CONNECTORS, ELECTRICAL, RECTANGULAR, NON-REMOVABLE PRESS-FIT SIGNAL CONTACTS AND REMOVABLE PRESS-FIT POWER CONTACTS

BASED ON TYPES SDD, SND, SCBM

ESCC Detail Specification No. 3401/098

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DCR No.	CHANGE DESCRIPTION
1698	Specification updated to incorporate changes per DCR.

TABLE OF CONTENTS

1 GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for Connectors, Electrical, Rectangular, Non-removable Press-fit Signal Contacts, Standard (Gauge 20), High Density (Gauge 22) and Removable Press-fit Contacts, Power (Gauge 8), based on types SDD, SND, SCBM.

It shall be read in conjunction with:

- ESCC Generic Specification No. 3401, Connectors, Electrical, Non-Filtered, Circular and Rectangular.
- ESCC Detail Specification No. 3401/022, Accessories for Rectangular Connectors 3401/001, 3401/002, 3401/098 and Connector Savers 3401/020, 3401/080.
- ESCC Detail Specification No. 3401/099, Contacts, Power, Press-fit Type for 3401/098 Connectors.

the requirements of which are supplemented herein.

1.2 RANGE OF COMPONENTS AND COMPONENT TYPE VARIANTS

The different sizes of the connectors and contact types specified herein, which are also covered by this specification, together with their mechanical characteristics, 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 connectors specified herein, are given in Table 1(b).

1.4 PARAMETER DERATING INFORMATION

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

1.5 PHYSICAL DIMENSIONS

The physical dimensions of the connectors specified herein and the available contact arrangements are shown in Figure 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 for Connectors, Electrical, Non-Filtered, Circular and Rectangular.

(b) ESCC Detail Specification No. 3401/022, Accessories for Rectangular Connectors, 3401/001, 3401/002 and Connector Savers 3401/020 and 3401/080.

(c) ESCC Detail Specification No. 3401/099, Contacts, Power, Press-fit Type for 3401/098 Connectors.

(d) ESCC Basic Specification No. 20500, External Visual Inspection.

(e) MIL-DTL-24308, Rack and Panel Connectors, Miniature.

(f) NASA/GSFC Specification S-311-P-10, Connectors, Electrical, Rectangular, Miniature, Polarised Shell, Rack and Panel, for Space Flight Use.

(g) IEC 60352-5, Solderless connections – Part 5: Press-in connections – General requirements, test methods and practical guidance.

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) - RANGE OF COMPONENTS AND TYPE VARIANTS

VARIANTS AND SHELL SIZES

Variant	Shell Size (1)	Max. Weight (g) (2) (3)		Mating Force (N max) (16)	Unmating Force (16)	
		Male	Female		N min	N max
01 (Gauge 20 Signal Contacts)	E	4.5	5	30	3.5	20
	A	5.5	7	50	4.5	34
	B	9	10	83	8	55
	C	12.5	13.5	123	11	83
	D	13.5	15	166	14.5	120
02 (Gauge 22 Signal Contacts)	E	5.2	6	46	3.4	28
	A	7.4	8	77	4.5	46
	B	11	12	127	7.9	77
	C	15.6	17	177	11.3	109
	D	18.2	20	222	14.7	136
03 (Gauge 8 Power Contacts)	A	6.1 (4)	7 (4)	55	4.5	44.5
		6.5 (5)	7.5 (5)	55	4.5	44.5
	B	8.6	10.1	85	8	70
	C	12	14	130	11	93

CONTACT TYPES

Contact Termination Code	Contact Type Description (6)	Maximum Weight of Contacts (g)					
		Variant 01		Variant 02		Variant 03	
		Male	Female	Male	Female	Male	Female
SND97	Gauge 20 straight press-fit signal contact	0.16	0.2	-	-	-	-
SDD97	Gauge 22 straight press-fit signal contact	-	-	0.12	0.14	-	-
SND62	Gauge 20 90° press-fit signal contact equipped with 90° bracket and screwlocks 4-40 (14)	-	0.23 (7) 0.29 (8) 0.34 (9)	-	-	-	-
SDD62	Gauge 22 90° press-fit signal contact equipped with 90° bracket and screwlocks 4-40 (14)	-	-	-	0.2 (10) 0.24 (11) 0.29 (12) 0.33 (13)	-	-
SCBM97	Gauge 8 power press-fit contact	-	-	-	-	2 (15)	1.8 (15)

NOTES:

1. See Figures 2(a), 2(b)
2. Weights without contacts or accessories.
3. Total maximum weight, in grammes, may be calculated from:
   - connector weight.
   - contact weight for all contacts including brackets and nuts (as applicable) (see Table 1(a) Contact Types and/or the relevant Detail Specification).
   - Accessories weight given in ESCC Detail Specification No. 3401/022 (if applicable).
4. Weight applicable to contact arrangement 3W3. See Figure 2(b).
5. Weight applicable to contact arrangement 3WK3. See Figure 2(b).
6. See Figure 2(c)
7. Weight of contact in row nearest the connector mounting plane (Ref. Plane).
8. Weight of contact in row farthest from connector mounting plane (Ref. Plane), except for size D, where it is the middle row.
9. For size D only, weight of contact in row farthest from connector mounting plane (Ref. Plane).
10. Weight of contact in row nearest the connector mounting plane (Ref. Plane).
11. Weight of contact in row after the row specified in (10).
12. Weight of contact in row after the row specified in (11).
13. Weight of contact in row after the row specified in (12).
14. Maximum Weight of brackets and nuts:
    - Shell sizes E, A, B, C : 3.1g (Var. 01), 3.95g (Var. 02)
    - Shell size D : 3.8g (Var. 01), 4.4g (Var. 02)
15. Power contacts shall be ordered separately in accordance with ESCC Detail Specification No. 3401/099.
16. For mating of connectors that include a plug connector (with male contacts) with a dimpled shell (see Figure 2(d) and Para. 4.5.2.1(i)), the maximum mating and unmating force shall be increased by 20N

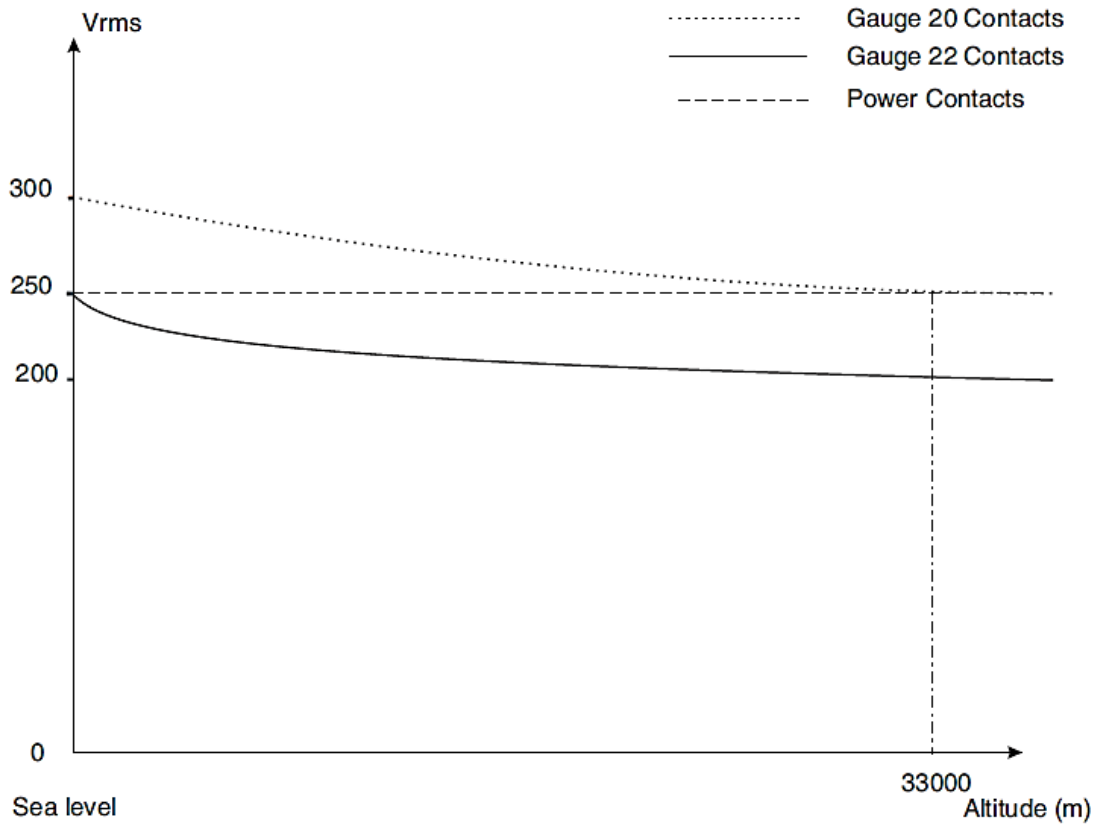
TABLE 1(b) - MAXIMUM RATINGS

No.	Characteristics	Symbol	Maximum Ratings	Unit	Remarks
1	Working Voltage (Sea Level) - Variant 01 - Variant 02 - Variant 03	U_R	 300 250 250	 Vrms Vrms Vrms	Note 1
2	Rated Current - Variant 01 - Variant 02 - Variant 03	I_R	 7.5 3 40	 A A A	-
3	Operating Temperature Range	T_{op}	-55 to +125	°C	T_{amb}
4	Storage Temperature Range	T_{stg}	-65 to +125	°C	-

NOTES:

