

# INTERNATIONAL STANDARD



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**Radio-frequency connectors –  
Part 59: Sectional specification for type L32-4 and L32-5 threaded multi-pin  
radio-frequency connectors**



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Part 59: Sectional specification for type L32-4 and L32-5 threaded multi-pin  
radio-frequency connectors**

INTERNATIONAL  
ELECTROTECHNICAL  
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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## RADIO-FREQUENCY CONNECTORS –

**Part 59: Sectional specification for type L32-4 and L32-5  
threaded multi-pin radio-frequency connectors**

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The text of this International Standard is based on the following documents:

|             |                  |
|-------------|------------------|
| CDV         | Report on voting |
| 46F/351/CDV | 46F/362/RVC      |

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 61169 series, under the general title: *Radio-frequency connectors*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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## **RADIO-FREQUENCY CONNECTORS –**

### **Part 59: Sectional specification for type L32-4 and L32-5 threaded multi-pin radio-frequency connectors**

#### **1 Scope**

This part of IEC 61169, which is a sectional specification (SS), provides information and rules for the preparation of detail specifications (DS) for type L32-4 and L32-5 threaded multi-pin radio frequency connectors with anti mismatching mechanism, 50  $\Omega$  nominal impedance. The operating frequency of each channel is up to 4 GHz. These connectors have been widely used in mobile communication system like TD-SCDMA and TD-LTE, and can also be used in some similar equipment.

It also prescribes mating face dimensions for general connectors-grade 2, gauging information and tests selected from IEC 61169-1, applicable to all detail specifications relating to type L32-4 and L32-5 multi-pin connectors.

This sectional specification provides information and rules for the preparation of detail specifications for type L32-4 and L32-5 multi-pin connectors together with the pro forma blank detail specification.

This specification indicates the recommended performance characteristics to be considered when writing a detail specification and it covers test schedules and inspection requirements for assessment levels M and H.

NOTE Metric dimension are original dimensions.

All undimensioned pictorial configurations are for reference purpose only.

#### **2 Normative references**

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61169-1:2013, *Radio frequency connectors – Part 1: Generic specification – General requirements and measuring methods*

IEC 61726, *Cable assemblies, cables, connectors and passive microwave components – Screening attenuation measurement by the reverberation chamber method*

IEC 62037 (all parts), *Passive RF and microwave devices, intermodulation level measurement*

#### **3 Terms and definitions**

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:



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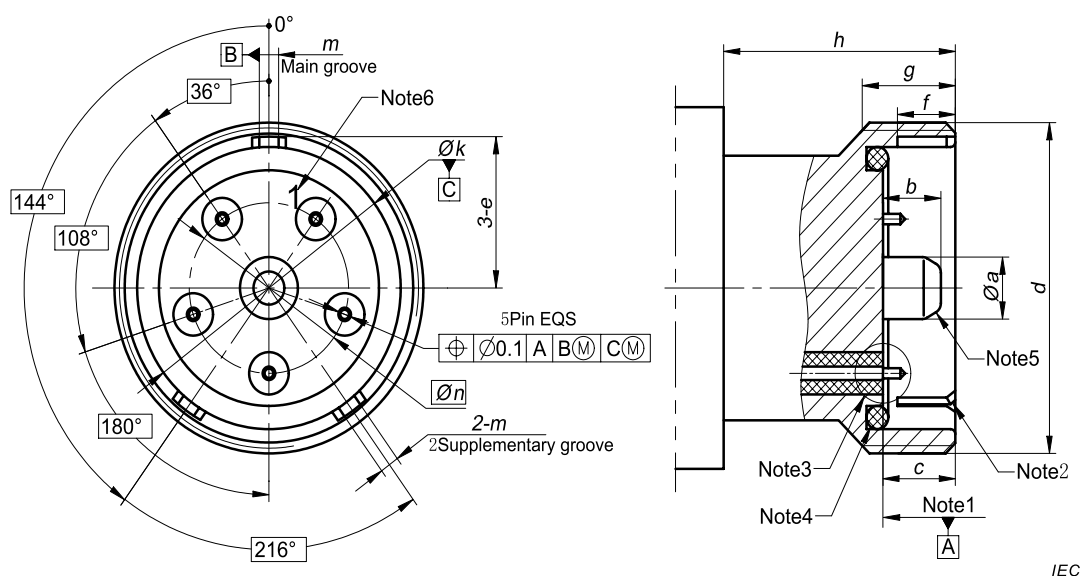
## 4 Mating face and gauge information

### 4.1 Dimensions – General connectors – Grade 2

#### 4.1.1 Connector with pin contact

##### 4.1.1.1 L32-5 connector with 5 pin contacts

The mating face of L32-5 connector with 5 pin contacts is shown in Figure 1 and its dimensions are shown in Table 1.



NOTE 1 Mechanical and electrical reference plane.

NOTE 2 Chamfer of three grooves is optional.

NOTE 3 The mating face of RF channel with pin contact is shown in Figure 5a) in 4.1.3 and its dimensions are shown in Table 5.

NOTE 4 The shape of seal ring is optional.

NOTE 5 Anti-mismating pin.

NOTE 6 The initial position number of RF channel with pin contact and the other positions numbered clockwise.

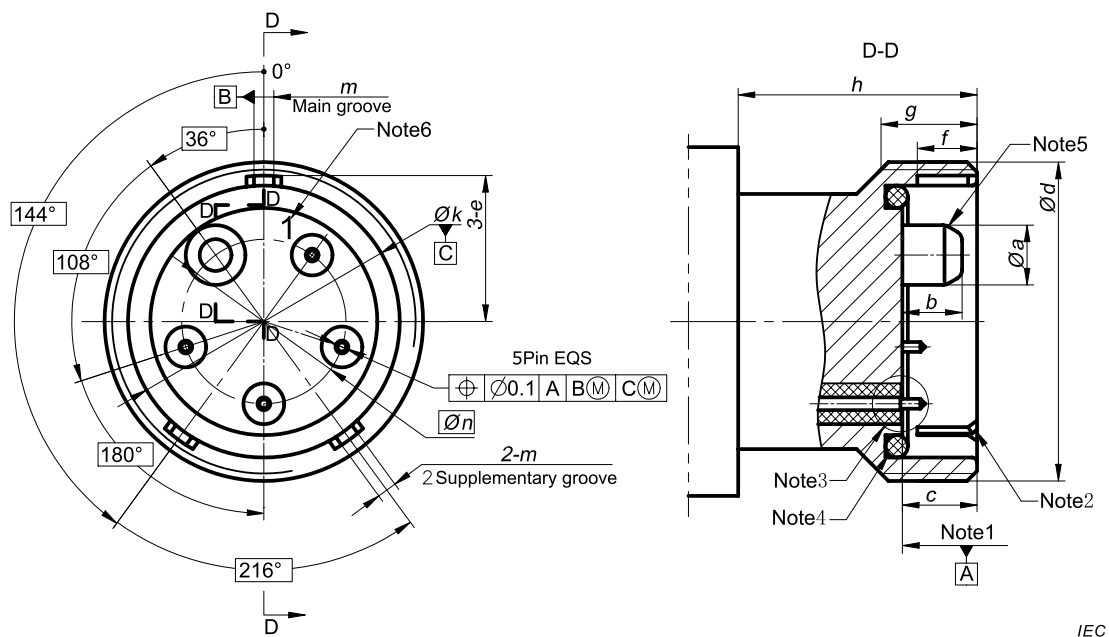
**Figure 1 – L32-5 connector with 5 pin contacts**

**Table 1 – Dimensions of L32-5 connector with 5 pin contacts**

| Ref.     | mm         |      |
|----------|------------|------|
|          | Min.       | Max. |
| <i>a</i> | 6,0        | 6,1  |
| <i>b</i> | 6,0        | 6,2  |
| <i>c</i> | 7,5        | 7,6  |
| <i>d</i> | M32X1,5-6g |      |
| <i>e</i> | 14,4       | 14,5 |
| <i>f</i> | 6,0        | –    |
| <i>g</i> | 9,5        | 9,7  |
| <i>h</i> | 24,0       | –    |
| <i>k</i> | 27,0       | 27,1 |
| <i>m</i> | 2,1        | 2,2  |
| <i>n</i> | 16,5       |      |

#### 4.1.1.2 L32-4 connector with 4 pin contacts

The mating face of L32-4 connector with 4 pin contacts is shown in Figure 2 and its dimensions are shown in Table 2.



