CONTACTS, ELECTRICAL, POWER, CRIMP, AND ACCESSORIES (FOR 3401/093 CONNECTORS)

BASED ON TYPE MMCSA

ESCC Detail Specification No. 3401/094

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DOCUMENTATION CHANGE NOTICE

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

DCR No.	CHANGE DESCRIPTION

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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, Power, Crimp, and Accessories (for 3401/093 Connectors), based on type MMCSA.

It shall be read in conjunction with:

- ESCC Generic Specification No. 3401, Connectors, Electrical, Rectangular and Circular.
- ESCC Detail Specification No. 3401/093, Connectors, Electrical, Rectangular, Microminiature (for Removable Power Contacts) based on type MMCSA.

the requirements of which are supplemented herein.

1.2 COMPONENT TYPE VARIANTS AND RANGE OF COMPONENTS

The component type variants and range of components applicable to this specification are as 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 components specified herein, are given in Table 1(b).

1.4 PARAMETER DERATING INFORMATION

The derating information applicable to the components specified herein is shown in Figure 1.

1.5 PHYSICAL DIMENSIONS

The physical characteristics of the components specified herein are shown in Figure 2.

TABLE 1(a) – COMPONENT TYPE VARIANTS AND RANGE OF COMPONENTS

Variant Number	Description	Weight Max (g)
01	MMCSA Male Power Contact, Size 12, Crimp, with termination, for use in connectors per ESCC 3401/093 (Note 1)	0.6 (Note 2)
	MMCSA Female Power Contact, Size 12, Crimp, with termination, and contact accessories, for use in connectors per ESCC 3401/093 (Note 1)	0.9 (Notes 2, 3)
02	Plug Connector Locking Clip, 4 Way (Note 4)	0.34
03	Plug Connector Locking Clip, 8 Way (Note 4)	0.64

NOTES:

1. The available configurations of Variant 01 includes various termination types in the form of pigtail or jumper contacts; see Figure 2.4 and Para. 4.5.2.1 for details.
2. The specified maximum weight applies only to the contact without any termination. The weight for the termination wire, and any other contact types, are per the applicable ESCC Detail Specification (see Para. 4.5.2.1).
3. The specified maximum weight for the female contact includes the contact accessories (i.e. the spring, the tube and the contact locking part (CLP)) (see Figure 2.2).
4. For use with plug connectors specified in ESCC Detail Specification No. 3401/093.

TABLE 1(b) - MAXIMUM RATINGS

No.	Characteristic	Symbol	Maximum Rating	Unit	Remarks
1	Rated Current	I_R	40	A	$T_{amb} \leq 100°C$ Variant 01 only Notes 1, 2
2	Operating Temperature Range	T_{op}	-55 to +200	°C	-
3	Storage Temperature Range	T_{stg}	-55 to +200	°C	-

NOTES:

1. See Figure 1.
2. Current may be limited by the termination wire derating.

FIGURE 1 - PARAMETER DERATING INFORMATION

FIGURE 1(a) – RATED CURRENT VERSUS OPERATING TEMPERATURE (VARIANT 01)

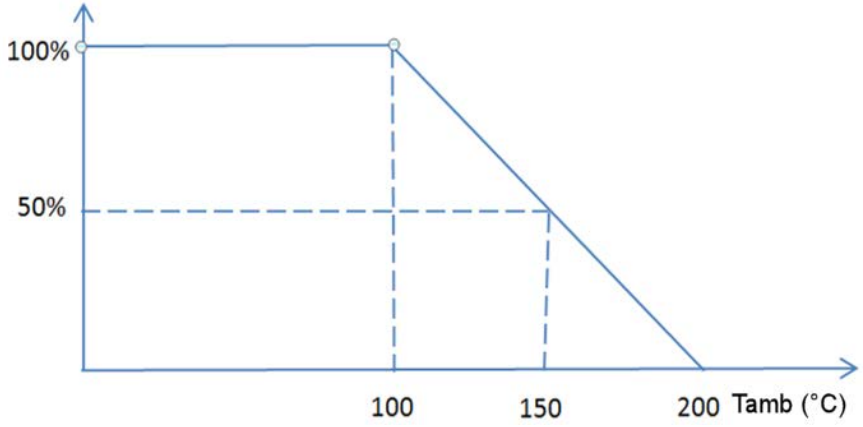
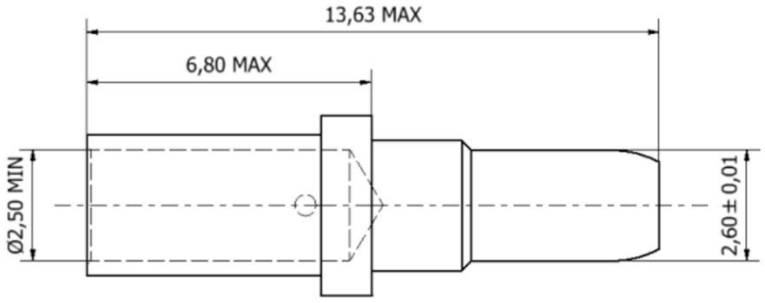