1. Between each contact and the shell.

FIGURE 1 - PARAMETER DERATING INFORMATION

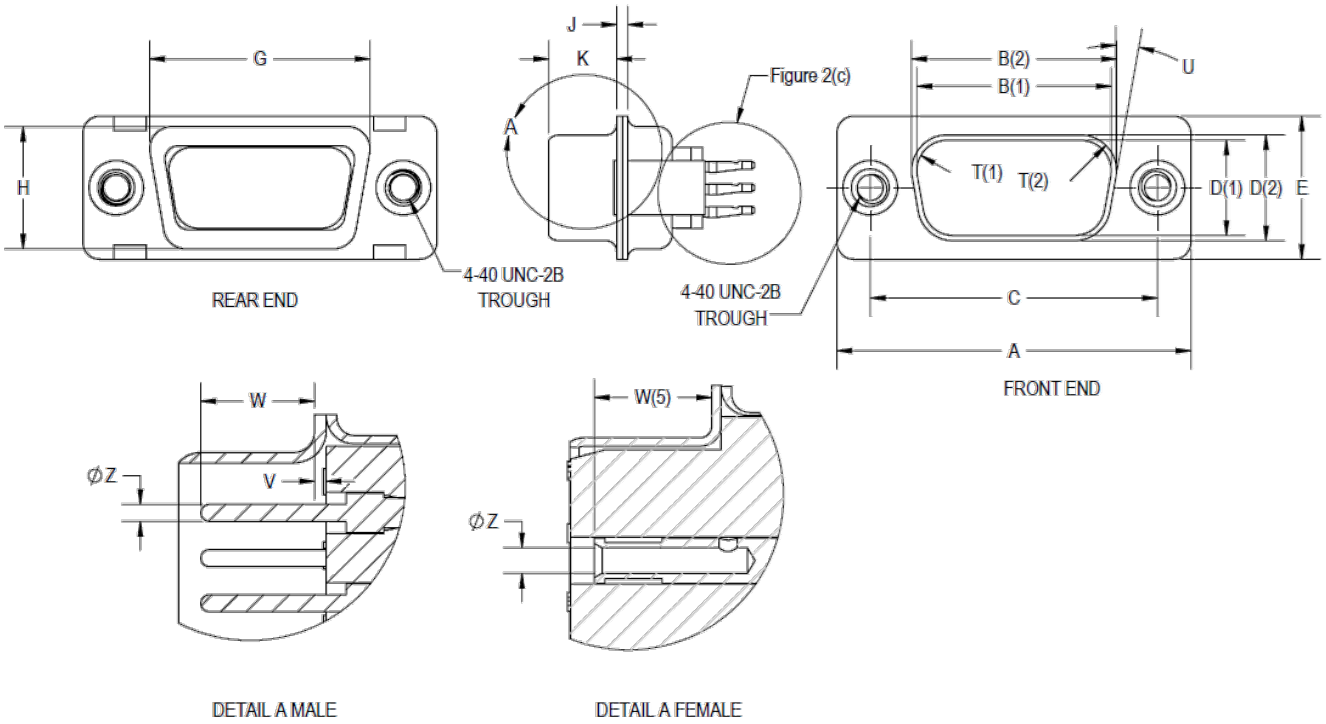


Working Voltage versus Altitude

FIGURE 2 - PHYSICAL DIMENSIONS

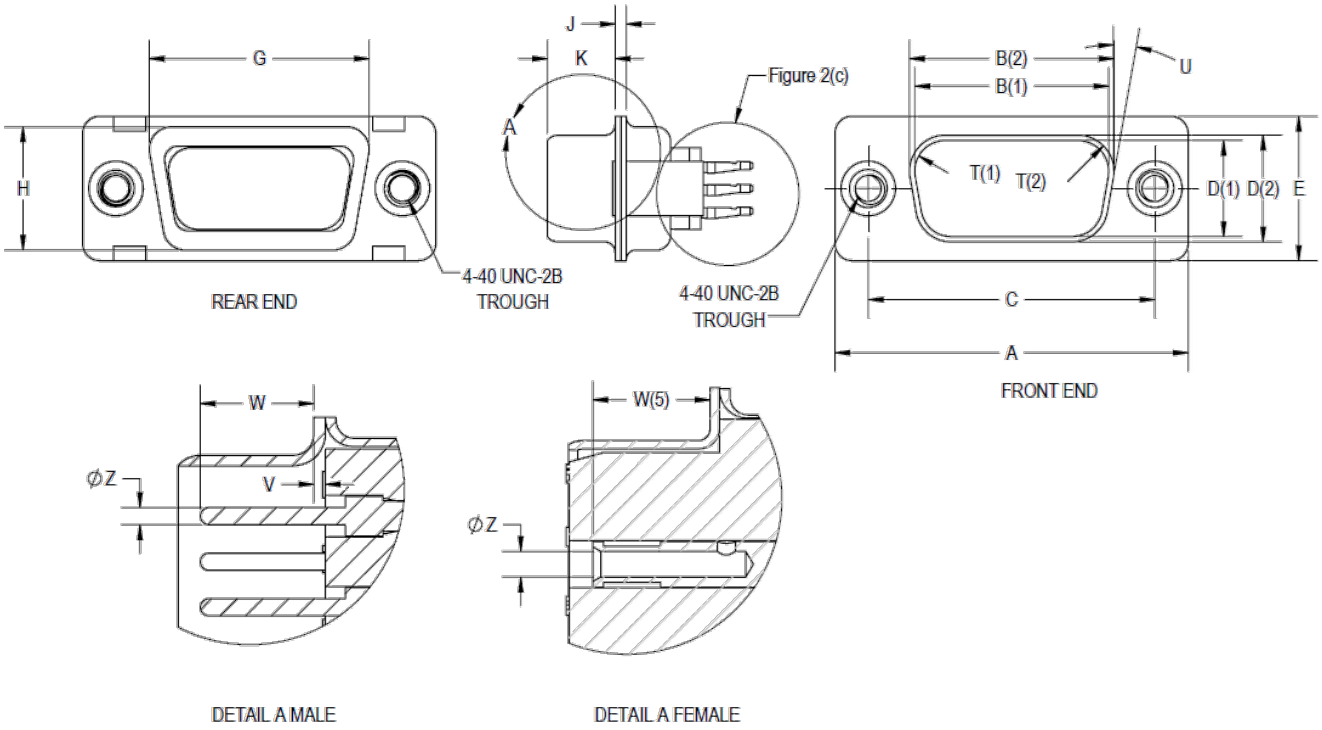
FIGURE 2(a) - RECEPTACLES AND PLUGS

VARIANTS 01, 02 – SHELL SIZE E



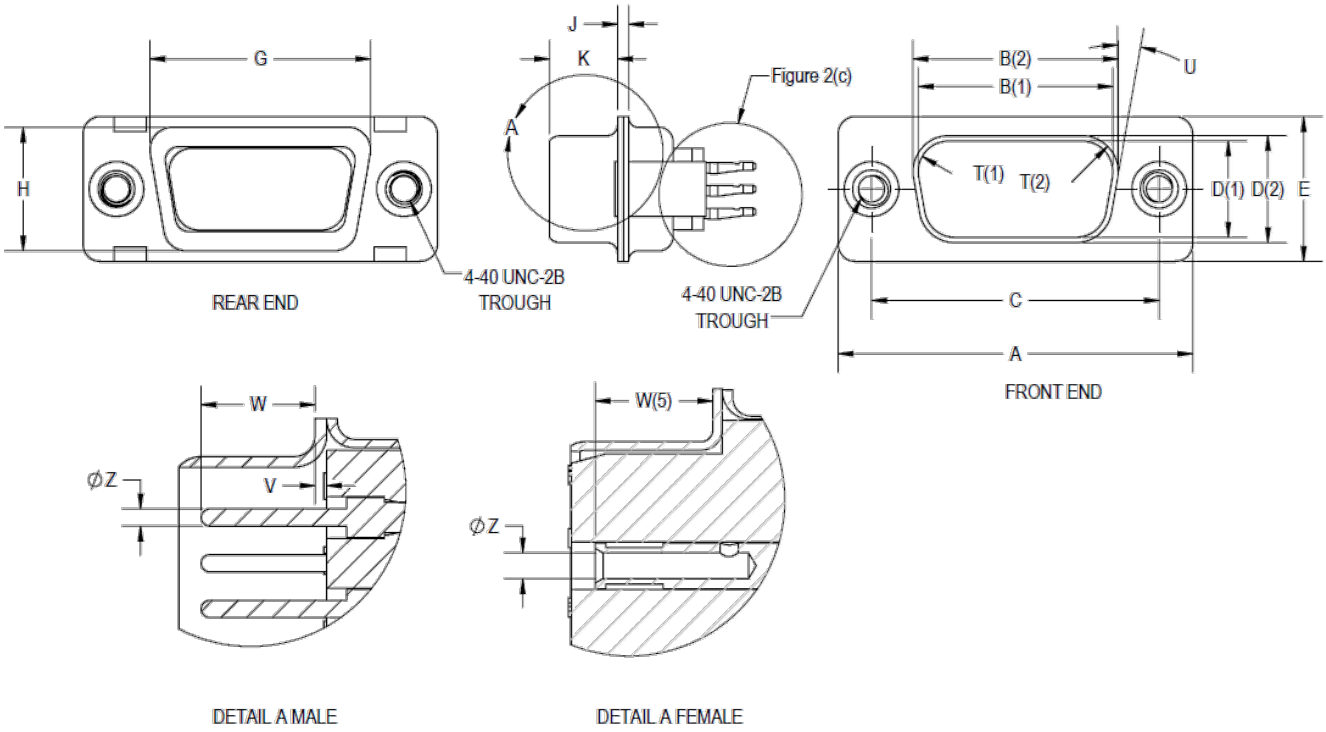
Contact Type	Connector Type	Symbol/ Dim.	A	B	C	D	E	G	H	J	K	T	U °	V	W	ØZ	
																V.01	V.02
Male	Plug	Min	30.43	16.79	24.87	8.23	12.17	19.02	10.46	0.51	5.82	2.59	9	0	4.03	0.99	0.75
		Max	31.19	17.04	25.12	8.48	12.93	19.53	10.97	1.02	6.05	2.69	11	0.6	-	1.04	0.77
Female	Receptacle	Min	30.43	16.21	24.87	7.77	12.07	19.02	10.46	0.51	6.05	2.46	9	-	3.63	1.07	0.78
		Max	31.19	16.46	25.12	8.03	12.93	19.53	10.97	1.02	6.3	2.62	11	-	-	1.14	-