NOTE 1 Mechanical and electrical reference plane.

NOTE 2 Chamfer of three grooves is optional.

NOTE 3 The mating face of RF channel with pin contact is shown in Figure 5a) in 4.1.3 and its dimensions are shown in Table 5.

NOTE 4 The shape of seal ring is optional.

NOTE 5 Anti-mismatching pin.

NOTE 6 The initial position number of RF channel with pin contact and the other positions numbered clockwise.

**Figure 2 – L32-4 connector with 4 pin contacts**

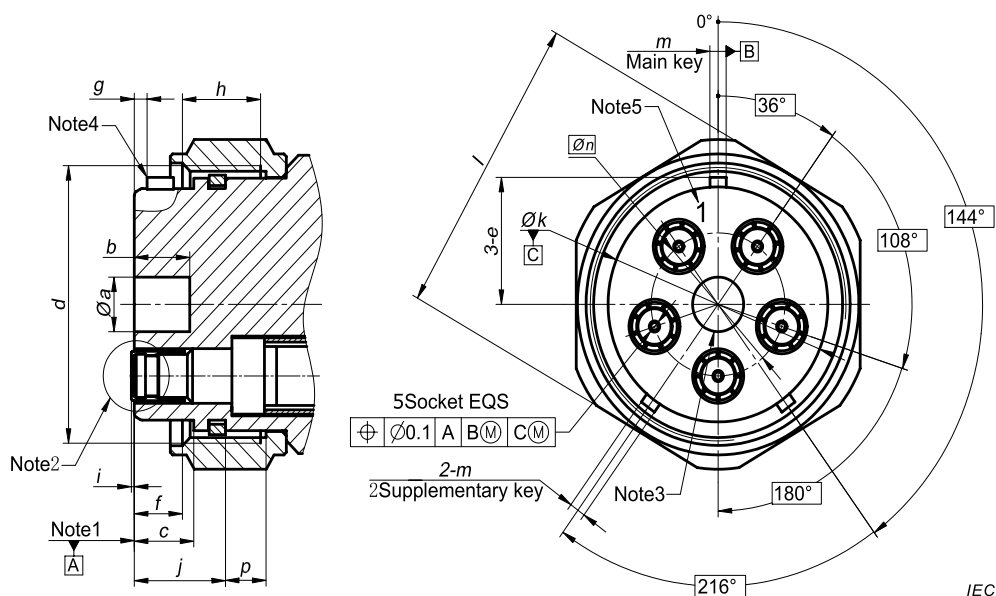
**Table 2 – Dimensions of L32-4 connector with 4 pin contacts**

| Ref.     | mm            |      |
|----------|---------------|------|
|          | Min.          | Max. |
| <i>a</i> | 6,0           | 6,1  |
| <i>b</i> | 6,0           | 6,2  |
| <i>c</i> | 7,5           | 7,6  |
| <i>d</i> | M32X1,5-6g    |      |
| <i>e</i> | 14,4          | 14,5 |
| <i>f</i> | 6,0           | --   |
| <i>g</i> | 9,5           | 9,7  |
| <i>h</i> | 24,0          | --   |
| <i>k</i> | 27,0          | 27,1 |
| <i>m</i> | 2,1           | 2,2  |
| <i>n</i> | 16,5<br>16,52 |      |

#### 4.1.2 Connector with socket contact

##### 4.1.2.1 L32-5 connector with 5 socket contacts

The mating face of L32-5 connector with 5 socket contacts is shown in Figure 3 and its dimensions are shown in Table 3.



NOTE 1 Mechanical and electrical reference plane.

NOTE 2 The mating face of RF channel with socket contact is shown in Figure 5b) in 4.1.3 and its dimensions are shown in Table 5.

NOTE 3 Anti-mismating socket.

NOTE 4 The shape of key of shell is optional.

NOTE 5 The initial position number of RF channel with socket contact and the other positions numbered anti-clockwise.

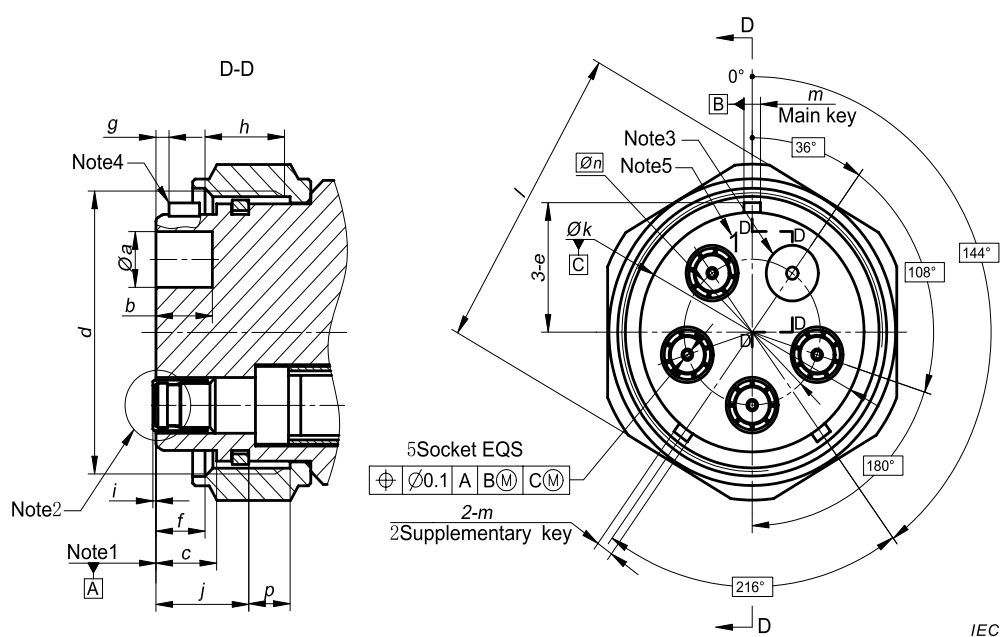
**Figure 3 – L32-5 connector with 5 socket contacts**

**Table 3 – Dimensions of L32-5 connector with 5 socket contacts**

| Ref.     | mm            |      |
|----------|---------------|------|
|          | Min.          | Max. |
| <i>a</i> | 6,25          | 6,35 |
| <i>b</i> | 7,0           | --   |
| <i>c</i> | 7,7           | 7,8  |
| <i>d</i> | M32X1,5-7H    |      |
| <i>e</i> | 14,2          | 14,3 |
| <i>f</i> | 7,6           | 8,0  |
| <i>g</i> | --            | 0,8  |
| <i>h</i> | 6,8           | --   |
| <i>i</i> | 0,08          | 0,3  |
| <i>j</i> | 11,5          | 11,7 |
| <i>k</i> | 26,6          | 26,7 |
| <i>l</i> | 34,9          | 35,0 |
| <i>m</i> | 1,9           | 2,0  |
| <i>n</i> | 16,5<br>16,52 |      |
| <i>p</i> | 5,8           | 6,1  |

#### 4.1.2.2 L32-4 connector with 4 socket contacts

The mating face of L32-4 connector with 4 socket contacts is shown in Figure 4 and its dimensions are shown in Table 4.



NOTE 1 Mechanical and electrical reference plane.

NOTE 2 The mating face of RF channel with socket contact is shown in Figure 5b) in 4.1.3 and its dimensions are shown in Table 5.

NOTE 3 Anti-mismatching socket.

NOTE 4 The shape of key of shell is optional.

NOTE 5 The initial position number of RF channel with socket contact and the other positions numbered anti-clockwise.

