



Pages 1 to 18

**CONTACTS, ELECTRICAL, CRIMP**

**FOR 3401/002 CONNECTORS**

**ESCC Detail Specification No. 3401/005**

**ISSUE 5**

**June 2009**




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**DOCUMENTATION CHANGE NOTICE**

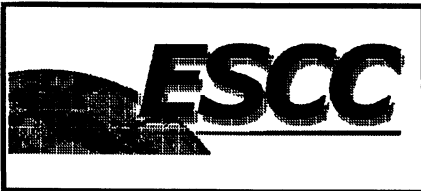
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DCR No.	CHANGE DESCRIPTION
432, 453	Specification upissued to incorporate editorial and technical changes per DCR.

	<p style="text-align: center;">ESCC Detail Specification No. 3401/005</p>		<p>PAGE 3 ISSUE 5</p>
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**TABLE OF CONTENTS**

		<u>Page</u>
<b>1.</b>	<b><u>GENERAL</u></b>	<b>5</b>
1.1	Scope	5
1.2	Type Variants	5
1.3	Maximum Ratings	5
1.4	Parameter Derating Information	5
1.5	Physical Dimensions	5
<b>2.</b>	<b><u>APPLICABLE DOCUMENTS</u></b>	<b>11</b>
<b>3.</b>	<b><u>TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS</u></b>	<b>11</b>
<b>4.</b>	<b><u>REQUIREMENTS</u></b>	<b>11</b>
4.1	General	11
4.2	Deviations from Generic Specification	11
4.2.1	Deviations from Special In-process Controls	11
4.2.2	Deviations from Final Production Tests	11
4.2.3	Deviations from Burn-in and Electrical Measurements	11
4.2.4	Deviations from Qualification Tests	11
4.2.5	Deviations from Lot Acceptance Tests	11
4.3	Mechanical Requirements	12
4.3.1	Dimension Check	12
4.3.2	Weight	12
4.3.3	Contact Capability	12
4.3.4	Contact Retention	12
4.3.5	Mating and Unmating Forces	12
4.3.6	Insert Retention	12
4.3.7	Jackscrew Retention	12
4.3.8	Contact Insertion and Withdrawal Forces	12
4.3.9	Engagement and Separation Forces	12
4.3.10	Oversize Pin Exclusion	12
4.3.11	Probe Damage	12
4.3.12	Solderability	12
4.4	Materials and Finishes	13
4.4.1	Shells	13
4.4.2	Inserts	13
4.4.3	Contacts	13
4.4.4	Contact Retaining Clip	13
4.4.5	Guiding and Locking Devices	13
4.4.6	Magnetism Level	13
4.5	Marking	13
4.5.1	General	13
4.5.2	The ESCC Component Number	13
4.5.3	Traceability Information	13
4.6	Electrical Measurements	14
4.6.1	Electrical Measurements at Room Temperature	14
4.6.2	Electrical Measurements at High and Low Temperatures	14
4.6.3	Circuits for Electrical Measurements	14
4.7	Burn-in and Electrical Measurements	14
4.8	Environmental and Endurance Tests	14
4.8.1	Measurements and Inspections on Completion of Environmental Tests	14
4.8.2	Measurements and Inspections at Intermediate Points during Endurance Tests	14
4.8.3	Measurements and Inspections on Completion of Endurance Tests	14
4.8.4	Conditions for Operating Life Test	14



4.8.5	Electrical Circuits for Operating Life Test	<u>Page</u> 14
4.8.6	Conditions for High Temperature Storage Test	14

**TABLES**

1(a)	Type Variants	6
1(b)	Maximum Ratings	7
2	Electrical Measurements at Room Temperature	15
3	Not applicable	N/A
4	Not applicable	N/A
5	Not applicable	N/A
6	Measurements and Inspections on Completion of Environmental and Endurance Tests	16

**FIGURES**

1	Parameter Derating Information	7
2	Physical Dimensions	
	- Variants 01 and 03 - Male Contacts	8
	- Variants 02 and 04 - Female Contacts	8
	- Variant 05 - Male Contact	9
	- Variant 06 - Female Contact	9
	- Variant 07 - Male Contact	10
	- Variant 08 - Female Contact	10

**APPENDICES (Applicable to specific Manufacturers only)**

A	C&K Components (F)	18
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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:

- ESCC Generic Specification No. 3401, Connectors, Electrical, Non-Filtered, Circular and Rectangular,
- ESCC 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.