VARIANTS 01, 02, 03 – SHELL SIZE A



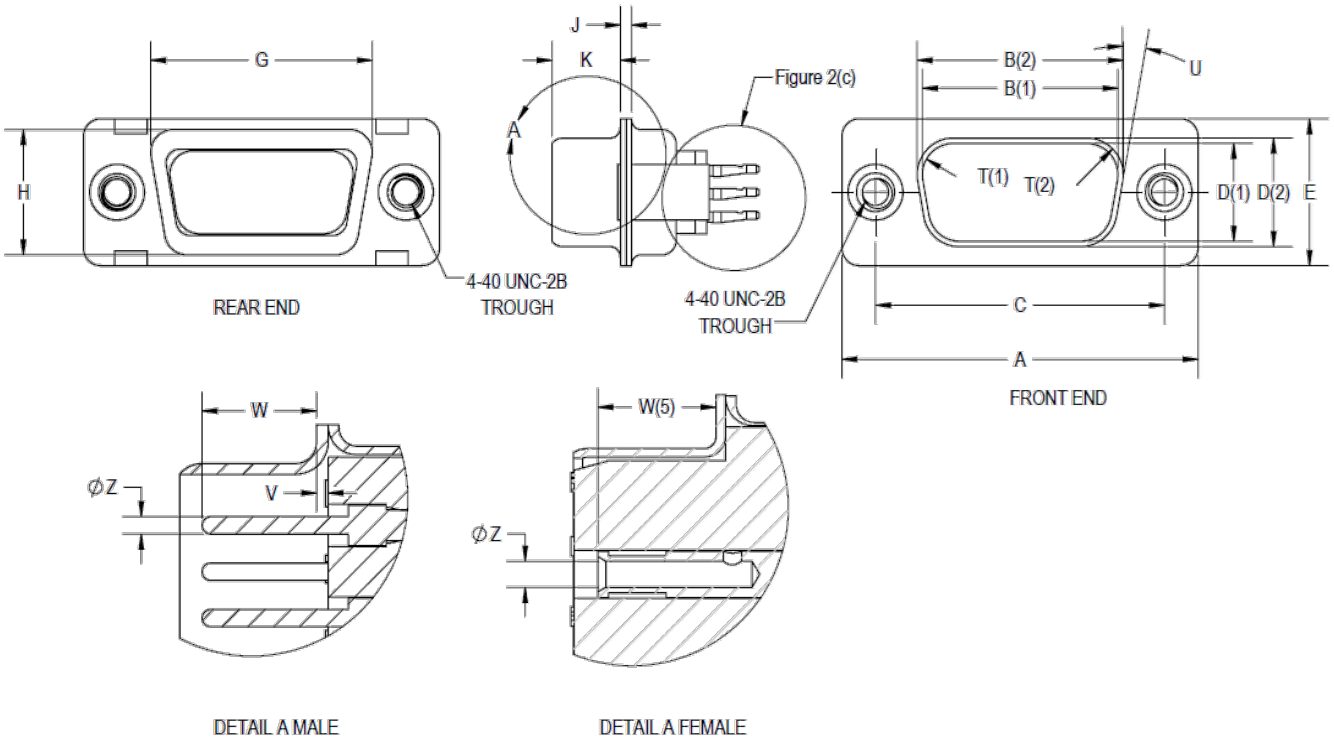
Contact Type	Connector Type	Symbol/ Dim.	A	B	C	D	E	G	H	J	K	T	U °	V	W (6)	ØZ (6)	
																V.01	V.02
Male	Plug	Min	38.76	25.12	33.2	8.23	12.17	27.25	10.46	0.51	5.82	2.59	9	0	4.03	0.99	0.75
		Max	39.52	25.37	33.45	8.48	12.93	27.76	10.97	1.02	6.05	2.69	11	0.6	-	1.04	0.77
Female	Receptacle	Min	38.76	24.54	33.2	7.77	12.17	27.25	10.46	0.51	6.05	2.46	9	-	3.63	1.07	0.78
		Max	39.52	24.79	33.45	8.03	12.93	27.76	10.97	1.02	6.3	2.62	11	-	-	1.14	-

VARIANTS 01, 02, 03 – SHELL SIZE B



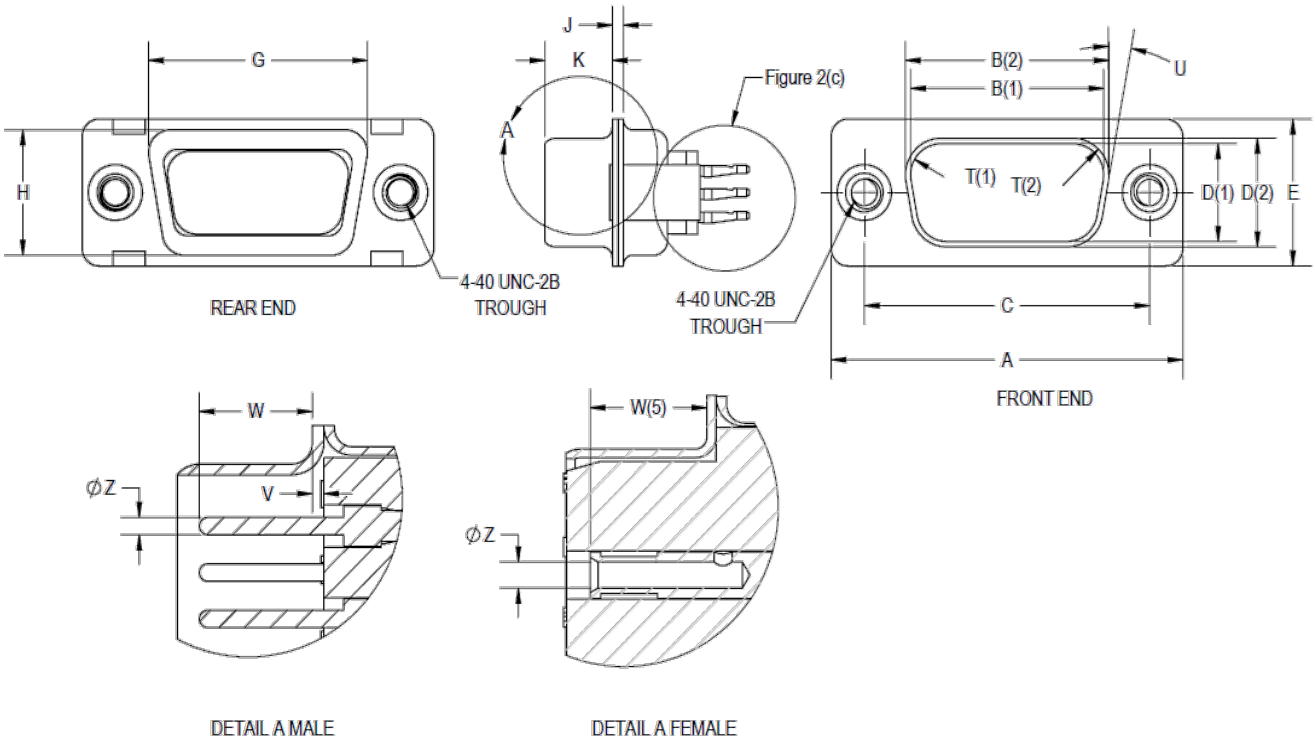
Contact Type	Connector Type	Symbol/ Dim.	A	B	C	D	E	G	H	J	K	T	U °	V	W (6)	ØZ (6)	
																V.01	V.02
Male	Plug	Min	52.65	38.84	46.91	8.23	12.17	41.02	10.46	0.51	5.69	2.59	9	0	4.03	0.99	0.75
		Max	53.42	39.09	47.17	8.48	12.93	41.53	10.97	1.24	5.99	2.69	11	0.6	-	1.04	0.77
Female	Receptacle	Min	52.65	38.25	46.91	7.77	12.17	41.02	10.46	0.51	6.05	2.46	9	-	3.63	1.07	0.78
		Max	53.42	38.51	47.17	8.03	12.93	41.53	10.97	1.02	6.3	2.62	11	-	-	1.14	-

VARIANTS 01, 02, 03 – SHELL SIZE C



Contact Type	Connector Type	Symbol/ Dim.	A	B	C	D	E	G	H	J	K	T	U °	V	W (6)	ØZ (6)	
																V.01	V.02
Male	Plug	Min	68.94	55.3	63.37	8.23	12.17	57.45	10.46	0.51	5.69	2.59	9	0	4.03	0.99	0.75
		Max	69.7	55.55	63.63	8.48	12.93	57.96	10.97	1.24	5.99	2.69	11	0.6	-	1.04	0.77
Female	Receptacle	Min	68.94	54.71	63.37	7.77	12.17	57.45	10.46	0.51	6.05	2.46	9	-	3.63	1.07	0.78
		Max	69.7	54.97	63.63	8.03	12.93	57.96	10.97	1.02	6.3	2.62	11	-	-	1.14	-