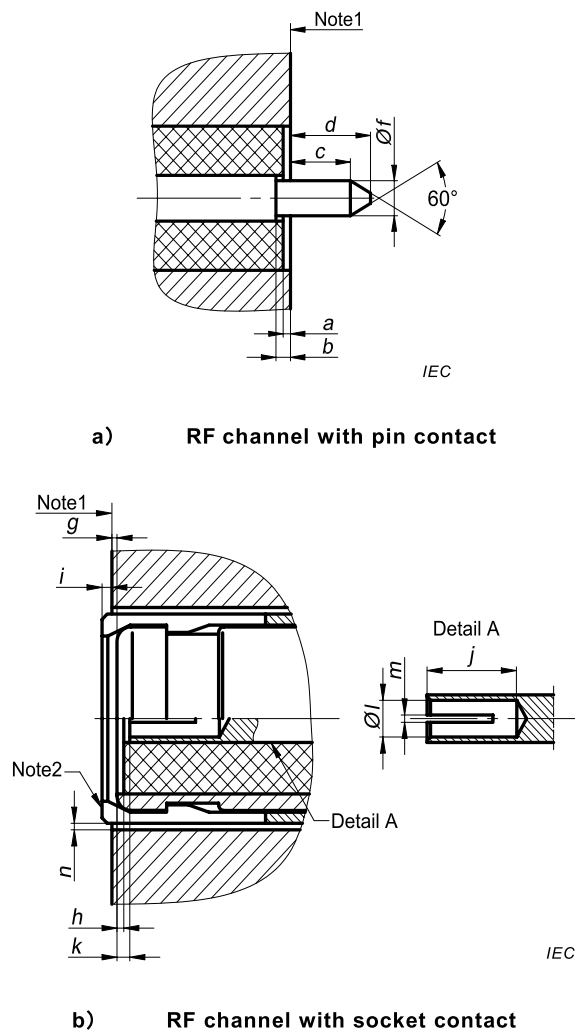
**Figure 4 – L32-4 connector with 4 socket contacts**

**Table 4 – Dimensions of L32-4 connector with 4 socket contacts**

| Ref.     | mm         |       |
|----------|------------|-------|
|          | Min.       | Max.  |
| <i>a</i> | 6,25       | 6,35  |
| <i>b</i> | 7,0        | –     |
| <i>c</i> | 7,7        | 7,8   |
| <i>d</i> | M32X1,5-7H |       |
| <i>e</i> | 14,2       | 14,3  |
| <i>f</i> | 7,6        | 8,0   |
| <i>g</i> | –          | 0,8   |
| <i>h</i> | 6,8        | –     |
| <i>i</i> | 0,08       | 0,3   |
| <i>j</i> | 11,5       | 11,7  |
| <i>k</i> | 26,6       | 26,7  |
| <i>l</i> | 34,9       | 35,0  |
| <i>m</i> | 1,9        | 2,0   |
| <i>n</i> | 16,5       | 16,52 |
| <i>p</i> | 5,8        | 6,1   |

### 4.1.3 Mating face of RF channel

The mating face of RF channel with pin contact is shown in Figure 5a), the mating face of RF channel with socket contact is shown in Figure 5b), their dimensions are shown as Table 5.



NOTE 1 Mechanical and electrical reference plane.

NOTE 2 The position of floating outer conductor in free state and its slot design is optional.

**Figure 5 – Mating face of RF channel**

**Table 5 – Dimensions of the mating face of RF channel**

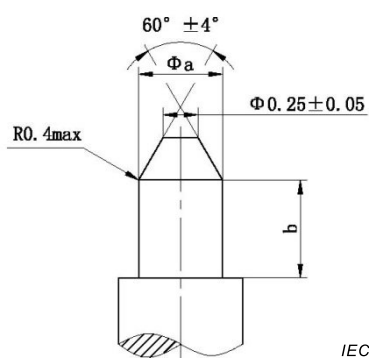
| Ref.                  | mm    |       |
|-----------------------|-------|-------|
|                       | Min.  | Max.  |
| <i>a</i>              | 0,00  | 0,25  |
| <i>b</i>              | 0,00  | 0,25  |
| <i>c</i>              | 1,27  | –     |
| <i>d</i>              | –     | 2,54  |
| <i>f</i>              | 0,902 | 0,935 |
| <i>g</i>              | 0,00  | 0,10  |
| <i>h</i>              | 0,00  | 0,25  |
| <i>i</i>              | 0,08  | 0,30  |
| <i>j</i>              | 2,67  | –     |
| <i>k</i>              | 0,00  | 0,25  |
| <i>l</i> <sup>a</sup> | –     | –     |
| <i>m</i> <sup>b</sup> | –     | –     |
| <i>n</i> <sup>c</sup> | 0,3   | –     |

a It is assumed that the mechanical and electrical requirements are met with the chosen dimension for pin  $\Phi 0,902$  mm to  $\Phi 0,935$  mm,  
 b Slot design is optional, as soon as it meets the mechanical and electrical requirements.  
 c 0,2 mm to 0,3 mm of radial displacement is allowed when mating of RF channel with pin contact.

## 4.2 Gauges

### 4.2.1 Gauge for socket centre contact

The gauge for socket contact of RF channel is shown in Figure 6 and its dimensions are shown in Table 6.

**Figure 6 – Gauge for socket contact of RF channel**

**Table 6 – Dimensions of gauge for socket contact**

| Ref. | Gauge A<br>(For sizing purpose) |       | Gauge B<br>(For insertion purpose) |       | Gauge C<br>(For retention purpose)<br>Mass of gauge : $28^{+2}_{-0}$ g |       |
|------|---------------------------------|-------|------------------------------------|-------|--|-------|
|      | mm                              |       | mm                                 |       | mm   |       |
|      | Min.                            | Max.  | Min.                               | Max.  | Min.   | Max.  |
| a    | 0,950                           | 0,955 | 0,935                              | 0,940 | 0,899  | 0,902 |
| b    | 0,76                            | 1,14  | 1,27                               | 1,91  | 1,27   | 1,91  |

Material: steel, polished. Surface roughness:  $R_a \leq 0,4 \mu\text{m}$ .

Test procedure:

a) Sizing test

The gauge A should insert the socket centre contact of RF channel three times; this is a sizing operation.

b) Insertion test

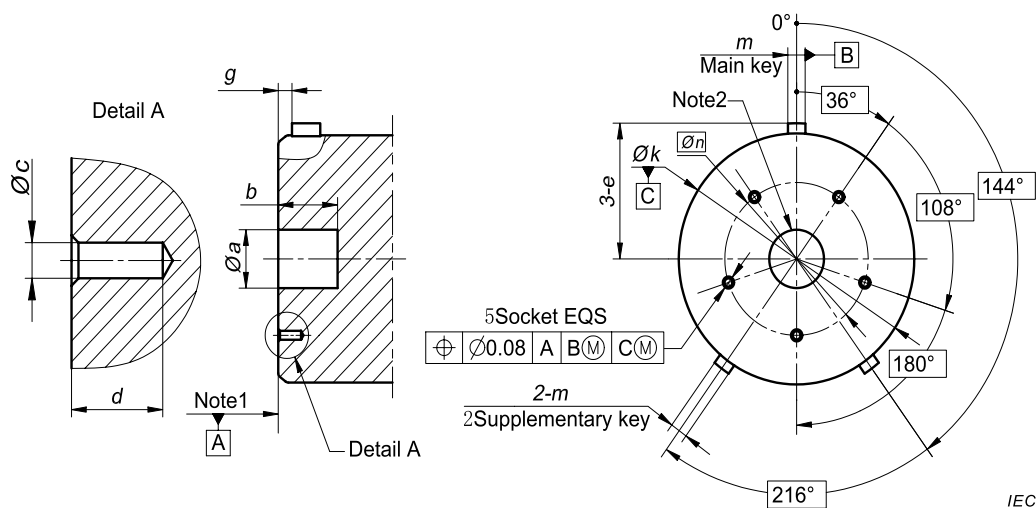
Following the sizing operation, if specified in the detail specification, the force necessary to insert Gauge B fully into the socket centre contact shall be measured. When this test is required, the insertion force shall not exceed 8,9 N.

c) Retention test

After sizing or insertion test, the gauge C shall be inserted into the socket centre contact. The contact shall retain the mass of the gauge C in a vertical downward position.