ESCC Detail Specification

No. 3401/005

PAGE 6

ISSUE 5

**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.	
							ENGAG. FORCES N (1)	SEPAR. FORCES N (1)	TEST PINS DIA mm	Pick-up (2) g	Drop (3) g	min.			max.	MO- MENT N.cm	PROBE DIA mm	FORCE MAX
01	Male	20	20	7.5	AWG 20 22 24	0.16	-	-	-	-	-	-	-	-	-	-	-	-
	Female						3.33	2.22	1.039	-	226.8	1.007	1.033	3.33	1.166	1.17		
02	Male	20	26	3.0	26 28	0.18	-	-	-	-	-	-	-	-	-	-	-	
	Female						3.33	2.22	1.039	-	226.8	1.007	1.033	3.33	1.166	1.17		
03	Male	20	18	7.5	18 20	0.3	-	-	-	-	-	-	-	-	-	-	-	
	Female						3.33	2.22	1.039	-	226.8	1.007	1.033	3.33	1.166	1.17		
04	Male	22	22	5.0	22 24 26	0.08	-	-	-	-	-	-	-	-	-	-	-	
	Female						3.33	2.22	1.039	-	226.8	1.007	1.033	3.33	1.166	1.17		
05	Male	22	22	5.0	22 24 26	0.11	-	-	-	-	-	-	-	-	-	-	-	
	Female						3.33	2.22	1.039	-	226.8	0.773	0.775	2.43	0.905	0.907		
06	Male	22	22	5.0	22 24 26	0.11	-	-	-	-	-	-	-	-	-	-	-	
	Female						3.33	2.22	1.039	-	226.8	0.749	0.751	2.43	0.905	0.907		
07	Male	22	22	5.0	22 24 26	0.11	-	-	-	-	-	-	-	-	-	-	-	
	Female						3.33	2.22	1.039	-	226.8	0.749	0.751	2.43	0.905	0.907		
08	Male	22	22	5.0	22 24 26	0.11	-	-	-	-	-	-	-	-	-	-	-	
	Female						3.33	2.22	1.039	-	226.8	0.749	0.751	2.43	0.905	0.907		

**NOTES**

- 1st line, maximum values with maximum diameter test pin;  
2nd line, minimum values with minimum diameter test pin.
- With minimum diameter test pin and minimum insertion depth of 4mm.
- With maximum diameter test pin and minimum insertion depth of 4mm.



