

JIS

JAPANESE INDUSTRIAL STANDARD

General rules of connectors for radio frequency coaxial cables

JIS C 5410—1991

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General rules of connectors for radio
frequency coaxial cables

C 5410-1991

1. Scope

This Japanese Industrial Standard specifies general matters concerning connectors for radio frequency coaxial cables (hereafter referred to as connectors) mainly used for electronic equipment and matters to be prescribed in detail specifications of connectors for electronic equipment (hereafter referred to as detail specifications), based on JIS C 5401.

Remarks 1: The following Standards are cited in this Standard:

JIS C 0042-Basic Environmental Testing Procedures Part 2:
Tests, Test Eb: Bump

JIS C 3501-Radio-frequency Coaxial Cables

JIS C 5401-General Rules of Connectors for Electronic
Equipment Use

JIS C 5402-Method for Test of Connector for Electronics
Equipment

2. The international standard corresponding to this Standard
is given below:

IEC 169-1 (1987) Radio-frequency connectors. Part 1:
General requirements and measuring methods

2. Definitions

For the purpose of this Standard, in addition to the definitions specified in JIS C 5401 and JIS C 5402, the following principal definitions shall apply:

- (1) plug connector A connector to be attached to the free end of a cable or the like.
- (2) receptacle connector A connector mounted on a panel or chassis.
- (3) adapter connector A connector which connects two or more connectors.
- (4) cap A cover which is used for waterproofing, dust-proofing, protection, etc. of the mating part of a connector.
- (5) connecting nut A ball head lock nut, which forms a part of the mating part and assists in mating of the connector pair and maintains the relative position of each connector.
- (6) connecting sleeve A metal fixture provided with a groove for locking of the bayonet, which forms a part of the mating part and assists in mating of the connector pair and maintains the relative position of each connector.

- (7) stud A projection, which forms a part of the mating part and assists in mating of the connector pair, maintains the relative position of each connector, and mates with the connecting sleeve.
- (8) center contact A contact which is located at the central part of a connector, intended for passing a high frequency current by its contact with the mating part.
- (9) external contact A contact which is located on the outside of the connector insulation, intended for prevention of leakage of the high-frequency current flowing through the central contact and for matching the impedance by its contact with the mating part.

3. System and precedence of Standards

The system and precedence of Standards for connectors shall be as specified in 3 (system and precedence of Standards) of JIS C 5401.

This Standard (JIS C 5410) provides rules for the different types.

4. Type designation

4.1 Structure of type designation The type designation shall be composed of the symbols as given below.

- (1) For designation of plug connectors, receptacle connectors, and adapter connectors

Symbol denoting connec- tor	Symbol denoting type	Symbol denoting connector shape	Symbol denoting contact shape	Symbol denoting size of applicable cable	Symbol denoting special construc- tion
4.2.1	4.2.2	4.2.3	4.2.4	4.2.5	4.2.6

Example: CN C01 SP M 050V W

Symbol denoting grade	Symbol denoting other necessary information
4.2.7	4.2.8

Example: X

- (2) For designation of caps

Symbol denoting connec- tor	Symbol denoting type	Symbol denoting connector shape	Symbol denoting special construc- tion
4.2.1	4.2.2	4.2.3	4.2.6

Example: CN C01 RC W

4.2 Symbols

4.2.1 Connector The symbol denoting connectors shall be CN.

4.2.2 Type The symbol denoting the type shall be C □ □ consisting of C and two numerals.

The numerals shall be prescribed in the detail specification.

