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Pages 1 to 17

CONTACTS, ELECTRICAL, CRIMP

FOR 3401/002 CONNECTORS

ESA/SCC Detail Specification No. 3401/005

space components
coordination group

Issue/Rev.	Date	Approved by	
		SCCG Chairman	ESA Director General or his Deputy
Issue 4	September 1993		
Revision 'A'	January 1995		
Revision 'B'	November 1996		
Revision 'C'	February 2000		

DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
		This issue supersedes Issue 3 and incorporates all modifications defined in Issue 3, Revisions 'A' and 'B' and the following DCR's:		
		Specification entirely rewritten further to the new issue of ESA/SCC Generic Specification No. 3401.		221066
		Addition of new variants for high density contacts (gauge 22)		221066
		Figure 2 :	Note about inspection hole added	22992
'A'	Jan. '95	P1. Cover page		None
		P2. DCN		None
		P9. Figure 2	: Variant 06, delete underlining for D and ØM	221181
		P10.	: Variant 08, delete underlining for ØM	221181
		P13. Para. 4.4.3	: Add and delete 1.27µm gold minimum over 2µm minimum over nickel.	221181/ 221222
		P16-17 Table 6	: Editorial corrections	221181/ 221194/ 23725
'B'	Nov. '96	P1. Cover page		None
		P2. DCN		None
		P8, 9 & 10 Figure 2	: ØG underlined in table	221370
		P11. Para. 2	: Items (c) and (d) deleted	221370
		P12. Para. 4.3.1	: Last sentence added	221370
		P13. Para. 4.4.3	: 2nd sentence deleted	221370
			: Gold plate thickness modified	221370
'C'	Feb. '00	P1. Cover page		None
		P2. DCN		None
		P11. Para. 2	: Items (c) and (d) added	221544
		P13. Para. 4.4.3	: Existing text extended	221544

TABLE OF CONTENTS

1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for Contacts, Electrical, Crimp, Gauge 20 and 22, for 3401/002 Connectors.

These contacts shall be packed separately from the connectors and may be procured either with the connectors or separately.

This specification shall be read in conjunction with:

- ESA/SCC Generic Specification No. 3401, Connectors, Electrical, Non-Filtered, Circular and Rectangular,
- ESA/SCC Detail Specification No. 3401/002, Connectors, Electrical, Rectangular, Removable Crimp Contacts, Based on Type D*MA,

the requirements of which are supplemented herein.

1.2 TYPE VARIANTS

The different sizes of contacts specified herein, which are also covered by this specification are scheduled 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 contacts specified herein, are scheduled in Table 1(b).

1.4 PARAMETER DERATING INFORMATION (FIGURE 1)

Not applicable.

1.5 PHYSICAL DIMENSIONS

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

TABLE 1(a) - TYPE VARIANTS

VAR-IANT	TYPE	MATING END SIZE	CRIMP BARREL SIZE	RATED CUR-RENT	ACCEPT WIRE	MAX WEIGHT	ENGAGEMENT & SEPARATION		CONTACT CAPABILITY				CON-TACT RETENT. FORCE MAX	CONTACT INSERT WITHDR FORCES MAX	PROBE DAMAGE			OVERSIZE PIN EXCL.		
									TEST PINS DIA mm		WEIGHT				MO-MENT	PROBE DIA mm		FORCE MAX	TEST PIN DIA mm	
							ENGAG. FORCES	SEPAR. FORCES			Pick-up (2)	Drop (3)								
				A	AWG	g	N (1)	N (1)	min.	max.	g	g	N	N	N.cm	min	max	N	min	max
01	Male	20	20	7.5	20 22 24	0.16	-	-	-	-	-	-	40	18.50	-	-	-	-	-	-
02	Female					0.18	3.33 -	2.22 0.28	1.039 0.990	1.040 0.993	- 28.35	226.80 -	40	18.50	5.65	1.007	1.033	3.33	1.166	1.170
03	Male	20	26	3.0	26 28	0.18	-	-	-	-	-	-	40	18.50	-	-	-	-	-	-
04	Female					0.21	3.33 -	2.22 0.28	1.039 0.990	1.040 0.993	- 28.35	226.80 -	40	18.50	5.65	1.007	1.033	3.33	1.166	1.170
05	Male	20	18	7.5	18 20	0.25	-	-	-	-	-	-	40	18.50	-	-	-	-	-	-
06	Female					0.28	3.33 -	2.22 0.28	1.039 0.990	1.040 0.993	- 28.35	226.80 -	40	18.50	5.65	1.007	1.033	3.33	1.166	1.170
07	Male	22	22	5.0	22 24	0.08	-	-	-	-	-	-	40	18.50	-	-	-	-	-	-
08	Female				26	0.11	3.33 -	2.22 0.20	0.773 0.749	0.775 0.751	- 19.84	226.80 -	40	18.50	1.30	0.749	0.774	2.43	0.905	0.907

