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Pages 1 to 21

CIRCULATORS, COAXIAL/DROP-IN

420 MHz - 18 GHz

BASED ON SERIES 10*XXXX AND 19*XXXX

ESA/SCC Detail Specification No. 3202/018

space components
coordination group

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		SCCG Chairman	ESA Director General or his Deputy
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DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
'A'	April '95	P1. Cover page		None
		P2. DCN		None
		P6. Table 1(a)	: Correction of typographical errors	23669
		P13. Figure 2(i)	: Dimension G corrected in drawing	23698

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1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for a Circulator, Coaxial/Drop-in, 420 MHz - 18 GHz, based on Series 10*XXXX and 19*XXXX. It shall be read in conjunction with ESA/SCC Generic Specification No. 3202, the requirements of which are supplemented herein.

1.2 TYPE VARIANTS

Variants of the basic type circulators specified herein, which are also covered by this specification, are given in Table 1(a).

1.3 MAXIMUM RATINGS

The maximum ratings, which shall not be exceeded at any time during use or storage, applicable to the circulators specified herein, are as scheduled in Table 1(b).

1.4 PHYSICAL DIMENSIONS

The physical dimensions of the circulators specified herein, are shown in Figure 2.

1.5 FUNCTIONAL DIAGRAM

The functional diagram, showing port identification of the circulators specified herein, is shown in Figure 3.

2. APPLICABLE DOCUMENTS

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

(a) ESA/SCC Generic Specification No. 3202, Ferrite Microwave Components, Isolators and Circulators.

(b) ESA/SCC Detail Specification No. 3402/001, RF Coaxial Connectors type SMA (Male Contact).

(c) ESA/SCC Detail Specification No. 3402/002, RF Coaxial Connectors type SMA (Female Contact).

3. TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESA/SCC Basic Specification No. 21300 shall apply.

TABLE 1(a) - TYPE VARIANTS

(1) VARIANT	(2) BASED ON TYPE	(3) CENTRE FREQ. (f_c) (GHz)	(4) MIN. BANDWIDTH (B) (GHz)	(5) MINIMUM ISOLATION			(6) MAXIMUM INSERTION LOSS			(7) MINIMUM RETURN LOSS			(8) INTERFACES (NOTE 1)			(9) OPERATING TEMP. RANGE		(10) FIGURE	(11) CONFIG. AND FUNCT. DIAG.
				ISO_{21} (dB)	ISO_{13} (dB)	ISO_{32} (dB)	IL_{12} (dB)	IL_{23} (dB)	IL_{31} (dB)	RL_1 (dB)	RL_2 (dB)	RL_3 (dB)	PORT 1 (dB)	PORT 2 (dB)	PORT 3 (dB)	MIN. (°C)	MAX. (°C)		
01	10*1601	2.0	0.2	20.0	20.0	20.0	0.5	0.5	0.5	19.1	19.1	19.1	SMA(F)	SMA(F)	SMA(F)	−54	+95	2(d)	3(a)
02	19*3401	2.25	0.1	20.0	20.0	20.0	0.5	0.5	0.5	19.1	19.1	19.1	M7TAB	M7TAB	M7TAB	−40	+80	2(e)	3(a)
03	19*1601	2.0	0.2	20.0	20.0	20.0	0.5	0.5	0.5	19.1	19.1	19.1	M7TAB	M7TAB	M7TAB	−54	+95	2(a)	3(b)
04	19*3401	2.25	0.1	20.0	20.0	20.0	0.5	0.5	0.5	19.1	19.1	19.1	M4TAB	M4TAB	M4TAB	−40	+80	2(f)	3(c)
05	10*1601	2.0	0.2	20.0	20.0	20.0	0.5	0.5	0.5	19.1	19.1	19.1	SMA(M)	SMA(M)	SMA(M)	−54	+95	2(c)	3(d)
06	10*3401	2.25	0.1	20.0	20.0	20.0	0.5	0.5	0.5	19.1	19.1	19.1	SMA(F)	SMA(F)	SMA(F)	−40	+80	2(g)	3(f)
07	19*1601	2.0	0.2	20.0	20.0	20.0	0.5	0.5	0.5	19.1	19.1	19.1	M4TAB	M4TAB	M4TAB	−54	+95	2(b)	3(e)
08	19*1401	1.2	0.12	20.0	20.0	20.0	0.5	0.5	0.5	19.1	19.1	19.1	M7TAB	M7TAB	M7TAB	−54	+95	2(i)	3(a)
09	19*1401	1.2	0.12	20.0	20.0	20.0	0.5	0.5	0.5	19.1	19.1	19.1	M7TAB	M7TAB	M7TAB	−54	+95	2(h)	3(b)
10	19*0701	0.43	0.04	20.0	20.0	20.0	0.5	0.5	0.5	19.1	19.1	19.1	M4TAB	M4TAB	M4TAB	−54	+95	2(j)	3(c)

NOTES

1. Interfaces are defined as follows:-

   Connectors: "SMA(F)" = SMA Female, "SMA(M)" = SMA Male.

   Tabs: "M4 TAB" or "M7 TAB" in accordance with Para. 4.4.4 of this specification.

