CONNECTORS, ELECTRICAL, RECTANGULAR, MICROMINIATURE, REMOVABLE CRIMP CONTACTS

BASED ON TYPE MDMA

ESCC Detail Specification No. 3401/077

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DCR No.	CHANGE DESCRIPTION
758	Specification upissued to incorporate editorial changes per DCR.

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1 GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for Electrical, Rectangular, Microminiature Connectors with Removable Crimp Contacts, based on type MDMA. It shall be read in conjunction with:

(a) ESCC Generic Specification No. 3401, Connectors, Electrical, Rectangular and Circular.
(b) ESCC Detail Specification No. 3401/032, Accessories for Connectors, Microminiature, 3401/029, 3401/077 and Connector Savers 3401/041.
(c) ESCC Detail Specification No. 3401/078, Contacts, Electrical, Crimp, for 3401/077 Microminiature Connectors based on type MDMA.

1.2 COMPONENT TYPE VARIANTS AND RANGE OF COMPONENTS

The different sizes of the basic type connectors specified herein, together with their mechanical characteristics, 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 connectors specified herein, are given in Table 1(b).

1.4 PARAMETER DERATING INFORMATION

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

1.5 PHYSICAL DIMENSIONS

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

1.6 CONTACT ARRANGEMENTS

Contact arrangements are shown in Figure 3.

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. 3401/032, Accessories for Connectors, Microminiature, 3401/029, 3401/077 and Connector Savers 3401/041.
(c) ESCC Detail Specification No. 3401/078, Contacts, Electrical, Crimp for 3401/077 Microminiature Connectors based on type MDMA.
(d) MIL-DTL-45204, Gold Plating, Electro-deposited.
(e) MIL-C-14550, 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.

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

Variants		Shell Size Note 1	Weight Max. g Note 2	Mating Force N Max.	Unmating Force	
Shell Finish						
Nickel	Gold				N Max.	N Min.
01	02	9	2.2	20	20	1.3
01	02	15	3	33	33	2
01	02	21	3.8	47	47	2.9
01	02	25	4.3	55	55	3.5
01	02	31	5.1	69	69	4.3
01	02	37	5.9	82	82	5.1

NOTES:
1. See Figures 2.1(a) and 2.1(b).
2. Weight without cables, floating eyelets, captive nut and contacts (see Para. 4.5.4.4). Add 0.4 grammes for connectors with floating mounts and 1 gramme for connectors with captive nuts. See Figures 2.3 and 2.4 for the weight of cable and ESCC Detail Specification No. 3401/078 for contact weights.

TABLE 1(b) - MAXIMUM RATINGS

No.	Characteristic	Symbol	Maximum Rating	Unit	Remarks
1	Working Voltage	U_R	150	Vrms	Note 1
2	Rated Current with	I_R		A	Note 2
	AWG24 wire		3.5		
	AWG26 and uninsulated solid wire		2.5		
	AWG28 wire		1.5		
3	Operating Temperature Range	T_{op}	-55 to +125	°C	T_{amb}
4	Storage Temperature Range	T_{stg}	-65 to +125	°C	-

NOTES:
1. At Sea Level, between contacts, and contact and shell. U_R requires derating at altitudes above sea level. See Figure 1(a).
2. I_R requires derating if the number of carrying contacts in the connector is 2 or greater. See Figure 1(b).