VARIANTS 01, 02 – SHELL SIZE D



Contact Type	Connector Type	Symbol/ Dim.	A	B	C	D	E	G	H	J	K	T	U °	V	W	ØZ	
																V.01	V.02
Male	Plug	Min	66.55	52.68	60.99	11.07	14.99	55.07	13.31	0.51	5.69	2.59	9	0	4.03	0.99	0.75
		Max	67.31	52.93	61.24	11.33	15.75	55.58	13.82	1.24	5.99	2.69	11	0.6	-	1.04	0.77
Female	Receptacle	Min	66.55	52.3	60.99	10.62	14.99	55.07	13.31	0.51	6.05	2.46	9	-	3.63	1.07	0.78
		Max	67.31	52.55	61.24	10.87	15.75	55.58	13.82	1.02	6.3	2.62	11	-	-	1.14	-

NOTES TO FIGURE 2(a):

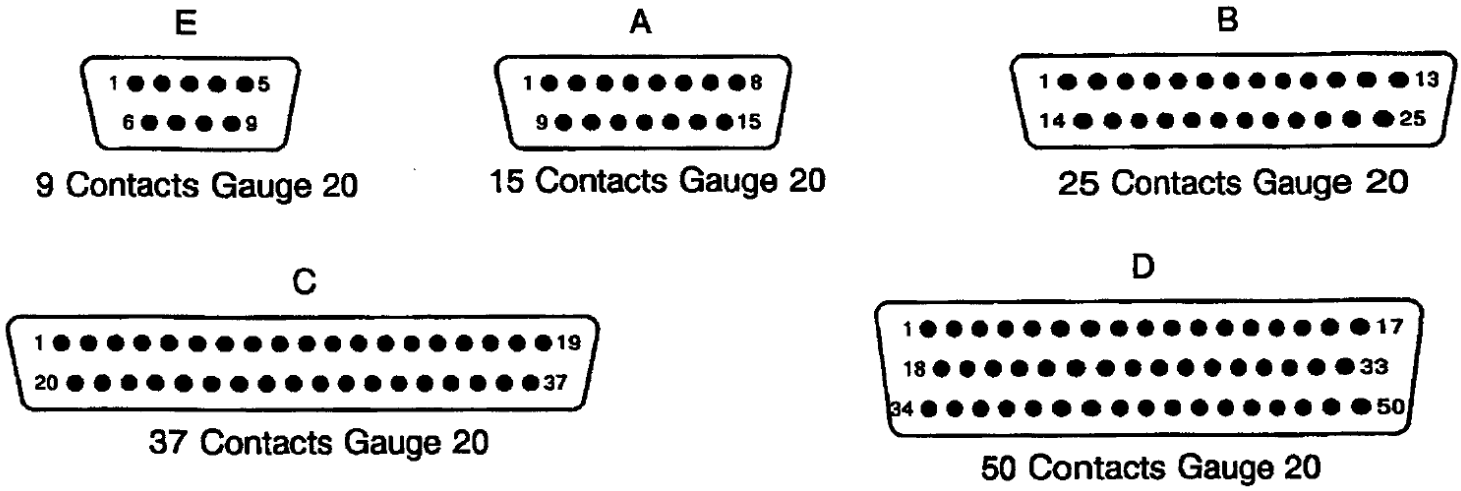
1. Inside dimension for connectors with male contacts.
2. Outside dimension for connectors with female contacts.
3. All dimensions are in mm (angles in degrees).
4. Underlined dimensions, in table, are critical to ensure intermateability.
5. Electrical contact position in female contact.
6. Not applicable to Variant 03.

FIGURE 2(b) - CONTACT ARRANGEMENTS

VARIANT 01 – STANDARD PRESS-FIT SIGNAL CONTACT ARRANGEMENTS

FRONT VIEW MALE INSERT

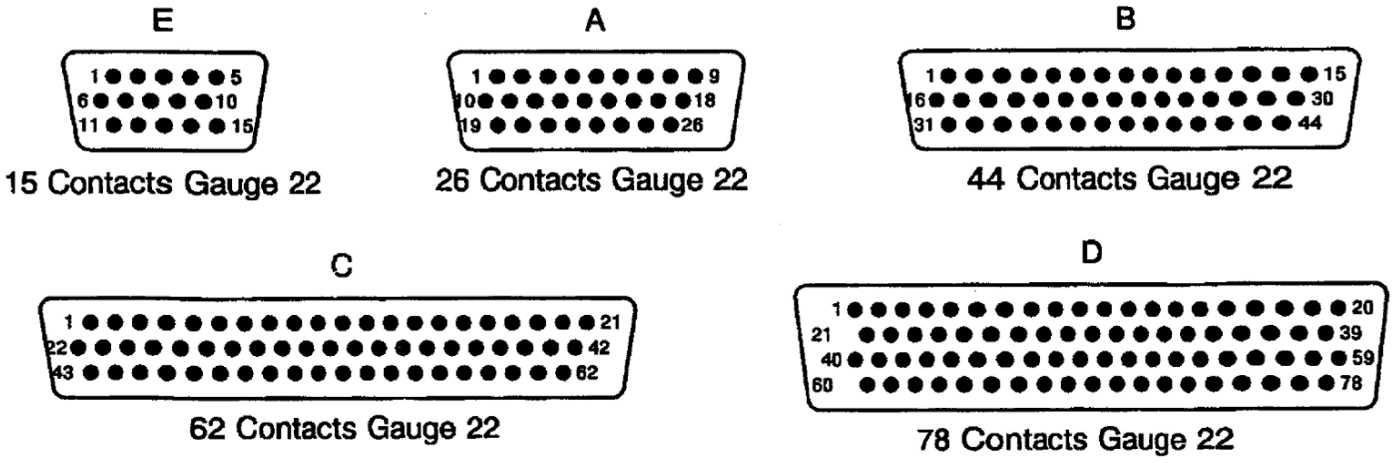
(See Notes 1, 2)



VARIANT 02 – HIGH DENSITY PRESS-FIT SIGNAL CONTACT ARRANGEMENTS

FRONT VIEW MALE INSERT

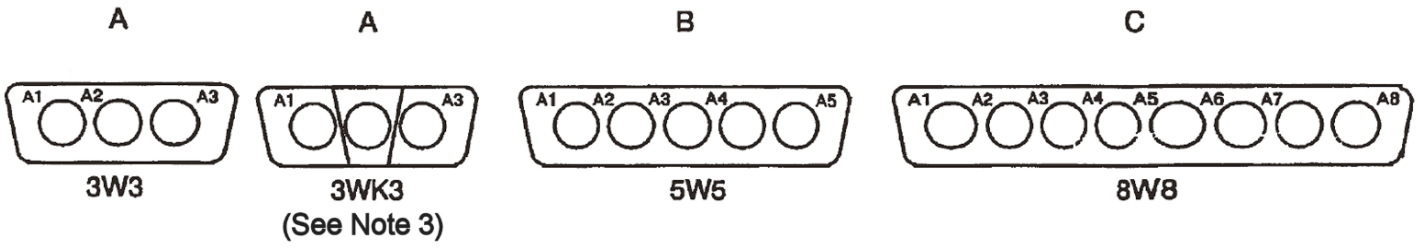
(See Notes 1, 2)



VARIANT 03 – PRESS-FIT POWER CONTACT ARRANGEMENTS

FRONT VIEW MALE INSERT

(See Notes 1, 2)

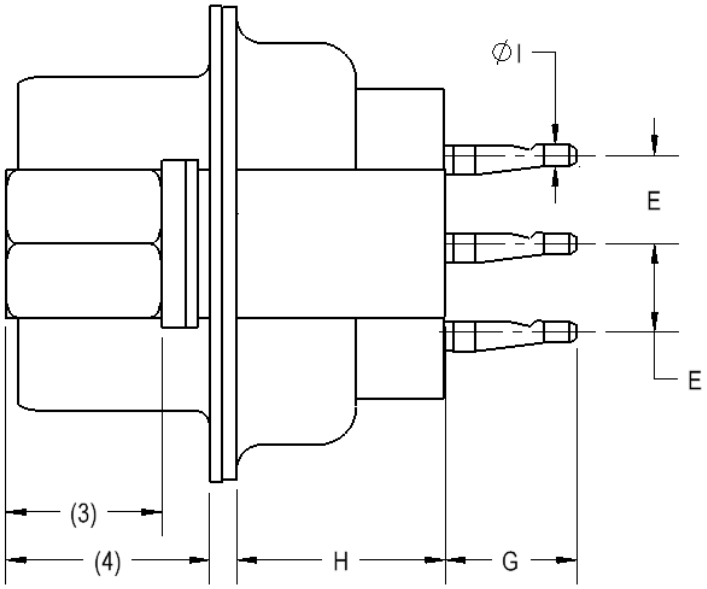


NOTES TO FIGURE 2(b):

1. Contact locations are in conformity with MIL-DTL-24308 specification sheets for signal contact arrangements and NASA/GSFC Specification S-311-P-10 for power contact arrangements, and shall not be checked during procurement.
2. The front side of the insert shall be marked with the minimum marking shown.
3. 3WK3 insulator with built-in keying (middle part recessed or protruding with respect to each side depending on the Contact Gender code) to avoid mismounting (K = keyed); see Para. 4.5.2.1(d) and (e).