FIGURE 2 - PHYSICAL DIMENSIONS

FIGURE 2.1 - VARIANT 01 - MMCSA MALE POWER CONTACTS, SIZE 12, CRIMP

MALE CONTACT (SHOWN WITHOUT TERMINATION)

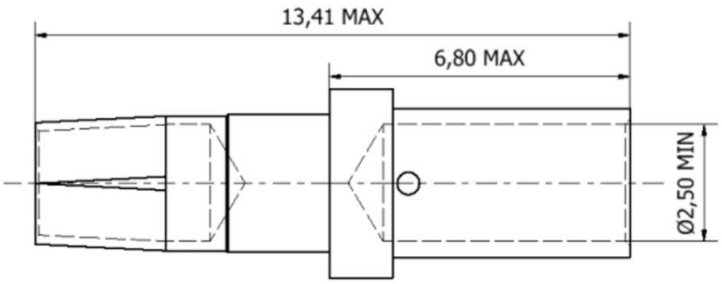


MALE CONTACT WITH TERMINATION WIRE

EXAMPLE

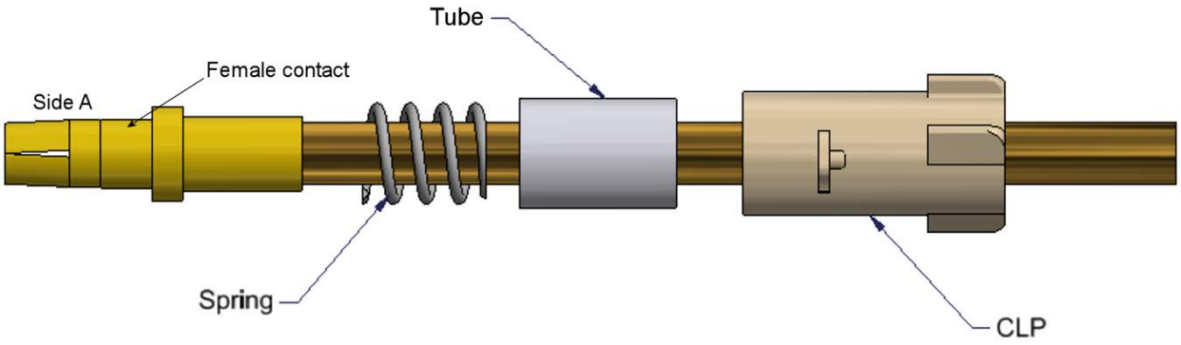
FIGURE 2.2 - VARIANT 01 - MMCSA FEMALE POWER CONTACTS, SIZE 12, CRIMP

FEMALE CONTACT (SHOWN WITHOUT TERMINATION)



FEMALE CONTACT WITH CONTACT ACCESSORIES AND TERMINATION WIRE

EXAMPLE



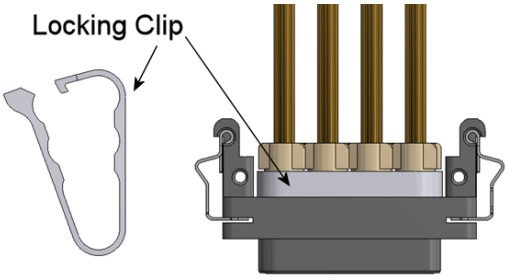
NOTES:

1. The contact accessories included with each female contact are the spring, the tube and the contact locking part (CLP) as shown.

