimp	Yes
E	Solder	Crimp	Yes
F	Solder	Crimp, Clamp	Yes
G	Crimp	Crimp	Yes
H	–	Clamp ([1])	–
J	–	Solder ([2])	–
K	Other method or no cable connection		

Notes: ([1]) Applicable for semi-rigid cable.

([2]) Applicable for the connectors on which the center conductor of the cable is the center contact of the connector.

Table H-6. Applicable Cable

Number	Name of cable	Number	Name of cable
1	RG-142/U	5	RG-402/U
2	RG-188/U	6	RG-405/U
3	RG-316/U	9 to 99	As specified in the detail specification
4	RG-400/U	0	Not applicable

H.2 Applicable Documents

H.2.1 Applicable Documents

The applicable documents shall be as follows in this appendix.

a) MIL-STD-202 Test Method Standard, Electronic and Electrical Component Parts
b) MIL-HDBK-454 General Guidelines For Electronic Equipment
c) Deleted
d) MIL-DTL-14072 FINISHES FOR GROUND BASED ELECTRONIC EQUIPMENT
e) MIL-I-17214 INDICATOR, PERMEABILITY; LOW-MU (GO-NO GO)
f) MIL-DTL-45204 GOLD PLATING, ELECTRODEPOSITED
g) MIL-C-14550 Copper Plating (Electrodeposited)
h) L-P-403 PLASTIC MOLDING MATERIAL, POLYTETRAFLUOROETHYLENE (TFE-FLUOCARBON)
i) ZZ-R-765 RUBBER, SILICON (GENERAL SPECIFICATION)
j) JIS B 0601 Geometrical Product Specifications (GPS) -- Surface texture: Profile method -- Terms, definitions and surface texture parameters
k) JIS G 4303 Stainless steel bars

l) JIS G 4307	Cold-rolled stainless steel plate, sheet and strip
m) JIS H 3100	Copper and copper alloy sheets, plates and strips
n) JIS H 3130	Copper beryllium alloy, copper titanium alloy, phosphor bronze, copper-nickel-tin alloy and nickel silver sheets, plates and strips for springs
o) JIS H 3250	Copper and copper alloy rods and bars
p) JIS H 3270	Copper beryllium alloy, phosphor bronze and nickel silver rods, bars and wires
q) JIS H 4000	Aluminum and aluminum alloy sheets and plates, strips and coiled sheets
r) JIS H 4040	Aluminum and aluminum alloy rod, bars and wires
s) JIS K 6888	Polytetrafluoroethylene sheets
t) JIS K 6889	Polytetrafluoroethylene rods
u) JIS Z 3261	Silver brazing filler metals
v) JIS Z 3282	Soft solders - Chemical compositions and forms
w) JIS Z 3283	Resin flux cored solders
x) JIS Z 9015-1	Sampling procedures for inspection by attributes-Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection
y) ASTM E595	Standard Test Method for Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment
z) EIA-364-08	Crimp Tensile Strength Test Procedure for Electrical Connectors.
aa) EIA-364-31	Humidity Test Procedure for Electrical Connectors and Sockets.
ab)EIA-364-106	Standing Wave Ratio (SWR)

H.2.2 Reference Documents

The following documents are the reference documents in this appendix.

a) MIL-PRF-39012F	CONNECTORS, COAXIAL, RADIO FREQUENCY, GENERAL SPECIFICATION FOR
b) ESCC3401 Issue 5	CONNECTORS, ELECTRICAL, NON-FILTERED, CIRCULAR AND RECTANGULAR

H.3 RequirementsCertification

H.3.1.1 Qualification Coverage

The qualification coverage shall be limited to connectors that are produced by the manufacturing line that conforms to materials, designs, constructions, ratings, and performance specified in paragraphs H.3.2 to H.3.8. The qualification coverage shall be fully represented by samples that have passed the qualification test. Within this coverage, the manufacturer is allowed to supply qualified products in accordance with the detail specification.

If necessary, additional definitions of qualification coverage shall be specified in the detail specification.

H.3.2 Materials

The materials used for connectors shall be as specified in paragraph 3.3 and as specified in Table H-7.

Table H-7. Materials

Part material	Applicable specification
Brass	JIS H 3100, JIS H 3250
Beryllium- copper	JIS H 3130, JIS H 3270
Phosphorus bronze	JIS H 3130, JIS H 3270
Soft copper	JIS H 3100, JIS H 3250
Copper	JIS H 3100, JIS H 3250
Aluminum alloy	JIS H 4000, JIS H 4040
Corrosive resistant steel	JIS G 4303, JIS G 4307
Tetrafluoroethylene resin,	JIS K 6888, JIS K 6889
Tetrafluoroethylene-hexafluoropropylene copolymer resin	L-P-403 or equivalent
Silicon rubber	ZZ-R-765 or equivalent
Silver brazing filler metals	JIS Z 3261
Solders	JIS Z 3282, JIS Z 3283

H.3.2.1 Dissimilar Metals

Where dissimilar metals having a potential difference are used in direct contact, protection against galvanic corrosion shall be provided. For guidance on dissimilar metals, see guideline 16 of MIL-HDBK-454.

H.3.2.2 Nonmagnetic Materials

All materials and surface treatments used for connectors shall be nonmagnetic. Residual magnetization of all parts shall be measured in accordance with paragraph H.4.3.2.4, and the results shall be included in the application datasheet.

H.3.2.3 Spring Members

Unless otherwise specified in the detail specification, center contact spring members shall be made of copper beryllium.

H.3.2.4 Bacteria Resistance

Materials of connectors shall be bacteria resistant.

H.3.2.5 Surface Finish

H.3.2.5.1 Center Contacts

Unless otherwise specified in the detail specification, the center contact shall be plated to a minimum gold thickness of 1.27μm in accordance with MIL-DTL-45204, type II, class 2, over a copper or an electroless nickel plating over a copper whose thickness is 2.5μm as a minimum in accordance with MIL-C-14550, class 4.
A silver underplate shall not be permitted.

H.3.2.5.2 Connector Surface

The metal parts used for the connector surface shall be corrosion-resistant.

H.3.2.6 Outgassing

When tested as specified in paragraph H.4.3.2.5, total mass loss (TML) and collected volatile condensable material (CVCM) shall meet the requirements specified in paragraph 3.3.2.

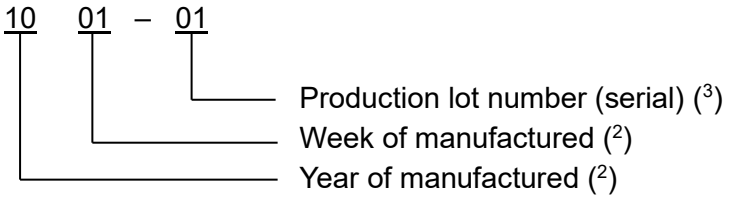
H.3.3 Externals, Dimensions and Marking

Externals, constructions, dimensions and mass of the connector shall be appropriate for normal handling during installation, usage, and maintenance. For details, see detail specification.

H.3.3.1 Marking

The following items shall be marked in the locations shown in the detail specification. The marking shall remain clearly legible after completion of all tests specified in this appendix, and even after one-minute immersion in ethanol.

a) Manufacturer's name and its abbreviation
b) Part number (paragraph **エラー! 参照元が見つかりません。**) (1)
c) Identification code (paragraph H.3.3.2)



Notes:

(1) For the small connectors with limited marking space, the identification number which indicates material, finish, cable connecting method and applicable cable, of the entire part number may only be marked.
(2) For the purpose of this appendix, "Year and week of manufacture" denotes the year and week when the final assembly is completed.
(3) Manufacturing lot number identifies the lots, which include products of the same part number, manufactured within a week. When only one lot is manufactured in the week, the manufacturing lot number shall be "01."

H.3.3.2 Traceability

The identification code shall be provided to identify the material lot and to trace the complete manufacturing process up to the final assembly even after the connectors are placed in the storage or installed in an electronic equipment. Manufacturers shall keep the records of the identification codes for at least 8 years.

H.3.3.3 Workmanship

Connectors shall be manufactured and processed based on a good design in a manner as to be uniform in quality in accordance with manufacturing specifications established in the quality assurance program (see paragraph 3.2.1). In addition, connectors shall be free from crazing, holes, chips or sharp cutting edges, burrs or

other defects that will degrade life, serviceability, as well as the electrical, mechanical, or physical performance of the connectors.

H.3.4 Plating

H.3.4.1 Plating Porosity

When tested as specified in paragraph H.4.3.2.2, there shall be no bubbling on the gold-finished center contacts.

H.3.4.2 Plating Thickness

When tested as specified in paragraph H.4.3.2.3, the thickness of gold plating over the center contacts shall be not less than 1.27μm, except for corners.

H.3.5 Rating

H.3.5.1 Rated Voltage

The rated voltages shall be as specified in the detail specification.

H.3.5.2 Nominal Impedance

The nominal impedance shall be as specified in the detail specification.

H.3.5.3 Operating Frequency Range

The operating frequency range shall be as specified in the detail specification.

H.3.5.4 Operating Temperatuare Range

The operating temperature range shall be as specified in the detail specification.

H.3.6 Electrical Performance

Connectors shall meet the following requirements.

H.3.6.1 Dielectric Withstanding Voltage

When tested as specified in paragraph H.4.3.4.1, connectors shall exhibit no evidence of short circuit.

H.3.6.2 Voltage Standing Wave Ratio (VSWR)

When tested as specified in paragraph H.4.3.4.2, voltage standing wave ratio (VSWR) of the connectors shall not exceed the values specified in Table H-8 or the detail specification.

Each half of a connector pair shall separately meet the requirement. This shall be only applied to cable plug or cable jack type connectors.