**4.2.2 Gauge for type L32-5 connector with 5 pin contacts**

The gauge for type L32-5 connector with 5 pin contacts is shown in Figure 7 and its dimensions are shown in Table 7.



NOTE 1 Mechanical and electrical reference plane.

NOTE 2 Anti-mismatching socket.

**Figure 7 – Gauge for L32-5 connector with 5 pin contacts**



**Table 7 – Dimensions of gauge L32-5 connector with 5 pin contacts**

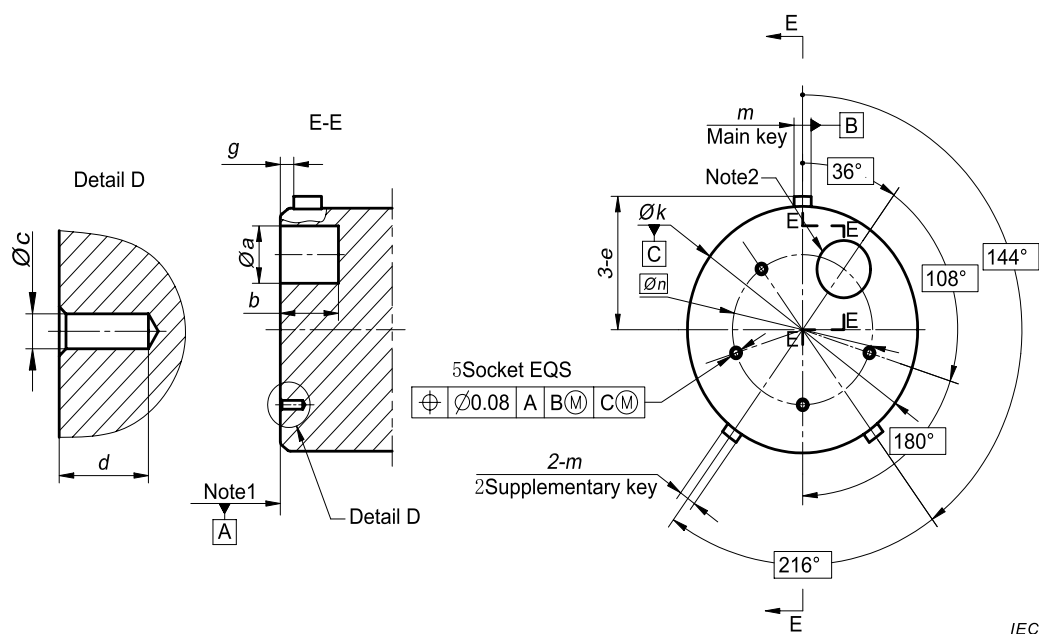
| Ref.     | mm    |       |
|----------|-------|-------|
|          | Min.  | Max.  |
| <i>a</i> | 6,25  | 6,35  |
| <i>b</i> | 7,0   | –     |
| <i>c</i> | 0,935 | 0,940 |
| <i>d</i> | 2,67  | –     |
| <i>e</i> | 14,4  | 14,5  |
| <i>g</i> | –     | 0,8   |
| <i>k</i> | 26,65 | 26,70 |
| <i>m</i> | 1,95  | 2,00  |
| <i>n</i> | 16,48 | 16,52 |

Test procedure:

Mechanical compatibility test: The gauge should insert the L32-5 connector with 5 pin contacts three times, and then measure the insertion force; the insertion force should be not less than 50 N.

#### 4.2.3 Gauge for L32-4 connector with 4 pin contacts

The gauge for L32-4 connector with 4 pin contacts is shown in Figure 8 and its dimensions are shown in Table 8.



NOTE 1 Mechanical and electrical reference plane.

NOTE 2 Anti-mismatching socket.

**Figure 8 – Gauge for L32-4 connector with 4 pin contacts**

**Table 8 – Dimensions of gauge L32-4 connector with 4 pin contacts**

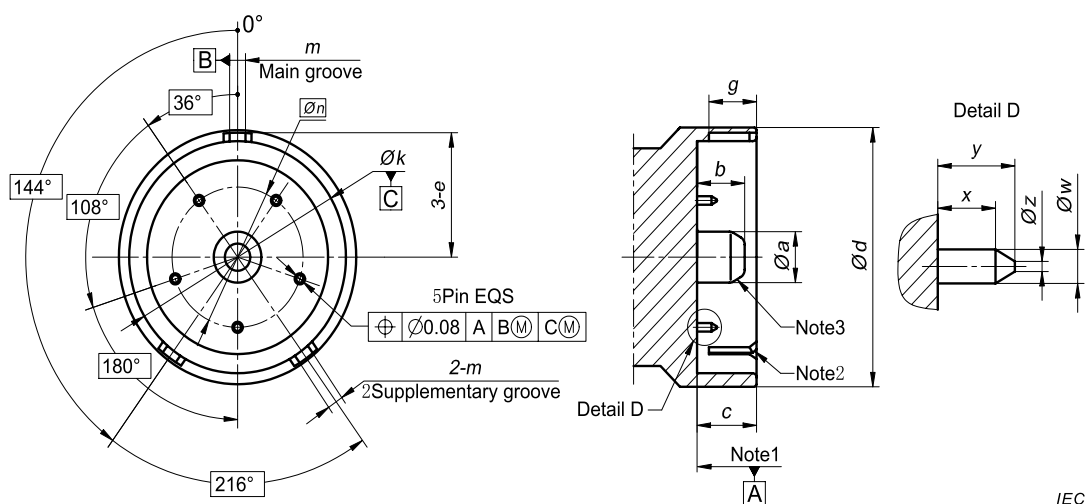
| Ref.     | mm    |       |
|----------|-------|-------|
|          | Min.  | Max.  |
| <i>a</i> | 6,25  | 6,35  |
| <i>b</i> | 7,0   | –     |
| <i>c</i> | 0,935 | 0,940 |
| <i>d</i> | 2,67  | –     |
| <i>e</i> | 14,4  | 14,5  |
| <i>g</i> | –     | 0,8   |
| <i>k</i> | 26,65 | 26,70 |
| <i>m</i> | 1,95  | 2,00  |
| <i>n</i> | 16,48 | 16,52 |

Test procedure:

Mechanical compatibility test: The gauge should insert the L32-4 connector with 4 pin contacts three times, and then measure the insertion force; the insertion force should be not less than 50 N.

#### 4.2.4 Gauge for L32-5 connector with 5 socket contacts

The gauge for L32-5 connector with 5 socket contacts is shown in Figure 9 and its dimensions are shown in Table 9.



NOTE 1 Mechanical and electrical reference plane.

NOTE 2 Chamfer of three grooves is optional.

NOTE 3 Anti-mismatching pin.