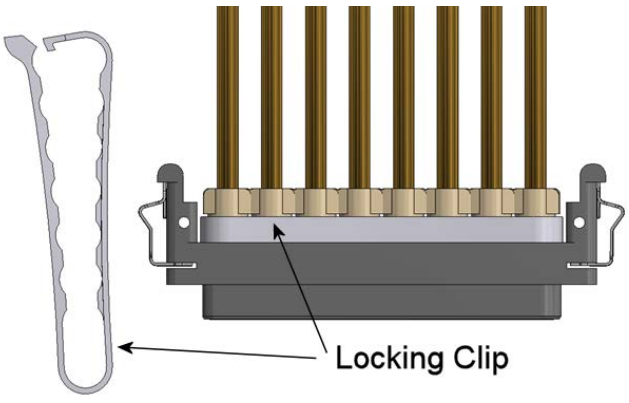
FIGURE 2.3 - VARIANTS 02, 03 - PLUG CONNECTOR LOCKING CLIP, 4 & 8 WAY

EXAMPLES

VARIANT 02: 4 WAY



VARIANT 03: 8 WAY



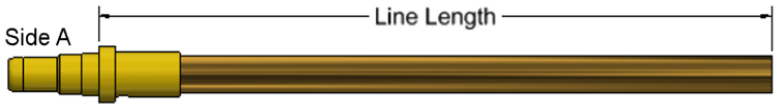
NOTES:

1. Locking clip maximum weight:
   - 4 Way: 0.34g
   - 8 Way: 0.64g
2. The plug connector locking clip is a single use securing accessory that prevents any unwanted unlocking of female contacts installed in plug connectors specified in ESCC Detail Specification No. 3401/093.

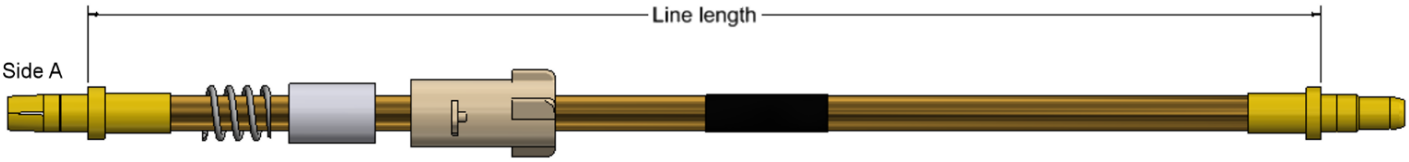
FIGURE 2.4 – LINE LENGTH (VARIANT 01)

EXAMPLES

MALE CONTACT WITH TERMINATION (PIGTAIL CONTACT)



FEMALE CONTACT WITH TERMINATION (JUMPER CONTACT)



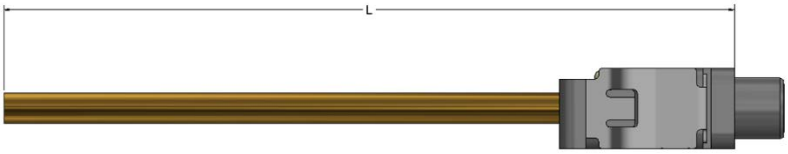
Symbol	Available Nominal Dimension Range (cm)	Tolerance (cm)
Line Length (Note 1)	≥ 10, ≤ 100	(-0, +3)
	> 100, ≤ 400	(-0, +5)
	> 400, ≤ 999	(-0, +10)

NOTES:

1. The line length is defined with reference to the front face of the contact flange as shown above. When the contact(s) is fitted into the applicable connector(s), the resulting pigtail or jumper connector assembly will have a different assembly length compared to the line length, due to the different points of reference used; see figures below for details. This should be taken into account when specifying the required line length for Variant 01.

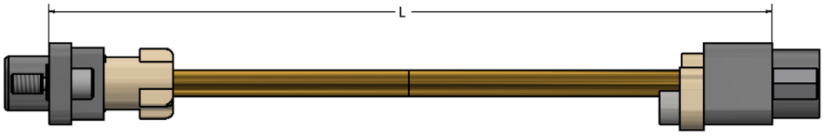
ASSEMBLY LENGTH FOR A PIGTAIL CONNECTOR ASSEMBLY

The assembly length, L, of a pigtail connector assembly is determined from the end of the wire to the front face of the connector flange.



