



RF COAXIAL CONNECTORS WITH MALE CONTACT

BASED ON TYPE SMA 2.9

ESCC Detail Specification No. 3402/021

Issue 5	November 2023
---------	---------------



LEGAL DISCLAIMER AND COPYRIGHT

European Space Agency, Copyright © 2023. All rights reserved.

The European Space Agency disclaims any liability or responsibility, to any person or entity, with respect to any loss or damage caused, or alleged to be caused, directly or indirectly by the use and application of this ESCC publication.

This publication, without the prior permission of the European Space Agency and provided that it is not used for a commercial purpose, may be:

- copied in whole, in any medium, without alteration or modification.
- copied in part, in any medium, provided that the ESCC document identification, comprising the ESCC symbol, document number and document issue, is removed.

DOCUMENTATION CHANGE NOTICE

(Refer to <https://escies.org> for ESCC DCR content)

DCR No.	CHANGE DESCRIPTION
1448	Specification updated to incorporate changes per DCR.

TABLE OF CONTENTS

1	GENERAL	5
1.1	SCOPE	5
1.2	APPLICABLE DOCUMENTS	5
1.3	TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS	5
1.4	THE ESCC COMPONENT NUMBER AND COMPONENT TYPE VARIANTS	5
1.4.1	The ESCC Component Number	5
1.4.2	Component Type Variants	5
1.5	MAXIMUM RATINGS	6
1.6	PHYSICAL DIMENSIONS (SEE ALSO PARA. 3)	7
1.6.1	Connector Interface Dimensions and Connector Interface Gauge Dimensions	7
1.7	MATERIALS AND FINISHES	7
2	REQUIREMENTS	8
2.1	GENERAL	8
2.1.1	Deviations from the Generic Specification	8
2.2	MARKING	8
2.3	ENVIRONMENTAL AND MECHANICAL TESTS	8
2.4	ROOM TEMPERATURE ELECTRICAL MEASUREMENTS (NOTE 1)	8
2.5	INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS	9
3	COMPONENT TYPE VARIANTS – DETAIL REQUIREMENTS	10
3.1	VARIANT 01 – STRAIGHT PLUG, SOLDER-TYPE, FOR MICROPOROUS SEMI-RIGID CABLE Ø2.2MM (0.085")	10
3.2	VARIANT 02 – STRAIGHT PLUG, SOLDER-TYPE, FOR MICROPOROUS SEMI-RIGID CABLE Ø3.58MM (0.141")	11
3.3	VARIANT 03 – STRAIGHT PLUG, SOLDER-TYPE, FOR SHF 3MS CABLE	12
3.4	VARIANT 04 – STRAIGHT PLUG, SOLDER-TYPE, FOR SHF 4.8MS CABLE	13
3.5	VARIANT 05 – STRAIGHT PLUG, SOLDER-TYPE, FOR SHF 5MS CABLE	14
3.6	VARIANT 07 – SQUARE FLANGE MALE RECEPTACLE	15
	APPENDIX A	16
	APPENDIX B	17

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. [3402](#).
- (b) [MIL-STD-348](#), Department of Defence Interface Standard: Radio Frequency Connector Interfaces.

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: 340202101

- Detail Specification Reference: 3402021
- Component Type Variant Number: 01 (as required)

1.4.2 Component Type Variants

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

Variant Number	Description (Note 1)
01	Straight Plug, Solder-Type, for Microporous Semi-Rigid Cable Ø2.2mm (0.085")
02	Straight Plug, Solder-Type, for Microporous Semi-Rigid Cable Ø3.58mm (0.141")
03	Straight Plug, Solder-Type, for SHF 3MS Cable
04	Straight Plug, Solder-Type, for SHF 4.8MS Cable
05	Straight Plug, Solder-Type, for SHF 5MS Cable
07	Square Flange Male Receptacle

NOTES:

1. See Para. 3 for details.

1.5 MAXIMUM RATINGS

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

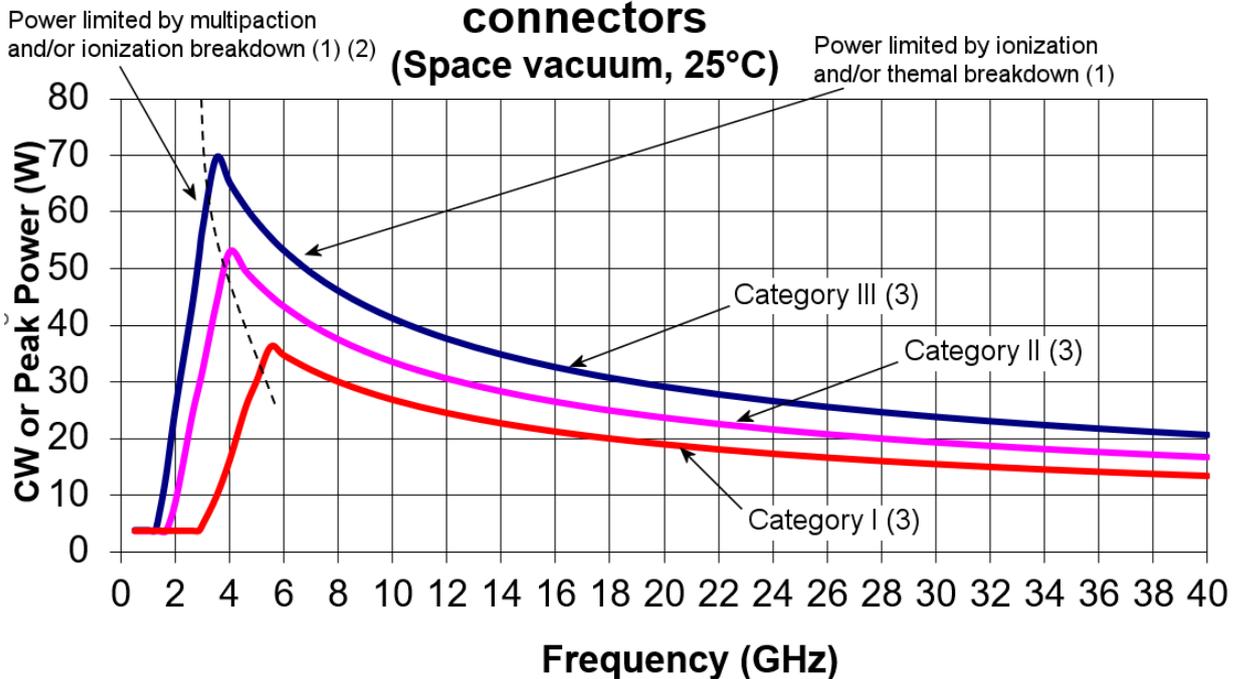
Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

Characteristics	Symbol	Maximum Ratings	Unit	Remarks
Power	P	See Para. 3	W	Notes 1, 2
Nominal Impedance	Z	50	Ω	-
Operating Frequency Range	f	See Para. 3	GHz	Note 1
Operating Voltage	V _{op}	350	V _{rms}	-
Operating Temperature Range	T _{op}	See Para. 3	°C	-
Storage Temperature Range	T _{stg}	As per T _{op}	°C	-
Soldering Temperature	T _{sol}	260	°C	Duration 10s maximum See Para. 3
Coupling Nut Torque (Coupling Proof Torque)	T _q	170	N.cm	See Note 3 for nominal coupling torque

NOTES:

- Derate Power with respect to Operating Frequency as follows:

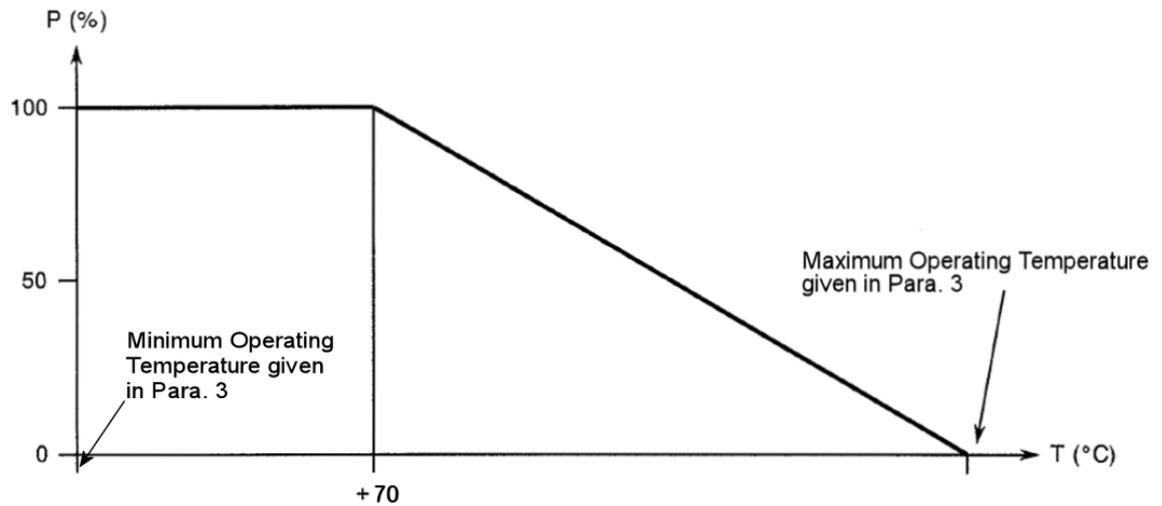
Maximum Power Handling: SMA 2.9 connectors
(Space vacuum, 25°C)



The following details apply:

- Load VSWR is better than 1.3:1.
- The part of the curve limited by multipaction takes into account a 6dB margin.
- See Para. 3 for applicability of power handling categories to the different Variants.
- These power handling curves have been constructed using the ESCC Multipactor Tool v1.0.

2. Derate Power with respect to Operating Temperature as follows:



3. Whenever a test is performed on mated pairs of connectors, the pairs shall be torqued at 80 to 115N.cm.

1.6 PHYSICAL DIMENSIONS (SEE ALSO PARA. 3)

1.6.1 Connector Interface Dimensions and Connector Interface Gauge Dimensions

- (a) SMA Male Connector Interface: compatible with series SMK pin contact interface as specified in [MIL-STD-348](#).
- (b) SMA Female Gauge Interface: compatible with series SMK socket contact connector interface as specified in [MIL-STD-348](#).

1.7 MATERIALS AND FINISHES

Materials and finishes shall be as follows (as applicable, see Para. 3):

- (a) Shell and coupling nut: amagnetic stainless steel, electro-passivated.
- (b) Centre Contact: beryllium copper, plated gold 1.3µm minimum over nickel 2µm minimum.
- (c) Insulator: ULTEM 1000.
- (d) Gaskets, front: silicone.
- (e) Crimping or soldering elements: brass or beryllium copper, plated silver 5µm minimum over copper 0.5µm minimum.
- (f) Insert ring: brass, plated gold 1.3µm minimum over nickel 2µm minimum.
- (g) Washers: beryllium copper, plated nickel 2µm minimum.

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

None.

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 or the primary package shall be:

- (a) The ESCC qualified components symbol (for ESCC qualified components only).
- (b) The ESCC Component Number (see Para. 1.4.1).
- (c) Traceability information.

2.3 ENVIRONMENTAL AND MECHANICAL TESTS

The following requirements apply to tests performed on the connector (and contact) lot as specified in the ESCC Generic Specification:

- (a) Coupling Proof Torque: See Para. 1.5.
- (b) Mating and Unmating Forces: Maximum torque: 23N.cm.
- (c) Centre Contact Retention: See Para. 3.