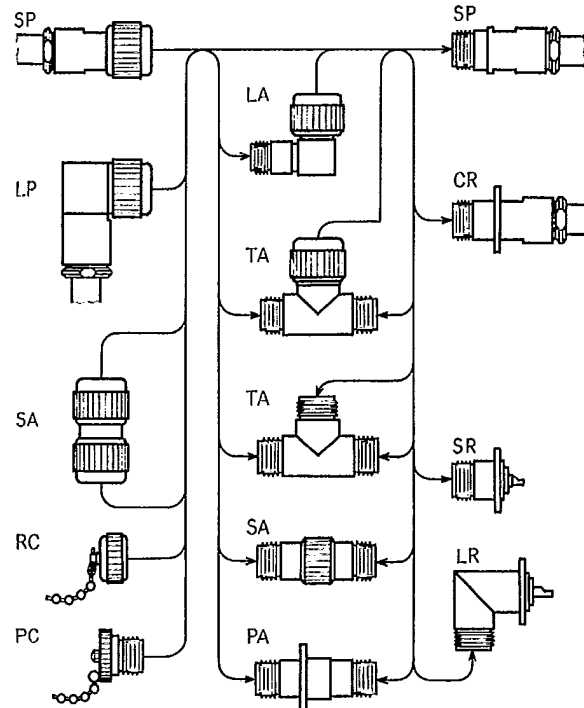
Remarks: The □ indicates a numeral.

4.2.3 Connector shape The symbol denoting connector shape shall consist of two capital letters, as shown in Table 1.

Table 1. Connector shape

Symbol	Shape (see Fig. 1)
SP	Plug connector pair in which the mating part axis and the cable entry axis lie on a straight line
LP	A plug connector in which the mating part axis is perpendicular to the cable entry axis
SR	A receptacle connector in which the mating part axis is perpendicular to the mounting surface
LR	A receptacle connector in which the mating part axis is parallel to the mounting surface
CR	A receptacle connector which can connect and maintain an applicable coaxial cable
SA	An adapter connector in which two mating part axes lie on a straight line
LA	An adapter connector in which two mating part axes meet at right angles
TA	An adapter connector in which three mating part axes form a T shape
PA	An adapter connector which is mounted on a panel, chassis, etc.
PC	A cap to be attached to the mating part of a plug connector
RC	A cap to be attached to the mating part of a receptacle connector

Fig. 1. Functional diagram of connectors

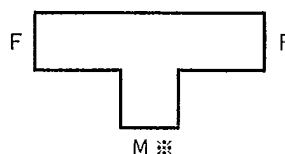


4.2.4 Contact shape The symbol denoting the contact shape shall be a single capital letter, as shown in Table 2.

Table 2. Contact shape

Symbol	Shape
M	The part which performs electrical contact is a male
F	The part which performs electrical contact is a female
H	The part which performs electrical contact is identical in shape for both components of the connector pair
X	The part which performs electrical contact has a shape other than the above

- Remarks 1. Since an adapter connector has two or more contacts, it shall be denoted by combining the symbols of Table 2.
2. If two different symbols are used, F shall be indicated first. For a T type adapter, the symbol for the contact marked with * in the schematic drawing given below shall be placed in the middle.



Example: CNC01TA FMF

4.2.5 Size of applicable cable The symbol denoting the size of the applicable cable shall be as shown in Table 3.

The applicable cables shall be in compliance with the provisions of JIS C 3501.

Table 3. Size of applicable cable

Unit: mm

Symbol	Applicable cable	
	Symbol of cable	Basic length of insulation
008V	0.8D-2V	0.8
015V	1.5D-2V	1.6
	1.5C-2V	
025V	2.5D-2V	2.7
	2.5C-2V	2.4
030V	3D-2V	3.0
	3C-2V	
	3C-2VCS	
	3C-2VS	
050V	5D-2V	4.8
	5C-2V	4.9
050W	5D-2W	4.8
	5C-2W	4.9
070V	7C-2V	7.3
080V	8D-2V	7.8
100V	10D-2V	9.7
	10C-2V	9.4
0000	No applicable cable	

4.2.6 Special construction The symbol denoting special construction shall be a single capital letter, as shown in Fig. 4.