Table H-8. VSWR

Applicable cable	Straight type, Straight/4-point, Straight/Jam nut		Angle type	
	VSWR (maximum)	Frequency	VSWR (maximum)	Frequency
RG-188/U RG-316/U	1.15+0.02f (GHz)	3GHz maximum	1.15+0.03f (GHz)	3GHz maximum
RG-142/U RG-400/U	1.15+0.01f (GHz)	12.4GHz maximum	1.15+0.02f (GHz)	12.4GHz maximum
RG-402/U	1.05+0.01f (GHz)	18.0GHz maximum or 80% of upper cutoff frequency, whichever is lower	1.10+0.01f (GHz)	
RG-405/U	1.07+0.01f (GHz)			

H.3.6.3 Insulation Resistance

When tested as specified in paragraph H.4.3.4.3, insulation resistance shall be 5000MΩ or higher.

H.3.6.4 Contact Resistance

When tested as specified in paragraph H.4.3.4.4, contact resistance of the center contacts and outer contacts as well as cable braids/outer conductor to the connector shall not exceed the before test values specified in Table H-9. For the central contact, contact resistance shall be measured after completion of vibration (paragraph H.3.8.1), shock (paragraph H.3.8.2) and thermal shock (paragraph H.3.8.3), and shall not exceed the after test values specified in Table H-9.

Table H-9. Contact Resistance (Voltage Drop)

Unit: mΩ

Measured part	Cable plug angle type		Other types	
	Before test	After test	Before test	After test
Center contact	4.0 maximum	6.0 maximum	3.0 maximum	4.0 maximum
Outer contact	2.0 maximum	-	2.0 maximum	-
Connector surface to cable braid/outer conductor	0.5 maximum	-	0.5 maximum	-

H.3.6.5 Partial Discharge

When tested as specified in paragraph H.4.3.4.5, there shall be no evidence of sustained partial discharge.

H.3.6.6 RF High Potential Withstanding Voltage

When tested as specified in paragraph H.4.3.4.6, there shall be no evidence of short circuit.

H.3.6.7 RF Leakage

When tested as specified in paragraph H.4.3.4.7, RF leakage, cable to cable shall not exceed as specified in Table H-10.

Table H-10. RF Leakage

Unit: dB

Applicable cable	RF leakage
RG-188/U, RG-316/U, RG-142/U, RG-400/U	-60
RG-402/U, RG-405/U	-90

H.3.6.8 RF Insertion Loss

When tested as specified in paragraph H.4.3.4.8, RF insertion loss shall not exceed as specified in Table H-11. This requirement shall be applied to cable plug or cable jack type connector.

Table H-11. RF Insertion Loss

Unit: dB

Applicable cable	RF insertion loss
RG-188/U, RG-316/U, RG-142/U, RG-400/U	0.06 x $\sqrt{Frequency\,(GHz)}$
RG-402/U, RG-405/U	0.03 x $\sqrt{Frequency\,(GHz)}$

H.3.7 Mechanical Performance

Connectors shall meet the following requirements.

H.3.7.1 Connector Mating and Unmating Forces

When tested as specified in paragraph H.4.3.5.1, the torque necessary to completely couple or uncouple the connectors shall not exceed 22.6N·cm {2.3kgf·cm}. The longitudinal force necessary to initiate the mating or unmating cycle shall not be applied.

H.3.7.2 Coupling Proof Torque

When tested as specified in paragraph H.4.3.5.2, the coupling mechanism shall not be dislodged. At the completion of the test, the interface dimensions of the connector shall remain as specified in the detail specification, and mating and unmating forces of the connectors shall meet the requirements specified in paragraph H.3.7.1. The coupling proof torque requirements are applied to the cable plug or cable jack type connectors with any connector configuration except for jam nut.

H.3.7.3 Contact Insertion, Release and Removal Force Test

When tested as specified in paragraph H.4.3.5.3, contact insertion, release and removal forces test shall meet the requirements specified in the detail specification.

And when the jack type connectors are tested as specified in paragraph H.4.3.5.3, contact insertion, release and removal forces shall meet the followings.
a) Engaging force: 13.3N {1.36kgf} maximum
b) Disengaging force: 0.28N {28.5gf} minimum
However, the above requirements are not applied to the plug type connectors.

H.3.7.4 Coupling Mechanism Retention

When tested as specified in paragraph H.4.3.5.4, the coupling mechanism shall not be dislodged. At the completion of the test, connector mating and unmating forces shall meet the requirements specified in paragraph H.3.7.1. The requirements for coupling mechanism retention are applied to cable plug connectors.

H.3.7.5 Center Contact Retention

When tested as specified in paragraph H.4.3.5.5, the inner contact shall be inspected after the forces have been applied in either direction of the center contact axis to determine if the contact has been displaced from the interface dimensions specified in Table H-22. The torque specified in paragraph H.4.3.5.5 or higher shall be applied to the center contact.

H.3.7.6 Cable Retention

When tested as specified in paragraph H.4.3.5.6, there shall be no evidence of mechanical failure, loosening, rupture, or discontinuity. The cable retention requirements are applied to cable plug or cable jack type connectors.

H.3.7.7 Durability

When tested as specified in paragraph H.4.3.5.7, connectors shall show no evidence of severe mechanical damage and the coupling mechanism shall remain functional. At the completion of the test, the characteristics of connector mating and unmating forces, and contact insertion, release and removal force test shall meet the requirements specified in paragraphs H.3.7.1 and H.3.7.3.

H.3.7.8 Center Contact Crimp Tensile Strength

When the crimp contact of the connectors are tested specified in paragraph H.4.3.5.8, tensile strength shall be as specified in Table H-12. This requirement is applied to cable plug and cable jack type connectors.
Unsatisfied requirements due to the scratches of the center conductors except for the scratches made by crimping do not mean that the connector failed this tensile strength test.

Table H-12. Center Contact Crimp Tensile Strength

Applicable cable	Tensile strength
RG-402/U, RG-400/U	17.75N (1.81kgf)

H.3.7.9 Solderability

When tested as specified in paragraph H.4.3.5.9, a minimum of 95% of the immersed external surface shall be covered by solder. This provision shall not apply to crimp-contact connectors.

H.3.8 Environmental Performance

Connectors shall meet the following requirements.

H.3.8.1 Vibration

When tested as specified in paragraph H.4.3.6.1, there shall be no electrical interruptions exceeding 1μs, short or open-circuits. At the completion of the test, connectors shall not show any mechanical damage, and contact resistance of center contact shall meet the requirements specified in paragraph H.3.6.4.

H.3.8.2 Shock

When tested as specified in paragraph H.4.3.6.2, there shall be no electrical interruptions exceeding1μs, short or open-circuits. At the completion of the test, connectors shall not show any mechanical damage, and contact resistance of center contact shall meet the requirements specified in paragraph H.3.6.4.

H.3.8.3 Thermal Shock

When tested as specified in paragraph H.4.3.6.3, there shall be no mechanical damage. At the completion of the test, dielectric withstanding voltage shall meet the requirements specified in paragraph H.3.6.1. Contact resistance of center contact shall meet the requirements specified in paragraph H.3.6.4.

H.3.8.4 Moisture Resistance

When tested as specified in paragraph H.4.3.6.4, there shall be no mechanical damage. At the completion of the test, insulation resistance shall be 200MΩ or higher and dielectric withstanding voltage shall meet the requirements specified in paragraph H.3.6.1.

H.3.8.5 Salt Spray

When tested as specified in paragraph H.4.3.6.5, there shall be no exposure of the base metal on the mating or internal surface. At the completion of the test, mating and unmating forces of connectors shall meet the requirements specified in paragraph H.3.7.1.

H.4 Quality Assurance Provisions

H.4.1 Qualification Test

Qualification test shall be in accordance with paragraph 4.4 and as follows.

H.4.1.1 Samples

Qualification test samples shall be manufactured in accordance with the process and the management of the manufacturing specification specified in quality assurance program.

H.4.1.1.1 Sample Size

The number of samples for qualification test shall be as specified below.

H.4.1.1.1.1 Individual Qualification

35 connectors and 35 of their mating connectors with identical part number to be qualified, and 12 contacts for each connector shall be provided.

H.4.1.1.1.2 Group Qualification

Connectors with the different part number can be qualified as a group when they are specified in the same detail specification. When the connectors are not specified in the same detail specification, however series, design, structures and manufacturing process of the connectors are identical, they can be qualified as a group of one series. In such case, the manufacturers of the connectors shall state clearly what part number connector in the same detail specification or in the same series they are applying for the group qualification to be approved by JAXA. When applying for qualification for a connector of new part number and there is already approved connector in the same detail specification, the manufacturer could prove that design, structure, and manufacturing process of the new connectors to be qualified are identical to the ones of the already approved connector in order to get approval of JAXA. If the connectors are approved by JAXA in such way, the data of the approved items of qualification test can be used and a part or all items of qualification test for the new connectors can be omitted.

H.4.1.2 Test Items

Test items shall be as shown in Tables H-13 and H-14. The tests in each group shall be conducted in the order listed in the table. After the completion of the group I tests, each test group of groups II through IV is conducted separately. For testing contacts, the sample size in groups I through III specified in Table H-14 shall be tested.