FIGURE 2(c) - REAR END

VARIANT 01 - (GAUGE 20) STRAIGHT PRESS-FIT SIGNAL CONTACTS
(CONTACT TERMINATION CODE: SND97)



Pitch between contacts:

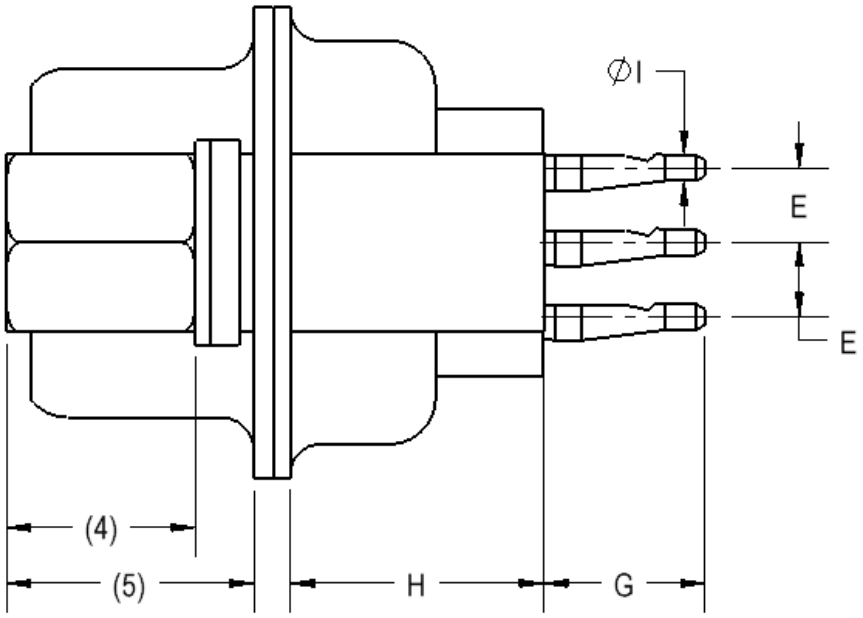
- Connector shell sizes E, A: 2.74mm
- Connector shell sizes B, C, D: 2.76mm

Symbol / Dimension (1)	E (2) (5)	G	H	ØI
Min	2.77	4	6.5	0.5
Max	2.91	4.5	7	1

NOTES:

1. All dimensions are in mm.
2. Typical = 2.84mm.
3. According to ESCC 3401/022, Figure 2(a), dimension K.
4. According to ESCC 3401/022, Figure 2(a), dimension G.
5. The example figure shown is for shell size D with 3 rows of rear contacts; shell sizes E, A, B, C have 2 rows of rear contacts.

VARIANT 02 - (GAUGE 22) STRAIGHT PRESS-FIT SIGNAL CONTACTS
(CONTACT TERMINATION CODE: SDD97)



Pitch between contacts:

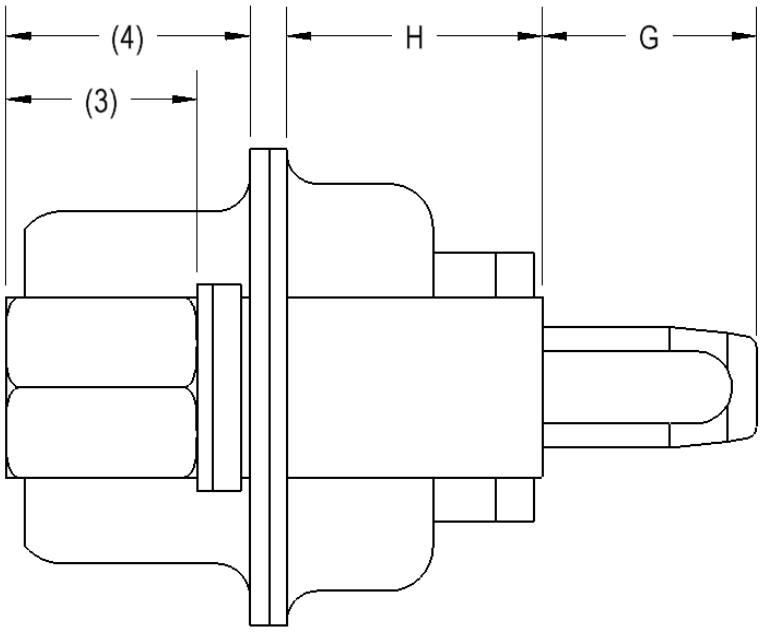
- Connector shell sizes E, A, B: 2.29mm
- Connector shell sizes C, D: 2.41mm

Symbol / Dimension (1)	E (6)		G	H	ØI
	Sizes: E, A, B, C (2)	Size D (3)			
Min	1.91	2.01	4	6.5	0.5
Max	2.05	2.15	4.5	7	1

NOTES:

1. All dimensions are in mm.
2. Typical = 1.98mm.
3. Typical = 2.08mm.
4. According to ESCC 3401/022, Figure 2(a), dimension K.
5. According to ESCC 3401/022, Figure 2(a), dimension G.
6. The example figure shown is for shell sizes E, A, B, C with 3 rows of rear contacts; shell size D has 4 rows of rear contacts.

VARIANT 03 - (GAUGE 8) PRESS-FIT POWER CONTACTS
(CONTACT TERMINATION CODE: SCBM97)



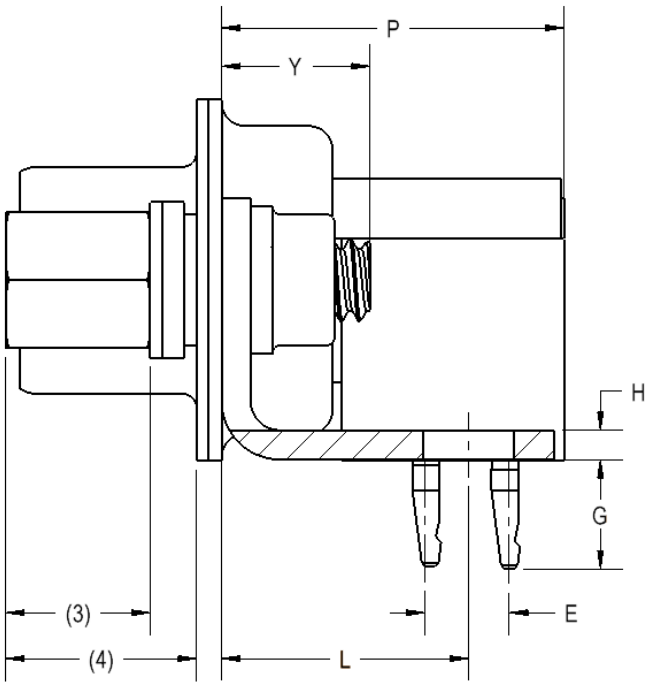
Symbol / Dimension (1)	G	H
Min	4	6.5
Max	6	7

NOTES:

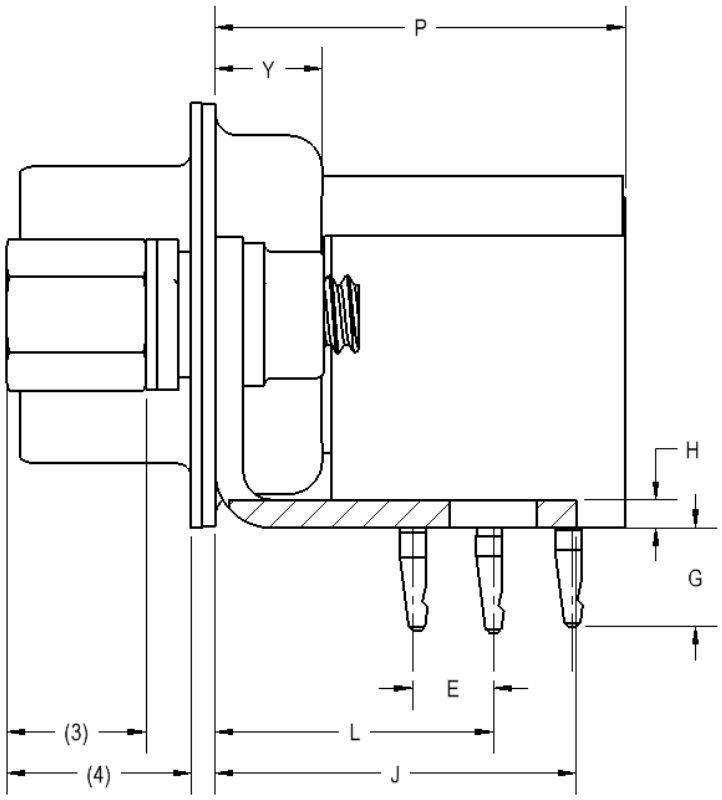
1. All dimensions are in mm.