NOTES

1. 1st line, maximum values with maximum diameter test pin;
   2nd line, minimum values with minimum diameter test pin.
2. With minimum diameter test pin and minimum insertion depth of 4.0mm.
3. With maximum diameter test pin and minimum insertion depth of 4.0mm.

TABLE 1(b) - MAXIMUM RATINGS

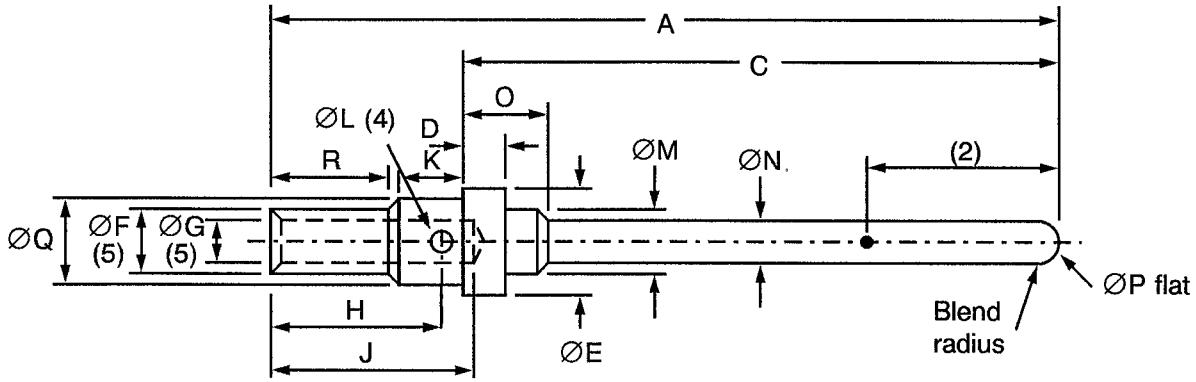
No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATING		UNIT
			MIN.	MAX.	
1	Rated Current	I_{CR}	-	See Table 1(a)	A
2	Operating Temperature Range	T_{op}	−55	+125	°C
3	Storage Temperature Range	T_{stg}	−65	+125	°C