Table H-13. Qualification Test (Connectors)

Test			Requirements paragraph	Test method paragraph	Pass/Fail criteria	
Group	Order	Items			Sample size	Quantity of allowable defects
I	1	Materials ([1])	H.3.2	H.4.3.2	---	---
	2	Externals, dimensions and marking	H.3.3	H.4.3.3	35	0
	3	Connector mating and unmating forces	H.3.7.1	H.4.3.5.1		
	4	Coupling proof torque	H.3.7.2	H.4.3.5.2		
	5	Contact insertion, release and removal force test	H.3.7.3	H.4.3.5.3		
	6	Nonmagnetic materials ([2])	H.3.2.2	H.4.3.2.4		
	7	Workmanship	H.3.3.3	H.4.3.3		
	8	Insulation resistance	H.3.6.3	H.4.3.4.3		
II	1	Center contact retention	H.3.7.5	H.4.3.5.5	5	0
	2	Salt spray	H.3.8.5	H.4.3.6.5		
III	1	Voltage Standing Wave Ratio (VSWR)	H.3.6.2	H.4.3.4.2	5	0
	2	Durability	H.3.7.7	H.4.3.5.7		
IV	1	Contact resistance (between center contacts)	H.3.6.4	H.4.3.4.4	5	0
	2	Dielectric withstanding voltage	H.3.6.1	H.4.3.4.1		
	3	Vibration	H.3.8.1	H.4.3.6.1		
	4	Shock	H.3.8.2	H.4.3.6.2		
	5	Thermal shock	H.3.8.3	H.4.3.6.3 .1		
	6	Moisture resistance	H.3.8.4	H.4.3.6.4		
	7	Partial discharge	H.3.6.5	H.4.3.4.5		
	8	RF High Potential Withstanding Voltage	H.3.6.6	H.4.3.4.6		
	9	Cable retention	H.3.7.6	H.4.3.5.6		
	10	Coupling Mechanism Retention	H.3.7.4	H.4.3.5.4		
V	1	RF leakage	H.3.6.7	H.4.3.4.7	5	0
VI	1	RF insertion loss	H.3.6.8	H.4.3.4.8	5	0
VII	1	Contact resistance	H.3.6.4	H.4.3.4.4	5	0
VIII	1	Solderability	H.3.7.9	H.4.3.5.9	5	0
IX	1	Outgassing	H.3.2.6	H.4.3.2.5	---	---

Notes: ([1]) The document shall be submitted to prove the design specification is satisfied.
([2]) The measurement results shall be listed in the application data sheet.

Table H-14. Qualification Test (Contact)

Test			Requirements paragraph	Test method paragraph	Pass/Fail criteria	
Group	Order	Items			Sample size	Quantity of allowable defects
I	1	Center contact resistance	H.3.7.8	H.4.3.5.8	4	0
II	1	Plating porosity	H.3.4.1	H.4.3.2.2	4	0
III	1	Plating thickness	H.3.4.2	H.4.3.2.3	4	0

H.4.1.3 Determination of Pass or Fail

A failure of any test specified in Tables H-13 and H-14 shall constitute failure of the qualification tests.

H.4.1.4 Disposition after Test

The disposition after test shall be in accordance with paragraph 4.4.5.

H.4.2 Quality Conformance Inspection

Quality conformance inspection shall be in accordance with paragraph 4.5.

H.4.2.1 Inspection Items and Sample Size

Inspection items and sample size shall be as specified in Tables H-15, H-16, and H-17 and the inspections shall be conducted in the order listed in each table.
Group B inspection shall be conducted for products that have passed group A inspection.

H.4.2.2 Determination of Pass or Fail

Determination of pass or fail shall be in accordance with paragraphs 4.5.1.3 and 4.5.2.3.

H.4.2.3 Disposition after Inspection

Disposition after inspection shall be in accordance with paragraphs 4.5.1.4 and as follows.
Samples used in groups B and C inspections shall not be shipped. If the samples are rejected in group B or C inspections, the manufacturer shall perform the failure analysis on the rejected samples and take corrective action on the materials and manufacturing process. The shipping of the products shall be cancelled until the results of the corrective actions are approved by JAXA.

Table H-15. Quality Conformance Inspection (Group A)

Inspection			Requirements paragraph	Test method paragraph	Pass/Fail criteria	
Group	Order	Item			Sample size	Quantity of allowable defects
A1	1	Materials	H.3.2	H.4.3.2	---	---
	2	Externals, dimensions and marking (1)	H.3.3	H.4.3.3	All	0
	3	Thermal shock (2)	H.3.8.3	H.4.3.6.3.2		
	4	Insulation resistance (2)	H.3.6.3	H.4.3.4.3		
	5	Dielectric withstanding voltage (2)	H.3.6.1	H.4.3.4.1		
	6	Contact insertion, release and removal force test	H.3.7.3	H.4.3.5.3		
A2	1	Surface finish	H.3.2.5	H.4.3.2.1	AQL=2.5% (3)	
	2	Connector mating and unmating forces	H.3.7.1	H.4.3.5.1	AQL=2.5% (3)	
	3	Coupling proof torque	H.3.7.2	H.4.3.5.2	AQL=2.5% (3)	

Notes (1) Connectors fail marking inspection only when the marking is unreadable or incorrect in external view. The acceptance or rejection of the dimensions and mass shall be based on 1.0% of the acceptable quality level (AQL) in "Single sampling plan for normal inspection" specified in JIS Z 9015, Attachment Table 2-A.

(2) Not applicable for the connectors without center contact and insulator.

(3) The acceptance quality level (AQL) is based on "Single sampling plan for normal inspection", specified in JIS Z 9015-1, Attachment Table 2-A.

Table H-16. Quality Conformance Inspection (Group B)

Inspection			Requirements paragraph	Test method paragraph	Pass/Fail criteria	
Group	Order	Item			Sample size	Quantity of allowable defects
B1	1	RF leakage	H.3.6.7	H.4.3.4.7	2	0
B2	1	RF insertion loss	H.3.6.8	H.4.3.4.8	2	0
B3	1	Contact resistance	H.3.6.4	H.4.3.4.4	2	0
B4	1	Solderability	H.3.7.9	H.4.3.5.9	2	0
B5	1	Center contact retention	H.3.7.5	H.4.3.5.5	2	0
B6	1	Voltage Standing Wave Ratio (VSWR) (1)	H.3.6.2	H.4.3.4.2	2	0
B7	1	Center contact resistance (2)	H.3.7.8	H.4.3.5.8	4	0
B8	1	Plating porosity (2)	H.3.4.1	H.4.3.2.2	4	0
B9	1	Plating thickness (2)	H.3.4.2	H.4.3.2.3	4	0

Notes: (1) Not applicable for receptacle type connectors.

(2) Applicable for contacts

Table H-17. Quality Conformance Inspection (Group C)

Inspection			Requirements paragraph	Test method paragraph	Pass/Fail criteria	
Group	Order	Item			Sample size	Quantity of allowable defects
C1	1	Center contact retention	H.3.7.5	H.4.3.5.5	2	0
	2	Salt spray	H.3.8.5	H.4.3.6.5		
C2	1	Voltage Standing Wave Ratio (VSWR)	H.3.6.2	H.4.3.4.2	2	0
	2	Durability	H.3.7.7	H.4.3.5.7		
C3	1	Contact resistance (between center contacts)	H.3.6.4	H.4.3.4.4	2	0
	2	Vibration	H.3.8.1	H.4.3.6.1		
	3	Shock (waveform specified)	H.3.8.2	H.4.3.6.2		
	4	Thermal shock	H.3.8.3	H.4.3.6.3		
	5	Moisture resistance	H.3.8.4	H.4.3.6.4		
	6	Partial discharge	H.3.6.5	H.4.3.4.5		
	7	RF withstanding voltage	H.3.6.6	H.4.3.4.6		
	8	Cable retention	H.3.7.6	H.4.3.5.6		
	9	Coupling mechanism retention	H.3.7.4	H.4.3.5.4		

H.4.3 Methods of Test and Inspection

H.4.3.1 Test Conditions

The tests and inspections shall be performed under the following environmental conditions.

a) Temperature: 15 to 35°C
b) Relative humidity: 25 to 75%RH
c) Atmospheric pressure: 73.3 to 106.7kPa (550 to 800mmHg)

H.4.3.2 Materials

Materials shall be tested as specified in the following paragraphs.

H.4.3.2.1 Surface Finish

Connectors shall be verified by manufacturing records, etc. that the surface finish of the connectors shall satisfy the requirements specified in paragraph H.3.2.5.

H.4.3.2.2 Plating Porosity

Five of each of unwired pin and socket contacts shall be completely immersed in nitric acid (concentration: 70^{+3}_{-1} %) at 25±3°C and observed for 30 seconds.

H.4.3.2.3 Plating Thickness

The plating thickness shall be tested in accordance with MIL-G-45204 and as follows.

a) Sample preparation: Unwired pin or socket contacts
b) Test method: The plating thickness shall be measured by a proper method such as microscopic test method, beta backscatter radiation method and X-ray fluorescence method.
c) Measuring points: As specified in the detail specification. The measuring point for SMA series shall be 1.5mm from the tip of the connecting part.

H.4.3.2.4 Residual Magnetization

Unmated connectors shall be tested in the following item a) or b). Measuring apparatus for residual magnetization shall be as shown in Figures H-1 and H-2.

a) When using a Milliammeter

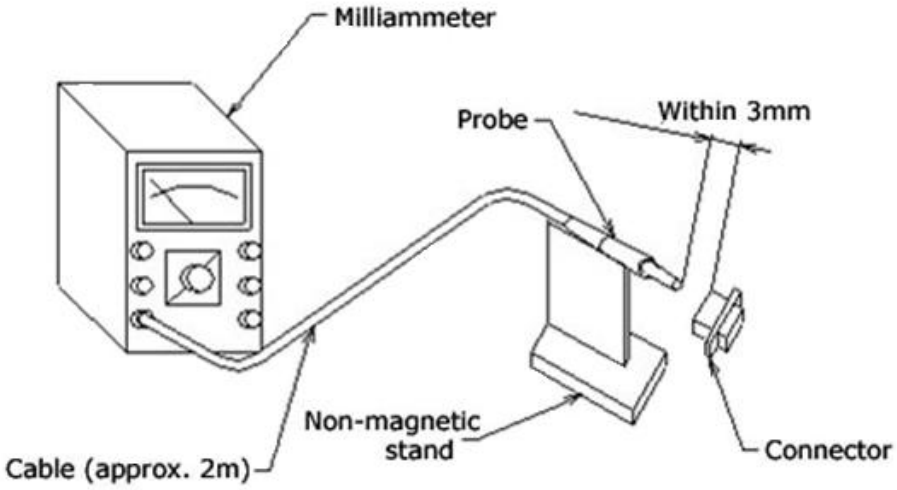


Figure H-1. Milliammeter

1) Warm up the milliammeter for a minimum of 15 minutes.
2) Mount the probe on the non-magnetic stand in a horizontal position extending the cable at full length from the milliammeter.
3) Set the meter in a proper scale range, and orient the probe in the magnetic east-west direction so that the meter reading shall be as close as 0.
4) Move the connector in one direction three times between magnet poles that create a field strength of 0.5T {5000 Gauss} or greater without touching poles.
5) Immediately after that, bring the connector gradually to the area within 3mm of the probe tip and record the maximum residual magnetism.