2.4 ROOM TEMPERATURE ELECTRICAL MEASUREMENTS (NOTE 1)

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

Characteristics	Symbols	Test Method and Conditions	Limits		Units
			Min	Max	
Insulation Resistance	R _i	ESCC No. 3402	5	-	GΩ
Voltage Proof Leakage Current (Voltage Proof)	I _L	ESCC No. 3402 See Para. 3 Note 2	-	2	mA

NOTES:

- 1. For Variants that are delivered with the centre contact and insulator not mounted in the connector, measurements shall not be performed during Chart F3; see Para. 3.
- 2. Between centre contact and shell.

2.5 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

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

Unless otherwise specified, the test methods and test conditions shall be as per the corresponding test defined in Para. 2.4 Room Temperature Electrical Measurements.

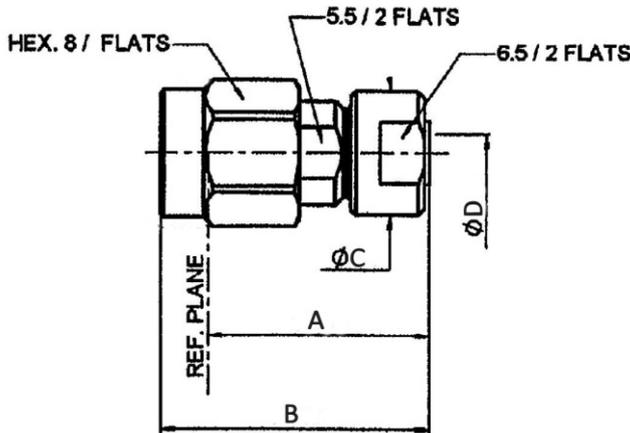
Test Reference per ESCC No. 3402	Characteristics and Test Conditions Ref. ESCC No. 3402	Symbols	Limits		Units
			Min	Max	
Random Vibration	Contact Resistance: $I_T = 10\text{mA}$, $V_T = 6\text{V}$ Centre Contact:	R_{ctc}	-	3	mΩ
Mechanical Shock	Contact Resistance: $I_T = 10\text{mA}$, $V_T = 6\text{V}$ Centre Contact:	R_{ctc}	-	3	mΩ
Temperature Cycling	Contact Resistance: $I_T = 10\text{mA}$, $V_T = 6\text{V}$ Centre Contact: Voltage Proof Leakage Current:	R_{ctc} I_L	-	3 Note 1	mΩ
Electrical Measurements at Room Temperature	Insulation Resistance: Voltage Proof Leakage Current: Contact Resistance: $I_T = 10\text{mA}$, $V_T = 6\text{V}$ Centre Contact: Shell: VSWR (Note 3): Insertion Loss:	R_I I_L R_{ctc} R_{cts} VSWR LI	-	Note 1 Note 1 3 2 Note 2 Note 2	mΩ mΩ
Endurance	Contact Resistance: $I_T = 10\text{mA}$, $V_T = 6\text{V}$ Centre Contact: Shell:	R_{ctc} R_{cts}	-	4 3	mΩ mΩ

NOTES:

1. As specified in Para. 2.4.
2. As specified in Para. 3.
3. Measured with suitable low level RF power applied.

3 COMPONENT TYPE VARIANTS – DETAIL REQUIREMENTS

3.1 VARIANT 01 – STRAIGHT PLUG, SOLDER-TYPE, FOR MICROPOROUS SEMI-RIGID CABLE Ø2.2mm (0.085")



Symbol	Dimensions mm	
	Min	Min
A	13.43	13.68
B	16.06	16.93
ØC	7.4	7.6
ØD	2.25	2.29

NOTES:

- Components are delivered with the centre contact and insulator not mounted in the connector.