Table 4. Special construction

Symbol	Construction
W	Connector of waterproof construction capable of outdoor service
P	Connector of air-tight construction capable of air pressure resistant service
H	Connectors so structured as to withstand high voltage
T	Connectors so structured as to withstand a specified high or low temperature
X	Connector for which the construction is not particularly specified

4.2.7 Grade The symbol denoting the grade shall be X (no quality assessment is specified).

4.2.8 Other necessary information The symbol denoting other necessary information is used where there is performance, construction, materials or other necessary matters which can not be expressed by the symbols of 4.2.1 to 4.2.7, and shall be prescribed in the detail specification.

5. Ratings

5.1 Category temperature range The category temperature range shall be one of the ranges stated in Table 5, and shall be prescribed in the detail specification.

Table 5. Category temperature range
Unit: °C

-25 to +85
-40 to +85
-40 to +125
-40 to +155
-55 to +125
-55 to +155

5.2 Rated voltage The rated voltage shall have one of the values given in Table 6, and shall be prescribed in the detail specification.

Table 6. Rated voltage
Unit: V (r.m.s. value of a.c.)

100	250
160	500
200	1600

5.3 Nominal characteristic impedance The nominal characteristic impedance shall have one of the values given in Table 7, and shall be prescribed in the detail specification.

Table 7. Nominal characteristic impedance
Unit: Ω

50	75
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5.4 Rated frequency The rated frequency shall have one of the values given in Table 8, and shall be prescribed in the detail specification.

Table 8. Rated frequency

200 MHz	10 GHz
500 MHz	18 GHz
1.5 GHz	26.5 GHz
4.0 GHz	

6. Classification by climatic resistance

The classification by climatic resistance shall be expressed by placing three sets of numerals separated by a slash, and the classification shall be selected from Table 9 and prescribed in the detail specification.

Table 9. Classification by climatic resistance

25/085/04	First set:	The temperature in the cold test is expressed by two numerals		
40/085/04	Second set:	The temperature in the dry heat test is expressed by three numerals. If the temperature is less than 100°C, three numerals are attained by adding a zero in front of the representative value.		
40/125/04	Third set:	The number of days of the damp heat test (steady state) is expressed by two numerals. If the days are less than 10 days, two numerals are attained by adding a zero in front of the representative value.		
40/085/21				
40/125/21				
40/155/21				
40/085/56				
40/125/56	Example:	First set Second set Third set 40 / 085 / 04		
40/155/56				
55/125/21				
55/155/21				
55/125/56				
55/155/56				

The example indicates that the tests are carried out with the cold test temperature at -40°C, the heat test temperature at 85°C, and the number of days of the damp heat test at 4 days.

7. Performance

7.1 General The items and criteria relating to performance shall be specified in the detail specification.

7.2 Electrical performance

7.2.1 Insulation resistance When the test of 9.2.1 is carried out, the insulation resistance shall satisfy the provision of the detail specification.

7.2.2 Voltage proof When the test of 9.2.2 is carried out, the specimen shall not show the abnormalities specified in the detail specification.

7.2.3 Contact resistance When the test of 9.2.3 is carried out, the contact resistance shall satisfy the provision of the detail specification.

7.2.4 Voltage standing-wave ratio (VSWR) When the test of 9.2.4 is carried out, the voltage standing-wave ratio shall satisfy the values prescribed in the detail specification.

7.2.5 Local discharge (corona discharge) When the test of 9.2.5 is carried out, there shall be no continuous local discharge at a voltage not exceeding the minimum extinction voltage prescribed in the detail specification.

7.2.6 Water immersion When the water immersion test is carried out as specified in 9.2.6, there shall be no ingress of water inside the connector. The values of insulation resistance stated in 7.2.1 and of voltage proof stated in 7.2.2 tested during immersion into water shall satisfy the relevant provision of the detail specification.

7.3 Mechanical performances

7.3.1 Interchangeability When the interchangeability test is carried out as specified in 9.3.1, the specimen shall mate and separate without any abnormality.