2. The Insulation Resistance shall be 5.0MΩ minimum.

TABLE 1(b) - MAXIMUM RATINGS

No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATINGS	UNIT	REMARKS
1	Frequency Range	-	2.5 to 18 1.65 to 3.7 0.5 to 1.65 0.42 to 1.215	GHz GHz GHz GHz	Figure 2(a) to (d) Figure 2(e) to (g) Figure 2(h) to (i) Figure 2(j)
2	Peak RF Power Peak RF Power Duration Peak RF Power Duty Cycle	P_p - -	200 1000 50 25 50 15	W W µs % % %	Figure 2(a) to (i) Figure 2(j) - Figure 2(a) to (g) Figure 2(h) to (i) Figure 2(j)
3	Peak RF Power (Reflected) Peak RF Power (Reflected) Duration Peak RF Power (Reflected) Duty Cycle	P_{pr} - -	50 100 50 25 50 15	W W µs % % %	Figure 2(a) to (i) Figure 2(j) - Figure 2(a) to (g) Figure 2(h) to (i) Figure 2(j)
4	Minimum RF Leakage	E	−70	dBc	Note 1
5	Operating Temperature Range	T_{op}	Note 2	°C	T_{amb}
6	Storage Temperature Range	T_{stg}	−60 to +125	°C	-
7	Maximum Tab Soldering Temperature	T_{sol}	+240	°C	Note 3

NOTES

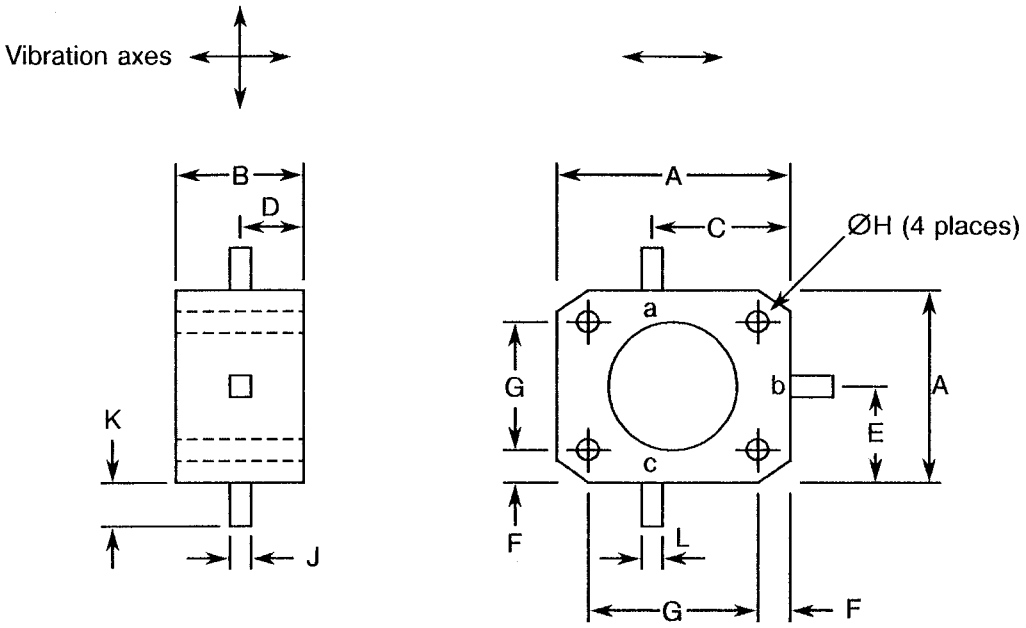
1. This parameter is not applicable to devices with one, or more, tab connections.
2. The Operating Temperature Range for a Type Variant shall be as specified in Column 9 of Table1(a). The Operating Temperature Range shall not exceed the Storage Temperature Range.
3. Duration 5 seconds maximum at a distance of not less than 1.5mm from the body and the same termination shall not be resoldered until 3 minutes have elapsed.

FIGURE 1 - PARAMETER DERATING INFORMATION

Not applicable.

