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**ISOLATORS, HIGH POWER, C-BAND (3.4GHz to 4.8GHz),
WITH NON-INTEGRAL TNC COAXIAL CONNECTORS**

BASED ON TYPES BG11E2-206 AND BG12E2-206

ESCC Detail Specification No. 3202/023

| | |
|---------|---------------|
| Issue 3 | November 2023 |
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| DCR No. | CHANGE DESCRIPTION |
|----------------------|--|
| 1571 | Specification upissued to incorporate changes per DCR. |

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1 GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics and test and inspection data for the component type variants and/or the range of components specified below. It supplements the requirements of, and shall be read in conjunction with, the ESCC Generic Specification listed under Applicable Documents.

1.2 APPLICABLE DOCUMENTS

The following documents form part of this specification and shall be read in conjunction with it:

- (a) ESCC Generic Specification No. [3202](#).
- (a) ESCC Detail Specification No. [3402/009](#), RF Coaxial Connectors Type TNC (Female Contact).

1.3 TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESCC Basic Specification No. [21300](#) shall apply.

1.4 THE ESCC COMPONENT NUMBER AND COMPONENT TYPE VARIANTS

1.4.1 The ESCC Component Number

The ESCC Component Number shall be constituted as follows:

Example: 3202023014.0

- Detail Specification Reference: 3202023
- Component Type Variant Number: 01 (as required)
- Characteristic code: Centre Frequency (4GHz): 4.0 (as required)

1.4.1.1 *Characteristics Codes*

Characteristics to be codified as part of the ESCC Component Number shall be as follows:

- (a) Centre Frequency expressed by means of the following codes. The unit quantity shall be GHz:

| Centre Frequency (GHz) | Code |
|------------------------|------|
| X | X.0 |
| X.X | X.X |

1.4.2 Component Type Variants

The component type variants applicable to this specification are as follows:

| Variant Number | Based on Type | Description (Note 1) | Centre Frequency Range f_c (GHz) (Note 2) | Maximum Weight (g) |
|----------------|---------------|---|---|--------------------|
| 01 | BG11E2-206 | Clockwise Isolator with Non-integral Female TNC Coaxial Connectors | 3.4 to 4.8 | 280 |
| 02 | BG12E2-206 | Anti-clockwise Isolator with Non-integral Female TNC Coaxial Connectors | 3.4 to 4.8 | 280 |

NOTES:

1. Direction of circulation as viewed from above; see Paras. 1.7 and 1.8.
2. Any centre frequency in the range, to 2 significant figures, is available.

1.5 MAXIMUM RATINGS

The maximum ratings shall not be exceeded at any time during use or storage.

Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

| Characteristics | Symbols | Maximum Ratings | Units | Remarks |
|---|------------|-----------------|-------------|-------------------------------------|
| Operating Frequency Range | f_{op} | $f_c \pm 0.25$ | GHz | Over T_{op} , Note 1 |
| Rated RF Power (Forward) | P_F | 160 | W | Over f_{op} and T_{op} |
| Rated RF Power (Reverse) | P_R | 160 | W | Over f_{op} and T_{op} , Note 2 |
| Nominal Impedance | Z | 50 | Ω | |
| Multipaction Level (Output Port Loaded) | M_L | 640 | W | Multipaction Classification Type: 2 |
| Corona level (Output Port Loaded) | C_L | 50 | W | |
| Functional Temperature Range | T_{func} | -30 to +120 | $^{\circ}C$ | T_{amb} , Notes 2, 3 |
| Operating Temperature Range | T_{op} | -30 to +90 | $^{\circ}C$ | Without derating. T_{amb} |
| Storage Temperature Range | T_{stg} | -40 to +125 | $^{\circ}C$ | |

NOTES:

1. f_c = centre frequency; see Para. 1.4.2.
2. Derate reverse power > +110 $^{\circ}C$ at 4W/ $^{\circ}C$
3. The electrical performance of the components at T_{amb} > +90 $^{\circ}C$ is neither guaranteed nor measured.