VARIANT 01 - (GAUGE 20) 90° PRESS-FIT SIGNAL CONTACTS
(CONTACT TERMINATION CODE: SND62)

SHELL SIZES E, A, B, C



SHELL SIZE D



Pitch between contacts:

- Connector shell sizes E, A, B, C, D: 2.76mm

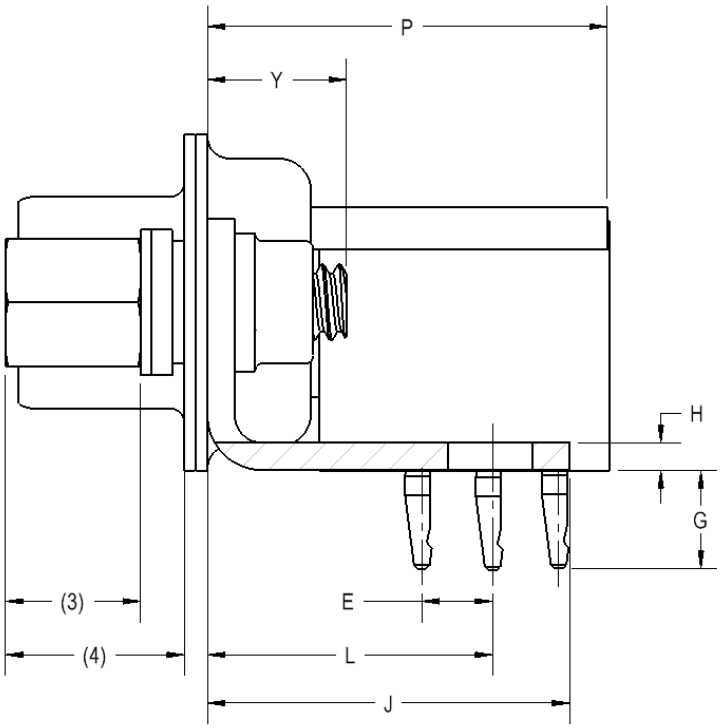
Symbol / Dimension (1)	E (2)	H	J	L		G	P	Y
				Sizes: E, A, B, C	Size D			
Min	2.79	1	-	8.54	9.96	3.5	-	-
Max	2.89	3.2	15	8.68	10.1	4	16	7

NOTES:

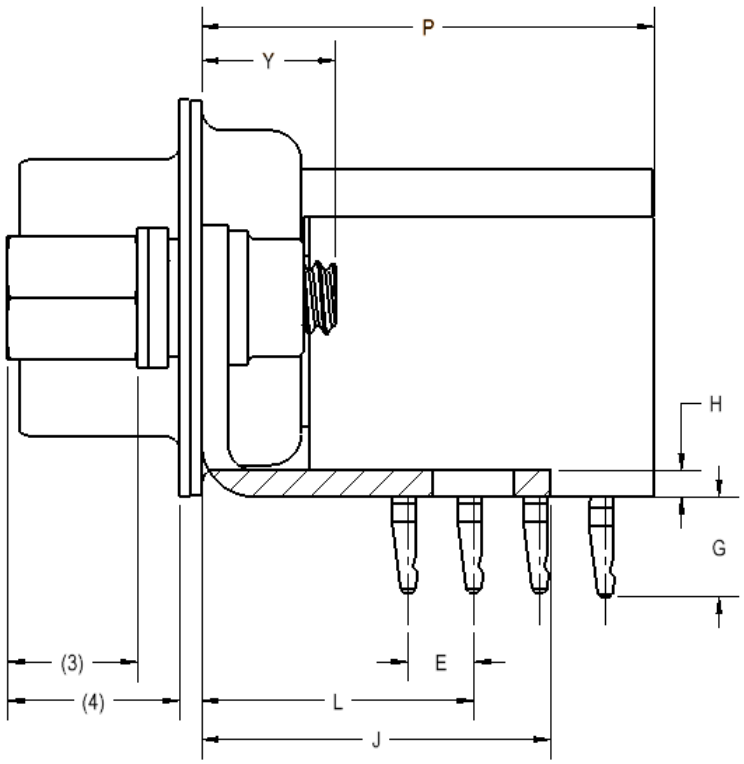
1. All dimensions are in mm.
2. Typical = 2.84mm.
3. According to ESCC 3401/022, Figure 2(a), dimension K.
4. According to ESCC 3401/022, Figure 2(a), dimension G.

VARIANT 02 - (GAUGE 22) 90° PRESS-FIT SIGNAL CONTACTS
(CONTACT TERMINATION CODE: SDD62)

SHELL SIZES E, A, B, C



SHELL SIZE D



Pitch between contacts:

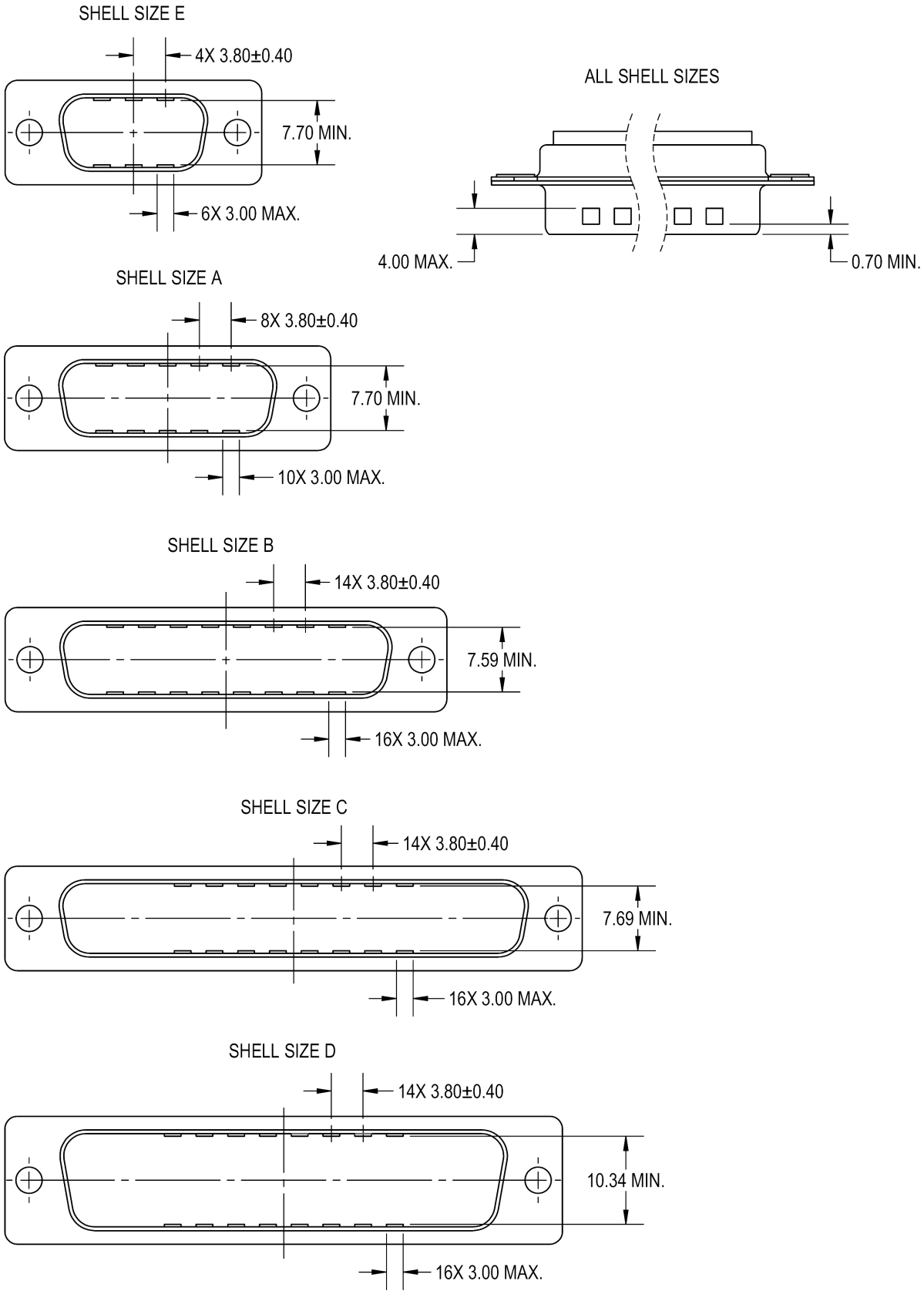
- Connector shell sizes E, A, B, C: 2.29mm
- Connector shell size D: 2.41mm

Symbol / Dimension (1)	E (2)	H	J	L		G	P	Y
				Sizes: E, A, B, C	Size D			
Min	2.49	1	-	10.39	10.45	3.5	-	-
Max	2.59	3.2	15	10.53	10.59	4	19	7

NOTES:

1. All dimensions are in mm.
2. Typical = 2.54mm.
3. According to ESCC 3401/022, Figure 2(a), dimension K.
4. According to ESCC 3401/022, Figure 2(a), dimension G.

FIGURE 2(d) – PLUG CONNECTORS WITH DIMPLED SHELL



NOTES:

1. All dimensions are in mm.

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. 9.9, Seal Test: Not applicable.

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. 9.10, Wiring: The following Press-Fit Insertion Force Test shall be performed in lieu of Wiring:

Choice of PCB

The PCB to be used during the press-fit insertion force test shall have the following characteristics:

- 12 layers, internal layer thickness: 17µm typical.
- PCB thickness: 2.4 ±1mm
- PCB material: Polyimide, suitable for space application (e.g. Arlon 35N, Arlon 85N, Ventec VT-901).
- PCB surface finish:
  - 0.05µm min. immersion gold over 4.5 ±1.5µm electroless nickel over 25µm min. copper

  or
  - 15µm min. Solder (≤ 95% tin, remainder lead) over 25µm min. copper

Press-Fit Insertion Force Test Procedure

The connectors shall be inserted into the PCB with an insertion speed of between 25mm/minute and 50mm/minute as per IEC 60352-5, clause 5.2.2.2. The insertion forces shall be monitored and reported. The proper insertion of the press-fit terminations shall then be examined under 5× magnification in accordance with ESCC Basic Specification No. 20500.

Any plating defects shall be reported. Scratches showing any base metal are not acceptable.

The terminations shall be checked following insertion to verify they have remained straight. Burrs are not acceptable.

The connectors shall then be removed from the PCB by pushing on the termination tails with a plane surface.

The connectors shall be re-inserted, removed and then inserted once more in accordance with the procedure described above.

Final Measurements (Data Points)

For each connector, the contact resistance between the press-fit terminations and the PCB shall be measured and reported as per IEC 60352-5, clause 5.2.3.1.

Sampling: 10% of all connector's contacts or 5 contacts, whichever is less.