Note: The test shall be performed in the area free from magnetic disturbance, operations of machines, electronic equipment and vehicles, and personnel traffic shall be restricted.

b) When Using a Gaussmeter

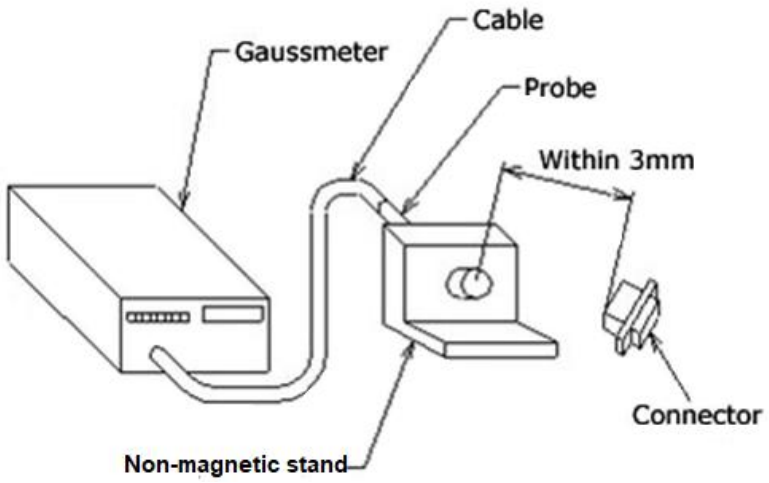


Figure H-2. Gaussmeter

1) Warm up the gaussmeter for a minimum of 30 minutes.
2) Mount the probe on the non-magnetic stand.
3) Set the meter in a proper scale range, and orient the probe in the magnetic east-west direction.
4) Move the connector three times between magnet poles that create a field strength of 0.5T {5000 Gauss} or greater.
5) The connector shall not contact the magnet poles, and shall be moved in the same direction.
6) Immediately after that, bring the connector gradually to the area within 3mm of the probe tip and record the maximum residual magnetism.

Note: The test shall be performed in the area free from magnetic disturbance, operations of machines, electronic equipment and vehicles, and personnel traffic shall be restricted.

H.4.3.2.5 Outgassing

The insulation materials and adhesives consisting of inserts of connectors shall be tested in accordance with ASTM-E595. The result shall be evaluated for outgassing weight allocation.

H.4.3.3 Externals, Dimensions and Marking

Externals, dimensions, marking and workmanship of connectors and contacts shall be examined as follows.

a) Externals, constructions and workmanship shall be examined visually.
b) Marking shall be examined visually.
c) Dimensions shall be examined using a proper instrument. The mated dimensions shall be examined after mating standard test connector specified in H.4.3.3.1 or detail specification.
d) Mass shall be examined using a proper instrument. This inspection is applied to the quality conformance inspection (group A inspection) performed prior to qualification test and quality conformance inspection (group B inspection).

H.4.3.3.1 Standard Test Connectors

H.4.3.3.1.1 Construction, Materials and Finish

The construction, materials and finish of the standard test connectors shall withstand 2000 cycles, of mating to electrical and mechanical operations when mating the standard connector.
The female, male, and mating parts of the standard test connectors shall be shown in Figures H-3, H-4, and H-5, respectively.

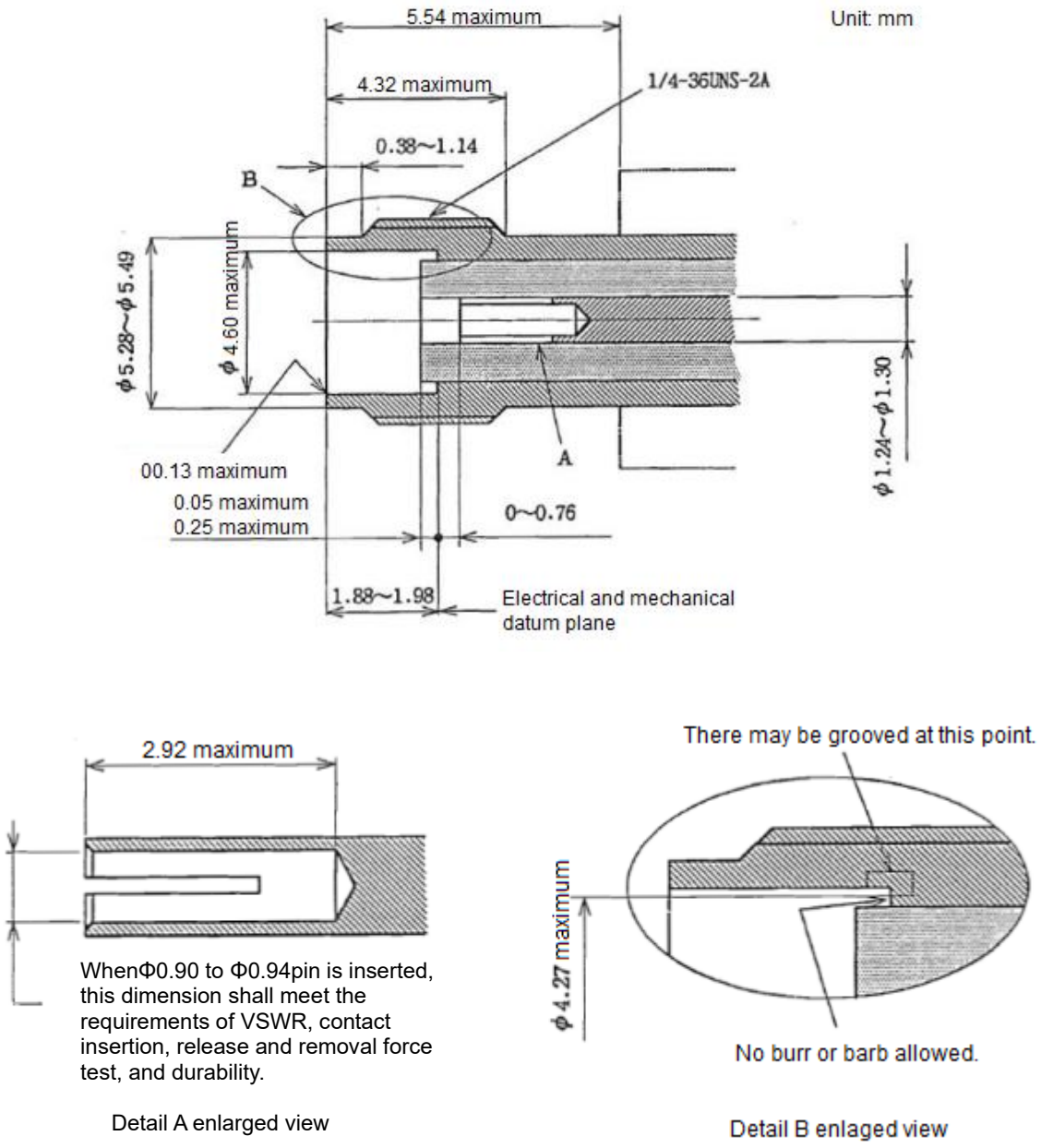


Figure H-3. Female Part of Standard Test Connector (SMA Series: 50Ω)