7.3.2 Vibration When the vibration test is carried out as specified in 9.3.2, the connector shall be free from mechanical damage at every part and chattering of the contacts during the test shall not exceed one microsecond (μ s).

After the test, the contact resistance stated in 7.2.3 shall satisfy the provision of the detail specification.

7.3.3 Shock When the shock test is carried out as specified in 9.3.3, the connector shall be free from mechanical damage at every part and chattering of the contacts during the test shall not exceed 1 μ s.

After the test, the contact resistance stated in 7.2.3 shall satisfy the provision of the detail specification.

7.3.4 Gauge retention force of contact When the test of 9.3.4 is carried out, the gauge retention force of contact shall satisfy the value prescribed in the detail specification.

7.3.5 Contact captivation When the test of 9.3.5 is carried out, the contact captivation shall satisfy the value prescribed in the detail specification.

7.3.6 Engagement and separation forces (including coupling devices) When the test of 9.3.6 is carried out, the engagement and separation forces (including coupling devices) shall satisfy the relevant values prescribed in the detail specification.

7.3.7 Robustness of cable clamp When the tests of 9.3.7 (1) to (4) are carried out, the robustness of the cable clamp shall satisfy the relevant performances prescribed in the detail specification.

There shall be no movement, slip, rotation, etc. of the cable, and no abnormalities on the cable or cable clamping part.

7.3.8 Robustness of mated parts When the robustness test of the mated parts is carried out as specified in 9.3.8, there shall be no such abnormalities as disengagement of the connecting nut or connecting sleeve, or loosening of the stud.

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7.3.9 Robustness of connector mounting part When the robustness test of the mounting part of the connector is carried out as specified in 9.3.9, there shall be no mechanical damage to any part of the connector.

7.3.10 Repetitive operation When the repetitive operation test is carried out as specified in 9.3.10, the values of voltage proof in 7.2.2, contact resistance in 7.2.3, gauge retention force of contact in 7.3.4, and engagement and separation forces (including coupling devices) in 7.3.6 shall satisfy the relevant values prescribed in the detail specification.

7.3.11 Bending moment When the bending moment test is carried out as specified in 9.3.11, there shall be no such abnormalities as disengagement of the connecting nut or connecting sleeve, or loosening of the stud.

The engagement and separation forces (including coupling devices) of 7.3.6 shall satisfy the values prescribed in the detail specification.

7.3.12 Bump When the bump test is carried out as specified in 9.3.12, the connector shall be free from mechanical damage at every part and chattering of the contacts during the test shall not exceed 1 μ s.

After the test, the contact resistance of 7.2.3 shall satisfy the provision of the detail specification.

7.4 Climatic conditioning

7.4.1 Climatic sequence When the climatic sequence tests are carried out as specified in 9.4.2, the following requirements shall be satisfied:

- (1) **Mated connector pair** The specimen shall satisfy the values of voltage proof in 7.2.2 and of contact resistance in 7.2.3, and shall show no abnormality in appearance.
- (2) **Non-mated connector** The specimen shall satisfy the values of insulation resistance in 7.2.1, of voltage proof in 7.2.2, and of contact resistance in 7.2.3, and the performance of sealing stated in 7.4.4, and shall show no abnormality in appearance.

7.4.2 Damp heat (steady state) When the damp heat test is carried out as specified in 9.4.3, the following requirements shall be satisfied:

- (1) **Mated connector pair** The specimen shall satisfy the values of voltage proof in 7.2.2 and of contact resistance in 7.2.3, and shall show no abnormality in appearance.
- (2) **Non-mated connector** The specimen shall satisfy the values of insulation resistance in 7.2.1, of voltage proof in 7.2.2, and of contact resistance in 7.2.3, and the performance of sealing stated in 7.4.4, and shall show no abnormality in appearance.