FIGURE 2 - PHYSICAL DIMENSIONS

FIGURES 2(a) TO 2(c) - 1/2" DROP-IN



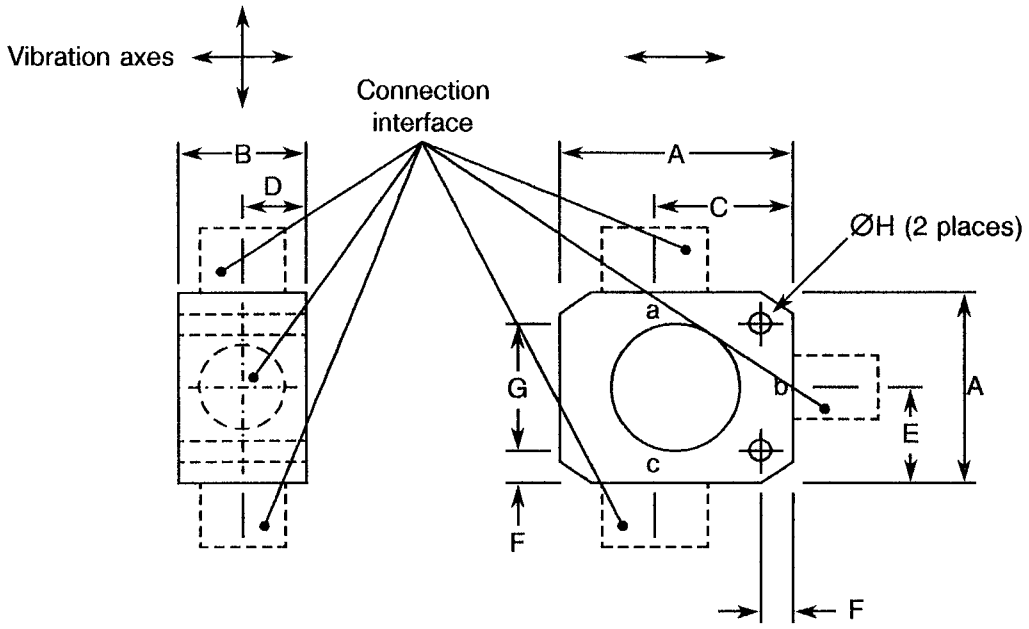
SYMBOL	MILLIMETRES		NOTES
	MIN.	MAX.	
A	-	12.95	
B	-	6.60	
C	8.13	8.64	
D	2.92	3.18	Figure 2(a)
	2.16	2.41	Figure 2(b)
	1.78	2.03	Figure 2(c)
E	6.10	6.60	
F	1.27	1.78	
G	9.40	9.91	
ØH	1.75	2.05	
J	0.10	0.15	
K	1.27	2.29	
L	0.51	0.76	

NOTES

1. Ports shall be marked as specified in Figure 3.

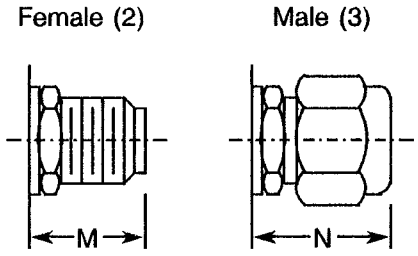
FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

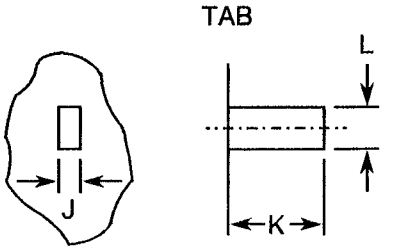
FIGURE 2(d) - 1/2" CONNECTORISED/DROP-IN



SYMBOL	MILLIMETRES	
	MIN.	MAX.
A	-	12.95
B	-	12.95
C	8.13	8.64
D	6.10	6.60
E	6.10	6.60
F	1.27	1.78
G	9.40	9.91
ØH	1.75	2.05
J	0.10	0.15
K	1.27	2.29
L	0.51	0.76
M	-	9.02
N	-	11.30

Connection interface as follows:
SMA



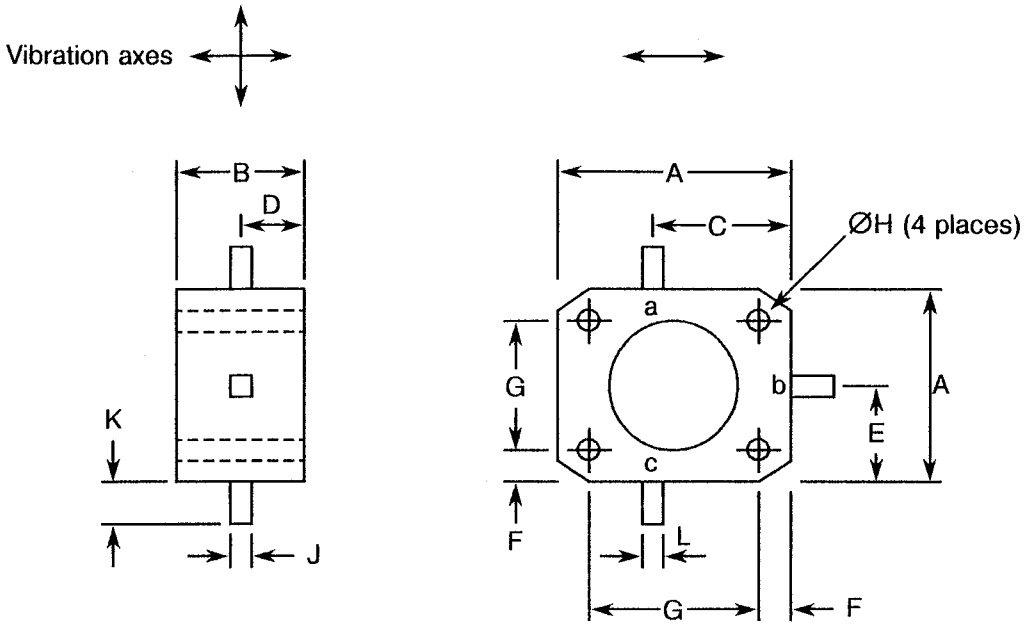


NOTES

1. Ports shall be marked as specified in Figure 3.
2. Full dimensions of the Female SMA interface are specified in ESA/SCC Detail Specification No. 3402/002.
3. Full dimensions of the Male SMA interface are specified in ESA/SCC Detail Specification No. 3402/001.

FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

FIGURES 2(e) TO 2(f) - 3/4" DROP-IN



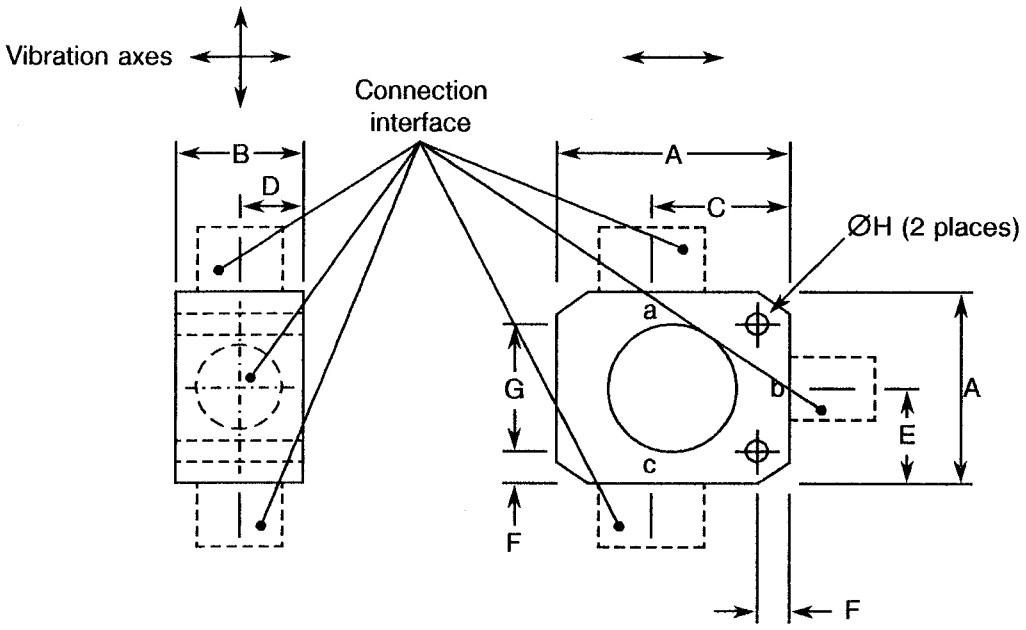
SYMBOL	MILLIMETRES		NOTES
	MIN.	MAX.	
A	-	19.30	
B	-	6.60	
C	12.57	13.08	
D	2.92	3.18	Figure 2(e)
	2.41	2.67	Figure 2(f)
E	9.40	9.65	
F	0.20	0.25	
G	14.22	14.73	
ØH	1.88	2.18	
J	0.10	0.15	
K	1.27	2.29	
L	0.51	0.76	

NOTES

1. Ports shall be marked as specified in Figure 3.

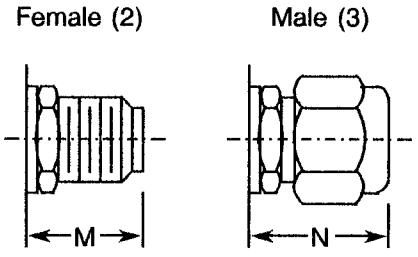
FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

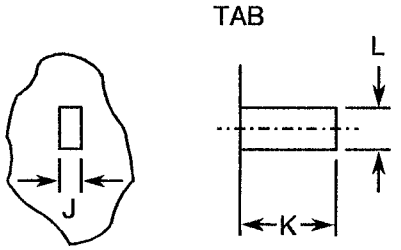
FIGURE 2(g) - 3/4" CONNECTORISED/DROP-IN



SYMBOL	MILLIMETRES	
	MIN.	MAX.
A	-	19.30
B	-	12.95
C	12.57	13.08
D	6.10	6.60
E	9.40	9.65
F	0.20	0.25
G	14.22	14.73
ØH	1.88	2.18
J	0.10	0.15
K	1.27	2.29
L	0.51	0.76
M	-	9.02
N	-	11.30