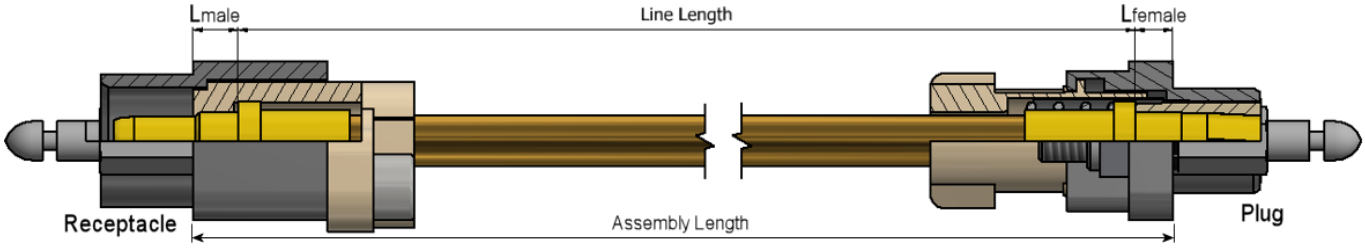
ASSEMBLY LENGTH FOR A JUMPER CONNECTOR ASSEMBLY

The assembly length, L, of a jumper connector assembly is determined from the front face of each connector flange.



LINE LENGTH VERSUS ASSEMBLY LENGTH

To determine the line length required in order to achieve a specific assembly length, the following conversion dimensions, Lmale, Lfemale, shall be subtracted from the required assembly length for each Variant 01 male or female contact in the assembly, as applicable:



Connector Type	Symbol	Conversion Dimension (mm)
Variant 01 male contacts	Lmale	3
Variant 01 female contacts	Lfemale	2

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, Circular and Rectangular.

(b) ESCC Detail Specification No. 3401/093, Connectors, Electrical, Rectangular, Microminiature (for Removable Power Contacts) based on type MMCSA.

(c) ESCC Detail Specification No. 3401/040, Contacts, Power, Crimp-Type, Solder-Type and PCB-Type For 3401/001 Connectors and Male/Female-Type for 3401/080 Connector Savers.

(d) ESCC Detail Specification No. 3901/001, Polyimide Insulated Wires and Cables, Low Frequency, 600V, -100 to +200°C.

(e) ESCC Detail Specification No. 3901/012, Extruded, Cross-Linked Fluoropolymer Insulated Wires and Cables on Silver-Plated Copper Conductor, Low Frequency, 600V, -100 to +200°C.

(f) ESCC Detail Specification No. 3901/013, PTFE Insulated Wires and Cables, Low Frequency, 600V, -100 to +200°C.

(g) ESCC Detail Specification No. 3901/019, Polyimide Insulated Wires and Cables, Low Frequency, 600V, -100 to +200°C.

(h) ECSS-Q-ST-70-26, Crimping of high-reliability electrical connections (replaces PSS-01-726).

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 connectors specified herein are stated in this specification and ESCC Generic Specification No. 3401. Deviations from the Generic Specification, applicable to this 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

(a) Solderability: Not applicable.

(b) For Variants 02, 03: All tests shall not be performed.

4.2.2 Deviations from Final Production Tests - Chart II(a)

(a) Para. 9.9, Seal Test: Not applicable.

(b) Para. 9.5, Magnetism Level: Not applicable.

(c) For Variants 02, 03: Only Paras. 9.6 Dimension Check, 4.4 Marking and 9.7 External Visual Inspection shall apply.

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

None (Chart III is not applicable).

4.2.4 Deviations from Qualification Tests - Chart IV

(a) Para. 9.9, Seal Test: Not applicable.

(b) Para. 9.11, Vibration: Measurements and inspections shall be performed in accordance with Table 6 herein.

(c) Para. 9.12, Shock or Bump: Measurements and inspections shall be performed in accordance with Table 6 herein.

(d) Para. 9.16, Rapid Change of Temperature: Measurements and inspections shall be performed in accordance with Table 6 herein.

(e) Para. 9.18, Endurance: Measurements and inspections shall be performed in accordance with Table 6 herein.

(f) Para. 9.21, High Temperature Storage: Measurements and inspections shall be performed in accordance with Table 6 herein.

(g) Para. 9.24, Jackscrew Retention: Not applicable.

(h) Para. 9.29, Oversize Pin Exclusion: Not applicable.

(i) Para. 9.30, Probe Damage: Not applicable.

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

(k) For Variants 02, 03: All tests shall not be performed.

4.2.5 Deviations from Lot Acceptance Tests - Chart V

(a) Para. 9.9, Seal Test: Not applicable.

(b) Para. 9.16, Rapid Change of Temperature: Measurements and inspections shall be performed in accordance with Table 6 herein.