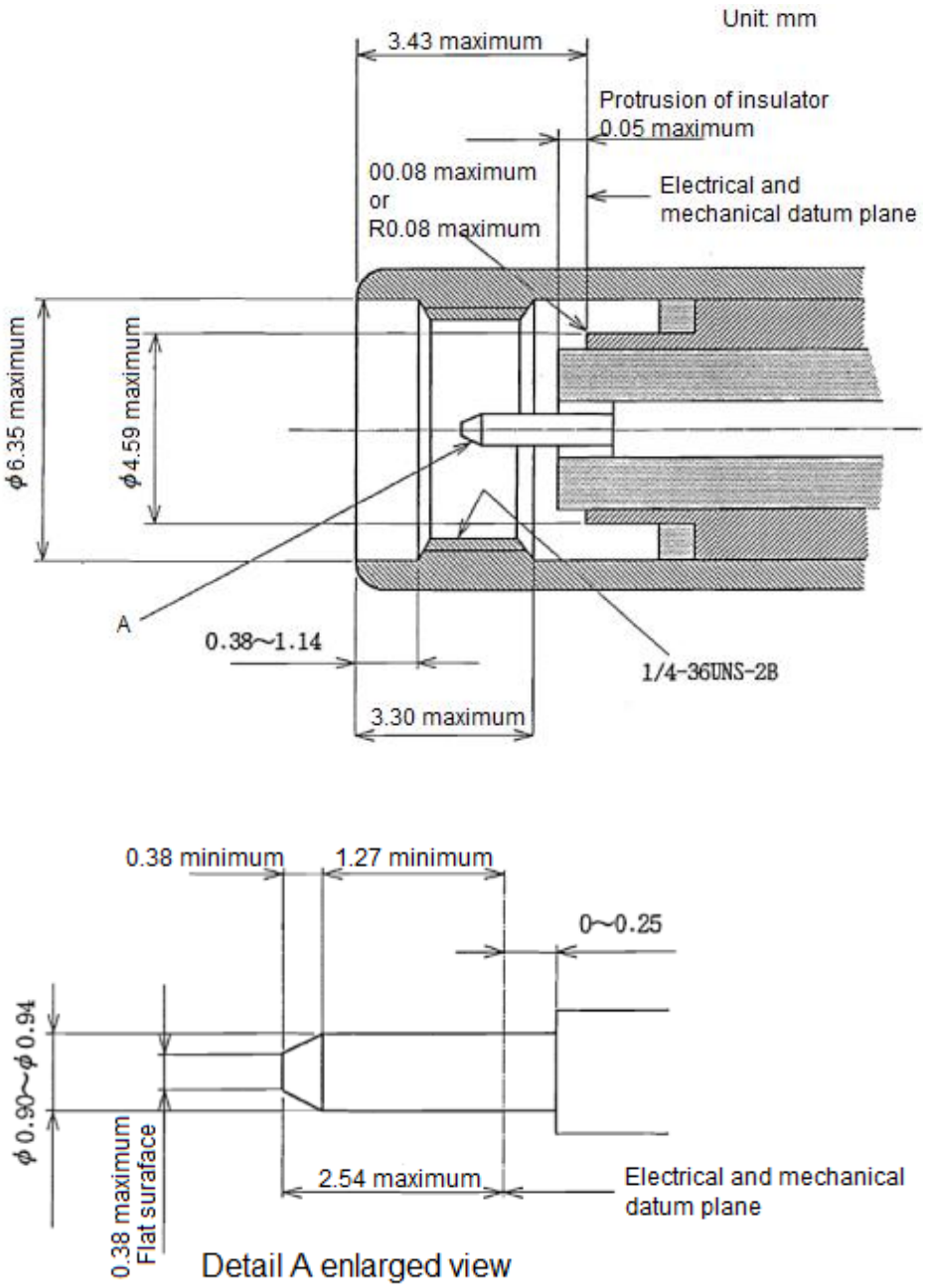


Figure H-4. Male Parts of Standard Test Connector (SMA Series: 50Ω)

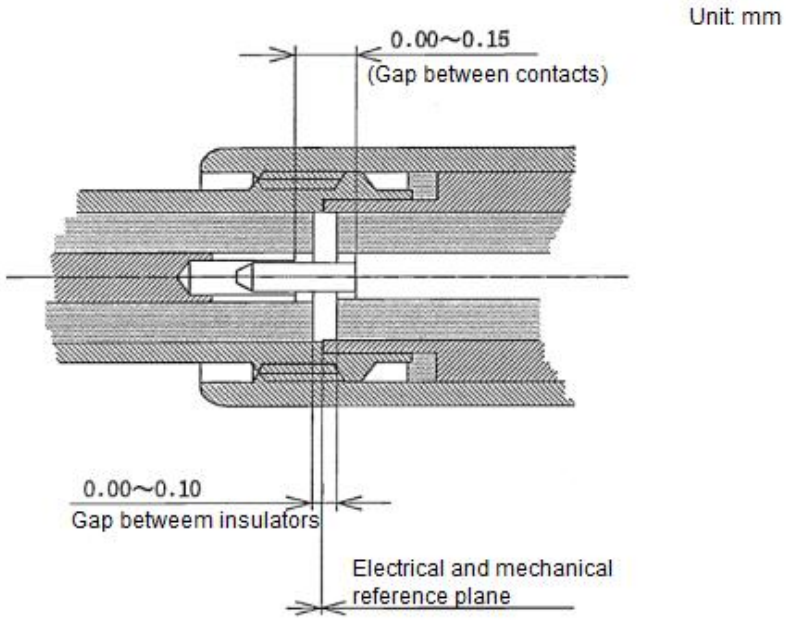


Figure H-5. **Mating Part of Standard Test Connector (SMA Series: 50Ω)**

H.4.3.4 Electrical Performance

Electrical performance tests shall be performed as follows.

H.4.3.4.1 Dielectric Withstanding Voltage

Dielectric withstanding voltage shall be tested in accordance with method 301 of MIL-STD-202. The following details shall apply.

a) Test condition:
The connectors shall be assembled in the same state as of use and precaution shall be taken to prevent air-gap short-circuiting.

b) Test environment:
The test shall be performed at a relative humidity of 50% or less. If it is not possible, the test may be performed under ambient conditions (25-75% relative humidity under room temperature) specified in paragraph H.4.3.1.

c) Test voltage and applied timing:
The AC voltage specified in the detail specification shall be applied instantaneously. However receptacle plug or receptacle jack/adaptor shall be applied 1000Vrms, and cable plug or cable jack shall be applied test voltage specified in Table H-18.

d) Points to be applied:
Between center contact and connector body shall be applied.

e) Others:
In case of any dispute when the test was performed under ambient conditions (25-75% relative humidity under room temperature), retest shall be made at 50% maximum relative humidity.

Table H-18. Dielectric Withstanding Voltage for Cable Plug or Cable Jack

Unit: Vrms

Applicable cable	Test voltage
RG-188/U, RG-316/U	750
RG-142/U, RG-400/U, RG-405/U	1000
RG-402/U	1500

H.4.3.4.2 Voltage Standing Wave Ratio (VSWR)

VSWR shall be tested in accordance with test procedure EIA-364-106 or as specified in the detail specification. The following details shall apply.

a) The standard test connectors of standard precise adaptor shall have the opening specified in paragraph H.4.3.3.1 and have the impedance of 50±0.5Ω.
b) The following conditions shall be applied to VSWR.
   1) No. 06 VSWR: 1.025+0.002f (GHz) or less
   2) No. 16 VSWR: 1.025+0.002f (GHz) or less
   3) Step 2 VSWR: 1.080+0.005f (GHz) or less
c) The long table of step 5 shall be applied in qualification test and quality conformance inspection (group B inspection).

H.4.3.4.3 Insulation Resistance

Connectors shall be tested in accordance with method 302 of MIL-STD-202. The following details shall apply.

a) Test preparation: Test shall be performed without cable attached.
b) Test condition: B (500V)
c) Points of measurement: Between center contact and connector body shall be measured.

H.4.3.4.4 Contact Resistance

Contact resistance shall be measured in proper method and the following points shall be measured.

a) Between cable braid/external conductor and connector contact point.
b) Between inserted external contacts, coupling nut shall be removed.
c) Between inserted center contacts.

H.4.3.4.5 Partial Discharge

Partial discharge shall be tested in the following conditions.

a) Sample preparation:
   The types of cable used shall be cable plug or cable jack, and receptacle plug or receptacle jack. The test sample shall be mated to counterpart connector. No grease on the sample shall be confirmed and the sample shall be purged of air.
b) Test equipment:
   Partial discharge test equipment shall be used. The components of the test circuit shall not discharge at 5 pico coulomb or lower upon increasing to the

specified test voltage in the commercial frequency range, under the reduced pressure condition specified in the detail specification.

c) Length of cable:
As specified in the detail specification. For cable plug or cable jack, the cable length shall be 0.6m or shorter.

d) Test conditions:
The pressure to be applied shall be 4.4kPa {33mmHg, 70,000ft}. The test voltage shall be 250Vrms for receptacle plug or receptacle jack, and shall be as specified in Table H-19 for cable plug or cable jack connectors.

Table H-19. Corona Level Test Voltage for Cable Plug or Cable Jack

Unit: Vrms

Applicable cable	Test voltage
RG-188/U, RG-316/U	190
RG-142/U, RG-400/U, RG-405/U	250
RG-402/U	375

e) Voltage application method:
Test samples after cleaned with air shall be apply the commercial AC voltage, increasing gradually until the detector is activated at 5 pico-coulomb level sensitivity and sustained partial discharge is displayed. Then the test voltage shall be gradually down to the specified test voltage.

f) Observation during test:
There shall be checked the presence or absence of sustained partial discharge at the test voltage shown in Table H-19, and if present, shall consider it as a partial discharge, and if not, shall consider it as no partial discharge.

Figure H-6. (Deleted)

H.4.3.4.6 RF High Potential Withstanding Voltage

The following conditions shall apply.

a) Sample preparation:
Connector shall be connected to the standard cable of approximately 50mm and mated with counterpart connector.

b) Test equipment:
The test equipment shall be constituted by combination of a high frequency generation power source and a withstand voltage tester. High frequency generation power source shall be capable to apply 500 to 1000V with a sine wave with a frequency of 5 to 7.5MHz. Withstand voltage tester shall be capable to measure the presence of shoots and leakage current under high voltage.
Test equipment shall be conducted under the equipment manufacturer to handle high voltages.

c) Test voltage and frequency:
Test voltage and frequency shall be applied to 670Vrms at 5MHz for receptacle plug or receptacle jack, and shall be as specified in Table H-20 for cable plug or cable jack. Test voltage and frequency shall not apply to adaptors.

d) Voltage application method:
The test voltage shall be applied between center contact and connector body instantaneously, and subsequently the test voltage shall be kept for one minute.

e) Measurements during and after test:
The occurrences of short-circuit shall be monitored, and leakage current shall be measured.