Connection interface as follows:
SMA



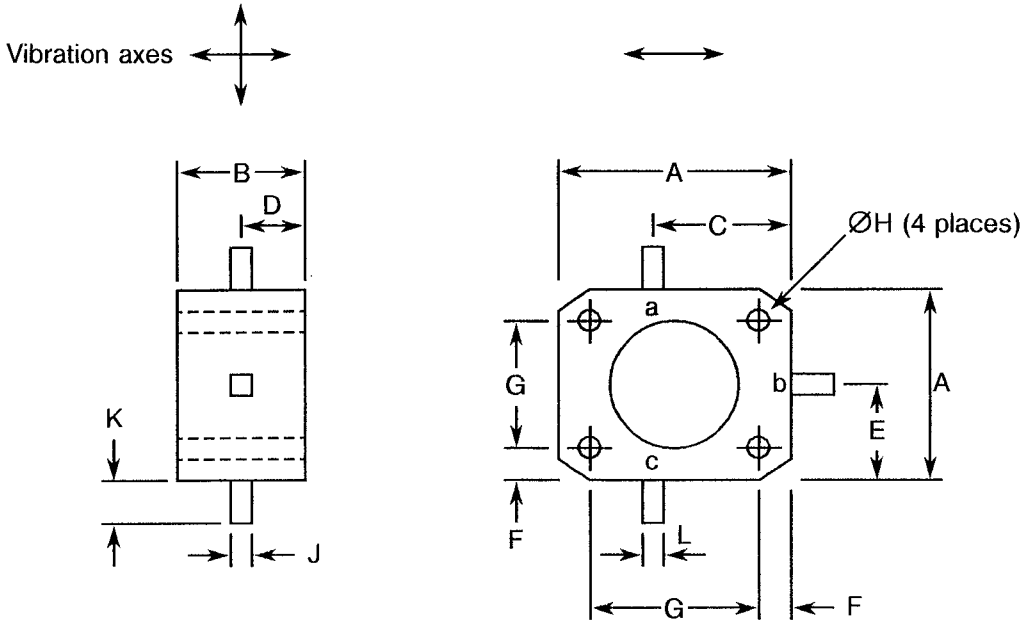


NOTES

1. Ports shall be marked as specified in Figure 3.
2. Full dimensions of the Female SMA interface are specified in ESA/SCC Detail Specification No. 3402/002.
3. Full dimensions of the Male SMA interface are specified in ESA/SCC Detail Specification No. 3402/001.

FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

FIGURE 2(h) - 1" DROP-IN



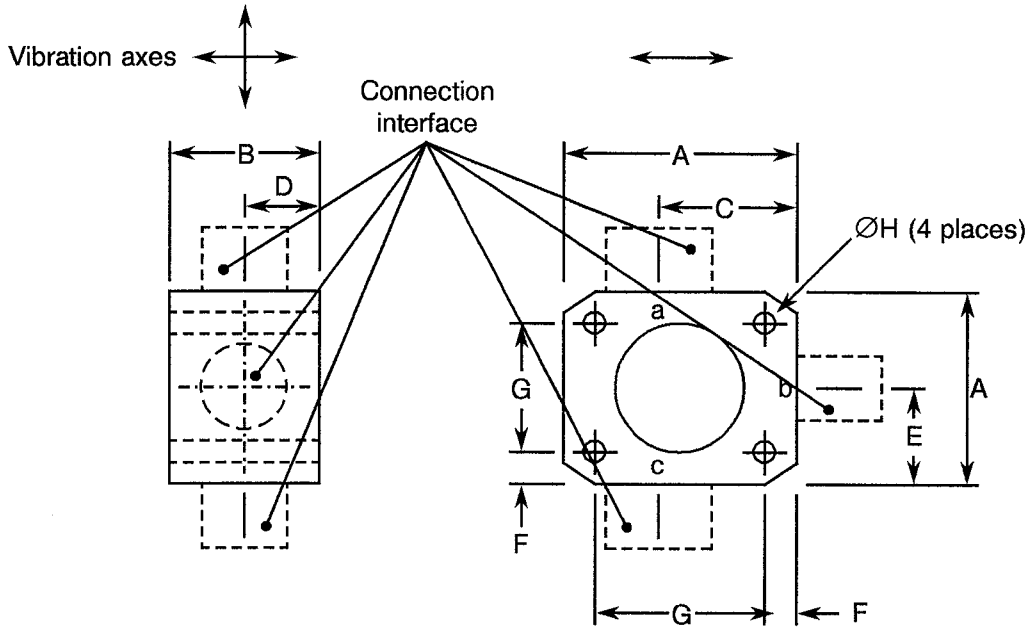
SYMBOL	MILLIMETRES	
	MIN.	MAX.
A	-	19.30
B	-	7.87
C	12.57	13.08
D	3.56	4.06
E	9.40	9.65
F	2.03	2.54
G	14.22	14.73
ØH	1.88	2.18
J	0.10	0.15
K	1.27	2.29
L	0.51	0.76

NOTES

1. Ports shall be marked as specified in Figure 3.

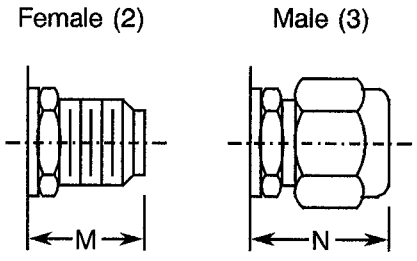
FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

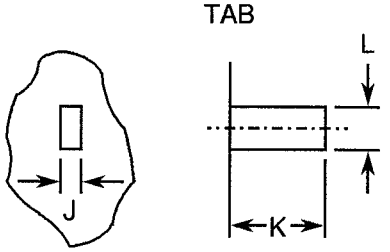
FIGURE 2(i) - 1" CONNECTORISED/DROP-IN



SYMBOL	MILLIMETRES	
	MIN.	MAX.
A	-	19.30
B	-	12.95
C	12.57	13.08
D	6.10	6.60
E	9.40	9.65
F	2.03	2.54
G	14.22	14.73
ØH	1.88	2.18
J	0.10	0.15
K	1.27	2.29
L	0.51	0.76
M	-	9.02
N	-	11.30