(c) Para. 9.18, Endurance: Measurements and inspections shall be performed in accordance with Table 6 herein.

(d) Para. 9.29, Oversize Pin Exclusion: Not applicable.

(e) Para. 9.30, Probe Damage: Not applicable.

(f) For Variants 02, 03: All tests shall not be performed.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

See Figure 2.

The dimensions for the termination wire, and other contact types are as specified in the applicable ESCC Detail Specification (see Para. 4.5.2.1).

4.3.2 Weight

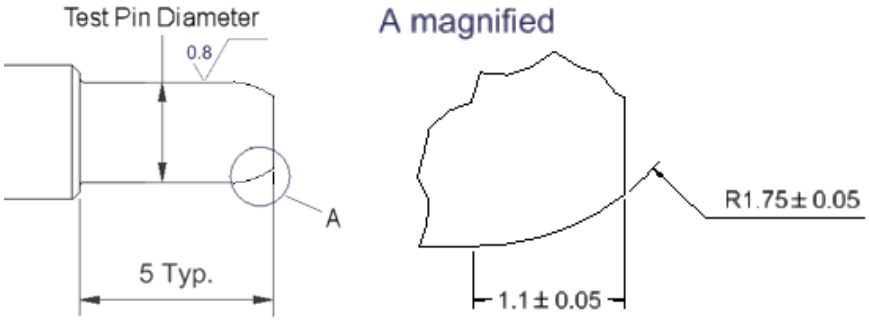
See Table 1(a).

4.3.3 Contact Capability (Variant 01 Female Contacts Only)

	Pick-Up Weight	Drop Weight
Weight (g)	86	600
Test Pin Diameter (mm) (1)	2.59 to 2.592	2.608 to 2.61
Insertion Depth (mm)	1.5	1.5

NOTES:

1. The following dimensions (in mm) shall apply to the test pin:



4.3.4 Contact Retention (in Insert) (Variant 01 Contacts Only)

Applied force: 41N.

4.3.5 Contact Insertion and Withdrawal Forces (Variant 01 Contacts Only)

For Variant 01 male contacts: Not applicable.

For Variant 01 female contacts: Contact insertion and withdrawal force: 8N maximum.

4.3.6 Engagement and Separation Forces (Variant 01 Female Contacts Only)

	Test Pin Diameter (mm)	Separation Force (N)	Engagement Force (N)	Insertion Depth (mm)
		Min	Max	Min
Maximum Diameter Test Pin (1)	2.608 to 2.61	0.85	-	1.5
Minimum Diameter Test Pin (1)	2.59 to 2.592	-	7.5	1.5

NOTES:
1. See Para. 4.3.3 for test pin dimensions.

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 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.

(a) MMCSA contacts (Variant 01): Beryllium Copper alloy, gold plated 1.27µm minimum over nickel underplate 1.27µm minimum.

For D*M contact types: in accordance with ESCC Detail Specification No. 3401/040 (see Para. 4.5.2.1(b)).

(b) Female contact accessories (Variant 01) (see Figure 2.2):
- Spring: Stainless steel
- Tube: Tefzel 207
- CLP: PEEK with 30% reinforced glass fibre

(c) Termination wire (Variant 01): in accordance with the applicable ESCC Detail Specification for the selected wire (unsheilded, single core wire) (see Para. 4.5.2.1(a)).

(d) Termination wire identification sleeve (Variant 01): modified and irradiated polyvinylidene (heat shrinkable).

(e) Plug connector locking clip (Variants 02, 03): PEEK.

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 paragraphs.

Each component or the component's primary package shall be marked in respect of:

(a) The ESCC qualified components symbol (for ESCC qualified components only).

(b) The ESCC Component Number (see Para. 4.5.2).

(c) Traceability Information.

4.5.2 The ESCC Component Number

The ESCC Component Number shall be constituted as follows:

(a) For Variant 01:

Example: 340109401B00129L150PDS

- Detail Specification Reference: 3401094
- Component Type Variant Number: 01
- Testing Level: B
- Characteristic code: Termination Wire Type (00129): termination wire per 390100129B (as required)
- Characteristic code: Line Length (L150): 150cm (as required)
- Characteristic code: Contact Type(s) (PDS): MMCSA male power contact and D*M female power contact type 340104012B (as required)

(b) For Variants 02, 03:

Example: 340109402B

- Detail Specification Reference: 3401094
- Component Type Variant Number: 02 (as required)
- Testing Level: B