**Figure 9 – Gauge for L32-5 connector with 5 socket contacts**

**Table 9 – Dimensions of gauge for L32-5 connector with 5 socket contacts**

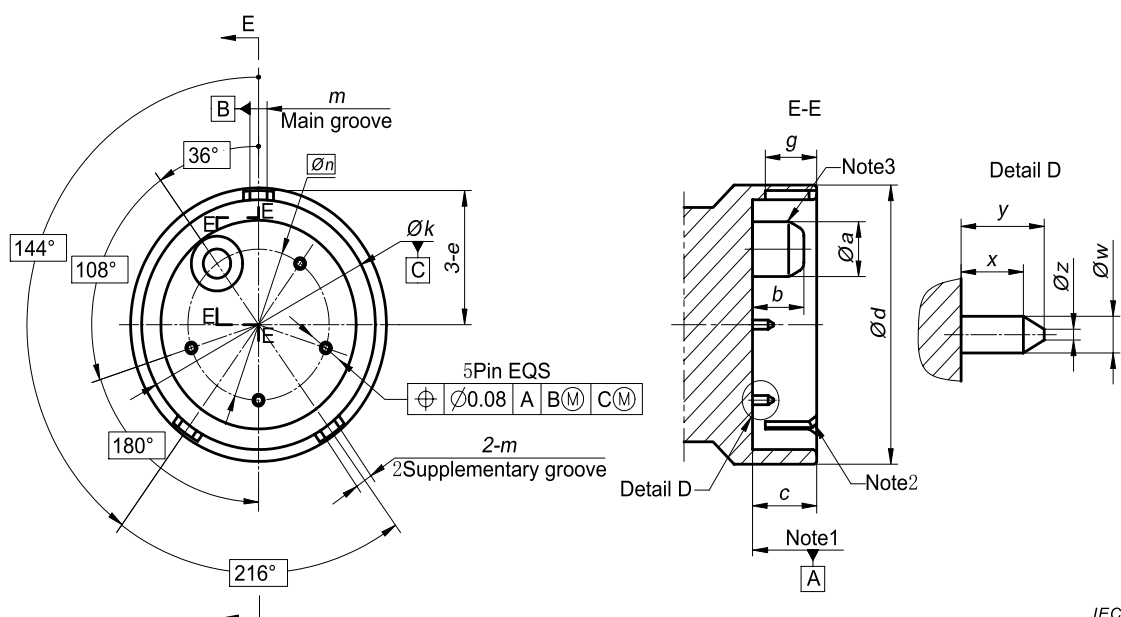
| Ref.     | mm    |       |
|----------|-------|-------|
|          | Min.  | Max.  |
| <i>a</i> | 6,0   | 6,1   |
| <i>b</i> | 6,0   | 6,2   |
| <i>c</i> | 7,5   | 7,6   |
| <i>d</i> | 29,8  | 30,0  |
| <i>e</i> | 14,4  | 14,5  |
| <i>g</i> | 6,0   | –     |
| <i>k</i> | 27,00 | 27,05 |
| <i>m</i> | 2,10  | 2,15  |
| <i>n</i> | 16,48 | 16,52 |
| <i>w</i> | 0,899 | 0,902 |
| <i>x</i> | 1,27  | 1,91  |
| <i>y</i> | –     | 2,54  |
| <i>z</i> | 0,10  | 0,30  |

Test procedure:

Mechanical compatibility test: The gauge should insert the L32-5 connector with socket contact three times, and then measure the insertion force; the insertion force should be not less than 50 N.

#### **4.2.5 Gauge for L32-4 connector with 4 socket contacts**

The gauge for L32-4 connector with 4 socket contacts is shown in Figure 10 and its dimensions are shown in Table 10.



IEC

NOTE 1 Mechanical and electrical reference plane.

NOTE 2 Chamfer of three grooves is optional.

NOTE 3 Anti-mismatching pin.

**Figure 10 – Gauge for L32-4 connector with 4 socket contacts**

**Table 10 – Dimensions of gauge for L32-4 connector with 4 socket contacts**

| Ref. | mm    |       |
|------|-------|-------|
|      | Min.  | Max.  |
| a    | 6,0   | 6,1   |
| b    | 6,0   | 6,2   |
| c    | 7,5   | 7,6   |
| d    | 29,8  | 30,0  |
| e    | 14,4  | 14,5  |
| g    | 6,0   | –     |
| k    | 27,00 | 27,05 |
| m    | 2,10  | 2,15  |
| n    | 16,48 | 16,52 |
| w    | 0,899 | 0,902 |
| x    | 1,27  | 1,91  |
| y    | –     | 2,54  |
| z    | 0,10  | 0,30  |

Test procedure:

Mechanical compatibility test: The gauge should insert the L32-4 connector with 4 socket contacts three times, and then measure the insertion force; the insertion force should be not less than 50 N.

## **5 Quality assessment procedure**

### **5.1 General**

Subclauses 5.2 to 5.4 provide recommended rating, performance and test conditions to be considered when writing a detail specification. They also prescribe the test schedules and procedure that suit the corresponding quality inspection level.

### **5.2 Rating and characteristics**

The values indicated below are recommended for type L32-4 and L32-5 threaded multi-pin radio frequency connector and are given for the writer of the detail specification. They are applicable for the condition when the connectors are fully mated. The preferable characteristics can be seen in Table 11.

Certain tests are listed without any recommended values being given when they are not required. When such tests are required, appropriate values shall be entered in the detail specification at the discretion of the specification writer.

**Table 11 – Rating and characteristics**

| Rating and characteristics                      | Test method<br>IEC 61169-<br>1:2013<br>Subclause | Value   | Remarks or<br>deviations from<br>standard test<br>methods   |
|---|--|---|---|
| Electrical                                      |  |   |   |
| Nominal impedance                               |  | 50 $\Omega$   |   |
| Frequency range <sup>a</sup>                    |  | DC~4 GHz  |   |
| Return loss                                     | 9.2.1  | $\geq 19$ dB (DC-2,7 GHz)<br>$\geq 16,5$ dB (2,7 GHz to<br>4 GHz) | Test each RF channel<br>separately  |
| Centre contact resistance <sup>b</sup>          | 9.2.3  |   | Test each RF channel<br>separately  |
| – initial                                       |  | $\leq 3,0$ m $\Omega$   |   |
| – after conditioning                            |  | $\leq 5,0$ m $\Omega$   |   |
| Outer conductor resistance                      | 9.2.3  |   | Test each RF channel<br>separately  |
| – initial                                       |  | $\leq 5,0$ m $\Omega$   |   |
| – after conditioning                            |  | $\leq 8,0$ m $\Omega$   |   |
| Insulation resistance <sup>b</sup>              | 9.2.5  |   | Test each RF channel<br>separately  |
| – initial                                       |  | $\geq 5\,000$ M $\Omega$  |   |
| – after conditioning                            |  | $\geq 200$ M $\Omega$   |   |
| Proof voltage at sea level <sup>c d</sup>       | 9.2.6  | 1 000 V   | 86 kPa to<br>106 kPa, Test each<br>RF channel<br>separately   |
| Screening effectiveness <sup>e</sup>            | IEC 61726  | $\geq 50$ dB, 2 to 3 GHz  | $Z_i \leq 10$ m $\Omega$ , Test each<br>RF channel<br>separately                                      |
| Discharge test                                  | 9.2.8  | See DS  | Test each RF channel<br>separately  |
| Isolation                                       | Annex A of this<br>document                      | $\geq 80$ dB, 0,05 GHz to<br>4 GHz                                | Test between two<br>adjacent <b>RF</b> channels   |
| Intermodulation level (PIM3)                    | 9.2.9  | Better than –155 dBc<br>Power: 2×20 W                             | Test each RF channel<br>separately  |
| Mechanical                                      |  |   |   |
| Centre contact captivation                      | 9.3.5  |   | Test each RF channel<br>separately  |
| – axial force<br>– axial torque                 |  | $\geq 22$ N<br>See DS   | After the test, the<br>centre contact meets<br>the requirement for<br>the dimension of<br>mating face |
| Outer contact captivation                       | 9.3.5  |   | Test each RF channel<br>with socket centre<br>contact separately                                      |
| – axial force                                   |  | $\geq 240$ N  | After the test, the<br>centre contact meets<br>the requirement for<br>the dimension of<br>mating face |
| Engagement and separation forces<br>and torques | 9.3.6  |   |   |