FIGURE 1 - PARAMETER DERATING INFORMATION

FIGURE 1(a) - WORKING VOLTAGE VERSUS ALTITUDE

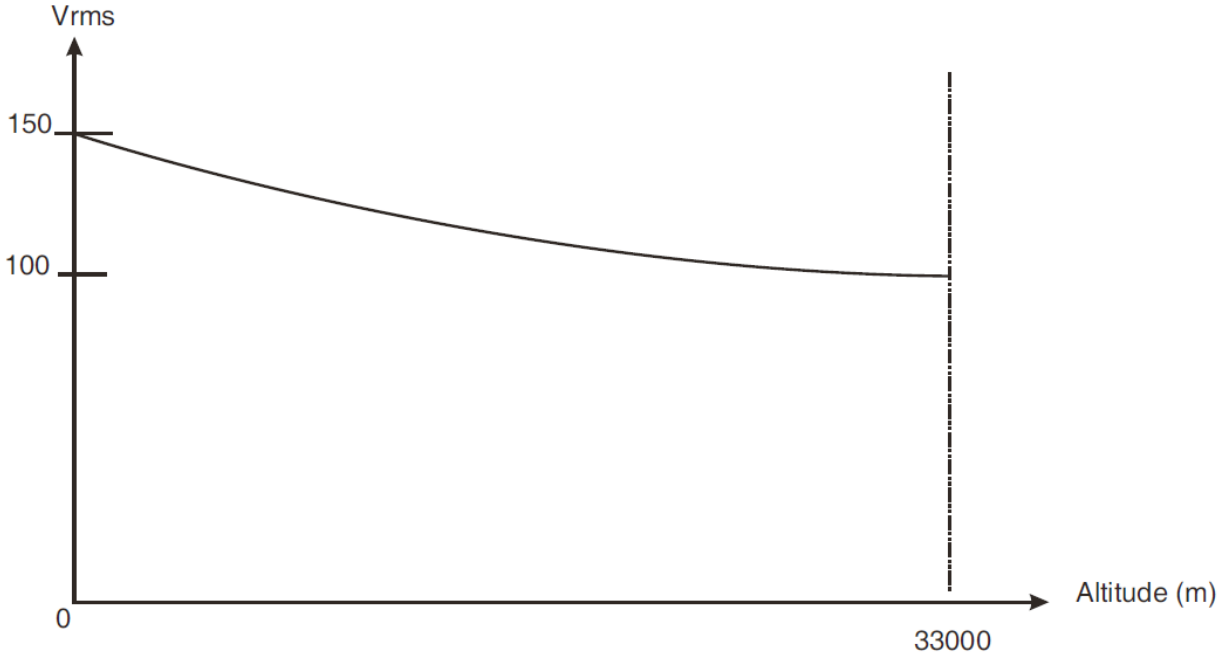
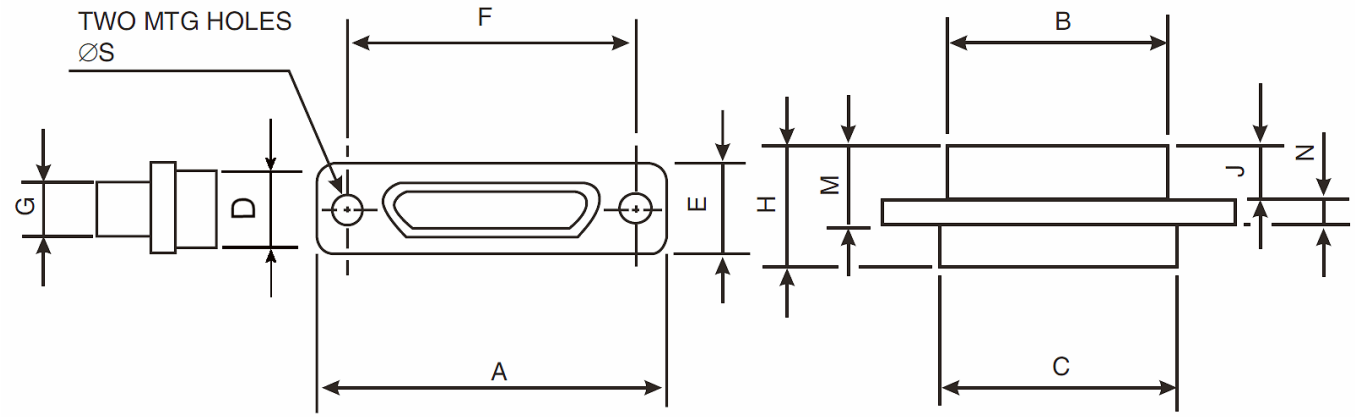


FIGURE 1(b) - MAXIMUM CURRENT VERSUS NUMBER OF CONTACTS

Number of Current-Carrying Contacts per Connector	Maximum Current per Contact (A)		
	Wire Size		
	AWG24	AWG26 and Uninsulated Solid Wire	AWG28
2 - 4	2.6	2	1.4
5 - 14	2.4	1.8	1.2
15 and over	1.9	1.4	0.9

FIGURE 2 - PHYSICAL DIMENSIONS

Figure 2.1(a) – Connector Shells - Plug (Male Contacts)