ELECTRICAL CHARACTERISTICS	VALUES	UNITS
Frequency range	0 to 40	GHz
Maximum voltage standing wave ratio (VSWR)	$1.05 + 0.005 f$ (GHz)	
Maximum insertion loss	$0.02 + 0.03 \sqrt{f}$ (GHz)	dB
Voltage proof	750	Vrms
Power Handling Category (See Para. 1.5 Note 1)	I	
RF Leakage (Note 2)	$-90 + f$ (GHz)	dBi

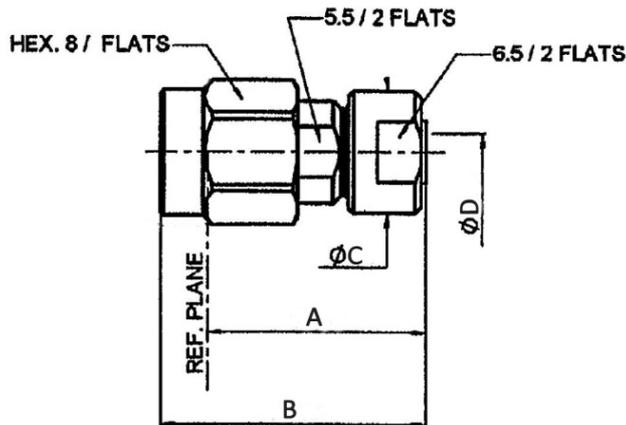
MECHANICAL CHARACTERISTICS	VALUES	UNITS
Minimum centre contact retention force (axial)	27	N
Minimum centre contact retention torque	Not applicable	
Maximum weight	4.5	g

OTHER CHARACTERISTICS	VALUES	UNITS
Operating temperature range (Note 3)	-65 to +165	°C
Seal: Maximum leakage	Not applicable	
Solderability	Applicable	
Cables used (Note 3)	Microporous semi-rigid cable Ø2.2mm (0.085", P/N UT 85-LL)	

NOTES:

- For information purposes only.
- In use, the maximum operating and storage temperature ratings shall be limited by the related maximum ratings of the particular cable used.

3.2 VARIANT 02 – STRAIGHT PLUG, SOLDER-TYPE, FOR MICROPOROUS SEMI-RIGID CABLE Ø3.58mm (0.141”)



Symbol	Dimensions mm	
	Min	Min
A	13.43	13.68
B	16.06	16.93
ØC	7.4	7.6
ØD	3.64	3.68

NOTES:

- Components are delivered with the centre contact and insulator not mounted in the connector.

ELECTRICAL CHARACTERISTICS	VALUES	UNITS
Frequency range	0 to 36 (Note 4)	GHZ
Maximum voltage standing wave ratio (VSWR)	1.05 + 0.005 f (GHz)	
Maximum insertion loss	0.02 + 0.03 √f (GHz)	dB
Voltage proof	750	Vrms
Power Handling Category (See Para. 1.5 Note 1)	III	
RF Leakage (Note 2)	-90 + f (GHz)	dBi

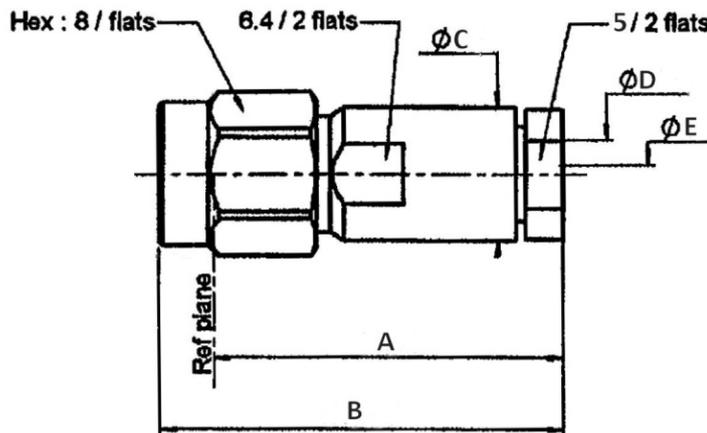
MECHANICAL CHARACTERISTICS	VALUES	UNITS
Minimum centre contact retention force (axial)	27	N
Minimum centre contact retention torque	Not applicable	
Maximum weight	4.3	g