FIGURE 1 - PARAMETER DERATING INFORMATION

Not applicable

FIGURE 2 - PHYSICAL DIMENSIONS

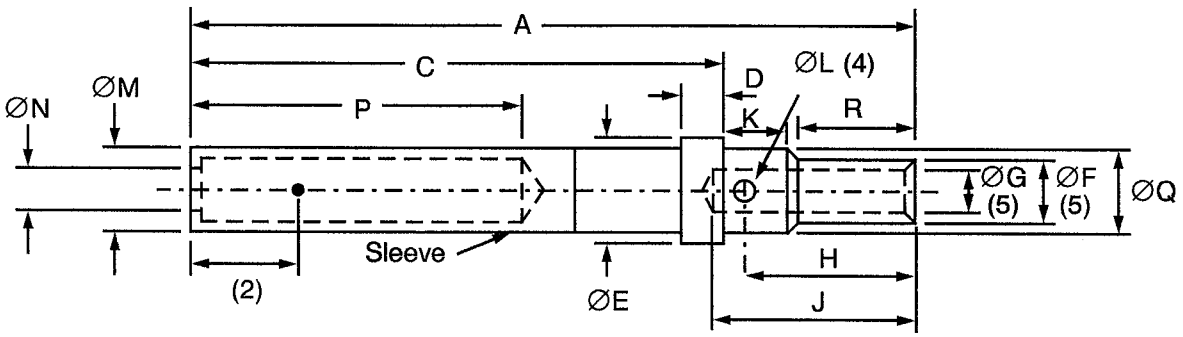
VARIANTS 01 AND 03 - MALE CONTACTS



	A	C	D	ØE	ØF	ØG (6)	H	J	K	ØL	ØM	ØN	O	ØP	ØQ	R
Min.	-	9.80	0.72	2.08	1.65	1.09	3.40	3.80	1.01	0.60	1.78	0.99	1.65	-	1.70	2.40
Max.	14.14	10.0	0.86	2.16	1.73	1.17	3.68	4.70	1.25	0.80	1.85	1.04	1.75	0.30	1.80	-

NOTES
1. All dimensions are in millimetres.
2. Measurement point for plating thickness: 4.0 ± 1.0.
3. Underlined dimensions, in table, are critical to ensure intermateability and interchangeability.
4. Inspection hole may be ØL square and shall only penetrate one wall of the crimp barrel.
5. ØF and ØG to be concentric within 0.04.
6. ØG of Variant 03 shall be 0.59 minimum, 0.66 maximum.

VARIANTS 02 AND 04 - FEMALE CONTACTS

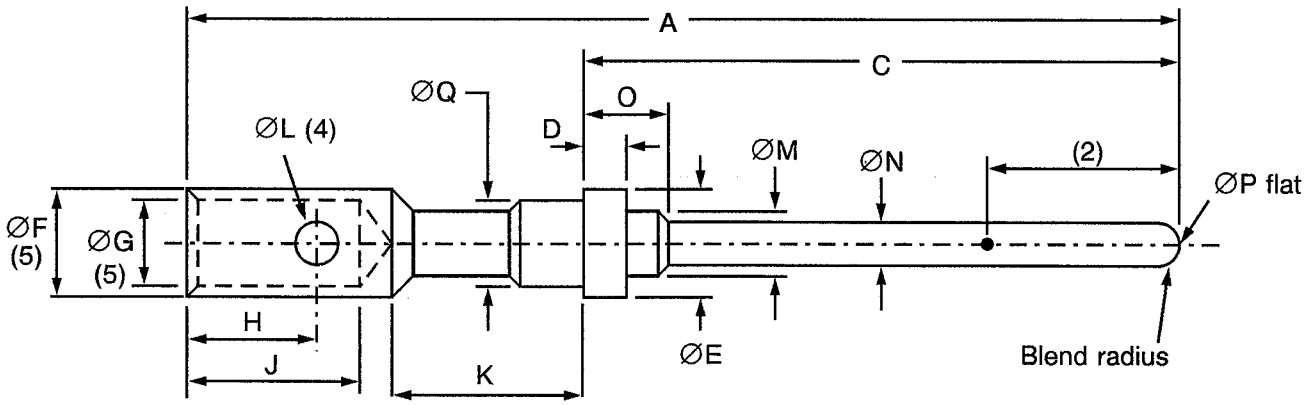


	A	C	D	ØE	ØF	ØG (6)	H	J	K	ØL	ØM	ØN	P	ØQ	R
Min.	-	9.45	0.72	2.08	1.65	1.09	3.40	3.80	1.01	0.60	1.70	1.07	7.0	1.73	2.40
Max.	13.80	9.65	0.86	2.16	1.73	1.17	3.68	4.70	1.25	0.80	1.85	1.14	-	1.80	-

NOTES
1. All dimensions are in millimetres.
2. Measurement point for plating thickness: 2.0 ± 1.0.
3. Underlined dimensions, in table, are critical to ensure intermateability and interchangeability.
4. Inspection hole may be ØL square and shall only penetrate one wall of the crimp barrel.
5. ØF and ØG to be concentric within 0.04.
6. ØG of Variant 04 shall be 0.59 minimum, 0.66 maximum.

FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

VARIANT 05 - MALE CONTACT

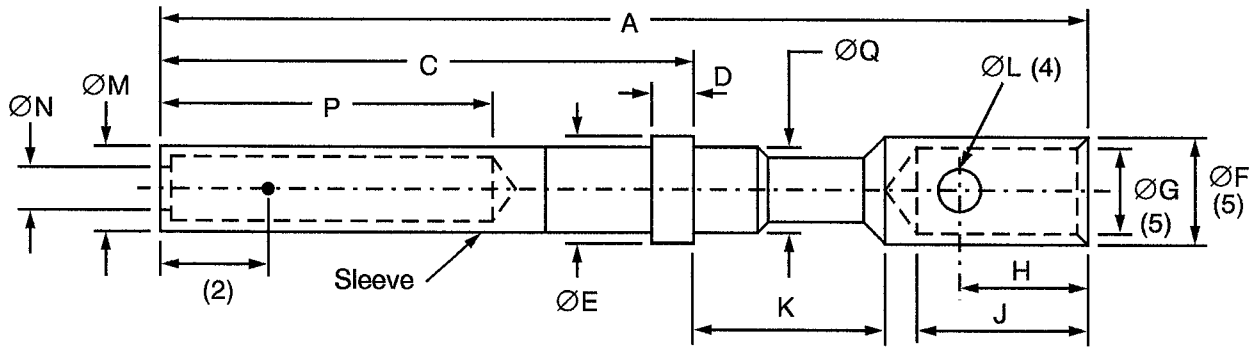


	A	C	D	ØE	ØF	ØG	H	J	K	ØL	ØM	ØN	O	ØP	ØQ
Min.	-	9.80	0.72	2.08	2.09	1.65	3.00	4.32	6.15	0.60	1.78	0.99	1.65	-	1.70
Max.	21.13	10.0	0.86	2.16	2.18	1.74	4.00	4.70	6.45	0.80	1.85	1.04	1.75	0.30	1.80

NOTES

1. All dimensions are in millimetres.
2. Measurement point for plating thickness: 4.0 ± 1.0.
3. Underlined dimensions, in table, are critical to ensure intermateability and interchangeability.
4. Inspection hole may be ØL square and shall only penetrate one wall of the crimp barrel.
5. ØF and ØG to be concentric within 0.04.

VARIANT 06 - FEMALE CONTACT



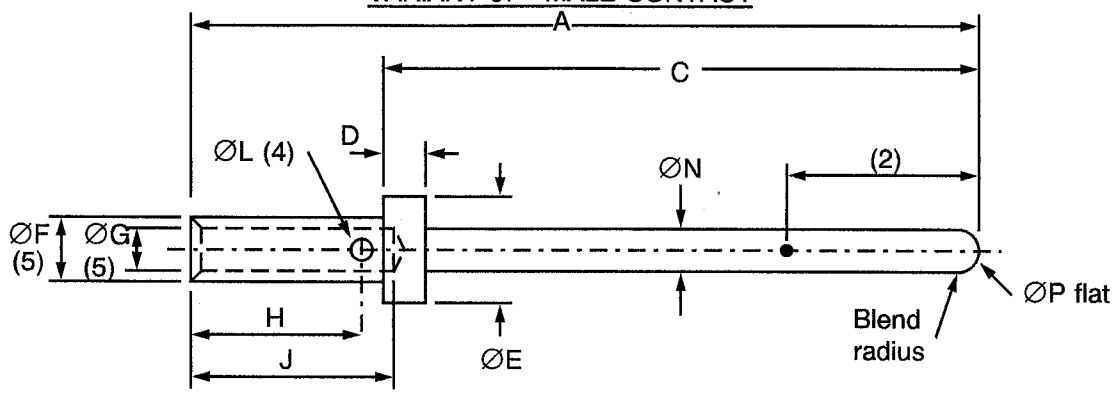
	A	C	D	ØE	ØF	ØG	H	J	K	ØL	ØM	ØN	P	ØQ
Min.	-	9.45	0.72	2.08	2.09	1.65	3.80	4.32	6.15	0.60	1.70	1.07	7.0	1.73
Max.	20.80	9.65	0.86	2.16	2.18	1.74	4.00	4.70	6.45	0.80	1.85	1.14	-	1.80

NOTES

1. All dimensions are in millimetres.
2. Measurement point for plating thickness: 2.0 ± 1.0.
3. Underlined dimensions, in table, are critical to ensure intermateability and interchangeability.
4. Inspection hole may be ØL square and shall only penetrate one wall of the crimp barrel.
5. ØF and ØG to be concentric within 0.04.

FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

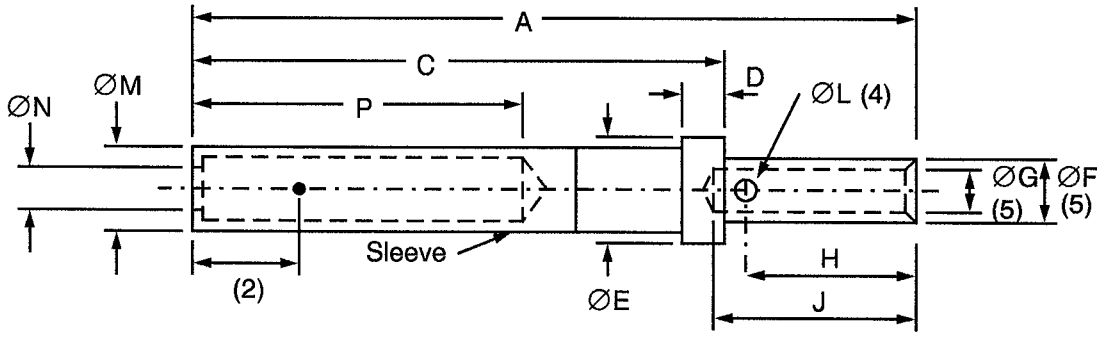
VARIANT 07 - MALE CONTACT



	A	C	D	ØE	ØF	ØG	H	J	ØL	ØN	ØP
Min.	-	7.49	0.74	1.52	1.17	0.85	3.09	3.58	0.46	0.75	-
Max.	13.64	7.62	0.84	1.57	1.22	0.90	3.27	3.99	0.56	0.77	0.20

NOTES
1. All dimensions are in millimetres.
2. Measurement point for plating thickness: 4.0 ± 1.0.
3. Underlined dimensions, in table, are critical to ensure intermateability and interchangeability.
4. Inspection hole may be ØL square and shall only penetrate one wall of the crimp barrel.
5. ØF and ØG to be concentric within 0.04.

VARIANT 08 - FEMALE CONTACT



	A	C	D	ØE	ØF	ØG	H	J	ØL	ØM	ØN	P
Min.	-	7.08	0.74	1.52	1.17	0.85	3.09	3.58	0.46	-	0.78	4.22
Max.	13.41	7.34	0.84	1.57	1.22	0.90	3.27	3.99	0.56	1.57	-	-

NOTES
1. All dimensions are in millimetres.
2. Measurement point for plating thickness: 2.0 ± 1.0.
3. Underlined dimensions, in table, are critical to ensure intermateability and interchangeability.
4. Inspection hole may be ØL square and shall only penetrate one wall of the crimp barrel.
5. ØF and ØG to be concentric within 0.04.

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. 3401, Connectors, Electrical, Non-Filtered, Circular and Rectangular.

(b) ESA/SCC Detail Specification No. 3401/002, Connectors, Electrical, Rectangular, Removable Crimp Contacts, Based on Type D*MA.

(c) MIL-G-45204, Gold Plating, Electro-deposited.

(d) MIL-C-14450, Copper Plating, Electro-deposited.

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.

4. REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the contacts specified herein are stated in this specification and ESA/SCC Generic Specification No. 3401. Deviations from the Generic Specification, applicable to this Detail Specification only, are listed in Para. 4.2.

Deviations from the applicable Generic Specification 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)

None.

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. 9.31, Solderability: Not applicable.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

(a) Para. 9.31, Solderability: Not applicable.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the contacts specified herein shall be verified in accordance with the requirements set out in Para. 9.6 of ESA/SCC Generic Specification No. 3401 and shall conform to those shown in Figure 2 of this specification. Only the underlined dimensions shall bechecked during procurement.

4.3.2 Weight

The maximum weight of the contacts specified herein shall be as specified in Table 1(a).

4.3.3 Contact Capability

For the purpose of this test, the pick-up and drop weights shall be as specified in Table 1(a).

4.3.4 Contact Retention (in insert)

The contact retention force shall be as specified in Table 1(a).

4.3.5 Mating and Unmating Forces

As specified in ESA/SCC Detail Specification No. 3401/002.