Table H-20. Test Voltage and Test Frequency of RF Withstanding Voltage for Cable Plug or Cable Jack

Applicable cable	Test voltage (Vrms)	Frequency
RG-188/U, RG-316/U	500	5 to 7.5 MHz
RG-142/U, RG-400/U, RG-405/U	670	
RG-402/U	1,000	

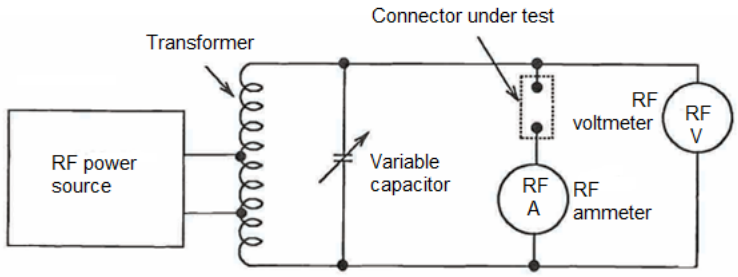


Figure H-7. Test Circuit Diagram for RF High Potential Withstanding Voltage

H.4.3.4.7 RF Leakage

The following conditions shall apply.

a) Test method:
The measurement of the leakage from connectors is performed by collecting the leakage energy in a coaxial system surrounding the leakage source.

b) Test frequency: 2 to 3 GHz

c) Sample preparation:
The mated connector pair shall be assembled as shown in Figure H-8 with the close fitting brass tubing screwed into the center of the connector in lieu of compression nut.

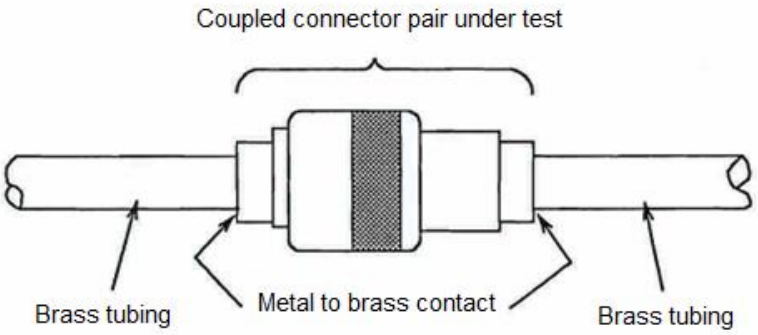


Figure H-8. Connector Assembly for RF Leakage Test

d) Test setup and measurement principle:
The test setup for RF leakage shall be shown in Figure H-9. The RF leakage specified herein shall be adjusted to compare, in principle, the relative leak level.

1) The test setup between 500MHz and 11GHz shall have a dynamic range between -20dBm and -100dBm or a difference of 90dB. Using +20dBm RF source with 10dB isolation, an additional 30dB range can be obtained by use of attenuator pads or a step attenuator producing a total dynamic range of 120dB.
2) The device from which leakage is to be measured is incorporated on a uniform transmission line which is terminated in a matched load.
3) The outer coaxial shall also be on a uniform line, and the detector shall be connected to the terminal to measure the leakage. The matched termination simplifies both the measurement procedure and data reduction.
4) The outer coaxial system is terminated at one end in an adjustable short-circulating plunger and at the other in a tapered transition terminated in a matched detector.
5) The short-circuit position shall be adjusted to assure that an adequately low impedance appears behind the leakage generator. ([1]) A matched termination can be substituted, but the resulting 6-dB loss cannot be tolerated in some cases.

Note: ([1]): When the distance to the short-circuit position is l, and the left impedance from the leakage generator is Z, $Z = jZ_0 \tan(2\pi l / \lambda)$. Therefore, when $l = (\lambda / 2) \times n$ (n=1,2,3...), Z = 0.
In addition, if the leakage source is directional, as it indeed is for connectors with multiple leakage, it is possible for the leakage to be directed to the termination at 50 Ω and not collected by the detector. For surface transfer-impedance measurements on connectors with leakage from more than one point in the connector, however, a matched termination is desirable in order to simplify the transformation of the measured data to absolute transfer impedance data. This is not needed to make relative comparisons in this test.

6) The equivalent leakage generator, in general, can have field components in the radial, axial, and circumferential directions. Furthermore, these components are not necessarily circularly symmetric. Locally, TE, TM, and TEM modes can all exist, and in fact, for complete leakage measurements, the detector should couple to all but the measurement is more complex in this case. The excitation of the outer coaxial line, however, is believed to be principally TEM, since the currents in the internal line are predominantly axial and symmetric. It is recommended that all measurements be made below the frequency that the higher order modes can propagate in the outer coaxial line.

7) The leakage power ratio is defined here as the ratio of the power detected by the detector connected to the outer coaxial line to the power flowing through the internal coaxial line. It is basically the attenuation from inside to outside.

8) The load impedance is set to 50Ω instead of being arbitrary because the leakage source impedance is comparatively low, the voltage at the 50Ω detector is essentially the open circuit leakage voltage. That is, the square of the ratio of the input voltage to output voltage is equal to the measured power ratio.

9) Surface transfer impedance Z_{21} is

$$Z_{21} = e_2 / i_1 \quad \text{.....(1)}$$

where i_1 : Current flowing in internal line

e_2 : Equivalent leakage voltage in external line

In the connector leakage case, considering the equivalent leakage generator to be e2 with an extremely low source impedance, this voltage e_2 appears at detector terminals, and the adjustable short circuit assures this. For a 50-ohm transmission-line system,

Input power: $50 i_1^2$

measured output power: $e_2^2 / 50$

Therefore, the measured power ratio A^2 is

$$A^2 = (e_2^2 / 50) / (50\, i_1^2) = e_2^2 / (50^2\, i_1^2) \quad \text{.....(2)}$$

Substituting and by definition,

$$Z_{21} = e_2 / i_1 = 50A \quad \text{.....(3)}$$

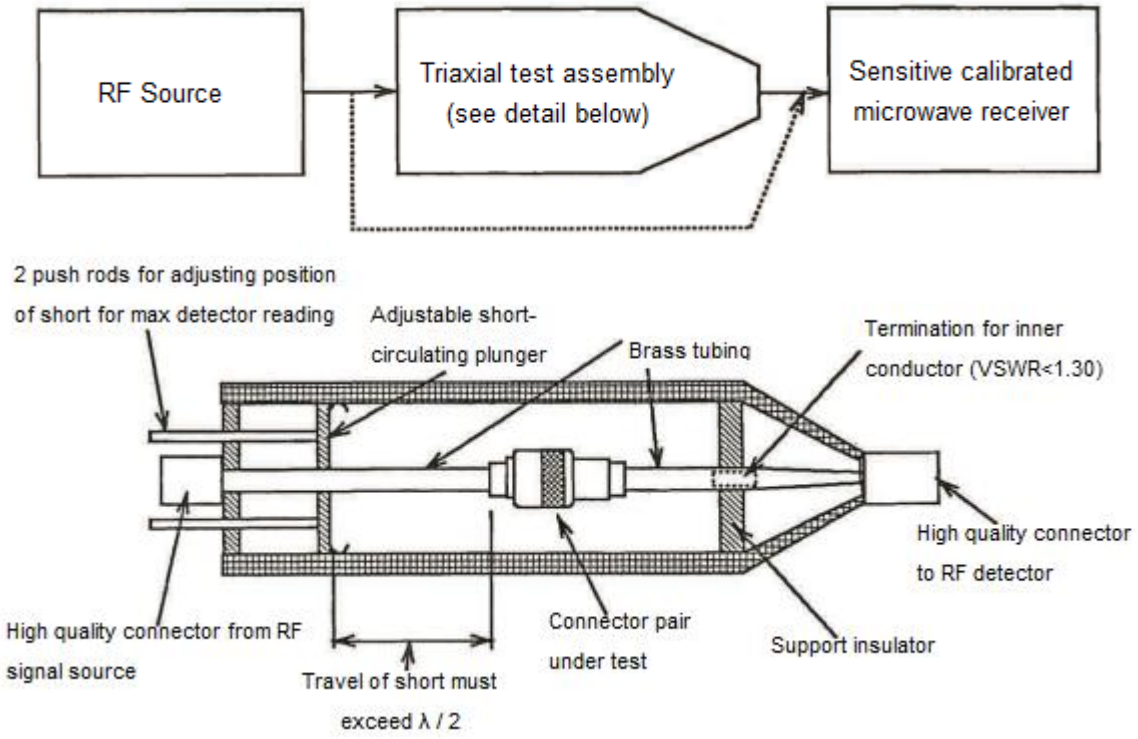


Figure H-9. RF Leakage Test Setup

e) Measurement procedure:
In measuring the leakage power ratio, A^2, basically a substitution technique is employed.

1) A matched detector system is installed at the output connector of the tri-axial unit, and the short circuit is adjusted to produce a maximum indication at the detector.
2) The detector is then connected directly to the source and the change of attenuation required to yield the initial detector level shown in 1), is measured. For the device where the calibrated attenuator is not built in, the adjusting attenuator shall be inserted prior to the detector connecting to the source.
3) The sensitivity of this system is obviously limited by the sensitivity of the detector and the power available. A sensitive parallel IF substitution system can be employed, and for the low leakage configuration, a minimum of 100 milliwatts of power shall be required.
4) The principal sources of error are attenuator errors and mismatch at the receiver (mixer) input. For connector measurements, the error due to mismatch is directly proportional to VSWR, and the measured leakage is P x (-VSWR), where P is the power that would be delivered to a matched system. Therefore, a VSWR of 2.0 will produce ± 3 dB error.
5) In advance of installing the inner coaxial system into the outer of the tri-axial system, the inner system may be excited, and the immediate vicinity of the leakage point and attachment points shall be probed with a small loop or dipole to establish how critical the coupling, the connector and joints are.

H.4.3.4.8 RF Insertion Loss

The following conditions shall apply.

a) Test method:
Mated connector pair with cable connected shall be insert to the measuring circuit to measure the increase of a loss due to insertion of a mated connector pair in a cable; this includes the reflection losses to the cable and the dissipating losses in the pair.

b) Test frequency: As specified in Table H-21.