Connection interface as follows:
SMA



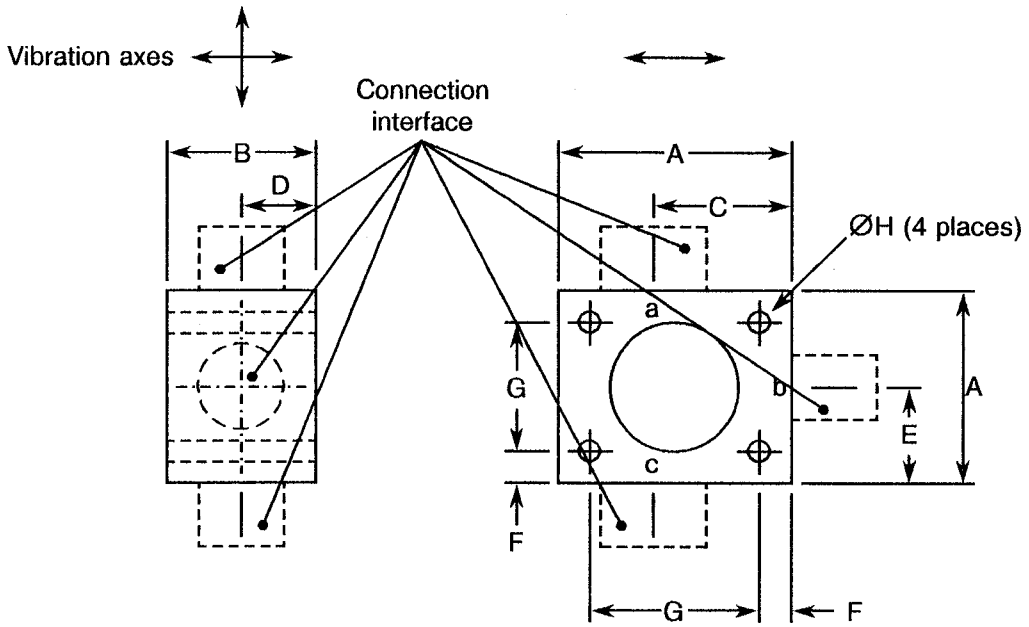


NOTES

1. Ports shall be marked as specified in Figure 3.
2. Full dimensions of the Female SMA interface are specified in ESA/SCC Detail Specification No. 3402/002.
3. Full dimensions of the Male SMA interface are specified in ESA/SCC Detail Specification No. 3402/001.

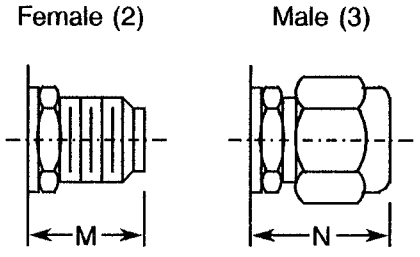
FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

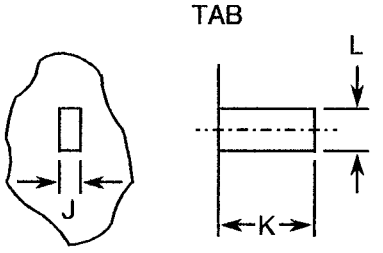
FIGURE 2(j) - 1 1/2" CONNECTORISED/DROP-IN



SYMBOL	MILLIMETRES	
	MIN.	MAX.
A	-	38.35
B	-	12.95
C	27.43	27.94
D	6.10	6.60
E	18.80	19.30
F	3.05	3.56
G	31.24	31.75
ØH	3.76	4.16
J	0.10	0.15
K	1.27	2.29
L	0.51	0.76
M	-	9.02
N	-	11.30

Connection interface as follows:
SMA

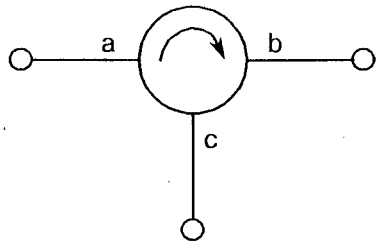




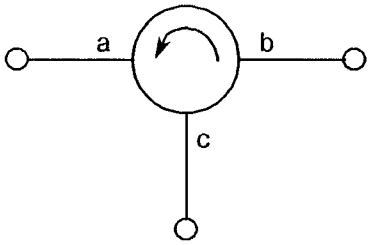
NOTES

1. Ports shall be marked as specified in Figure 3.
2. Full dimensions of the Female SMA interface are specified in ESA/SCC Detail Specification No. 3402/002.
3. Full dimensions of the Male SMA interface are specified in ESA/SCC Detail Specification No. 3402/001.