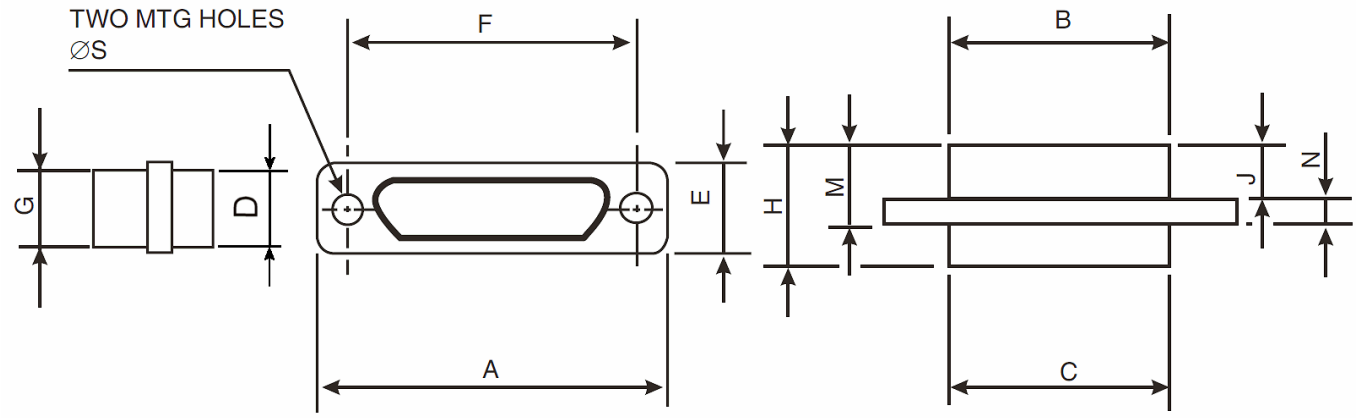


Shell Size	A Max.	B Max.	C Max.	D Max.	E Max.	F		G Max.	H Max.	J Max.	M Max.	N		ØS	
						Min.	Max.					Min.	Max.	Min.	Max.
9	19.94	8.46	10.16	6.86	7.82	14.22	14.48	4.69	10.57	4.72	7.26	2.23	2.49	2.23	2.39
15	23.75	12.27	13.97	6.86	7.82	18.03	18.29	4.69	10.57	4.72	7.26	2.23	2.49	2.23	2.39
21	27.56	16.08	17.78	6.86	7.82	21.84	22.1	4.69	10.57	4.72	7.26	2.23	2.49	2.23	2.39
25	30.1	18.62	20.32	6.86	7.82	24.38	24.64	4.69	10.57	4.72	7.26	2.23	2.49	2.23	2.39
31	33.91	22.43	24.13	6.86	7.82	28.19	28.45	4.69	10.57	4.72	7.26	2.23	2.49	2.23	2.39
37	37.72	26.24	27.94	6.86	7.82	32	32.26	4.69	10.57	4.72	7.26	2.23	2.49	2.23	2.39

NOTES:

1. All dimensions are in millimetres.

Figure 2.1(b) – Connector Shells - Receptacle (Female Contacts)



Shell Size	A Max.	B Max.	C Max.	D Max.	E Max.	F		G Max.	H Max.	J Max.	M Max.	N		ØS	
						Min.	Max.					Min.	Max.	Min.	Max.
9	19.94	10.16	10.16	6.86	7.82	14.22	14.48	6.38	10.9	5.05	7.59	2.23	2.49	2.23	2.39
15	23.75	13.97	13.97	6.86	7.82	18.03	18.29	6.38	10.9	5.05	7.59	2.23	2.49	2.23	2.39
21	27.56	17.78	17.78	6.86	7.82	21.84	22.1	6.38	10.9	5.05	7.59	2.23	2.49	2.23	2.39

25	30.1	20.32	20.32	6.86	7.82	24.38	24.64	6.38	10.9	5.05	7.59	2.23	2.49	2.23	2.39
31	33.91	24.13	24.13	6.86	7.82	28.19	28.45	6.38	10.9	5.05	7.59	2.23	2.49	2.23	2.39
37	37.72	27.94	27.94	6.86	7.82	32	32.26	6.38	10.9	5.05	7.59	2.23	2.49	2.23	2.39

NOTES:

1. All dimensions are in millimetres.

FIGURE 2.2 – CONTACT POSITIONS

Figure 2.2.1 – Mounting Condition

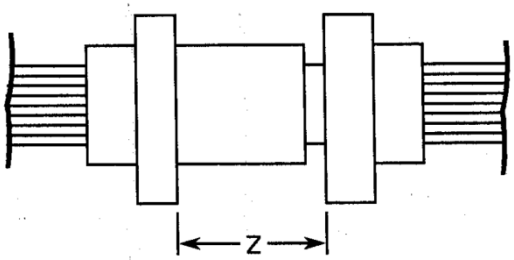


Figure 2.2.2 – Plug Male Contact

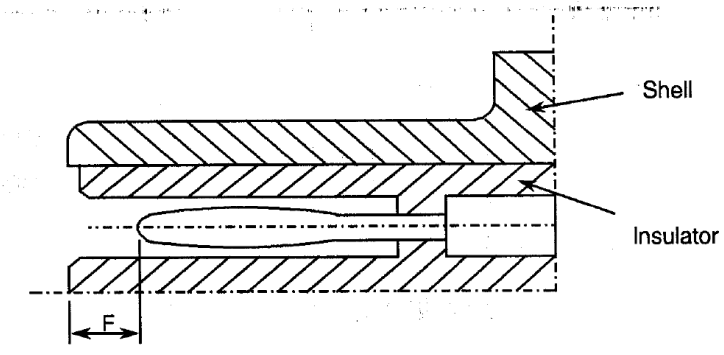
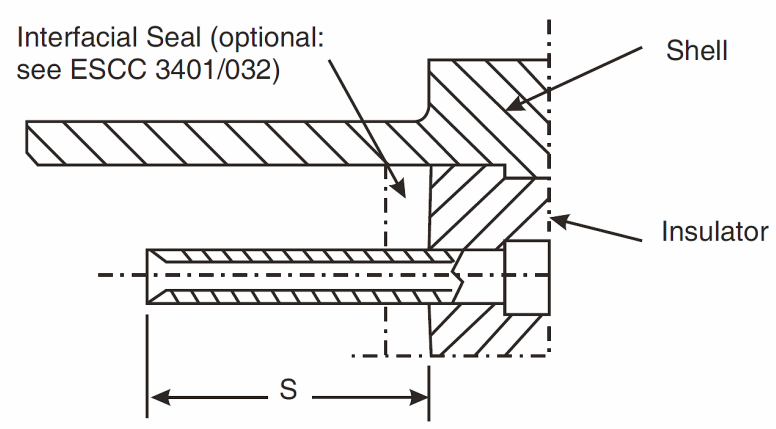


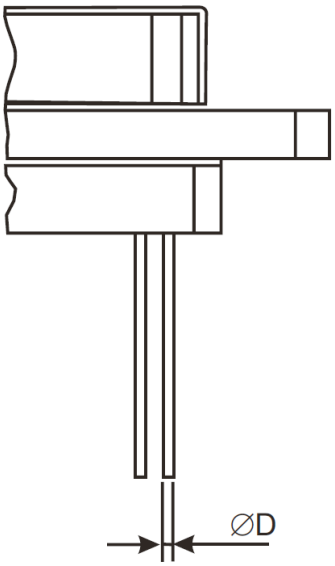
Figure 2.2.3 – Receptacle Female Contact



F		S		Z
Min.	Max.	Min.	Max.	Max.
0.25	0.91	3.3	3.66	5.49

NOTES:
1. All dimensions in millimeters.

FIGURE 2.3 – UNINSULATED SOLID WIRES ACCEPTED

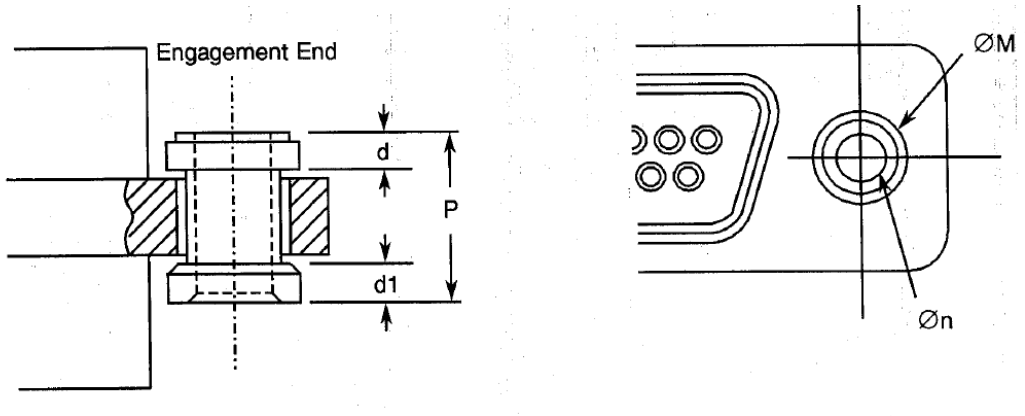


Wire Size AWG	25
Max Diameter D mm	0.46
Min Diameter D mm	0.45
Min Gold Plating Thickness µm	0.5
Max. Weight g/m	1.6