(c) Para. 9.11.2, Sinusoidal Vibration: The following test conditions shall apply:

- Number of cycles: 1 (25Hz to 200Hz)
- Sweep rate: 1 octave/minute
- Vibration Amplitude (Power Specral Density):
  - 25g for 25Hz to 100Hz
  - 15g for 100Hz to 200Hz

(d) Para. 9.11.3, Random Vibration: The following 2 test conditions shall apply to all test samples:

- Condition 1:
  - Axis of Vibration: Parallel to PCB mounting plane
  - Vibration Amplitude (Power Specral Density):

Global Envelope: 27.1grms	
20 to 100 Hz	+6dB/Octave
100 to 800 Hz	$0.5g^2$/Hz
800 to 2000 Hz	-3dB/Octave

  - Duration: 5 minutes
- Condition 2:
  - Axis of Vibration: Perpendicular to PCB mounting plane
  - Vibration Amplitude (Power Specral Density):

Global Envelope: 28.5grms	
20 to 100 Hz	+6dB/Octave
100 to 500 Hz	$1g^2$/Hz
500 to 2000 Hz	-6dB/Octave

  - Duration: 5 minutes

(e) Para. 9.13, Climatic Sequence: At the end of the test, the contact resistance between the press-fit terminations and the PCB shall be measured and reported as per IEC 60352-5, clause 5.2.3.1.

Sampling: 10% of all connector's contacts or 5 contacts, whichever is less.

(f) Para 9.15, Joint Strength: Not applicable.

(g) Para. 9.16, Rapid Change of Temperature: At the end of the test, the contact resistance between the press-fit terminations and the PCB shall be measured and reported as per IEC 60352-5, clause 5.2.3.1.

Sampling: 10% of all connector's contacts or 5 contacts, whichever is less.

The connectors shall then be removed from the PCB for the remainder of the test path.

(h) Para. 9.22, Corrosion: At the end of the test, the contact resistance between the press-fit terminations and the PCB shall be measured and reported as per IEC 60352-5, clause 5.2.3.1.

Sampling: 10% of all connector's contacts or 5 contacts, whichever is less.

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

(j) 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. 9.10, Wiring: The following Press-Fit Insertion Force Test shall be performed in lieu of Wiring:

Choice of PCB

The PCB to be used during the press-fit insertion force test shall have the following characteristics:

- 12 layers, internal layer thickness: 17µm typical.
- PCB thickness: 2.4 ±1mm
- PCB material: Polyimide, suitable for space application (e.g. Arlon 35N, Arlon 85N, Ventec VT-901).
- PCB surface finish:
  - 0.05µm min. immersion gold over 4.5 ±1.5µm electroless nickel over 25µm min. copper
    or
  - 15µm min. Solder (≤ 95% tin, remainder lead) over 25µm min. copper

Press-Fit Insertion Force Test Procedure

The connectors shall be inserted into the PCB with an insertion speed of between 25mm/minute and 50mm/minute as per IEC 60352-5, clause 5.2.2.2. The insertion forces shall be monitored and reported. The proper insertion of the press-fit terminations shall then be examined under 5× magnification in accordance with ESCC Basic Specification No. 20500.

Any plating defects shall be reported. Scratches showing any base metal are not acceptable.

The terminations shall be checked following insertion to verify they have remained straight. Burrs are not acceptable.

The connectors shall then be removed from the PCB by pushing on the termination tails with a plane surface.

The connectors shall be re-inserted, removed and then inserted once more in accordance with the procedure described above.

Final Measurements (Data Points)

For each connector, the contact resistance between the press-fit terminations and the PCB shall be measured and reported as per IEC 60352-5, clause 5.2.3.1.

Sampling: 10% of all connector’s contacts or 5 contacts, whichever is less.

(c) Para. 9.13, Climatic Sequence: At the end of the test, the contact resistance between the press-fit terminations and the PCB shall be measured and reported as per IEC 60352-5, clause 5.2.3.1.

Sampling: 10% of all connector’s contacts or 5 contacts, whichever is less.

(d) Para 9.15, Joint Strength: Not applicable.

(e) Para. 9.16, Rapid Change of Temperature: At the end of the test, the contact resistance between the press-fit terminations and the PCB shall be measured and reported as per IEC 60352-5, clause 5.2.3.1.

Sampling: 10% of all connector’s contacts or 5 contacts, whichever is less.

The connectors shall then be removed from the PCB for the remainder of the test path.

(f) Para. 9.22, Corrosion: At the end of the test, the contact resistance between the press-fit terminations and the PCB shall be measured and reported as per IEC 60352-5, clause 5.2.3.1.

Sampling: 10% of all connector's contacts or 5 contacts, whichever is less.

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 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, with contacts where applicable, 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 follows:

Signal Contacts	Measurements	Pick-Up Weight	Drop Weight
Gauge 20	Weight (g)	28.35	226.8
	Pin diameter (mm)	0.99 to 0.993	1.039 to 1.04
	Insertion depth (mm)	4	4
Gauge 22	Weight (g)	19.84	226.8
	Pin diameter (mm)	0.749 to 0.751	0.773 to 0.775
	Insertion depth (mm)	4	4

See ESCC Detail Specification No. 3401/099 for power contacts.

4.3.4 Contact Retention (in insert)

For gauge 20 and 22 signal contacts the contact retention force shall be 40N.

See ESCC Detail Specification No. 3401/099 for power contacts.

4.3.5 Mating and Unmating Forces

The forces applied for 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 42.8N/cm^2 without being dislodged from the shell.

4.3.7 Contact Insertion and Withdrawal Forces

See ESCC Detail Specification No. 3401/099 for power contacts. Not applicable to signal contacts.

4.3.8 Engagement and Separation Forces

The engagement and separation forces of the female signal contacts shall be tested with the applicable test pin and shall not exceed the values of the table hereunder.

Signal Contacts	Measurements	Diameter (mm)		Engagement Max (N)	Separation (N)	
		Min	Max		Min	Max
Gauge 20	Max Ø Test Pin	1.039	1.04	3.33	-	2.22
	Min Ø Test Pin	0.99	0.993	-	0.28	-
Gauge 22	Max Ø Test Pin	0.773	0.775	3.33	-	2.22
	Min Ø Test Pin	0.749	0.751	-	0.2	-

See ESCC Detail Specification No. 3401/099 for power contacts.

4.3.9 Oversize Pin Exclusion

The diameter of the test pin and the force applied to it shall be as follows:

Signal Contacts	Test Pin Diameter (mm)		Force (N) Max
	Min	Max	
Gauge 20	1.166	1.17	3.33
Gauge 22	0.905	0.907	2.43

See ESCC Detail Specification No. 3401/099 for power contacts.

4.3.10 Probe Damage

The probe diameter and the moment at the end of the probe shall be as follows:

Signal Contacts	Probe Diameter (mm)		Moment (N.cm)
	Min	Max	
Gauge 20	1.007	1.033	5.65
Gauge 22	0.749	0.774	1.3

See ESCC Detail Specification No. 3401/099 for power contacts.

4.3.11 Press-fit Insertion Force

Receiving holes for press-fit terminations and the insertion force shall be as follows:

Signal Contacts	Receiving Hole Diameter (mm)		Max. Insertion Force (N)
	Min	Max	
Gauge 20	1.04	1.14	50
Gauge 22	1.04	1.14	50

See ESCC Detail Specification No. 3401/099 for power contacts.

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

Shells shall be made of brass. The standard plating finish (i.e. no Modification Code) shall be 1.27µm minimum of gold over 1µm minimum of copper. An alternative plating finish is 12.7µm minimum electroless nickel (Modification Code A175).

4.4.2 Inserts, Additional Spacing Insert

Inserts shall be made of glass-fibre filled diallylphthalate resin or a suitable thermoplastic material.

For Variant 03, the additional spacing insert which provides the required increased insulation shall be made of a suitable thermoplastic material.

4.4.3 Signal Contacts

The contact body shall be made of copper alloy with an underplate of 1µm minimum of copper, gold plated with 1.27µm minimum of gold.

The female contact spring element shall be made of copper alloy with an underplate of 1µm minimum of nickel or copper, gold plated with 1.27µm minimum of gold.

4.4.4 Contact Retaining Clip

Not applicable to gauge 20 and 22 signal contacts.

See ESCC Detail Specification No. 3401/099 for power contacts.

4.4.5 Guiding and Locking Devices

As specified in ESCC Detail Specification No. 3401/022.

4.4.6 Magnetism Level

The allowable value of magnetism shall not exceed that specified for the relevant level (see Para. 4.5.2.1(f)). Only magnetism levels NMC and NMD are verified.

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

(b) Contact number marking (see Figure 2(b)).
(c) The ESCC qualified components symbol (for ESCC qualified components only).
(d) The ESCC Component Number (see Para. 4.5.2).
(e) Traceability information.

4.5.2 The ESCC Component Number

The ESCC Component Number shall be constituted as follows (note 1):

Example: 340109801BDAM15PNMBSND97A175D

- Detail Specification Reference: 3401098
- Component Type Variant Number: 01 (as required; see Table 1(a))
- Testing Level: B
- Characteristic code: Series: D
- Characteristic code: Shell Size: A (as required)
- Characteristic code: Insert Type: M
- Characteristic code: Contact Arrangement: 15 (as required)
- Characteristic code: Contact Gender: P (as required)
- Characteristic code: Magnetism Level: NMB (as required)
- Characteristic code: Contact Termination Code: SND97 (as required)
- Characteristic code: Modification Code(s): A175D (if/as required)

NOTES:

1. A dash (-) or space may be included as part of the ESCC Component Number marking in order to separate one or more of the individual characteristic codes.

4.5.2.1 Characteristics Codes

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

(a) Series
The connector series shall be indicated by the code letter: D.