OTHER CHARACTERISTICS	VALUES	UNITS
Operating temperature range (Note 3)	-65 to +165	°C
Seal: Maximum leakage	Not applicable	
Solderability	Applicable	
Cables used (Notes 3, 4)	Microporous semi-rigid cable Ø3.58mm (0.141”, P/N UT 141-LL)	

NOTES:

- For information purposes only.
- In use, the maximum operating and storage temperature ratings shall be limited by the related maximum ratings of the particular cable used.
- The test frequency shall be limited by the applicable cable maximum frequency.

3.3 VARIANT 03 – STRAIGHT PLUG, SOLDER-TYPE, FOR SHF 3MS CABLE



Symbol	Dimensions mm	
	Min	Min
A	19.47	19.82
B	22.1	23.07
ØC	7.1	7.3
ØD	3.3	3.35
ØE	0.85	0.9

NOTES:

- Components are delivered with the centre contact and insulator not mounted in the connector.

ELECTRICAL CHARACTERISTICS	VALUES	UNITS
Frequency range	0 to 40	GHZ
Maximum voltage standing wave ratio (VSWR)	$1.05 + 0.005 f$ (GHz)	
Maximum insertion loss	$0.02 + 0.03 \sqrt{f}$ (GHz)	dB
Voltage proof	750	Vrms
Power Handling Category (See Para. 1.5 Note 1)	II	
RF Leakage (Note 2)	$-90 + f$ (GHz)	dBi

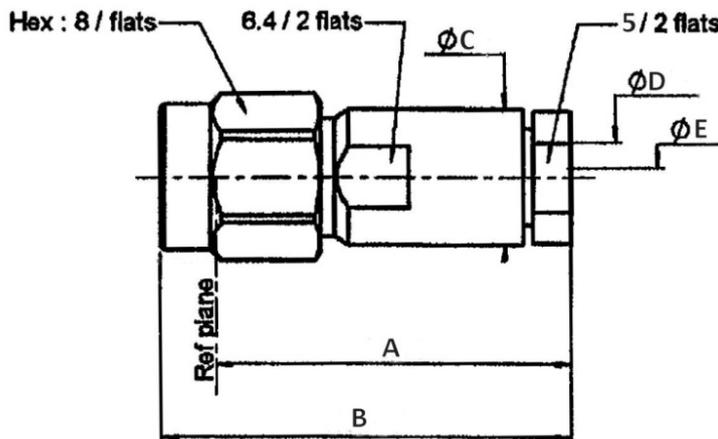
MECHANICAL CHARACTERISTICS	VALUES	UNITS
Minimum centre contact retention force (axial)	27	N
Minimum centre contact retention torque	Not applicable	
Maximum weight	6	g

OTHER CHARACTERISTICS	VALUES	UNITS
Operating temperature range (Note 3)	-65 to +165	°C
Seal: Maximum leakage	Not applicable	
Solderability	Applicable	
Cables used (Note 3)	SHF 3MS	

NOTES:

- For information purposes only.
- In use, the maximum operating and storage temperature ratings shall be limited by the related maximum ratings of the particular cable used.

3.4 VARIANT 04 – STRAIGHT PLUG, SOLDER-TYPE, FOR SHF 4.8MS CABLE



Symbol	Dimensions mm	
	Min	Min
A	20.27	20.62
B	22.9	23.87
ØC	7.1	7.3
ØD	3.75	3.85
ØE	1.5	1.1

NOTES:

- Components are delivered with the centre contact and insulator not mounted in the connector.