| Rating and characteristics  | Test method<br>IEC 61169-<br>1:2013<br>Subclause | Value   | Remarks or<br>deviations from<br>standard test<br>methods |
|---|--|---|---|
| – axial force<br>– torque   |  | $\leq 50$ N<br>$\leq 4,1$ N·m   |   |
| Gauge retention (resilient contacts)<br>centre contact  | 9.3.4  | $\geq 0,28$ N   | See 4.2.1   |
| Mechanical compatibility  | 9.1.2.2  | Insertion force $\leq 50$ N   | See 4.2.2 and 3.2.5                                       |
| Mechanical test for cable clamping<br>device  |  |   |   |
| – cable rotation (nutating of cable<br>end)   | 9.3.7  | See DS  |   |
| – cable pulling   | 9.3.8  | See DS  |   |
| – cable bending   | 9.3.9  | See DS  |   |
| – cable torsion   | 9.3.10   | See DS  |   |
| Strength of coupling mechanism  | 9.3.11   | Axial force: $\geq 450$ N<br>Coupling torque<br>resistance: $\geq 30$ N·m |   |
| Vibration   | 9.3.3  | $50 \text{ m/s}^2$ (10 Hz to<br>2 000 Hz)                                 |   |
| Shock   | 9.3.14   | $500 \text{ m/s}^2$ , 1/2 sine<br>wave, 11 ms                             |   |
| Environmental   |  |   |   |
| Climatic category <sup>f</sup>  |  | A:40/85/21  |   |
| Sealing non-hermetic sealed<br>connectors   | 9.4.7  | See DS  |   |
| Water immersion test  | 9.4.9  | See DS  |   |
| Salt mist   | 9.4.10   | 48 h  | Duration of spraying                                      |
| Endurance   |  |   |   |
| Mechanical endurance  | 9.3.15   | 200 operations  |   |
| <p><sup>a</sup> These values apply to a basic connector. In practice, these may be influenced by the cable used and reference should always be made to the actual values given in the DS.</p> <p><sup>b</sup> Values for a single pair of RF channel.</p> <p><sup>c</sup> Voltages are RMS values of AC at 40 Hz to 65 Hz, unless otherwise specified.</p> <p><sup>d</sup> Some cables usable with these connectors have ratings lower than the values given here.</p> <p><sup>e</sup> When interfaces are fully mated.</p> <p><sup>f</sup> For certain connectors, the upper temperature limit is restricted by the cable characteristics. Reference should be made to the relevant cable specification.</p> |  |   |   |

### 5.3 Test schedule and inspection requirements

#### 5.3.1 Acceptance tests

Table 12 describes the acceptance tests to be performed.

**Table 12 – Acceptance tests**

| –  | Test method<br>IEC 61169-1 | Assessment level M (higher) |    |       |            | Assessment level H (lower) |    |       |            |
|--|----------------------------|-----------------------------|----|-------|------------|----------------------------|----|-------|------------|
|  | Subclause                  | Test required               | IL | AQL   | Period     | Test required              | IL | AQL   | Period     |
|  |                            |                             |    | %     |            |                            |    | %     |            |
| Group A1   |                            |                             |    |       | Lot by lot |                            |    |       | Lot by lot |
| Visual examination   | 9.1.1                      | a                           | II | 1     |            | a                          | S3 | 1,5   |            |
| Group B1   |                            |                             |    |       |            |                            |    |       |            |
| Outline dimension  | 9.1.2                      | a                           | S4 | 0,4   |            | a                          | S3 | 4,0   |            |
| Mechanical compatibility   | 9.1.2.2                    | a                           | II | 1     |            | a                          | S3 | 1,5   |            |
| Engagement and separation  | 9.3.6                      | a                           | S4 | 0,4   |            | a                          | S3 | 1,5   |            |
| Gauge retention (resilient contacts)                                   | 9.3.4                      | ia                          | II | 1     |            | ia                         | S3 | 1,5   |            |
| Sealing  |                            |                             |    |       |            |                            |    |       |            |
| non hermetic   | 9.4.7                      | ia                          | II | 0,65  |            | ia                         | S3 | 1     |            |
| hermetic   | 9.4.8                      | ia                          | II | 0,015 |            | ia                         | S3 | 0,025 |            |
| Voltage proof  | 9.2.6                      | a                           | II | 0,4   |            | a                          | II | 4,0   |            |
| Solderability (d)  | 9.3.2.2                    | ia                          | S4 | 0,4   |            | ia                         | S3 | 4,0   |            |
| Insulation resistance  | 9.2.5                      | a                           | S4 | 0,4   |            | a                          | S3 | 4,0   |            |
| For the tables, abbreviations and procedures, see the end of Table 13. |                            |                             |    |       |            |                            |    |       |            |

### 5.3.2 Periodic tests

Table 13 describes the periodic tests to be performed.

There are no group C tests for levels H and M.



Table 13 – Periodic tests

|   | Test method<br>IEC 61169-1<br>Subclause | Assessment level M (higher) |                     |                                |         | Assessment level H (lower) |                     |                                |         |
|---|---|-----------------------------|---------------------|--------------------------------|---------|----------------------------|---------------------|--------------------------------|---------|
|   |   | Test required               | Number of specimens | Permitted failures per group1# | Period  | Test required              | Number of specimens | Permitted failures per group1# | Period  |
| <b>Group D1 (d)</b>   |   |                             | 6                   | 1                              | 3 years |                            | 3                   | 1                              | 3 years |
| Solderability - connector assemblies  | 9.3.2.2                                 | ia                          |                     |                                |         | ia                         |                     |                                |         |
| Resistance to soldering heat  | 9.3.2.3                                 | ia                          |                     |                                |         | ia                         |                     |                                |         |
| Mechanical tests on cable fixing  |   |                             |                     |                                |         |                            |                     |                                |         |
| Cable rotation (nutating)   | 9.3.7                                   | na                          |                     |                                |         | na                         |                     |                                |         |
| Cable pulling   | 9.3.8                                   | ia                          |                     |                                |         | ia                         |                     |                                |         |
| Cable bending   | 9.3.9                                   | ia                          |                     |                                |         | ia                         |                     |                                |         |
| Cable torsion   | 9.3.10                                  | ia                          |                     |                                |         | ia                         |                     |                                |         |
| <b>Group D2 (d)</b>   |   |                             | 6                   | 1                              | 3 years |                            | 3                   | 1                              | 3 years |
| Contact resistance, outer conductor and screen continuity centre conductor continuity | 9.2.3                                   | a                           |                     |                                |         | a                          |                     |                                |         |
| Vibration   | 9.3.3                                   | a                           |                     |                                |         |                            |                     |                                |         |
| Damp heat, steady state   | 9.4.3                                   | a                           |                     |                                |         | a                          |                     |                                |         |
| <b>Group D3 (d)</b>   |   |                             | 1                   | 1                              | 3 years |                            | 1*                  | 1                              | 3 years |
| Dimensions piece-parts and materials  | 9.1.2                                   | a                           |                     |                                |         | a                          |                     |                                |         |
| <b>Group D4 (d)</b>   |   |                             | 6                   | 1                              | 3 years |                            | 3                   | 1                              | 3 years |
| Mechanical endurance  | 9.3.15                                  | a                           |                     |                                |         | a                          |                     |                                |         |
| High temperature endurance  | 9.4.5                                   | a                           |                     |                                |         | a                          |                     |                                |         |
| Discharge test  | 9.2.8                                   |                             |                     |                                |         |                            |                     |                                |         |
| Climatic conditioning   | 9.4                                     | na                          |                     |                                |         | na                         |                     |                                |         |
| <b>Group D5 (d)</b>   |   |                             | 6                   | 1                              | 3 years |                            | 3                   | 1                              | 3 years |
| Reflection factor   | 9.2.1                                   | a                           |                     |                                |         | a                          |                     |                                |         |
| Screening effectiveness   | 9.2.7                                   | a                           |                     |                                |         | a                          |                     |                                |         |
| Water immersion   | 9.4.9                                   | ia                          |                     |                                |         | ia                         |                     |                                |         |
| <b>Group D6 (d)</b>   |   |                             | 6                   | 1                              | 3 years |                            | 3                   | 1                              | 3 years |