4.3.6 Insert Retention (In Shell)

As specified in ESA/SCC Detail Specification No. 3401/002.

4.3.7 Jackscrew Retention

As specified in ESA/SCC Detail Specification No. 3401/002.

4.3.8 Contact Insertion and Withdrawal Forces

The contact insertion and withdrawal forces shall be as specified in Table 1(a).

4.3.9 Engagement and Separation Forces

The diameter of the test pin and the engagement and separation forces of the female contacts shall be as specified in Table 1(a).

4.3.10 Oversize Pin Exclusion

The diameter of the test pin and the force applied to it shall be as specified in Table 1(a).

4.3.11 Probe Damage

The probe diameter and the moment at the end of the probe shall be as specified in Table 1(a).

4.3.12 Solderability

Not applicable.

4.4 MATERIALS AND FINISHES

The materials and finishes shall be as specified herein. Where a definite material is not specified, a material which will enable the connectors 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.

4.4.1 Shells

As specified in ESA/SCC Detail Specification No. 3401/002.

4.4.2 Inserts

As specified in ESA/SCC Detail Specification No. 3401/002.

4.4.3 Contacts

The contact body shall be made of copper alloy with an underplate of 1.0µm minimum of copper to MIL-C-14450, gold plated with 1.27µm of gold, Type 2 Grade C of MIL-G-45204.

The female contact spring element shall be made of copper alloy with an underplate of 1.0µm minimum of nickel or copper to MIL-C-14450, gold plated with 1.27µm minimum of gold, Type 2 Grade C of MIL-G-45204.

4.4.4 Contact Retaining Clip

As specified in ESA/SCC Detail Specification No. 3401/002.

4.4.5 Guiding and Locking Devices

As specified in ESA/SCC Detail Specification No. 3401/002.

4.4.6 Magnetism Level

As specified in ESA/SCC Detail Specification No. 3401/002.

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 and the following subparagraphs.

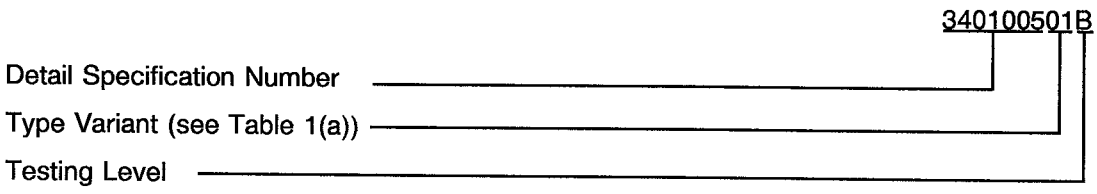
These components being too small to accommodate the marking as specified hereafter, the full marking information shall accompany each lot of components in its primary package. Such marking shall comprise:-

(a) The SCC Component Number.

(b) Traceability information.

4.5.2 The SCC Component Number

The SCC component number shall be constituted and marked as follows:-



4.5.3 Traceability Information

Traceability information shall be marked in accordance with ESA/SCC Basic Specification No. 21700.

4.6 ELECTRICAL MEASUREMENTS

4.6.1 Electrical Measurements at Room Temperature

The parameters to be measured in respect of electrical characteristics are scheduled in Table 2. Unless otherwise specified these measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

4.6.2 Electrical Measurements at High and Low Temperatures (Table 3)

Not applicable.

4.6.3 Circuit for Electrical Measurements (Figure 4)

Not applicable.

4.7 BURN-IN AND ELECTRICAL MEASUREMENTS (TABLES 4 AND 5)

Not applicable.

4.8 ENVIRONMENTAL AND ENDURANCE TESTS

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 testing are scheduled in Table 6. Unless otherwise specified, these measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

4.8.2 Measurements and Inspections at Intermediate Points during Endurance Tests

Not applicable.

4.8.3 Measurements and Inspections on Completion of Endurance Tests

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

4.8.4 Conditions for Operating Life Test (Part of Endurance Testing)

Not applicable.

4.8.5 Electrical Circuits for Operating Life Test

Not applicable.