(b) Shell Size
The shell size shall be indicated by the following code letters: E, A, B, C, D. See Table 1(a).

(c) Insert Type
The type of insert shall be indicated by the code letter: M.

(d) Contact Arrangement
The contact arrangement shall be indicated by the following codes; see Figure 2(b):

Code	Shell Size	Number of Signal Contacts Gauge 20	Number of Signal Contacts Gauge 22	Number of Power Contact Cavities (Note 1)
9	E	9	0	0
15	A	15	0	0
15	E	0	15	0
3W3	A	0	0	3
3WK3	A	0	0	3 (Note 2)
25	B	25	0	0
26	A	0	26	0
5W5	B	0	0	5
37	C	37	0	0
8W8	C	0	0	8
44	B	0	44	0
50	D	50	0	0
62	C	0	62	0
78	D	0	78	0

NOTES:

1. For Variant 03, the power contacts shall be ordered separately in accordance with ESCC Detail Specification No. 3401/099.

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

2. Either 2 male plus 1 female power contact, or 2 female plus1 male power contact (see Para. 4.5.2.1(e)).

(e) Contact Gender
The gender of the contacts shall be indicated by the following code letters:

- P: male contact
- S: female contact

For Contact Arrangement Code 3WK3, the gender of the power contacts installed in cavities A1 and A3 (see Figure 2(b)) shall determine the code letter to be used.

(f) Magnetism Level
The magnetism level shall be indicated by the following codes:

Code	Definition
NMB	Magnetism Level: ≤ 200 gamma (1)
NMC	Magnetism Level: ≤ 20 gamma
NMD	Magnetism Level: ≤ 2 gamma

NOTES:

1. Guaranteed, but not measured.

(g) Contact Termination Code
The contact termination codes are specified in Table 1(a).

(h) Modification Code
A modification code shall be included in the ESCC Component Number when required, otherwise it shall be omitted. When more than a single code is applicable, all codes shall be concatenated together.

Finish codes: the following modification codes shall apply when required (see Para. 4.4.1):

- A175: electroless nickel finish.

Other codes: the following modification codes shall apply when required:

- D: plug connector (with male contacts) with dimpled shell (see Figure 2(d))

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
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 ±3°C.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE

No.	Characteristic	Symbol	ESCC 3401 Test Method and Test Conditions	Limits		Unit
				Min	Max	
1	Insulation Resistance	R_I	Para. 9.1.1.1	5000	-	MΩ
2	Voltage Proof Leakage Current - Variant 01 - Variants 02, 03	I_L	Para. 9.1.1.2 1250Vrms 1000Vrms	 - -	 2 2	mA
3	Low Level Contact Resistance - Gauge 20 Signal Contacts - Gauge 22 Signal Contacts - Gauge 8 Power Contacts	R_{CL}	Para. 9.1.1.3	 - - -	 6 12 Note 1	mΩ
4	Rated Current Contact Resistance - Gauge 20 Signal Contacts - Gauge 22 Signal Contacts - Gauge 8 Power Contacts	R_{CR}	Para. 9.1.1.3 7.5A 3A Note 1	 - - -	 5 10 Note 1	mΩ

NOTES:

1. See ESCC Detail Specification No. 3401/099 for power contacts.

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

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

4.7.3 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 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 (1)	Test Method and Conditions	Identification	Conditions		Min	Max	
01	Wiring	Paras. 4.2.4, 4.2.5 and 4.3.11 of this Spec.	Press-fit Insertion Force	Para. 4.3.11 of this Spec.	-	Para. 4.3.11 of this Spec.		-
			Final Measurements					
			Low Level Contact Resistance	Table 2 Item 3	R_{CL}	Table 2 Item 3		mΩ
			Rated Current Contact Resistance	Table 2 Item 4	R_{CR}	Table 2 Item 4		mΩ
02	Vibration	Para. 9.11 and Para. 4.2.4 of this Spec.	**Initial Measurements**					
			Coupling Screw(s) Unlocking Torque	-	-	Record Values		
			Final Measurements	Full Engagement				
			Coupling Screw(s) Unlocking Torque Drift	-	Δ	-25	+25	%
			Visual Examination	-	-	-	-	
03	Shock or Bump	Para. 9.12	**Final Measurements**	Full Engagement				
			Visual Examination	-	-	-	-	
04	Climatic Sequence	Para. 9.13 and Paras. 4.2.4 and 4.2.5 of this Spec.	**Dry Heat**					
			Insulation Resistance	At high temperature Table 2 Item 1	R_I	1000	-	MΩ
			Low Air Pressure					
			Voltage Proof Leakage Current	Figure 1	I_L	Table 2 Item 2		mA
			Damp Heat					
			Insulation Resistance	Immediately after test Table 2 Item 1	R_I	100	-	MΩ
			Final Measurements	**After 1 - 24hrs Recovery**				
			External Visual Inspection	ESCC 3401 Para. 9.7	-	ESCC 3401 Para. 9.7		
			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
05	Plating Thickness	Para. 9.14	Thickness	-	-	Para. 4.4.3 of this Spec.		
06	Rapid Change of Temperature	Para. 9.16 and Paras. 4.2.4 and 4.2.5 of this Spec.	Visual Examination	-	-	-	-	
			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
07	Contact Retention (In Insert)	Para. 9.17 and Para. 4.3.4 of this spec	Contact Displacement	-	-	ESCC 3401 Para. 9.17		

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	
08	Endurance	Para. 9.18	**Initial Measurements**					
			Mating/Unmating Forces	-	F	Para. 4.3.5 of this Spec.		N
			Low Level Contact Resistance	Table 2 Item 3	R_{CL}	Record Values		mΩ
			Final Measurements					
			Visual Examination	-	-	-	-	
			Mating/Unmating Forces	-	F	Para. 4.3.5 of this Spec.		N
			Low Level Contact Resistance Drift	Table 2 Item 3	ΔR_{CL}	-	3	mΩ
			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
09	Permanence of Marking	Para. 9.19	As applicable	-	-	-	-	-
10	Mating and Unmating Forces	Para. 9.20	Force	-	F	Para. 4.3.5 of this Spec.		N
11	High Temperature Storage	Para. 9.21	**Initial Measurements**					
			Low Level Contact Resistance	Table 2 Item 3	R_{CL}	Record Values		mΩ
			Final Measurements					
			Visual Examination	-	-	-	-	-
			Mating/Unmating Forces	-	F	Para. 4.3.5 of this Spec.		N
			Low Level Contact Resistance Drift	Table 2 Item 3	ΔR_{CL}	-	3	mΩ
			Rated Current Contact Resistance	Table 2 Item 4	R_{CR}	Table 2 Item 4		mΩ
			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)	Para. 4.3.4 of this Spec.	-	ESCC 3401 Para. 9.17		N
12	Corrosion	Para. 9.22 and Paras. 4.2.4 and 4.2.5 of this Spec.	Visual Examination	-	-	-	-	-
13	Insert Retention (In Shell)	Para. 9.23 and Para. 4.3.6 of this Spec.	Visual Examination	-	-	Para. 4.3.6 of this Spec.		-
14	High Temperature Measurements	Para. 9.25	Insulation Resistance	Table 2 Item 1	R_I	500	-	MΩ

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	
15	Overload Test	Para. 9.26	Internal Temperature	-	T	-	+100	°C
			Rated Current Contact Resistance	Table 2 Item 4	R_{CR}	Table 2 Item 4		mΩ
			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
16	Maintenance Ageing	Para. 9.27	Visual Examination	-	-	-	-	-
			Contact Retention	Para. 4.3.4 of this Spec.	-	ESCC 3401 Para. 9.17		N
			Contact Insertion & Withdrawal Forces	Para. 4.3.7 of this Spec.	F	Para. 4.3.7 of this Spec.		N
17	Engagement and Separation Forces	Para. 9.28 and Para. 4.3.8 of this Spec.	Force	-	F	Para. 4.3.8 of this Spec.		-
18	Oversize Pin Exclusion	Para. 9.29 and Para. 4.3.9 of this Spec.	-	-	-	ESCC 3401 Para. 9.29		-
19	Probe Damage	Para. 9.30 and Para. 4.3.10 of this Spec.	Contact Separation Force	Para. 4.3.8 of this Spec.	F	Para. 4.3.8 of this Spec.		-

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 POSITRONIC (F)

Items Affected	Description of Deviations
Para. 4.2.2 Deviations from Final Production Tests - Chart II(b)	Contact Capability: 100% Contact Capability Test may be omitted for non-removable standard and high density signal contacts provided that a 100% visual inspection of the contact and a 10% Contact Capability test are performed in accordance with the Positronic PID requirements. The results of the Contact Capability test shall be considered for PDA.
	Electrical Measurements at Room Temperature: Low Level Contact Resistance and Rated Current Contact Resistance measurements performed in accordance with Table 2 of the Detail Specification may be omitted for non-removable standard and high density signal contacts provided that Low Level Contact Resistance measurements are performed on 10 contacts per contact batch in accordance with the Positronic PID requirements. The results of the Low Level Contact Resistance measurements shall be considered for PDA.
Para. 4.2.4 Deviations from Qualification Tests - Chart IV	As part of Qualification testing in accordance with Chart IV, additional test requirements have been applied as detailed in Positronic Procedure 170035 (Adapted qualification program for press-fit connectors and Positronic product range). This included: • Adapted tests: ○ PCB insertion added at wiring step. ○ Supplementary vibration level (at Spacecraft severity) as per ECSS-Q-ST-70-61, High reliability assembly for surface mount and through hole connections. • New tests/steps: ○ Press-fit contact resistance. ○ PCB removal and Destructive Physical Analysis between PCB and press-fit termination.