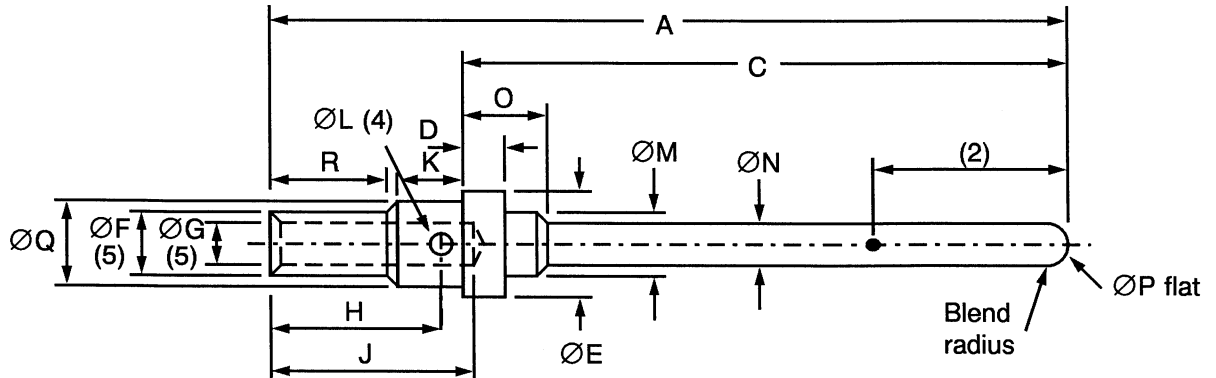
**TABLE 1(b) - MAXIMUM RATINGS**

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**

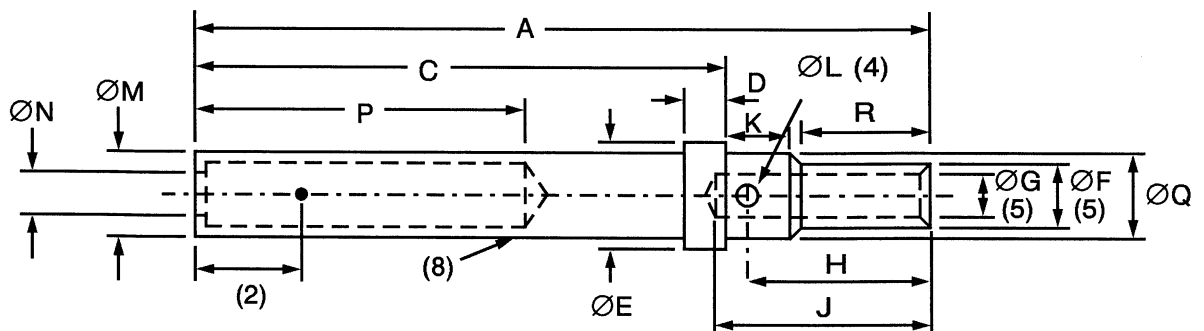


	A	<u>C</u>	D	<u>ØE</u>	ØF	<u>ØG</u> (6)	H	J	K	ØL (7)	ØM	<u>ØN</u>	<u>Q</u>	ØP	<u>ØQ</u>	R
Min.	-	9.8	0.72	2.08	1.65	1.09	3.4	3.8	1.01	0.6	1.78	0.99	1.65	-	1.7	2.4
Max.	14.14	10	0.86	2.16	1.73	1.17	3.68	4.7	1.25	0.8	1.85	1.04	1.75	0.3	1.8	-

**NOTES**

1. All dimensions are in millimetres.
2. Measurement point for plating thickness:  $4 \pm 1$ .
3. Underlined dimensions, in table, are critical to ensure intermateability and interchangeability.
4. Inspection hole may be  $\varnothing L$  square and shall only penetrate one wall of the crimp barrel.
5.  $\varnothing F$  and  $\varnothing G$  to be concentric within 0.04.
6.  $\varnothing G$  of Variant 03 shall be 0.59 minimum, 0.66 maximum.
7.  $\varnothing L$  of Variant 03 shall be 0.45 minimum, 0.55 maximum.

**VARIANTS 02 AND 04 - FEMALE CONTACTS**



	A	<u>C</u>	D	<u>ØE</u>	ØF	<u>ØG</u> (6)	H	J	K	ØL	ØM	<u>ØN</u>	<u>P</u>	<u>ØQ</u>	R
Min.	-	9.45	0.72	2.08	1.65	1.09	3.4	3.8	1.01	0.6	1.7	1.07	7	1.7	2.4
Max.	13.8	9.65	0.86	2.16	1.73	1.17	3.68	4.7	1.25	0.8	1.85	1.14	-	1.8	-