7.4.3 Rapid change of temperature When the rapid change of temperature test is carried out as specified in 9.4.4, the following requirements shall be satisfied:

- (1) Mated connector pair The specimen shall satisfy the values of voltage proof in 7.2.2 and of contact resistance in 7.2.3, and shall show no abnormality in appearance.
- (2) Non-mated connector The specimen shall satisfy the values of insulation resistance in 7.2.1, of voltage proof in 7.2.2, and of contact resistance in 7.2.3 and the performances of sealing stated in 7.4.4, and shall show no abnormality in appearance.

7.4.4 Sealing When the sealing test is carried out as specified in 9.4.5, the specimen shall satisfy the required performances prescribed in the detail specification.

7.4.5 Salt mist When the salt mist test is carried out as specified in 9.4.6, the connector shall be free from corrosion which may impair its functions, and shall allow engagement and separation by normal procedures.

The values of voltage proof in 7.2.2 and of contact resistance in 7.2.3 shall satisfy the provisions of the detail specification.

7.4.6 Solderability When the solderability test is carried out as specified in 9.4.7, the wetting by solder shall be good.

7.4.7 High temperature endurance When the high temperature endurance test is carried out as specified in 9.4.8, the values of insulation resistance in 7.2.1, of voltage proof in 7.2.2, of contact resistance in 7.2.3 and the performances of sealing stated in 7.4.4 shall satisfy the provisions of the detail specification, and shall show no abnormality in appearance.

8. appearance, construction and dimensions

8.1 Appearance When the appearance of connectors is checked visually, no abnormality shall be observed.

8.2 Construction and dimensions For the construction and dimensions of connectors, the matters given below shall be prescribed in the detail specifications.

The tolerances on a dimension for which no tolerance is specified shall be +0.4 mm if the basic size is specified in an integer or to the first decimal place, and shall be ± 0.13 mm if the basic size is specified to the second decimal place. The angular tolerances shall be $\pm 30'$.

- (1) Construction and dimensions of the mating part
- (2) External shape
- (3) Dimension of the connector mounting part
- (4) Other dimensions necessary for compatibility

8.3 Materials and finish

8.3.1 Materials Materials which satisfy the various performances specified in this Standard and relevant detail specifications shall be used.

8.3.2 Finish

- (1) Surface treatment Surface treatments which satisfy the performance specified in this Standard shall be applied to all metallic components. The type and thickness of surface treatment shall be prescribed in the detail specification as needed.
- (2) Finish There shall be no sharp edges or sheeter lines on the metallic parts, except the parts where such edges are necessary due to mechanical or electrical reasons.

9. Tests

9.1 Test conditions

- (1) Standard conditions for testing The tests and measurements shall be carried out under the standard conditions for testing (temperature 15 to 35°C, relative humidity 25 to 85 %, air pressure 86 to 106 kPa) specified in 3.1 of JIS C 5402. If any doubt arises on the decision based on the measured values under this standard conditions or if particularly required, the tests and measurements shall be made under the conditions for judgment testing given below.
- (2) Conditions for judgment testing The conditions for judgment testing shall be as specified in 3.2 of JIS C 5402 (temperature $20 \pm 2^\circ\text{C}$, relative humidity 60 to 70 %, air pressure 86 to 106 kPa).

9.2 Electrical performance tests

9.2.1 Insulation resistance The insulation resistance test shall be as follows:

- (1) Test Measure the resistance between the center contact and the external contact of the connector (specimen) without attached cable in accordance with 5.2 (insulation resistance) of JIS C 5402. The measurement shall be made at d.c. 500 V or the voltage prescribed in the detail specification.
- (2) Item to be prescribed in detail specification The following item shall be prescribed in the detail specification:

The test voltage, if it is other than 500 V

9.2.2 Voltage proof The voltage proof test shall be as follows:

- (1) Test Test the specimen for its dielectric strength between the center contact and the external contact in accordance with 5.1 (voltage proof) of JIS C 5402.

The test voltage shall be in the r.m.s. value at power frequency and the duration of application shall be $1 \text{ min} \pm 5 \text{ s}$.