|  | Test method IEC 61169-1 Subclause | Assessment level M (higher) |                     |                                |                | Assessment level H (lower) |                     |                                |                |
|--|-----------------------------------|-----------------------------|---------------------|--------------------------------|----------------|----------------------------|---------------------|--------------------------------|----------------|
|  |                                   | Test required               | Number of specimens | Permitted failures per group1# | Period         | Test required              | Number of specimens | Permitted failures per group1# | Period         |
| Contact captivation  | 9.3.5                             | a                           |                     |                                |                | a                          |                     |                                |                |
| Rapid change of temperature  | 9.4.4                             | na                          |                     |                                |                | na                         |                     |                                |                |
| Climatic sequence  | 9.4.2                             | a                           |                     |                                |                | a                          |                     |                                |                |
| <b>Group D7 (d)</b>  |                                   |                             | <b>1§</b>           |                                | <b>3 years</b> |                            | <b>1§</b>           |                                | <b>3 years</b> |
| Salt mist  | 9.4.10                            | a                           |                     |                                |                |                            |                     |                                |                |
| a suggested as applicable<br>ia test suggested (if technically applicable)<br>na not applicable<br>IL inspection level<br>AQL acceptable quality level<br>* one set of piece-parts each style and variant, unless using common piece parts<br># for qualification approval (QA), a total of two failures only permitted for level H and 1 failure only for level M from groups D1 to D7<br>§ Group D7 – number of pairs for each solvent<br>(d) destructive tests – specimens shall not be returned to stock |                                   |                             |                     |                                |                |                            |                     |                                |                |

## 5.4 Procedures for the qualification approval

### 5.4.1 Quality conformance inspection

This shall consist of test group A1 and B1 on a lot-by-lot basis and test group D1 to D7 on a periodic basis.

### 5.4.2 Qualification approval and its maintenance

This shall consist of three consecutive lots passing test groups A1 and B1 followed by selection of specimens from the lots as appropriate. These specimens shall successfully pass the specified periodic D tests.

### 5.4.3 Periodic tests

There are no group C tests for levels H and M. Table 13 lists the periodic tests to be performed.

### 5.4.4 Procedures for quality conformance

#### 5.4.4.1 Quality conformance inspection

This shall consist of test group A1 and B1 on a lot-by-lot basis.

#### 5.4.4.2 Quality conformance and its maintenance

This shall consist of three consecutive lots passing test groups A1 and B1 followed by selection of specimens from the lots as appropriate. These specimens shall successfully pass the specified periodic D tests.

## 6 Instructions for preparation of detail specifications

### 6.1 General

Detail specifications (DS) writers shall use the appropriate blank detail specification (BDS). The following pages comprise the BDS dedicated for use with Type L32-4 and L32-5 threaded multi-pin radio frequency connectors. As such, it will have already entered on it information relating to:

- a) the basic specification number applicable to all the detail specifications covering connector styles of the series covered by the sectional specification;
- b) the connector series designation.

The specification writer should enter the details relating to the connector style to be covered as indicated. The numbers in brackets in the BDS correspond to the following indications, which shall be given.

### 6.2 Identification of the component

- 1) Enter the following details:
  - Style: the style designation of the connector including type of fixing and sealing if applicable.
  - Attachment: by deletion of the inapplicable options of cable/wire given for centre and outer conductors.
  - Special features and markings: as applicable.
  - Series designation: in bold characters/digits approximately 15 mm high.
- 2) Enter details of assessment level and the climatic category.
- 3) A reproduction of the outline drawing and details of the panel piercing (if applicable). It shall provide the maximum envelope dimensions, also the position of the reference plane and, in the case of a fixed connector, the position of the mounting plane both relative to the front face of the connector.
- 4) Any maximum panel thickness limitations for fixed connectors shall be stated.
- 5) Particulars of all variants covered by the DS. As appropriate, the information shall include:
  - cable types (or sizes) applicable to each variant;
  - alternative plated or protective finishes;
  - details of alternative mounting flanges having either tapped or plain mounting holes;
  - details of alternative solder spills or solder buckets including, when applicable, those for use with microwave integrated circuit (MIC) components.

### 6.3 Performance

- 6) Performance data listing the most important characteristics of the connector in accordance with the requirements of the relevant sectional specification. Deviations from the minimum requirements shall be clearly indicated. Non-applicable parameters shall be marked “na”.

### 6.4 Marking, ordering information and related matters

- 7) Insert marking and ordering information as appropriate, together with details of related documents and any invoked structural similarity.

### 6.5 Selection of tests, test conditions and severities

- 8) “na” shall be used to indicate non-applicable tests. All tests marked “a” by the detail specification writer shall be mandatory.

When using the normal procedure with a dedicated BDS, the letter “a” – for applicable – shall be entered in the “test required” column against each of the tests indicated as being

mandatory in the test schedule of the relevant sectional specification. Any additional test required at the discretion of the specification writer shall also be indicated by an “a”.

The specification writer shall also indicate, when necessary, details of deviations from the standard test methods and conditions including any relevant deviations given in the test schedule of the sectional specification.

## 6.6 Blank detail specification pro-forma for Type L32-4 and L32-5 threaded multi-pin radio frequency connectors

The following pages contain the complete BDS.

|  |                                      |  |                                     |  |      |
|--|--------------------------------------|--|-------------------------------------|--|------|
| (1)  |                                      | Page 1 of  |                                     |  |      |
|  |                                      | (2)  |                                     |  |      |
| <b>ELECTRONIC COMPONENT OF ASSESSED QUALITY IN ACCORDANCE WITH GENERIC SPECIFICATION<br/>IEC 61169-1 NATIONAL REFERENCE</b>                      |                                      | ISSUE  |                                     |  |      |
|  |                                      | (3)  |                                     |  |      |
|  |                                      | (4)  |                                     |  |      |
| <b>(5) Detail specification for radio frequency coaxial connector of assessed quality</b>  |                                      |  |                                     |  | Type |
| Style  |                                      |  | Special features and markings       |  |      |
| Method of cable/wire+ attachment   |                                      | centre conductor – solder/crimp +<br>outer conductor – solder/clamp/crimp +<br>+ delete as appropriate |                                     |  |      |
| (6) Assessment level   | Characteristic impedance<br>$\Omega$ |  | Climatic category...../...../...../ |  |      |
| (7) Outline and maximum dimensions   |                                      |  | Panel piercing and mounting details |  |      |
| (8) Variants   |                                      |  |                                     |  |      |
| Variant No.  | Description of variant               | 61196 IEC  |                                     |  |      |
|  |                                      |  |                                     |  |      |
| Information about manufacturers who have components qualified to this detail specification is available through IECQ on-line certificate system. |                                      |  |                                     |  |      |

(9) Performance (including limiting conditions of use)

| Ratings and characteristics  | Variant No. Designation | IEC 61169-1:2013 Subclause | Value                        | Remarks including any deviations from standard test methods |
|--|-------------------------|----------------------------|------------------------------|---|
| <b>Electrical</b>  |                         |                            |                              |   |
| Nominal impedance  |                         |                            | 50..Ω                        |   |
| Frequency range<br>Reflection factor   |                         | 9.2.1                      | GHz<br>GHz<br>GHz<br>GHz     | Measurement frequency range                                 |
| Centre contact resistance  |                         | 9.2.3                      | ≤ mΩ<br>≤ mΩ                 | Initial<br>After conditioning                               |
| Centre conductor continuity  |                         | 9.2.3                      | ≤ mΩ<br>≤ mΩ<br>≤ mΩ<br>≤ mΩ | Resistance change due to conditioning                       |
| Outer contact continuity   |                         | 9.2.3                      | ≤ mΩ<br>≤ mΩ                 | Initial<br>After conditioning                               |
| Insulation resistance  |                         | 9.2.5                      | ≥ GΩ<br>≥ GΩ                 | Initial<br>After conditioning                               |
| + Proof voltage at sea level   |                         | 9.2.6                      | kV<br>kV<br>kV<br>kV         | 86 kPa to 106 kPa   |
| + Proof voltage at 4,4 kPa   |                         | 9.2.6                      | kV<br>kV<br>kV<br>kV         | kPa (if not 4,4 kPa)  |
| Screening effectiveness  |                         | 9.2.7                      | dB at<br>GHz                 | $Z_1 \leq \dots$ mΩ   |
| Discharge test (corona) at sea level   |                         | 9.2.8                      | ≥ V<br>≥ V<br>≥ V<br>≥ V     | Extinction voltage  |
| <b>ADDITIONAL ELECTRICAL CHARACTERISTICS</b>                                   |                         |                            |                              |   |
| Intermodulation level  |                         | IEC 6203<br>7              | dB at<br>GHz                 | Under 2 carries of +43 dBm                                  |
|  |                         |                            |                              |   |
| + Voltage values are RMS values at 50 Hz to 60 Hz, unless otherwise specified. |                         |                            |                              |   |