FIGURE 2.4 – INSULATED SOLID WIRES ACCEPTED

		ESCC 3901/002			ESCC 3901/013		
		Wire Size AWG					
		24	26	28	24	26	28
Conductor Characteristics	Maximum Diameter mm	0.64	0.53	0.43	0.62	0.5	0.42
	Nominal Cross-section mm²	0.21	0.15	0.1	0.22	0.14	0.1
Wire Characteristics	Maximum Diameter mm	0.88	0.78	0.68	1.04	0.89	0.82
	Maximum Weight g/m	2.64	1.93	1.23	3.34	2.3	1.8

FIGURE 2.5 – FLOATING MOUNT (Notes 2 and 3)

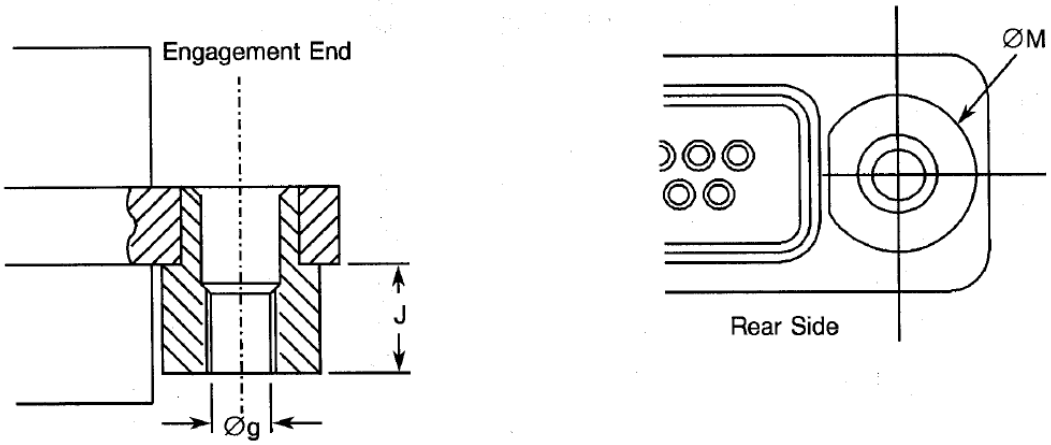


d	d1	ØM Max.	ØN Min.	P Max.
1	0.8	4	2.26	4.7

NOTES:

1. All dimensions are in millimetres.
2. Total Lateral Float 0.4 (typical).
3. Total Axial Float 0.4 (typical).

FIGURE 2.6 - CAPTIVE NUT



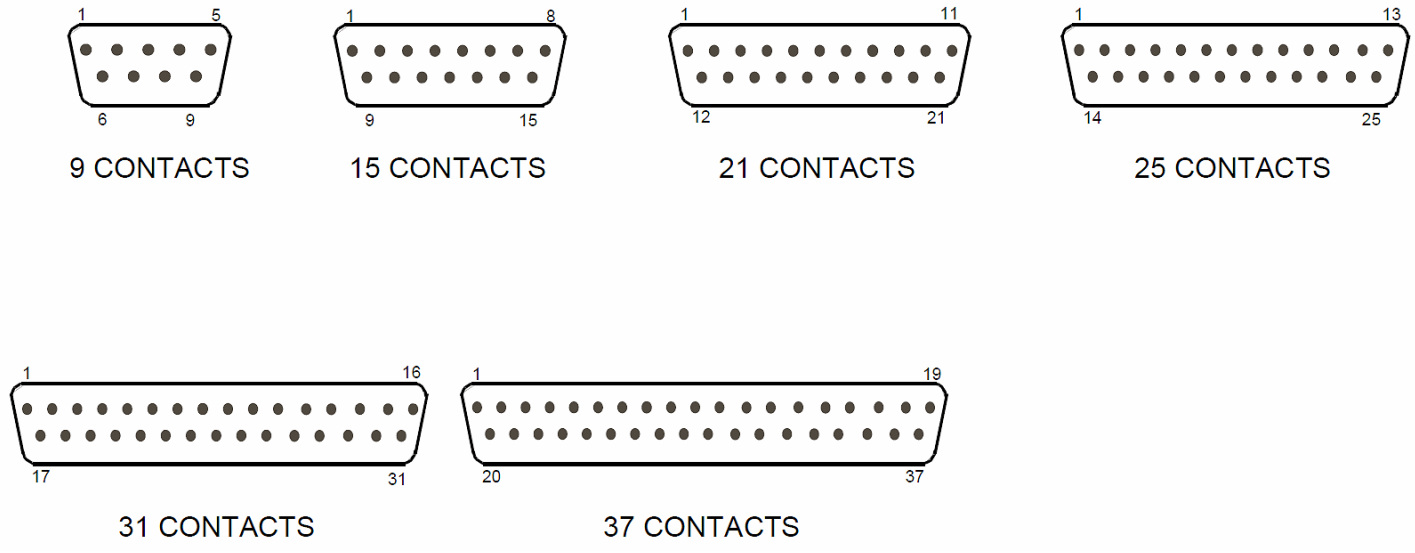
Øg	J Max.	ØM Max.
Note 2	2.6	5.1

NOTES:

1. All dimensions are in millimetres.
2. Øg: 2-56 UNC 28, Maximum Torque 0.44Nm.

FIGURE 3 – CONTACT ARRANGEMENTS

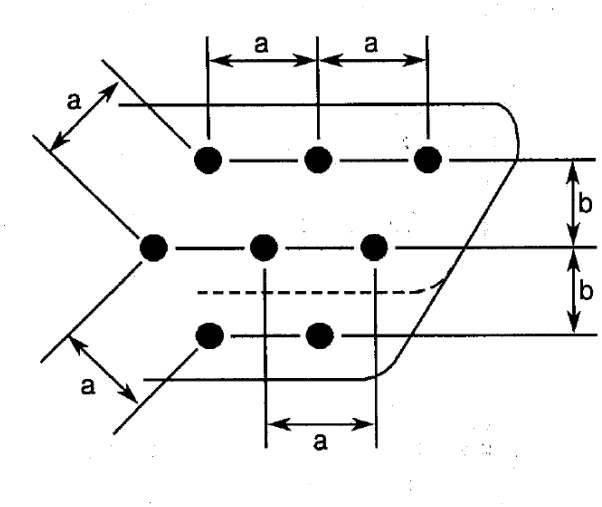
FRONT VIEW OF MALE INSERT – USE MIRROR VIEW FOR FEMALE INSERT



NOTES:

1. Only the outside contact cavities on each row are identified in the drawing, the remainder follow sequentially. Contact numbers are shown outside the insert for readability.

Contact Centres



NOTES:

1. a = Distance between contact centres: 1.27mm (typical).
2. b = Distance between rows: 1.09mm (typical).

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

None.

4.2.2 Deviations from Final Production Tests (Chart II)

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

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

Chart III is not applicable.

4.2.4 Deviations from Qualification Tests (Chart IV)

(a) Para. 9.9, Seal Test: Not applicable.
(b) Para. 9.29, Oversize Pin Exclusion: Not applicable.
(c) Para. 9.30, Probe Damage: Not applicable.
(d) Para. 9.31, Solderability: Not applicable.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

(a) Para. 9.9, Seal Test: Not applicable.
(b) Para. 9.29, Oversize Pin Exclusion: Not applicable.
(c) Para. 9.30, Probe Damage: Not applicable.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the connectors 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 connectors specified herein, without contacts and interfacial seals, shall be in accordance with the values given in Table 1(a) of this specification.

4.3.3 Contact Capability

As specified in ESCC Detail Specification No. 3401/078.

4.3.4 Contact Retention (In insert)

As specified in ESCC Detail Specification No. 3401/078.

4.3.5 Mating and Unmating Forces
The forces applied for the mating and unmating of the connectors shall conform to the values specified in Table 1(a).

4.3.6 Insert Retention (In shell)
Connector inserts shall withstand a pressure of 34.4N/cm^2 applied from the mating side to the rear side.

4.3.7 Jackscrew Retention
Not applicable.

4.3.8 Contact Insertion and Withdrawal Forces
As specified in ESCC Detail Specification No. 3401/078.

4.3.9 Engagement and Separation Forces (Male Contacts)
As specified in ESCC Detail Specification No. 3401/078.

4.3.10 Oversize Pin Exclusion
Not applicable.

4.3.11 Probe Damage
Not applicable.

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 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.

4.4.1 Shells
Shells shall be made of aluminium alloy. Variant 01 shall have a minimum plating thickness of 25.4µm of electroless nickel. The plating for Variant 02 shall be 0.7µm minimum of gold with 25.4µm minimum electroless nickel underplating.

4.4.2 Inserts
Inserts shall be made of a suitable thermoplastic material.

4.4.3 Contacts
As specified in ESCC Detail Specification No. 3401/078.

4.4.4 Contact Retaining Clip
The retaining clip shall be made of beryllium copper.

4.5 MARKING

4.5.1 General

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

Each component shall be marked in respect of:

(a) The ESCC qualified components symbol (for ESCC qualified components only).
(b) The ESCC Component Number.
(c) Series.
(d) Characteristics.
(e) Traceability Information.

4.5.2 The ESCC Component Number

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

Example: 340107701B

- Detail Specification Number: 3401077
- Type Variant (See Table 1(a)): 01
- Testing Level: B

4.5.3 Series

The series of the connector, MDMA, shall be marked on the connector if space permits.