4.5.2.1 Characteristics Codes (Variant 01 only)

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

(a) Termination Wire Type and Line Length

The termination wire type and the nominal line length shall be indicated by the following codes (see Figure 2.4):

Termination Wire Type (ESCC Component Number)	Applicable Wire ESCC Detail Specification	Termination Wire Size (AWG)	Code
390100129B	ESCC 3901/001	16	00129
390100130B		14	00130
390100131B		12	00131
390101208B	ESCC 3901/012	16	01208
390101209B		14	01209
390101210B		12	01210
390101357B	ESCC 3901/013	16	01357
390101907B	ESCC 3901/019	16	01907
390101908B		12	01908

Nominal Line Length (cm)	Line Length Code
10 to 99	L0XX
100 to 999	LXXX

(b) Contact Type(s)
The contacts on the 2 sides of the termination wire shall be indicated by the following codes (see Figure 2.4):

Side A Contact Type	Side B Contact Type	Code
MMCSA Male (Variant 01)	N/A (pigtail)	P
MMCSA Female (Variant 01)	N/A (pigtail)	S
MMCSA Male (Variant 01)	MMCSA Male (Variant 01)	PP
MMCSA Female (Variant 01)	MMCSA Female (Variant 01)	SS
MMCSA Male (Variant 01)	MMCSA Female (Variant 01)	PS
MMCSA Male (Variant 01)	D*M Male Power Contact Type: 340104011B (Note 1)	PDP
MMCSA Female (Variant 01)	D*M Male Power Contact Type: 340104011B (Note 1)	SDP
MMCSA Male (Variant 01)	D*M Female Power Contact Type: 340104012B (Note 1)	PDS
MMCSA Female (Variant 01)	D*M Female Power Contact Type: 340104012B (Note 1)	SDS

NOTES:
1. In accordance with ESCC Detail Specification No. 3401/040.

4.5.3 Traceability Information
Traceability information shall be marked in accordance with the requirements of ESCC Basic Specification No. 21700.

4.6 ELECTRICAL MEASUREMENTS

4.6.1 Electrical Measurements at Room Temperature (Variant 01 only)
The parameters to be measured in respect of electrical characteristics are scheduled in Table 2. Unless otherwise specified, the measurements shall be performed at T_{amb} = +22 ±3°C.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE (VARIANT 01 ONLY)

No.	Characteristic	Symbol	ESCC 3401 Test Method	Test Condition	Limits		Unit
					Min	Max	
1	Contact Resistance (Low Level Current)	R_{cl}	Para. 9.1.1.3	I_{test} ≤ 10mA	-	2	mΩ
2	Contact Resistance (Rated Current)	R_{cr}	Para. 9.1.1.3	I_{test} = 23A	-	2.5	mΩ

TABLES 3, 4 AND 5

Not applicable.

4.7 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESCC GENERIC SPECIFICATION No. 3401) (VARIANT 01 ONLY)

4.7.1 Measurements and Inspections on Completion of Environmental Tests
The parameters to be measured and inspections to be performed on completion of environmental testing shall be those specified in Table 6. Unless otherwise specified, these measurements shall be performed at T_{amb} = +22 ±3°C.

4.7.2 Measurements and Inspections on Completion of Endurance Tests
The parameters to be measured and inspections to be performed on completion of endurance testing shall be those specified in Table 6. Unless otherwise specified, these measurements shall be performed at T_{amb} = +22 ±3°C.

TABLE 6 - MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL AND ENDURANCE TESTING (VARIANT 01 ONLY)

No.	ESCC Generic Spec. 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	Contact Resistance (Low Level Current)	Table 2	R_{cl}	-	Table 2	
02	Vibration	Para. 9.11	**Initial Measurements**					
			Contact Resistance (Low Level Current)	Table 2	R_{cl}	Record values		
			Contact Resistance (Rated Current)	Table 2	R_{cr}	Record values		
			During Testing					
			Monitor contacts for discontinuities	ESCC 3401	-	No discontinuities > 1µs		
			Final Measurements					
			Contact Resistance Drift (Low Level Current)	Table 2	ΔR_{cl}	-	+1	mΩ
			Contact Resistance Drift (Rated Current)	Table 2	ΔR_{cr}	-	+1	mΩ
			Visual Examination	ESCC 3401	-	-	-	
03	Shock or Bump	Para. 9.11	**Initial Measurements**					
			Contact Resistance (Low Level Current)	Table 2	R_{cl}	Record values		
			Contact Resistance (Rated Current)	Table 2	R_{cr}	Record values		
			During Testing					
			Monitor contacts for discontinuities	ESCC 3401	-	No discontinuities > 1µs		
			Final Measurements					
			Contact Resistance Drift (Low Level Current)	Table 2	ΔR_{cl}	-	+1	mΩ
			Contact Resistance Drift (Rated Current)	Table 2	ΔR_{cr}	-	+1	mΩ
			Visual Examination	ESCC 3401	-	-	-	