Table H-21. Test Frequency

Cable type	Test frequency
RG-142	6GHz
RG-188	
RG-316	
RG-400	
RG-402	9 to 12.4 GHz
RG-405	

c) Test sample preparation:
1) Assemble one 203.2 ± 25.4mm {8 ± 1in} long cable assembly by attaching a male test connector to one end and female test connector to the other.
2) Record the electrical length of the cable assembly with the following equation.
Electrical length = $\sqrt{g}$ x L
where L: Physical length L between termination connectors
g: Constant of the substance filled in between termination connectors (see IEC-46D)
For instance, when the cable is filled with g=2.25 polyethylene, the electrical length is 1.5L.
3) The combination of cables and connectors shall be in accordance with detail specification.

d) Measurement procedure:
1) The measurement shall be made on a Vector Network Analyzer (VNA). The reflection of test cable shall be calibrated to 0 (VSWR 1.00), and then shall be on place gently without touching adjusting screws, etc.
2) Insertion loss (L1) of the tuner #4 and test cable assembly shall be measured.
3) Test cable assembly shall be cut in the middle and attach the male and female connectors. The lengths of cable cut off at both sides, ΔL_1 and ΔL_2 shall be taken so that the electrical length after attaching the connector pair to the cable will be identical to the above recorded electrical length, and the reproducible error should be within ±0.5mm. Record the lengths, ΔL_1 and ΔL_2 of the cut-off cable insulator beads.

4) Insertion loss L_2 of tuner #4 + cable assembled in above 3) shall be measured including the connector pair. Make certain that the adjusted tuner #4 shall be maintained in undisturbed state.
5) Using the left-over cable from the cable assembly fabrication, measure the attenuation of a 15.24 m (50 ft) test cable and determine the loss per meter, α (dB/m).
6) With the following equation, the insertion loss L_C of test connector pair shall be calculated.

$$L_C = L_2 - L_1 + \alpha\ (\Delta L_1 + \Delta L_2)(\mathrm{dB})$$

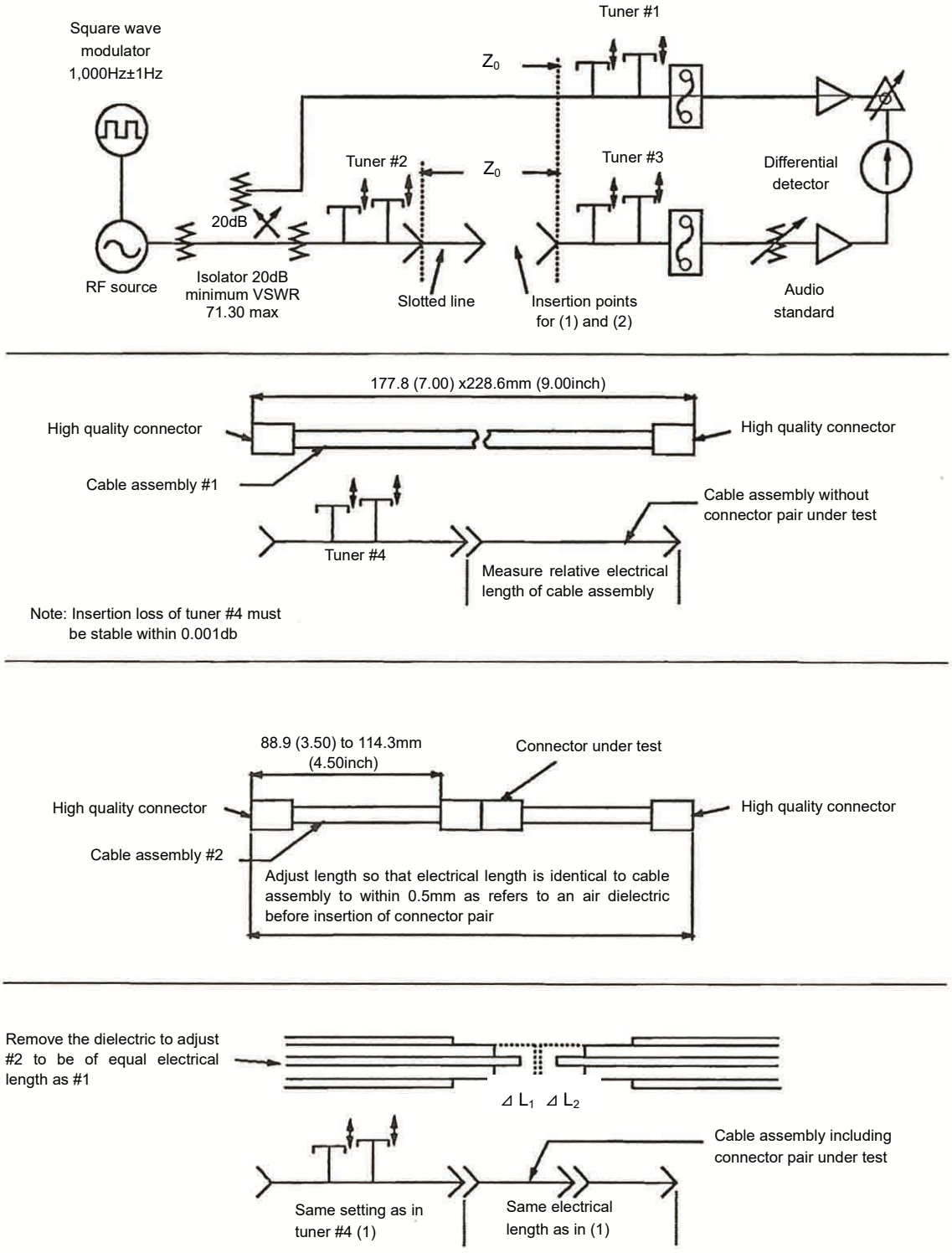


Figure H-10. Measurement Method of Insertion Loss of Connector Pair

H.4.3.5 Mechanical Performance

Mechanical performance tests shall be performed as follows.

H.4.3.5.1 Connector Mating and Unmating Forces

The connector shall be mating and unmating with its mating test standard part. The torque at the beginning of mating and unmating of the connector and when the connector is fully mated and unmated shall be measured.
The connector shall be fully engaged with its mating test standard part when their reference planes coincide. No additional tightening torque shall be applied. The mating standard test part is a steel jig containing the interface dimensions specified in paragraph H.4.3.3.1 and the surface finish of the mating part shall not exceed 1.6S as specified in JIS B 0601. The spring shall be made of age-hardened (heat-treated) beryllium copper.

H.4.3.5.2 Coupling Proof Torque

The following conditions shall apply.

a) Test method:
Connector shall be mated with its mating standard part and the coupling nut tightened to the torque value of 169.7N·cm {17.30kgf·cm}. After one minute the connector and its mating standard part shall be unmated.

b) Observation during test:
Observation shall be made to determine whether the mating mechanism (screws, etc.) becomes disengaged.

c) Inspection after test:
Internal mating surface dimension, and mating and unmating forces of connectors shall be observed in accordance with paragraphs H.4.3.3 and H.4.3.5.1, respectively.

H.4.3.5.3 Contact Insertion, Release and Removal Forces Test

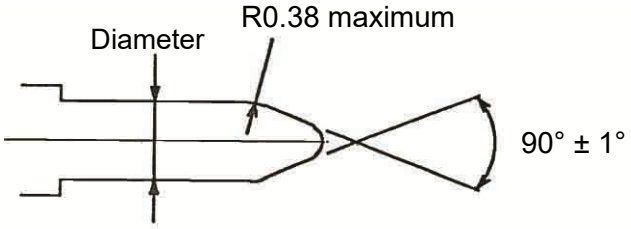
The following conditions shall apply.

a) Sample preparation:
After insertion and removal of the oversize pin specified in Figure H-11 for 3 times, the contact to be tested shall be fixed by means of a suitable jig or fixture.

b) Test setup:
A gauge containing the test pin or test ring and a suitable force indicating dial shall be aligned to within 0.1mm of any plane passing through the axis of the contact under test. The test pin and test ring shall be made from steel and the surface finish of the insertion part shall not exceed 1.6S as specified in JIS B 0601. The test pin and test ring may be chamfered to facilitate entry, but the specified insertion length shall not include the chamfer length.

c) Test method:
Engagement or separation of the test pin or test ring shall be made smoothly and at such a rate that the dial does not bounce or otherwise give a false reading.

d) Measurement:
In the case of jack connector, after the measurement of the maximum dimensions of engagement and separation, mating dimension shall be measured in accordance with paragraph H.4.3.3. In the case of plug connector, only the mating dimension shall be measured in accordance with paragraph H.4.3.3.



Unit: mm

	Oversize test pin	Engagement test pin	Separationl test pin
Diameter	$0.935\ ^{+0.003}_{0}$	$0.940\ ^{+0.003}_{0}$	$0.902\ ^{0}_{-0.003}$
Insertion depth	0.762 to 1.143	1.270 to 1.905	

Figure H-11. Test Pin of Contact Insertion, Release and Removal Force Test

H.4.3.5.4 Coupling Mechanism Retention

The following conditions shall apply.

a) Sample preparation:
The connector body and coupling mechanism shall be respectively secured to the lower and upper jaws of a tensile tester in an appropriate manner.

b) Measuring retention:
A tensile load shall be applied at a rate of 441.3N {45kgf} per second up to the force of 266.7N {20kgf} and held at that value for one minute. During the one minute of steadily applied force, the coupling mechanism shall be rotated with respect to the connector body, two full revolutions in each direction.

c) Observation during test:
Observation shall be made to determine whether the mating mechanism becomes disengaged from the connector body.

d) Inspection after test:
The connector body and coupling mechanism shall be inspected for any evidence of mechanical damages.

H.4.3.5.5 Center Contact Retention

The following conditions shall apply.

a) Sample preparation:
The uncabled connector shall be anchored with the center contact firmly attached to it.

b) Measurement of retention:
An axial force as specified in the detail specification shall be applied, first in one direction and then the other, to the center contact of the uncabled

connector. The inner contact shall be inspected after the force has been applied in one direction and again after the force has been applied in the opposite direction to determine if the contact has been displaced from the specified interface dimensions. The measurement shall be in accordance with paragraph H.4.3.3. A torque meter shall be installed to the center contact by an appropriate mean, and the torque specified in the detail specification shall be applied to the center contact to affirm that the contact does not rotate. The center contact retention shall be as specified in Table H-22.