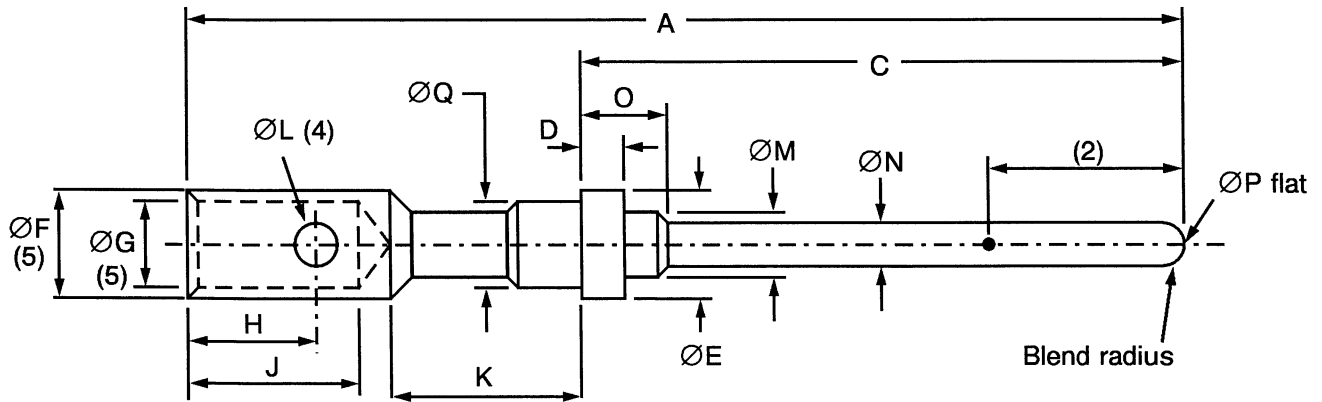
**NOTES**

1. All dimensions are in millimetres.
2. Measurement point for plating thickness:  $2 \pm 1$ .
3. Underlined dimensions, in table, are critical to ensure intermateability and interchangeability.
4. Inspection hole may be  $\varnothing L$  square and shall only penetrate one wall of the crimp barrel.
5.  $\varnothing F$  and  $\varnothing G$  to be concentric within 0.04.
6.  $\varnothing G$  of Variant 04 shall be 0.59 minimum, 0.66 maximum.
7.  $\varnothing L$  of Variant 04 shall be 0.45 minimum, 0.55 maximum.
8. The mechanical pressure member shall be shrouded. Sleeve, if used, shall conform to the applicable requirements.



**FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)**

VARIANT 05 - MALE CONTACT

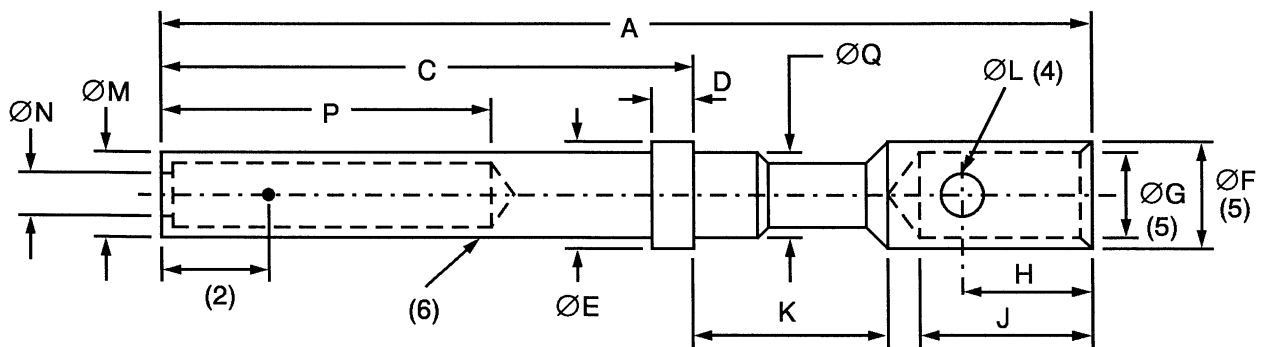


	<u>A</u>	<u>C</u>	D	<u>ØE</u>	<u>ØF</u>	<u>ØG</u>	H	J	K	<u>ØL</u>	<u>ØM</u>	<u>ØN</u>	<u>Ø</u>	<u>ØP</u>	<u>ØQ</u>
Min.	-	9.8	0.72	2.08	2.09	1.65	3.8	4.32	6.15	0.6	1.78	0.99	1.65	-	1.7
Max.	21.13	10	0.86	2.16	2.18	1.74	4.0	4.7	6.45	0.8	1.85	1.04	1.75	0.3	1.8