4.8.6 Conditions for High Temperature Storage Test (Part of Endurance Testing)

The requirements for the high temperature storage test are specified in Section 9 of ESA/SCC Generic Specification No. 3401. The conditions for high temperature storage testing shall be the maximum storage temperature specified in Table 1(b) of this specification.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITION	VARIANTS	LIMITS		UNIT
						MIN.	MAX.	
1	Contact Resistance (Low Level Current)	Rcl	ESA/SCC No. 3401 Para 9.1.1.3	Para 9.1.1.3	All	-	6.0	mΩ
2	Contact Resistance (Rated Current)	Rcr	ESA/SCC No. 3401 Para 9.1.1.3	Para 9.1.1.3				
				7.5A	01,02,05,06	-	5.0	mΩ
				3.0A	03,04	-	5.0	mΩ
				5.0A	07,08	-	5.0	mΩ

TABLES 3, 4 AND 5

Not applicable

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

NO.	ESA/SCC GENERIC NO. 3401		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN	MAX	
01	Wiring	Para. 9.10 & Table 1(a) of this spec.	Low Level Contact Resistance	Table 2 Item 1	Rcl	Table 2 Item 1		
02	Vibration	Para. 9.11	ESA/SCC 3401/002					
03	Shock or Bump	Para. 9.12	ESA/SCC 3401/002					
04	Climatic Sequence	Para. 9.13	ESA/SCC 3401/002					
05	Seal Test	Para. 9.9	ESA/SCC 3401/002					
06	Plating Thickness	Para. 9.14	Thickness	-	-	Para. 4.4.3 of this spec		
07	Joint Strength	Para. 9.15	ESA/SCC 3401 Para 9.15					
08	Rapid Change of Temperature	Para. 9.16	ESA/SCC 3401/002					
09	Contact Retention (in insert)	Para. 9.17 & Para. 4.3.4 of this spec.	Contact Displacement		-	ESA/SCC 3401 Para. 9.17		
10	Endurance	Para. 9.18	**Initial** Low Level Contact Resist **Final** Low Level Contact Resistance Drift	 Table 2 Item 1 Table 2 Item 1	 Rcl ΔRcl	 Record Values -	 3.0	 mΩ
11	Permanence of Marking	Para. 9.19	As applicable					
12	Mating/Unmating Forces	Para. 9.20	ESA/SCC 3401/002					
13	High Temperature Storage	Para. 9.21	**Initial** Low Level Contact Resist **Final** Low Level Contact Resistance Drift Rated Current Contact Resistance Contact Retention (in insert)	 Table 2 Item 1 Table 2 Item 1 Table 2 Item 2 Para. 4.3.4 of this spec.	 Rcl ΔRcl Rcr -	 Record Values - Table 2 Item 2 ESA/SCC 3401 Para. 9.17	 3.0	 mΩ
14	Corrosion	Para. 9.22	Visual Examination					

NOTES

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

TABLE 6 - MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL AND ENDURANCE TESTS (CONTINUED)

NO.	ESA/SCC GENERIC NO. 3401		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN	MAX	
15	Insert Retention (in shell)	Para. 9.23 & Para. 4.3.6 of this spec.	ESA/SCC 3401/002					
16	Jackscrew Retention	Para. 9.24 & Para. 4.3.7 of this spec.	ESA/SCC 3401/002					
17	High Temperature Measurements	Para. 9.25	ESA/SCC 3401/002					
18	Overload Test	Para. 9.26	Rated Current Contact Resistance	Table 2 Item 2	Rcr	Table 2 Item 2		
19	Maintenance Aging	Para. 9.27	Visual Examination Contact Retention Contact Insertion & Withdrawal Forces	- Para. 4.3.4 of this spec. Para. 4.3.8 of this spec.	- - -	- ESA/SCC 3401 Para. 9.17 Para. 4.3.8	-	
20	Engage/Separation Forces	Para. 9.28 & Para. 4.3.9 of this spec.	Force		-	Para. 4.3.9		
21	Oversize Pin Exclusion	Para. 9.29 & Para. 4.3.10 of this spec.			-	ESA/SCC 3401 Para. 9.29		
22	Probe Damage	Para. 9.30 & Para. 4.3.11 of this spec.	Contact Separation Force	Para. 4.3.9 of this spec.	-	Para. 4.3.9		
23	Solderability	Para. 9.31 & Para. 4.3.12 of this spec.	Not applicable					

NOTES

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