Table H-22. Center Contact Retention

	Cable plug or cable jack	Receptacle plug or receptacle jack
Axial direction	26.7N {2.72kgf} (only applicable for captivated contact)	26.7N {2.72kgf}
Radial direction	Not applicable	2.82N·cm {287.6gf·cm}

H.4.3.5.6 Cable Retention Force

The following conditions shall apply.

a) Sample preparation:
Connector shall be firmly fixed on to an appropriate jig and a movable sleeve shall be attached to the cable. Then a scale for measuring the retention force shall be attached to the sleeve.

b) Retention force: As specified in Table H-23

c) Tensile test:

1) Test method:
The sleeve is then moved longitudinally away from the fixed connector gradually and in such a manner that the cable remains unbent and untwisted. The force shall be held for 30 seconds minimum.

2) Measurement during test:
The assembly shall then be tested for continuity using suitable method.

3) Inspection after test:
The assembly shall then be examined for mechanical failure, loosening, or rupture.

d) Torque and bend test

1) Test method:
The cable shall be anchored at the position where the distance from the sample is 10 times the cable diameter, and the specified torque shall be applied to the cable perpendicular to its axis in each direction. The cable shall be bent at a radius of 10 times the diameter of the cable starting at the connectors at an angle of 90º ± 5º from the axis of the connector, then reversed 180º ± 10º. Repeat this procedure four times, then retest and reexamine as outlined above.

2) Inspection after test:
Items 1) through 3) of c) in this paragraph shall be performed.

Table H-23. Cable Retention Force

Applicable cable	Axial direction N {kgf}	Radius direction N·cm {kgf·cm}
RG-188/U, RG-316/U	88.5 {9.02}	---
RG-400/U	177.0 {18.14}	---
RG-142/U	200.0 {20.41}	---
RG-405/U	133.4 {13.60}	11.28 {1.15}
RG-402/U	266.8 {27.21}	38.83 {3.96}

H.4.3.5.7 Durability

Each connector under test shall be mated with a typical test sample and shall be subjected to the number of cycles of mating and unmating as specified in the detail specification. The following conditions shall apply.

a) Sample preparation:
Lubrication of the threads or rotational parts shall not be employed for this test.

b) Test method:
The connector shall be subjected to 500 cycles of mating and unmating with the mated connector at a rate of 12 cycles as a maximum per one minute.

c) Treatment during test:
It is permissible to remove dust from the threads or interface surfaces at intervals of not less than 50 cycles. Solvents or tools shall not be used for cleaning.

d) Measurement after test:
Connector shall be measured for connector mating and unmating forces and contact insertion, release and removal force test in accordance with paragraphs H.4.3.5.1, and H.4.3.5.3, and examined for mechanical damage.

H.4.3.5.8 Center Contact Resistance

Connector shall be tested for center contact resistance in accordance with test procedure EIA-364-08. The following conditions shall apply.

a) Sample to be tested:
Center conductor of pin or socket type contact other than soldered type.

b) Crimp tool:
As specified in the detail specification.

H.4.3.5.9 Solderability

Solderability shall be tested in accordance with method 208 of MIL-STD-202. The following conditions shall apply.

a) Sample to be tested:
All connectors except for crimp type connectors.

b) Number of terminals to be tested:
As specified in the detail specification. One terminal per sample shall be tested for SMA series connectors.

c) Immersion depth:
Deeper than the mating part of the connector body and contact.

d) Inspection after test:
Connectors shall be inspected visually for its solderability.

H.4.3.6 Environmental Performance

Environmental performance tests shall be performed as follows.

H.4.3.6.1 Vibration

Connectors shall be tested in accordance with method 204 of MIL-STD-202. The following conditions shall apply.

a) Sample preparation:
Connector with an attaching part shall be mounted on the vibration table by using a normal method as shown in Figure H-12, and the connector without an attaching part shall be mounted on a jig as shown in Figure H-12 in an appropriate manner. For semi-rigid cable, the cable clamp shall be mounted on the vibration table and clamp length shall be set so that the it will not resonate with the cable.
Connector shall be mounted in such a way that it is subjected to the same restraining force and mass that it is subjected to when it is in use.

b) Test current: 100mA

c) Test condition: G (294m/s^2 {30G} peak)

d) Measurement during test:
Unless otherwise specified, continuity shall be monitored during vibration with a detector capable of detecting electrical interruptions of 1μs duration or longer.

e) Measurement after test:
Contact resistance of center contact shall be tested in accordance with paragraph H.4.3.4.4, and connector shall be inspected for mechanical damage.

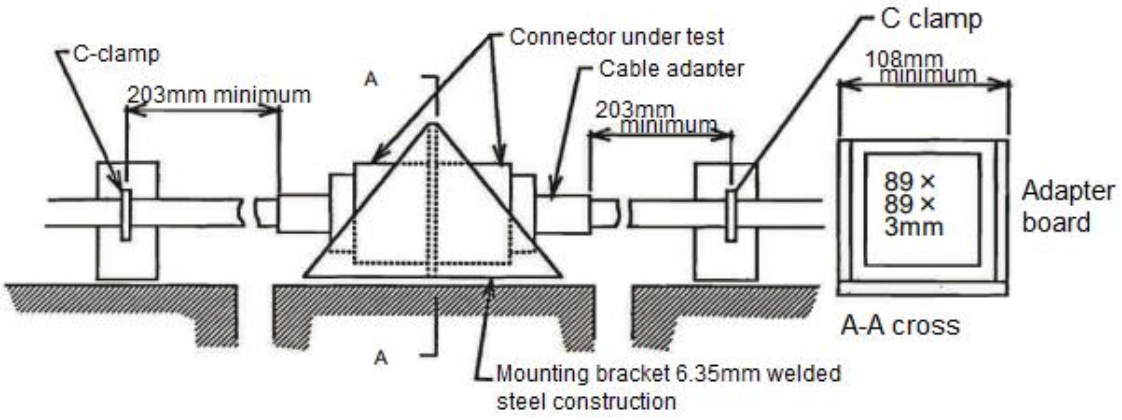


Figure H-12. Vibration Test Setup

H.4.3.6.2 Shock

Connector shall be tested in accordance with method 213 of MIL-STD-202. The following conditions shall apply.

a) Sample preparation:
Connector with an attaching part shall be mounted on the shock test table by using a normal method, and the connector without an attaching part shall be mounted on the table in an appropriate manner. The connector shall be mounted so that the same restraint force and mass are applied when it is in use.
b) Test current: 100mA
c) Acceleration condition: D (2942m/s^2 {300G}, half-sine wave)
d) Direction and number of shock cycle:
Three blows in each of three mutually perpendicular planes; one of which shall be parallel to the axis of the connector.
e) Measurement during test: As specified in item d) of paragraph H.4.3.6.1.
f) Measurement after test: As specified in item e) of paragraph H.4.3.6.1.

H.4.3.6.3 Thermal Shock

Connector shall be tested in accordance with method 107 of MIL-STD-202. The following conditions shall apply.

H.4.3.6.3.1 Qualification Test

a) Test condition letter and classification:
Test condition B (-65°C to +125°C, 5 cycles) in method 107 of MIL-STD-202 shall be applied. The maximum temperatures shall be 200°C for receptacle plug, receptacle jack and adaptors, and shall be as specified in Table H-24 for cable plug or cable jack.
b) Measurement after test:
Dielectric withstanding voltage and contact resistance of center contact shall be measured in accordance with paragraphs H.4.3.4.1, and H.4.3.4.4, and connector shall be inspected for mechanical damage.

Table H-24. Maximum Temperature of Thermal Shock for Cable Plug or Cable Jack

Unit: °C

Applicalbe cable	Maximum temperature
RG-188/U, RG-316/U, RG-142/U, RG-400/U	200
RG-402/U, RG-405/U	115

H.4.3.6.3.2 Quality Conformance Inspection

a) Test condition letter and classification:
Test condition B (-65°C to + 125°C, 5 cycles) in method 107 of MIL-STD-202 shall be applied. The temperatures shall be in accordance with detail specification.
b) Measurement after test: Dielectric withstanding voltage, insulation resistance, and contact engagement and separation characteristics shall be

measured in accordance with paragraphs H.4.3.4.1, H.4.3.4.3, and H.4.3.5.3, respectively.

H.4.3.6.4 Moisture Resistance

Connectors shall be tested in accordance with test procedure EIA-364-31. The following details shall apply.

a) Sample preparation:
   Test cable shall be attached to the connector.
b) Measurement during test: Not applicable.
c) Load during test: Not applicable.
d) Test condition:
   Method IV. Measurements at high humidity shall be performed when specified in the detail specification.

H.4.3.6.5 Salt Spray

Connectors shall be tested in accordance with method 101 of MIL-STD-202. The following details shall apply.

a) Sample preparation:
   Connectors shall not installed cables nor contact.
b) Test condition: Test condition B (48 hours) in method 101 of MIL-STD-202.
c) Salt solution: 5%
d) Measurement after test:
   After exposure, connectors shall be washed and lightly brushed and then permitted to dry for 24 hours at 40°C. Mating and unmating forces of connector shall be measured in accordance with paragraph H.4.3.5.1, and visual inspection shall be performed.

H.4.4 Long-Term Storage

Long-term storage shall be as specified in paragraph 4.7.

H.4.5 Change and Optimization of Tests and Inspections

Change to tests and inspections shall be as specified in paragraph 4.8.

H.5 Preparation for DeliveryPreparation for delivery shall be as specified in paragraph 5.

H.6 NotesNotes for Manufacturer

Notes for manufacturer shall be as specified in paragraph 6.1.

H.6.2 Notes for Purchaser

Notes for purchaser shall be as specified in paragraph 6.2.