4.5.4 Characteristics

The characteristics to be marked in the following order of precedence are:

(a) Mounting.
(b) Shell Size.
(c) Contact Type.
(d) Contact Information.

The information shall be constituted and marked as follows (example): Y37P-FO

- Mounting: Y
- Shell size: 37
- Contact Type: P
- Contact Information: -FO

4.5.4.1 Fixing Option

The letter "Y" shall indicate a floating mount. The letter "E" shall indicate captive nuts. If the shell has standard mounting holes, the letter shall be omitted.

4.5.4.2 Shell Size

Shell size shall be designated by the number of contacts.

Specified numbers are: 9, 15, 21, 25, 31 and 37.

4.5.4.3 Contact Type

Contact types shall be indicated by the following code letters.

Code Letter	Contact Type
P	Male
S	Female

4.5.4.4 Contact Information

-FO = Connector ordered without contacts. This information shall not be marked on the connector; it is only included on the packaging and all relevant data documentation.

Contacts must be from the same Manufacturer as the connector in which they are fitted and this shall be verified prior to assembly.

4.5.4.5 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

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.

4.6.2 Electrical Measurements at High and Low Temperatures

Not applicable.

4.6.3 Circuits for Electrical Measurements

Not applicable.

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

Not applicable.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE

No.	Characteristic	Symbol	ESCC 3401 Test Method	Test Condition	Limits		Unit
					Min.	Max.	
1	Insulation Resistance	R_i	Para. 9.1.1.1	Para. 9.1.1.1	5000	-	MΩ
2	Voltage Proof Leakage Current	I_L	Para. 9.1.1.2	600 Vrms	-	2	mA
3	Mated Shell Conductivity (Voltage Drop) Note 1	V_D	Para. 9.1.1.4	Para. 9.1.1.4	Not applicable		mV

NOTES

1. Applicable to mated connectors with grounding option.

TABLES 3, 4 AND 5

Not applicable.

4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESCC GENERIC SPECIFICATION No. 3401)

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 shall be those specified in Table 6. Unless otherwise specified, these measurements shall be performed at T_{amb} = +22 ±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 testing shall be those specified in Table 6. Unless otherwise specified, these measurements shall be performed at T_{amb} = +22 ±3°C.

4.8.4 Conditions for Operating Life Test (Part of Endurance Testing)
Not applicable.

4.8.5 Electrical Circuit 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 temperature to be applied shall be the maximum storage temperature specified in Table 1(b) of this specification.

TABLE 6 – MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL AND ENDURANCE TESTING

No.	ESCC Generic Spec. No. 3401		Measurements and Inspections		Symbol	Limits		Unit
	Environmental and Endurance Tests Note 1	Test Method and Conditions	Identification	Conditions		Min.	Max.	
01	Seal Test	Para. 9.9	Not applicable					
02	Wiring	Para. 9.10	ESCC 3401/078	-	-	-	-	
03	Vibration	Para. 9.11	**Initial Measurements** Coupling Screw(s) Unlocking Torque **Final Measurements** Full Engagement Coupling Screw(s) Unlocking Torque Drift Visual Examination	 - -	 Tqe ΔTqe/Tqe -	 Record Values -25 -	 +25 -	 %
04	Shock or Bump	Para. 9.12	Full Engagement Visual Examination	-	-	-	-	
05	Climatic Sequence	Para. 9.13	**Dry Heat** Insulation Resistance **Low Air Pressure** Voltage Proof Leakage Current **Damp Heat** Insulation Resistance **Final Measurements** External Visual Inspection Insulation Resistance Voltage Proof Leakage Current	At High Temperature Table 2, Item 1 Figure 1 Immediately after test Table 2, Item 1 After 1-24 hrs Recovery ESCC 3401 Para. 9.7 Table 2, Item 1 Table 2, Item 2	 R_i I_L R_i R_i I_L	 10 ESCC 3401 Para. 9.13.5 100 ESCC 3401 Para. 9.7 Table 2, Item 1 Table 2, Item 2	 - - 	 MΩ mA MΩ MΩ mA
06	Plating Thickness	Para. 9.14	Thickness	-	-	-		
07	Joint Strength	Para. 9.15	ESCC 3401/078	-	-	-		
08	Rapid Change of Temperature	Para. 9.16	Visual Examination Insulation Resistance Voltage Proof Leakage Current	- Table 2, Item 1 Table 2, Item 2	- R_i I_L	- Table 2, Item 1 Table 2, Item 2	- 	 MΩ mA
09	Contact Retention (in Insert)	Para. 9.17 & Para. 4.3.4 of this spec.	Contact Displacement	ESCC 3401/078	-	ESCC 3401/078		