ELECTRICAL CHARACTERISTICS	VALUES	UNITS
Frequency range	0 to 31.5 (Note 4)	GHz
Maximum voltage standing wave ratio (VSWR)	$1.05 + 0.005 f$ (GHz)	
Maximum insertion loss	$0.02 + 0.03 \sqrt{f}$ (GHz)	dB
Voltage proof	750	Vrms
Power Handling Category (See Para. 1.5 Note 1)	III	
RF Leakage (Note 2)	$-90 + f$ (GHz)	dBi

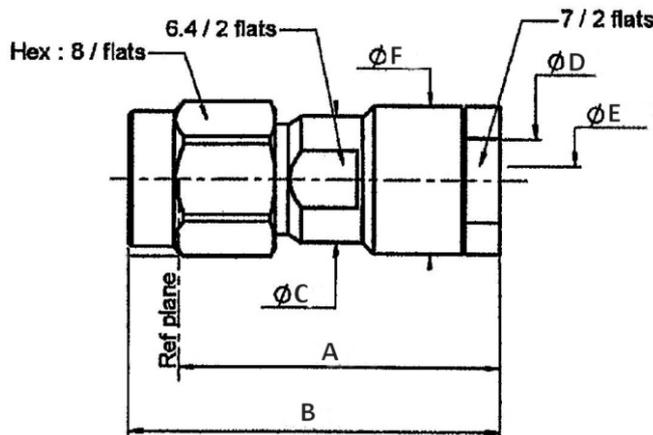
MECHANICAL CHARACTERISTICS	VALUES	UNITS
Minimum centre contact retention force (axial)	27	N
Minimum centre contact retention torque	Not applicable	
Maximum weight	5.6	g

OTHER CHARACTERISTICS	VALUES	UNITS
Operating temperature range (Note 3)	-65 to +165	°C
Seal: Maximum leakage	Not applicable	
Solderability	Applicable	
Cables used (Notes 3, 4)	SHF 4.8MS	

NOTES:

- For information purposes only.
- In use, the maximum operating and storage temperature ratings shall be limited by the related maximum ratings of the particular cable used.
- The test frequency shall be limited by the applicable cable maximum frequency.

3.5 VARIANT 05 – STRAIGHT PLUG, SOLDER-TYPE, FOR SHF 5MS CABLE



Symbol	Dimensions mm	
	Min	Min
A	18.47	18.82
B	21.1	21.97
ØC	7.1	7.3
ØD	4.7	4.75
ØE	1.51	1.55
ØF	8.4	8.6

NOTES:

- Components are delivered with the centre contact and insulator not mounted in the connector.

ELECTRICAL CHARACTERISTICS	VALUES	UNITS
Frequency range	0 to 26.5 (Note 4)	GHZ
Maximum voltage standing wave ratio (VSWR)	1.05 + 0.005 f (GHz)	
Maximum insertion loss	0.02 + 0.03 √f (GHz)	dB
Voltage proof	750	Vrms
Power Handling Category (See Para. 1.5 Note 1)	III	
RF Leakage (Note 2)	-90 + f (GHz)	dBi