No.	ESCC Generic Spec. No. 3401		Measurements and Inspections		Symbol	Limits		Unit
	Environmental and Endurance Tests (1)	Test Method and Conditions	Identification	Conditions		Min	Max	
04	Climatic Sequence	Para. 9.13	Per ESCC 3401/093	-	-	-	-	
05	Plating Thickness	Para. 9.14	Plating thickness	ESCC 3401	-	Para. 4.4		
06	Joint Strength	Para. 9.15	Per ESCC 3401/093	-	-	-	-	
07	Rapid Change of Temperature	Para. 9.16	**Initial Measurements**					
			External Visual Inspection	ESCC 3401	-	-		
			Contact Resistance (Low Level Current)	Table 2	R_{cl}	Record values		
			Contact Resistance (Rated Current)	Table 2	R_{cr}	Record values		
			During Testing					
			Monitor contacts for discontinuities	-	-	No discontinuities > 1µs		
			Final Measurements					
			Visual Examination	ESCC 3401	-	-	-	
			Contact Resistance Drift (Low Level Current)	Table 2	ΔR_{cl}	-	+1	mΩ
			Contact Resistance Drift (Rated Current)	Table 2	ΔR_{cr}	-	+1	mΩ
08	Contact Retention (in Insert)	Para. 9.17 and Para. 4.3.4 herein	Contact axial displacement	ESCC 3401	-	ESCC 3401		
09	Endurance	Para. 9.18	**Initial Measurements**					
			Contact Resistance (Low Level Current)	Table 2	R_{cl}	Record Values		
			Contact Resistance (Rated Current)	Table 2	R_{cr}	Record Values		
			Final Measurements					
			Visual Examination	-	-	-	-	
			Contact Resistance Drift (Low Level Current)	Table 2	ΔR_{cl}	-	+1	mΩ
			Contact Resistance Drift (Rated Current)	Table 2	ΔR_{cr}	-	+1	mΩ
10	Permanence of Marking	Para. 9.19	-	-	-	-	-	
11	Mating and Unmating Forces	Para. 9.20	Per ESCC 3401/093	-	--	-	-	

No.	ESCC Generic Spec. No. 3401		Measurements and Inspections		Symbol	Limits		Unit
	Environmental and Endurance Tests (1)	Test Method and Conditions	Identification	Conditions		Min	Max	
12	High Temperature Storage	Para. 9.21	**Initial Measurements**					
			Contact Resistance (Low Level Current)	Table 2	R_{cl}	Record Values		
			Contact Resistance (Rated Current)	Table 2	R_{cr}	Record Values		
			Final Measurements					
			Visual Examination	-	-	-		
			Contact Resistance Drift (Low Level Current)	Table 2	ΔR_{cl}	-	+1	mΩ
			Contact Resistance Drift (Rated Current)	Table 2	ΔR_{cr}	-	+1	mΩ
			Contact Retention (In Insert)	ESCC 3401	-	Para. 4.3.4		
13	Corrosion	Para. 9.22	Per ESCC 3401/093	-	-	-	-	
14	Insert Retention (in Shell)	Para. 9.23	Per ESCC 3401/093	-	-	-	-	
15	High Temperature Measurements	Para. 9.25	Per ESCC 3401/093	-	-	-	-	
16	Overload Test	Para. 9.26	Contact Resistance (Rated Current)	Table 2	R_{cr}	-	Table 2	°C
17	Maintenance Ageing	Para. 9.27	Contact Insertion and Withdrawal Forces	ESCC 3401	-	Para. 4.3.5		
			Visual Examination	ESCC 3401	-	ESCC 3401		
			Contact Retention (In Insert)	ESCC 3401	-	Para. 4.3.4		
18	Engagement and Separation Forces	Para. 9.28 and Para. 4.3.6 herein	Force	Para. 4.3.6	F	Para. 4.3.6		

NOTES:

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