No.	ESCC Generic Spec. No. 3401		Measurements and Inspections		Symbol	Limits		Unit
	Environmental and Endurance Tests Note 1	Test Method and Conditions	Identification	Conditions		Min.	Max.	
10	Endurance	Para. 9.18	**Initial Measurements**					
			Mating/Unmating Forces	-	F	Para. 4.3.5 of this spec.		N
			Low Level Contact Resistance	ESCC 3401/078	R_{cl}	ESCC 3401/078		mΩ
			Mated Shell Conductivity	Table 2, Item 3	V_D	Not applicable		mV
			Final Measurements					
			Visual Examination	-	-	-	-	
			Mating/Unmating Forces	-	F	Para. 4.3.5 of this spec.		N
			Low Level Contact Resistance Drift	ESCC 3401/078	ΔR_{cl}	ESCC 3401/078		mΩ
			Mated Shell Conductivity	Table 2, Item 3	V_D	Not applicable		mV
			Insulation Resistance	Table 2, Item 1	R_i	Table 2, Item 1		MΩ
			Voltage Proof Leakage Current	Table 2, Item 2	I_L	Table 2, Item 2		mA
11	Permanence of Marking	Para. 9.19	As applicable	-	-	-		
12	Mating / Unmating Forces	Para. 9.20	Force	-	F	Para. 4.3.5 of this spec.		N
13	High Temperature Storage	Para. 9.21	**Initial Measurements**					
			Low Level Contact Resistance	ESCC 3401/078	R_{cl}	ESCC 3401/078		mΩ
			Mated Shell Conductivity	Table 2, Item 3	V_D	Not applicable		mV
			Final Measurements					
			Visual Examination	-	-	-	-	
			Mating/Unmating Forces	-	F	Para. 4.3.5 of this spec.		N
			Low Level Contact Resistance Drift	ESCC 3401/078	ΔR_{cl}	ESCC 3401/078		mΩ
			Rated Current Contact Resistance	ESCC 3401/078	R_{cr}	ESCC 3401/078		mΩ
			Mated Shell Conductivity	Table 2, Item 3	V_D	Not applicable		mV
			Insulation Resistance	Table 2, Item 1	R_i	Table 2, Item 1		MΩ
			Voltage Proof Leakage Current	Table 2, Item 2	I_L	Table 2, Item 2		mA
			Contact Retention (In Insert)	ESCC 3401/078		ESCC 3401/078		N
14	Corrosion	Para. 9.22	Visual Examination	-	-	-	-	
15	Insert Retention (In Shell)	Para. 9.23 & Para. 4.3.6 of this spec.	Visual Examination	-	-	Para. 4.3.6 of this spec.		
16	Jackscrew Retention	Para. 9.24 & Para. 4.3.7 of this spec.	Not applicable					

No.	ESCC Generic Spec. No. 3401		Measurements and Inspections		Symbol	Limits		Unit
	Environmental and Endurance Tests Note 1	Test Method and Conditions	Identification	Conditions		Min.	Max.	
17	High Temperature Measurements	Para. 9.25	Insulation Resistance	Table 2 Item 1	R_i	10	-	MΩ
18	Overload Test	Para. 9.26	Internal Temperature	-	T	-	+100	ºC
			Rated Current Contact Resistance	ESCC 3401/078	R_{cr}	ESCC 3401/078		mΩ
			Mated Shell Conductivity	Table 2 Item 3	V_D	Not applicable		mV
			Insulation Resistance	Table 2 Item 1	R_i	Table 2, Item 1		MΩ
			Voltage Proof Leakage Current	Table 2 Item 2	I_L	Table 2, Item 2		mA
19	Maintenance Ageing	Para. 9.27	Visual Examination	-	-	-	-	
			Contact Retention (In insert)	ESCC 3401/078	-	ESCC 3401/078		N
			Contact insertion and Withdrawal Forces	ESCC 3401/078		ESCC 3401/078		N
20	Engage/Separation Forces	Para. 9.28 & Para. 4.3.9 of this spec.	Force	ESCC 3401/078	F	ESCC 3401/078		N
21	Oversize Pin Exclusion	Para. 9.29 & Para. 4.3.10 of this spec.	Not applicable					
22	Probe Damage	Para. 9.30 & Para. 4.3.11 of this spec.	Not applicable					
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
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 contacts is performed on each batch submitted to tests defined in the C&K PID requirements.