**NOTES**

1. All dimensions are in millimetres.
2. Measurement point for plating thickness:  $4 \pm 1$ .
3. Underlined dimensions, in table, are critical to ensure intermateability and interchangeability.
4. Inspection hole may be  $\varnothing L$  square and shall only penetrate one wall of the crimp barrel.
5.  $\varnothing F$  and  $\varnothing G$  to be concentric within 0.04.

VARIANT 06 - FEMALE CONTACT



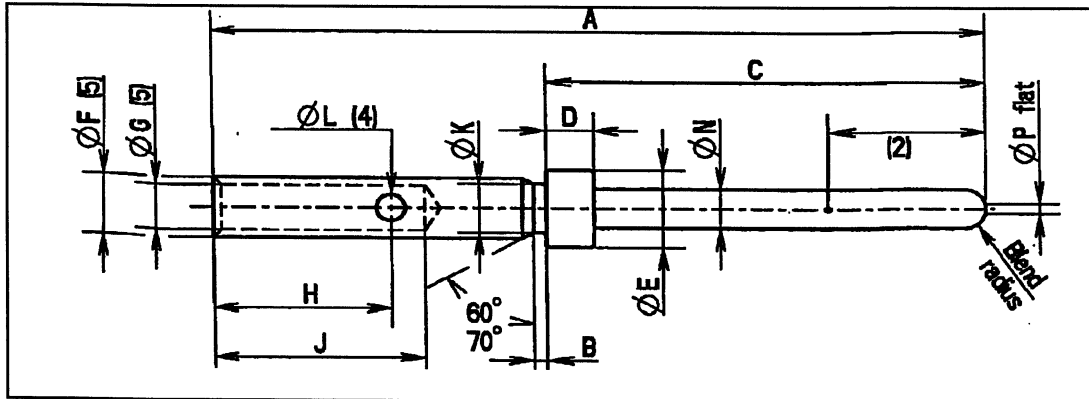
	<u>A</u>	<u>C</u>	D	<u>ØE</u>	<u>ØF</u>	<u>ØG</u>	H	J	K	<u>ØL</u>	<u>ØM</u>	<u>ØN</u>	<u>P</u>	<u>ØQ</u>
Min.	-	9.45	0.72	2.08	2.09	1.65	3.8	4.32	6.15	0.6	1.70	1.07	7.0	1.7
Max.	20.80	9.65	0.86	2.16	2.18	1.74	4	4.7	6.45	0.8	1.85	1.14	-	1.8

**NOTES**

1. All dimensions are in millimetres.
2. Measurement point for plating thickness:  $2 \pm 1$ .
3. Underlined dimensions, in table, are critical to ensure intermateability and interchangeability.
4. Inspection hole may be  $\varnothing L$  square and shall only penetrate one wall of the crimp barrel.
5.  $\varnothing F$  and  $\varnothing G$  to be concentric within 0.04.
6. The mechanical pressure member shall be shrouded. sleeve, if used, shall conform to the applicable requirements.

**FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)**

**VARIANT 07 - MALE CONTACT**

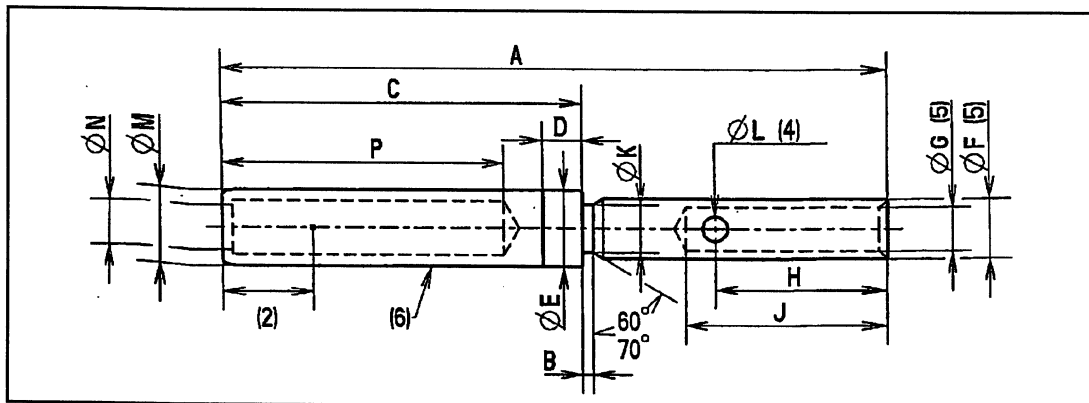


	A	B	<u>C</u>	<u>D</u>	<u>ØE</u>	ØF	<u>ØG</u>	H	J	ØK	ØL	<u>ØN</u>	ØP
Min.	-	0.2	7.49	0.74	1.52	1.17	0.85	3.09	3.58	0.91	0.46	0.75	-
Max.	13.64	0.25	7.62	0.84	1.57	1.22	0.9	3.27	3.99	1.01	0.56	0.77	0.2

**NOTES**

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

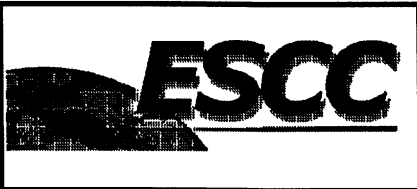
**VARIANT 08 - FEMALE CONTACT**



	A	B	<u>C</u>	<u>D</u>	<u>ØE</u>	ØF	<u>ØG</u>	H	J	ØK	ØL	ØM	<u>ØN</u>	ØP
Min.	-	0.2	7.08	0.74	1.52	1.17	0.85	3.09	3.58	0.91	0.46	-	0.78	4.22
Max.	13.41	0.25	7.34	0.84	1.57	1.22	0.9	3.27	3.99	1.01	0.56	1.57	-	

**NOTES**

1. All dimensions are in millimetres.
2. Measurement point for plating thickness:  $2 \pm 1$ .
3. Underlined dimensions, in table, are critical to ensure intermateability and interchangeability.
4. Inspection hole may be  $\text{ØL}$  square and shall only penetrate one wall of the crimp barrel.
5.  $\text{ØF}$  and  $\text{ØG}$  to be concentric within 0.04.
6. The mechanical pressure member shall be shrouded. Sleeve, if used, shall conform to the applicable requirements.



## 2. APPLICABLE DOCUMENTS

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

- (a) ESCC Generic Specification No. 3401, Connectors, Electrical, Non-Filtered, Circular and Rectangular.
- (b) ESCC 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 ESCC 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 ESCC 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 ESCC 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)

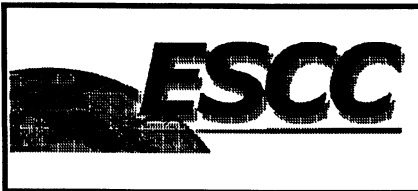
Not applicable.

#### 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 ESCC Generic Specification No. 3401 and shall conform to those shown in Figure 2 of this specification. Only the underlined dimensions shall be checked 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 ESCC Detail Specification No. 3401/002.

##### 4.3.6 Insert Retention (In Shell)

As specified in ESCC Detail Specification No. 3401/002.

##### 4.3.7 Jackscrew Retention

As specified in ESCC 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 ESCC Detail Specification No. 3401/002.