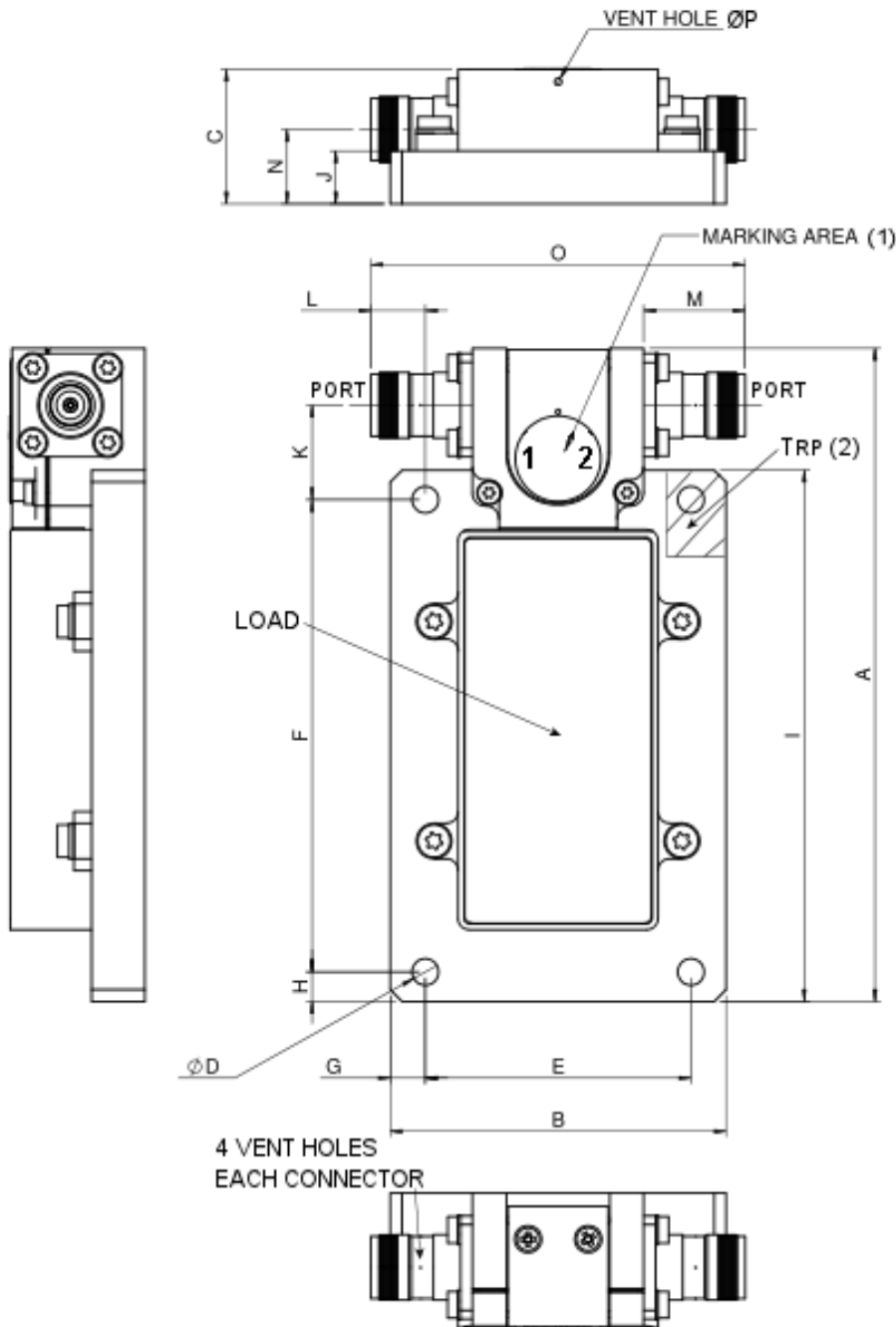
1.6 HANDLING PRECAUTIONS

These devices are susceptible to damage by strong magnetic fields. Therefore suitable precautions shall be employed for protection during all phases of manufacture, testing, packaging, shipment and any handling.

The load contains Beryllium Oxide (BeO) and therefore it must not be ground, machined, sandblasted or subjected to any mechanical operation which will produce dust. The case must not be subjected to any chemical process (e.g. etching) which will produce fumes.

1.7 PHYSICAL DIMENSIONS AND PORT IDENTIFICATION

All dimensions shown below are critical dimensions.