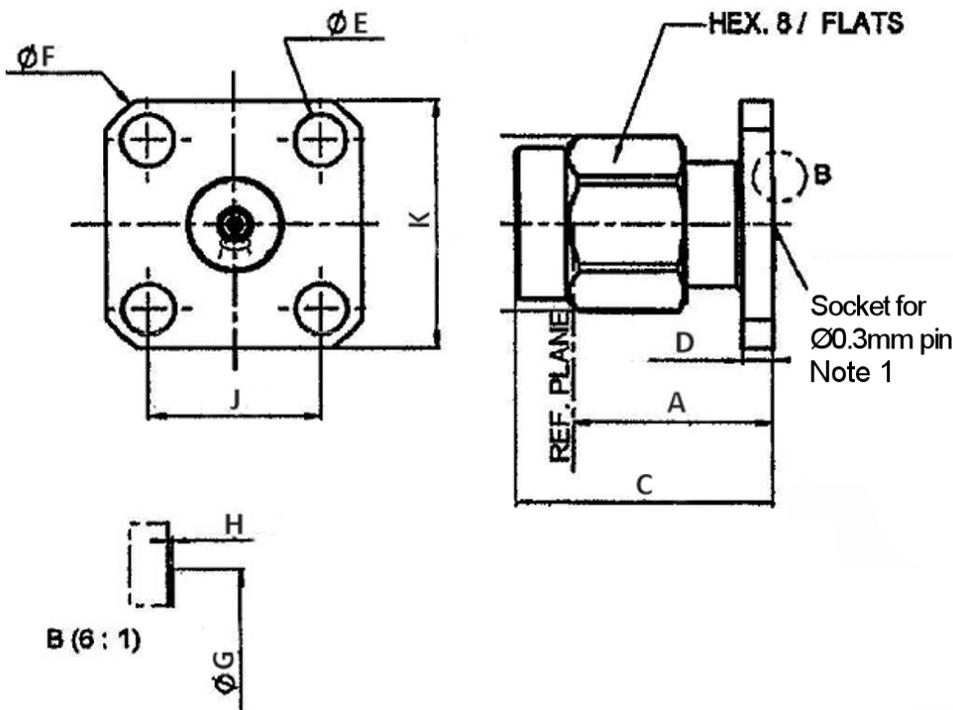
MECHANICAL CHARACTERISTICS	VALUES	UNITS
Minimum centre contact retention force (axial)	27	N
Minimum centre contact retention torque	Not applicable	
Maximum weight	5.7	g

OTHER CHARACTERISTICS	VALUES	UNITS
Operating temperature range (Note 3)	-65 to +165	°C
Seal: Maximum leakage	Not applicable	
Solderability	Applicable	
Cables used (Notes 3, 4)	SHF 5MS	

NOTES:

- For information purposes only.
- In use, the maximum operating and storage temperature ratings shall be limited by the related maximum ratings of the particular cable used.
- The test frequency shall be limited by the applicable cable maximum frequency.

3.6 VARIANT 07 – SQUARE FLANGE MALE RECEPTACLE



Symbol	Dimensions mm		Notes
	Min	Max	
A	10.03	10.09	
C	12.66	13.34	
D	1.4	1.7	
ØE	2.55	2.7	4 holes
ØF	15.9	16.1	
ØG	4.46	4.66	
H	0.055	0.135	
J	8.59	8.69	2 places
K	12.6	12.8	2 places

ELECTRICAL CHARACTERISTICS	VALUES	UNITS
Frequency range	0 to 40	GHz
Maximum voltage standing wave ratio (VSWR)	$1.05 + 0.005 f$ (GHz)	
Maximum insertion loss	$0.02 + 0.03 \sqrt{f}$ (GHz)	dB
Voltage proof	750	Vrms
Power Handling Category (See Para. 1.5 Note 1)	I	
RF Leakage (Note 2)	$-90 + f$ (GHz)	dBi

MECHANICAL CHARACTERISTICS	VALUES	UNITS
Minimum centre contact retention force (axial)	27	N
Minimum centre contact retention torque	Not applicable	
Maximum weight	4.8	g

OTHER CHARACTERISTICS	VALUES	UNITS
Operating temperature range	-65 to +165	°C
Seal: Maximum leakage	Not applicable (Note 1)	
Solderability	Not applicable	
Cables used	Not applicable	

NOTES:

- For hermetic application, use with connecting piece type [340202307](#) (hermetic glass seal).
- For information purposes only.

APPENDIX A
AGREED DEVIATIONS FOR RADIALL (F)

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS
Para. 1.4.1, The ESCC Component Number	The ESCC Component Number may include the additional Manufacturer's codes 'B' and/or '3' as indicated in the following example: Example: 340202101 <u>B3</u>

APPENDIX B
AGREED DEVIATIONS FOR ROSENBERGER (D)

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS
Para. 1.4.1, The ESCC Component Number	The ESCC Component Number may include the additional Manufacturer's codes 'B' and/or '3' as indicated in the following example: Example: 340202101 <u>B3</u>