FIGURE 3 - FUNCTIONAL DIAGRAM



FIGURES 3(a) TO 3(c)



FIGURES 3(d) TO 3(f)

FIGURE	PORT		
	a	b	c
3(a)	1	2	3
3(b)	2	3	1
3(c)	3	1	2
3(d)	3	2	1
3(e)	2	1	3
3(f)	1	3	2

4. REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the circulators specified herein shall be as stated in this specification and ESA/SCC Generic Specification No. 3202. Deviations from the Generic Specification, applicable to this Detail Specification only, are listed in Para. 4.2.

Deviations from the applicable Generic Specifications and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESA/SCC requirements and do not affect the components' reliability, are listed in the appendices attached to this specification.

4.2 DEVIATIONS FROM GENERIC SPECIFICATION

4.2.1 Deviations from Special In-process Controls

None.

4.2.2 Deviations from Final Production Tests (Chart II)

(a) Para. 9.6, Seal Test: Shall not be performed.

(b) Para. 9.12, Multipaction: Shall not be performed.

4.2.3 Deviations from Burn-in and Electrical Measurements (Chart III)

Not applicable.

4.2.4 Deviations from Qualification Tests (Chart IV)

(a) Para. 9.6, Seal Test: Shall not be performed.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

(a) Para. 9.6, Seal Test: Shall not be performed.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Contact Engagement and Separation Forces

Where applicable, the test conditions shall be as specified in ESA/SCC Detail Specification Nos. 3402/001 or 3402/002.

4.3.2 Voltage Proof

Where applicable, the test conditions shall be as specified in ESA/SCC Detail Specification Nos. 3402/001 or 3402/002.

4.3.3 Weight

The maximum weight of the components specified herein shall be as follows:-

FIGURE	No. OF TABS	No. OF SMA CONNECTORS	MAXIMUM WEIGHT (g)
2(a) to 2(c)	3	0	6
2(d)	2	1	11
2(d)	1	2	16
2(d)	0	3	21
2(e) to 2(f)	3	0	15
2(g)	2	1	22
2(g)	1	2	27
2(g)	0	3	32
2(h)	3	0	26
2(i)	2	1	41
2(i)	1	2	46
2(i)	0	3	51
2(j)	3	0	113
2(j)	2	1	118
2(j)	1	2	123
2(j)	0	3	128

4.3.4 Coupling Proof Torque

Where applicable, the applied torque shall be as specified in ESA/SCC Detail Specification Nos. 3402/001 or 3402/002.

4.3.5 Mating and Unmating Forces

Where applicable, the maximum torque shall be as specified in ESA/SCC Detail Specification Nos. 3402/001 or 3402/002.

4.3.6 Centre Contact Retention

Where applicable, the test conditions shall be as specified in ESA/SCC Detail Specification Nos. 3402/001 or 3402/002.

4.3.7 Dimension Check

The dimensions of the components specified herein shall be verified in accordance with the requirements set out in Para. 9 of ESA/SCC Generic Specification No. 3202 and shall conform to those shown in Figure 2.

4.3.8 Endurance

Where applicable, the test conditions shall be as specified in ESA/SCC Detail Specification Nos. 3402/001 or 3402/002.

4.4 MATERIALS AND FINISHES

4.4.1 General

The materials and finishes shall be as specified herein. Where a definite material is not specified, a material which will enable the components specified herein to meet the performance requirements of this specification shall be used. Acceptance or approval of any constituent material does not guarantee acceptance of the finished product.

4.4.2 Body

Stainless Steel, plated 3.0μm (min) nickel.

4.4.3 Connector Receptacle

Where applicable, as per ESA/SCC Detail Specification Nos. 3402/001 or 3402/002.

4.4.4 Tab

Where applicable, the tab material shall be either Type 'M' with Type '4' finish or Type 'M' with Type '7' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500. The particular material and finish shall be as specified in Table 1(a).

4.5 MARKING

4.5.1 General

The marking of all components delivered to this specification shall be in accordance with the requirements of ESA/SCC Basic Specification No. 21700. Each component shall be marked in respect of:-

(a) Port Identification.

(b) The SCC Component Number.

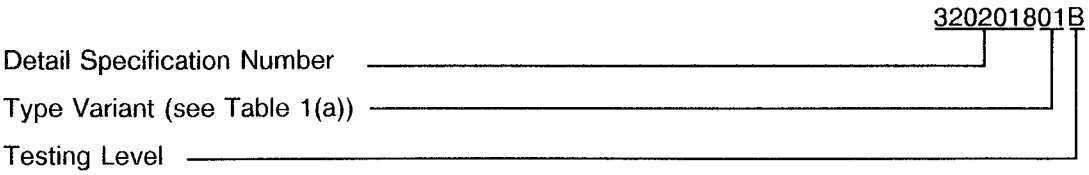
(c) Traceability Information.

4.5.2 Port Identification

Port identification shall be as shown in Table 1(a) and Figure 3.

4.5.3 The SCC Component Number

Each component shall bear the SCC Component Number which shall be constituted and marked as follows:



4.5.4 Traceability Information

Each component shall be marked in respect of traceability information in accordance with the requirements of ESA/SCC Basic Specification No. 21700.