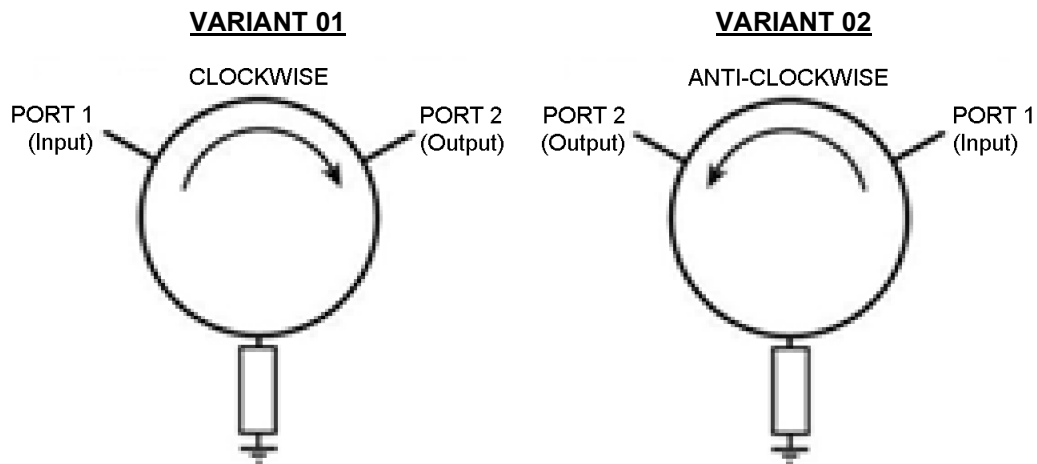


| Symbol | Millimetres | |
|--------|-------------|--------|
| | Min | Max |
| A | 110.45 | 110.85 |
| B | 56.7 | 57.1 |
| C | 22.55 | 22.95 |
| ØD | 4.5 | 4.6 |
| E | 44.8 | 45.2 |
| F | 79.8 | 80.2 |
| G | 5.75 | 6.15 |
| H | 4.8 | 5.2 |
| I | 89.9 | 90.1 |
| J | 8.8 | 9.2 |
| K | 15.8 | 16.2 |
| L | 8.9 | 9.5 |
| M | 17.1 | 17.3 |
| N | 12.4 | 12.8 |
| O | 63.2 | 63.6 |
| ØP | 1.1 | 1.3 |

NOTES:

1. Port identification and direction of circulation is specified by reference to the port number marking, 1 or 2, in the marking area shown. The figure above shows the port identification for Variant 01 as an example.
2. The location of the reference point for measurement of surface temperature (T_{RP}) shall be within the area shown.
3. The TNC interface dimensions for the 2 connectors are as specified in ESCC Detail Specification No. [3402/009](#).
4. The body is painted black except around the mounting holes, in the T_{RP} area, around the vent hole and on the mounting foot surface.

1.8 FUNCTIONAL DIAGRAM



NOTES:

1. The 2 ports may be configured as either the Input (Port 1) or Output (Port 2). The direction of circulation is given by the port number marking (1 to 2); see Para. 1.7.
2. Grounding via mounting foot.

1.9 MATERIALS AND FINISHES

- (a) Main Body: Aluminium, silver plated, plating thickness 13µm minimum, painted black (see Para. 1.7).
- (b) Yoke: Steel, nickel plated, plating thickness 5µm minimum, painted black (see Para. 1.7).
- (c) Connectors: Non-integral TNC (female contact) connectors, amagnetic stainless steel, electro-passivated with copper alloy contacts, gold, 1.27µm, over nickel, 2µm.
- (d) Load block: The load block shall be made of a Beryllium Oxide substrate with a suitable resistive material.

2 REQUIREMENTS

2.1 GENERAL

The complete requirements for procurement of the components specified herein are as stated in this specification and the ESCC Generic Specification. Permitted deviations from the Generic Specification, applicable to this specification only, are listed below.

Permitted deviations from the Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESCC requirement and do not affect the component's reliability, are listed in the appendices attached to this specification.

2.1.1 Deviations from the Generic Specification

2.1.1.1 *Deviations from Special In-Process Controls (Chart F2)*

- (a) **Resistive Load Element Operating Life:**
4 assembled load blocks shall be subjected to a DC power life test with the following conditions. If any failure occurs, the load block production lot shall be considered as failed:
- Duration: 1000 hours minimum.
 - Test Temperature: $T_{amb} = +125 (+0 -3)^{\circ}\text{C}$.
 - DC Power Applied: 100Wdc (equivalent DC rated power at $+125^{\circ}\text{C}$) (in a permanently 'on' condition).
 - Load Resistance Limits: 47.5 Ω minimum, 52.5 Ω maximum.
 - Data Points:
Load Resistance and Change in Load Resistance shall be measured at 0 hours and after 1000 hours. Change in Load Resistance shall be $\leq 5\%$, related to the 0 hour measurement.
- (b) **Resistive Load Element Burn-in (performed after assembly):**
Each isolator shall be subjected to a DC power burn-in with the following conditions. Any failures shall be rejected:
- Duration: 168 hours minimum.
 - Test Temperature: $T_{amb} = +90 (+0 -3)^{\circ}\text{C}$.
 - DC Power Applied: 160Wdc.
 - Load Resistance Limits: 47.5 Ω minimum, 52.5 Ω maximum.
 - Data Points:
Load Resistance and Change in Load Resistance shall be measured at 0 hours and after 168 hours. Change in Load Resistance shall be $\leq 5\%$, related to the 0 hour measurement.

2.1.1.2 *Deviations from Screening Tests - Chart F3*

- (a) **Multipaction:** shall be performed as specified in the Generic Specification.
- (b) **Corona Level:** shall not be performed.
- (c) **Radiographic Inspection:** shall be performed only on the load block. It may be performed prior to isolator assembly.