4.4.2 Inserts

As specified in ESCC 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 non-magnetic nickel or copper to MIL-C-14450, gold plated with 1.27µm minimum 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 ESCC Detail Specification No. 3401/002.

4.4.5 Guiding and Locking Devices

As specified in ESCC Detail Specification No. 3401/002.

4.4.6 Magnetism Level

As specified in ESCC Detail Specification No. 3401/002.

4.5 MARKING

4.5.1 General

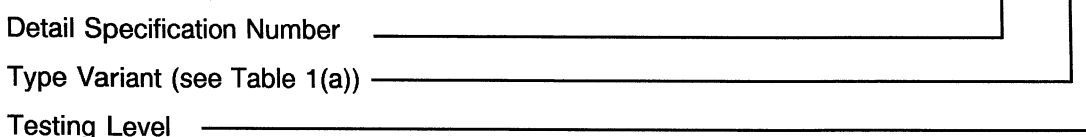
The marking of all components delivered to this specification shall be in accordance with the requirements of ESCC Basic Specification No. 21700 and the following subparagraphs.

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 ESCC Component Number.
- (b) Traceability information.

4.5.2 The ESCC Component Number

340100501B



4.5.3 Traceability Information

Traceability information shall be marked in accordance with ESCC 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 ESCC 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	ESCC No. 3401 Para 9.1.1.3	Para 9.1.1.3	All	-	6	mΩ
2	Contact Resistance (Rated Current)	Rcr	ESCC No. 3401 Para 9.1.1.3	Para 9.1.1.3		-	5	mΩ
				7.5A	01,02,05,06	-	5	mΩ
				3A	03,04	-	5	mΩ
				5A	07,08	-	5	mΩ

**TABLES 3, 4 AND 5**

Not applicable

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

NO.	ESCC 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	ESCC 3401/002					
03	Shock or Bump	Para. 9.12	ESCC 3401/002					
04	Climatic Sequence	Para. 9.13	ESCC 3401/002					
05	Seal Test	Para. 9.9	ESCC 3401/002					
06	Plating Thickness	Para. 9.14	Thickness	-	-	Para. 4.4.3 of this spec		
07	Joint Strength	Para. 9.15	ESCC 3401 Para 9.15					
08	Rapid Change of Temperature	Para. 9.16	ESCC 3401/002					
09	Contact Retention (in insert)	Para. 9.17 & Para. 4.3.4 of this spec.	Contact Displacement		-	ESCC 3401 Para. 9.17		
10	Endurance	Para. 9.18	<b>Initial</b> Low Level Contact Resist <b>Final</b> Low Level Contact Resistance Drift	Table 2 Item 1  Table 2 Item 1	Rcl  $\Delta Rcl$	Record Values  -	  3	m $\Omega$
11	Permanence of Marking	Para. 9.19	As applicable					
12	Mating/Unmating Forces	Para. 9.20	ESCC 3401/002					
13	High Temperature Storage	Para. 9.21	<b>Initial</b> Low Level Contact Resist <b>Final</b> 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  $\Delta Rcl$  Rcr  -	Record Values  -	  3  Table 2 Item 2  ESCC 3401 Para. 9.17	m $\Omega$
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.	ESCC 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.	ESCC 3401/002					
16	Jackscrew Retention	Para. 9.24 & Para. 4.3.7 of this spec.	ESCC 3401/002					
17	High Temperature Measurements	Para. 9.25	ESCC 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.	- - -	- - ESCC 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.			-	ESCC 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.



**APPENDIX 'A'**

AGREED DEVIATIONS FOR C&K COMPONENTS (F)

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS
Para. 4.2.2, Deviations from Final Production Tests (Chart II)	Para. 9.4, Contact Capability: 100% Contact Capability Test may be omitted provided that a 100% visual inspection of the contact and a 10% Contact Capability test are performed in accordance with the C&K PID requirements. The results of the Contact Capability test shall be considered for PDA.