4.6 ELECTRICAL MEASUREMENTS

4.6.1 Electrical Measurements at Room Temperature

The parameters to be measured at room temperature are scheduled in Table 2. The measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

4.6.2 Electrical Measurements at High and Low Temperatures

The parameters to be measured at high and low temperatures are scheduled in Table 3. Measurements shall be performed at the temperature extremes as defined in Column 9 of Table 1(a).

4.6.3 Circuits for Electrical Measurements

Circuits for use in performing electrical measurements given in ESA/SCC Generic Specification No. 3202.

4.7 BURN-IN TESTS

Not applicable.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE

No.	CHARACTERISTICS	SYMBOL	ESA/SCC 3202 TEST METHOD AND CONDITION	LIMITS		UNIT
				MIN.	MAX.	
1	Isolation	ISO	Para. 9.7.1.2	Table 1(a) Column 5		dB
2	Insertion Loss	IL	Para. 9.7.1.3	Table 1(a) Column 6		dB
3	Return Loss	RL	Para. 9.7.1.4	Table 1(a) Column 7		dB
4	Insulation Resistance	R_i	Para. 9.7.1.5	5.0	-	MΩ

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	CHARACTERISTICS	SYMBOL	ESA/SCC 3202 TEST METHOD AND CONDITION	LIMITS	
				MIN.	MAX.
1	Isolation	ISO	Para. 9.7.1.2	Table 1(a) Column 5	
2	Insertion Loss	IL	Para. 9.7.1.3	Table 1(a) Column 6	
3	Return Loss	RL	Para. 9.7.1.4	Table 1(a) Column 7	

FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

Not applicable.

TABLE 4 - PARAMETER DRIFT VALUES

Not applicable.

TABLE 5 - CONDITIONS FOR OPERATING LIFE TEST

No.	CHARACTERISTICS	SYMBOL	CONDITION	UNIT
1	Ambient Temperature	T_{amb}	+125	°C

FIGURE 5 - ELECTRICAL CIRCUIT FOR OPERATING LIFE TEST

Not applicable.

4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESA/SCC GENERIC SPECIFICATION NO. 3202)

4.8.1 Measurements and Inspections on Completion of Environmental Tests

The parameters to be measured and inspections to be performed on completion of environmental tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +22 \pm 3°C$.

4.8.2 Measurements and Inspections at Intermediate Points and on Completion of Endurance Tests

The parameters to be measured and inspections to be performed at intermediate points and on completion of endurance tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +22 \pm 3°C$.

4.8.3 Conditions for Operating Life Tests (Part of Endurance Testing)

The requirements for operating life testing are specified in Section 9 of ESA/SCC Generic Specification No. 3202. The conditions for operating life testing shall be as specified in Table 5 of this specification.

4.8.4 Electrical Circuits for Operating Life Tests

Not applicable.

TABLE 6 - MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTS

No.	ESA/SCC GENERIC SPECIFICATION NO. 3202		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS	UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS			
01	Rapid Change of Temperature	Para. 9.4	Electrical Measurements Visual Examination	Table 2 -		Table 1(a) -	
02	Vibration	Para. 9.5	Electrical Measurements Visual Examination	Table 2 -		Table 1(a) -	
03	Shock or Bump	Para. 9.16	Electrical Measurements Visual Examination	Table 2 -		Table 1(a) -	
04	Permanence of Marking	Para. 9.17	Visual Examination	-		-	
05	Climatic Sequence Dry Heat Cold Test Low Air Pressure Damp Heat	Para. 9.18 Para. 9.18.2 Para. 9.18.4 Para. 9.18.5 Para. 9.18.6	 Electrical Measurements Electrical Measurements 3202, Para. 9.18.5 Electrical Measurements	 Table 3 Table 3 - Table 2		 Table 1(a) Table 1(a) 3202, Para. 9.18.5 Table 1(a)	
06	Corrosion	Para. 9.19	Visual Examination	-		-	
07	Coupling Proof Torque	Para. 9.8	Interface Dimensions Visual Examination	- -		3402/001 or 002, Figure 2 -	
08	Endurance	Para. 9.20	Mating/Unmating Forces Contact Resistance Visual Examination	3402, Para. 9.18 - -	 R_c	3402/001 or 002, Table 6 3402/001 or 002, Table 6 -	 mΩ
09	Solderability	Para. 9.21	Visual Examination	-		-	
10	Robustness of Terminations	Para. 9.22	Visual Examination	-		-	
11	Seal Test	Para. 9.6	Not applicable	-		-	
12	Damp Heat	Para. 9.23	Electrical Measurements Visual Examination	Table 2 -		Table 1(a) -	
13	Operating Life	Para. 9.24.1 Para. 9.24.3 Para. 9.24.5	Init. Elec. Measurements Inter. Elec. Measurements Final Elec. Measurements	Table 2 Table 2 Table 2		Table 1(a) Table 1(a) Table 1(a)	
14	Mating and Unmating Forces	Para. 9.9	3402/001 or 002, Table 6	-		3402/001 or 002, Table 6	
15	Contact Engagement and Separation Forces	Para. 9.13	3402/001 or 002, Table 6	-		3402/001 or 002, Table 6	

NOTES

1. The tests in this table refer to either Chart IV or V and shall be used as applicable.