2.2 MARKING

The marking shall be in accordance with the requirements of ESCC Basic Specification No. [21700](#) and as follows.

The information to be marked on the component shall be:

- (a) The Port identification.
- (b) The ESCC qualified components symbol (for ESCC qualified components only).
- (c) The ESCC Component Number.
- (d) Traceability information.
- (e) Warning sign for Beryllium Oxide.

2.3 ELECTRICAL MEASUREMENTS AT ROOM, HIGH AND LOW TEMPERATURES

The measurements shall be performed at room, high and low temperatures.

2.3.1 Room Temperature Electrical Measurements

The measurements shall be performed at $T_{amb} = +22 \pm 3^{\circ}\text{C}$.

| Characteristics | Symbols | Test Method and Conditions (Note 1) | Limits | | Units |
|-----------------------------|---------|-------------------------------------|--------|------|-------|
| | | | Min | Max | |
| Voltage Standing Wave Ratio | VSWR | ESCC No. 3202 | - | 1.22 | - |
| Isolation | ISO | ESCC No. 3202 | 20 | - | dB |
| Insertion Loss | I_L | ESCC No. 3202 | - | 0.3 | dB |

NOTES:

1. Tested over the full operating frequency range as applicable.

2.3.2 High and Low Temperatures Electrical Measurements

The measurements shall be performed at $T_{amb} = +90 (+0 -3)^{\circ}\text{C}$ and $T_{amb} = -30 (+3 -0)^{\circ}\text{C}$.

| Characteristics | Symbols | Test Method and Conditions (Note 1) | Limits | | Units |
|-----------------------------|----------|-------------------------------------|--------|------|--------------------|
| | | | Min | Max | |
| Voltage Standing Wave Ratio | VSWR | ESCC No. 3202 | - | 1.22 | - |
| Isolation | ISO | ESCC No. 3202 | 20 | - | dB |
| Insertion Loss | I_L | ESCC No. 3202 | - | 0.3 | dB |
| Reference Point Temperature | T_{RP} | ESCC No. 3202 Note 2 | - | +90 | $^{\circ}\text{C}$ |

NOTES:

1. Tested over the full operating frequency range as applicable.

2. Only tested during Screening Tests, Power Thermal Vacuum. See Para. 1.7 for location of the reference point.

2.4 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

Unless otherwise specified, the measurements shall be performed at $T_{amb} = +22 \pm 3^{\circ}C$.

Unless otherwise specified, test methods and test conditions shall be as per the corresponding test defined in Para. 2.3.1 Room Temperature Electrical Measurements.

The drift values (Δ) shall not be exceeded for each characteristic where specified. The corresponding absolute limit values for each characteristic shall not be exceeded.

| Test Reference per ESCC No. 3202 | Characteristics | Symbols | Limits | | Units |
|--|---|-------------------|--|-----|------------------|
| | | | Min | Max | |
| Random Vibration Final Measurements | Voltage Standing Wave Ratio Isolation Insertion Loss | VSWR ISO IL | As per Para. 2.3.1 As per Para. 2.3.1 As per Para. 2.3.1 | | - dB dB |
| Shock Final Measurements | Voltage Standing Wave Ratio Isolation Insertion Loss | VSWR ISO IL | As per Para. 2.3.1 As per Para. 2.3.1 As per Para. 2.3.1 | | - dB dB |
| Thermal Shock Final Measurements | Voltage Standing Wave Ratio Isolation Insertion Loss | VSWR ISO IL | As per Para. 2.3.1 As per Para. 2.3.1 As per Para. 2.3.1 | | - dB dB |
| Thermal Stability of Insertion Loss | Continuous monitoring of: Insertion Loss (at f_c) | IL | As per ESCC No. 3202 | | - |
| Radiated Emission Sniff Test | Shielding Effectiveness | SE | 70 | - | dBi |
| Power Thermal Vacuum (Test #2) | Continuous monitoring of: Voltage Standing Wave Ratio (at f_c) Reference Point Temperature | VSWR T_{RP} | As per Para. 2.3.1 - | +90 | - $^{\circ}C$ |

APPENDIX A
AGREED DEVIATIONS FOR EXENS SOLUTIONS (F)

| Items Affected | Description of Deviations |
|---|---|
| Para. 2.1.1 Deviations from the Generic Specification: Non-Integral Coaxial Connectors | Non-Integral connectors may not be ESCC Qualified but shall comply with the requirements specified in ESCC Generic Specification No. 3402 . For qualified isolators, the detail specification used to procure the connectors shall be agreed by the ESCC Executive and shall form part of the PID. |