| Ratings and characteristics   |  | IEC 61169-1:2013 Subclause | Value                                | Remarks including any deviations from standard test methods       |
|---|--|----------------------------|--------------------------------------|---|
| <b>Mechanical</b>   |  |                            |                                      |   |
| Soldering   |  | 9.3.2                      |                                      |   |
| Gauge retention resilient contacts<br>- inner contact<br>- outer contact                              |  | 9.3.4                      | N<br>N                               |   |
| Centre contact captivation<br>- axial force<br>- permitted displacement in each direction<br>- torque |  | 9.3.5                      | N<br>mm<br>Nm                        |   |
| Engagement and separation<br>- axial force and torques  |  | 9.3.6                      |                                      | Achievable by hand  |
| Strength of coupling mechanism  |  | 9.3.11                     | N                                    |   |
| Effectiveness of cable fixing against<br>- cable rotation   |  | 9.3.7                      | Rotations                            |   |
| - cable pulling   |  | 9.3.8                      | N<br>N<br>N<br>N                     | Point of application and duration<br>mm s<br>mm s<br>mm s<br>mm s |
| - cable bending   |  | 9.3.9                      | cycles<br>cycles<br>cycles<br>cycles | Length of cable mass<br>mm<br>mm<br>mm<br>mm                      |
| - cable torsion   |  | 9.3.10                     | Nm<br>Nm<br>Nm<br>Nm                 | Duration of applied torque<br>s<br>s<br>s<br>s                    |
| Bending moment  |  | 9.3.12                     | Nm                                   | Relative to reference plane                                       |
| Bumps total   |  | 9.3.13                     | m/s <sup>2</sup><br>to<br>Hz         | ( g <sub>n</sub> acceleration)                                    |
| Vibration   |  | 9.3.3                      | m/s <sup>2</sup><br>to<br>Hz         | ( g <sub>n</sub> acceleration)                                    |
| Shock   |  | 9.3.14                     | m/s <sup>2</sup><br>Shape<br>ms      | ( g <sub>n</sub> acceleration)                                    |
| <b>ADDITIONAL MECHANICAL CHARACTERISTICS</b>  |  |                            |                                      |   |
|   |  |                            |                                      |   |
|   |  |                            |                                      |   |
|   |  |                            |                                      |   |

| Ratings and characteristics                                |  | IEC 61169-1:2013 Subclause | Value                                   | Remarks including any deviations from standard test methods |
|--|--|----------------------------|---|---|
| <b>Environmental</b>                                       |  |                            |   |   |
| Climatic category  |  |                            |   |   |
| Sealing non-hermetically sealed connectors                 |  | 9.4.7                      | cm <sup>3</sup> /h                      | 100 kPa to 110 kPa pressure differential                    |
| Sealing hermetically sealed connectors                     |  | 9.4.8                      | 10 <sup>-3</sup> bar/cm <sup>3</sup> /h | 100 kPa to 110 kPa pressure differential                    |
| Water immersion  |  | 9.4.9                      |   |   |
| Salt mist  |  | 9.4.10                     | h                                       | Duration of spraying  |
| <b>ADDITIONAL ENVIRONMENTAL CHARACTERISTICS</b>            |  |                            |   |   |
| <b>ENDURANCE</b>   |  |                            |   |   |
| Mechanical   |  | 9.3.15                     | operations                              |   |
| High temperature   |  | 9.4.5                      | at h °C                                 |   |
| ADDITIONAL ENDURANCE CHARACTERISTICS                       |  |                            |   |   |
| <b>CHEMICAL CONTAMINATION</b>                              |  |                            |   |   |
| Resistance to solvents and contaminating fluids to be used |  | 9.4.11                     |   |   |
| Applicable fluids  |  |                            |   |   |
| Sulphur dioxide  |  | 9.4.12                     | days                                    |   |

|  |   |                         |  |                |            |
|--|---|-------------------------|--|----------------|------------|
| <b>- Marking of the component: in accordance with 11.1 of IEC 61169-1:2013 in the following order of procedure</b> |   |                         |  |                |            |
| 1)   | Identity of manufacture   |                         |  |                |            |
| 2)   | Manufacturing date code   |                         |  |                | year /week |
| 3)   | Component identification  | variant No./designation |  | Identification |            |
|  |   |                         |  | .              |            |
|  |   |                         |  | .              |            |
|  |   |                         |  | .              |            |
|  |   |                         |  | .              |            |
|  |   |                         |  | .              |            |
|  |   |                         |  | .              |            |
|  |   |                         |  | .              |            |
|  |   |                         |  | .              |            |
| <b>- Marking and contents of package: in accordance with 11.2 of IEC 61169-1:2013</b>                              |   |                         |  |                |            |
| 1)   | Information prescribed in 11.1 of IEC 61169-1:2013 detailed above |                         |  |                |            |
| 2)   | Nominal characteristic impedance                                  |                         |  |                | Ω          |
| 3)   | Assessment level code letter                                      |                         |  |                |            |
| 4)   | Any additional marking required                                   |                         |  |                |            |
| <b>- Ordering information:</b>   |   |                         |  |                |            |
| 1)   | Number of the detail specification/variant code                   |                         |  |                |            |
| 2)   | Assessment level code letter                                      |                         |  |                |            |
| 3)   | Body finish (if more than one listed)                             |                         |  |                |            |
| 4)   | Any additional information or special requirements                |                         |  |                |            |
| Related documents (if not included in IEC 61169-1:2013 or sectional specification):                                |   |                         |  |                |            |
|  | ...   |                         |  | .              |            |
|  |   |                         |  | .              |            |
| <b>- Structural similarity in accordance with 10.2.2 of IEC 61169-1:2013</b>                                       |   |                         |  |                |            |
| Relevant information on a basic style should be entered as variant 01.   |   |                         |  |                |            |



## **7 Marking**

### **7.1 Marking of component**

Each component shall be legibly and durably marked, where space permits and in the following order of precedence, with:

- a) identity code of the manufacturer;
- b) manufacturer's connector identification code or IEC connector designation.

### **7.2 Marking and contents of package**

The package shall be marked with the information prescribed in 7.1 and, in addition, the following information shall be given:

- a) nominal characteristic impedance;
- b) manufacturing date code;
- c) any additional marking required by the relevant specification.

When required by the relevant specification, the package shall also include instructions for assembling the connector(s) and instructions for the use of any special tools or materials, as necessary.

## **Annex A** (normative)

### **Isolation test method**

#### **A.1 Preparation of test sample**

The connector under test shall have both ends of each of its RF channels appropriately terminated with suitable RF cables of equal length, so that the assembly can be tested by using a network analyser.

#### **A.2 Test procedure**

The test procedure is the following:

- a) Setting the equipment parameters: Set vector network analyzer to S12 or S21 and adjust the measure frequency range to 0,05 GHz to 4 GHz, and ensure that the measured points are not less than 401;
  - b) Calibrating system: Insert one RF channel of the test sample between the two ports of the vector network analyzer and calibrate it into zero.
  - c) Disconnect one port of the vector network analyzer and connect it to one end of another RF channel which is adjacent to the RF channel calibrated. The other side of the two adjacent channels shall be terminated with matched load.
  - d) Read the value (dB) of the vector network analyzer which is the isolation between the adjacent RF channels.
  - e) Measure the isolation between other adjacent RF channels in the same way.
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