



**CONNECTORS, ELECTRICAL, RECTANGULAR,
NANO-MINIATURE, NON-REMOVABLE CRIMP CONTACTS
AND UNINSULATED SOLID WIRE CONTACTS**

BASED ON TYPE NANO-D

ESCC Detail Specification No. 3401/086

| | |
|---------|-----------|
| Issue 2 | June 2020 |
|---------|-----------|



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| DCR No. | CHANGE DESCRIPTION |
|----------------------|--|
| 1326 | Specification upissued to incorporate 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 Connectors, Electrical, Rectangular, Nano-miniature, with Non-removable Crimp-type Contacts and Uninsulated Solid Wire Contacts, Based on Type Nano-D. It shall be read in conjunction with ESCC Generic Specification No. [3401](#), the requirements of which are supplemented herein, and ESCC Detail Specification No. [3901/012](#).

1.2 COMPONENT TYPE VARIANTS AND RANGE OF COMPONENTS

The different sizes of the basic connector types and the contact types specified herein, which are also covered by this specification, 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 scheduled 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 dimensions of the connectors specified herein are shown in Figures 2 and 3. Figure 4 shows the connector mounting.

1.6 CONTACT ARRANGEMENTS

The available 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, Non-filtered, Circular and Rectangular.
- (b) 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.
- (c) MIL-DTL-32139: Connectors, Electrical, Rectangular, Nanominiature, Polarised Shell, General Specification for.
- (d) MIL-M-24519: Moulding Plastics, Electrical, Thermoplastic.
- (e) ASTM-B194: Copper-beryllium Alloy Plate, Sheet, Strip, and Rolled Bar.
- (f) ASTM-B488: Gold for Engineering Use, Electrodeposited Coatings of.
- (g) ASTM-B541: Alloy, Electrical Contact, Gold.
- (h) SAE-AMS-QQ-N-290: Nickel Plating (Electrodeposited).
- (i) ECSS-Q-ST-70-26: Crimping of High-reliability Electrical Connections.

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. In addition the following terms and abbreviations are used:

- (a) Terms:
 - Jumper: Two connectors (either two plugs, or 1 plug and 1 receptacle) of the same number of ways (n), wired together with n wires (per ESCC 3901/012) of the same, specified, length. Length of wire ≥ 50mm.
 - Potting: Epoxy compound, used as an encapsulant.
- (b) Abbreviations:
 - CBR: Condensed Board Right-angle (describes a type of receptacle).
 - SMV: Surface Mount Vertical (describes a type of receptacle).
 - BS: Board Straight (describes a type of receptacle).

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

| Shell Size (Note 1) | Weight Max (g) (Notes 2, 3) | | | | | Mating and Unmating Forces (N) | |
|------------------------|-------------------------------------|-------------------------------------|------------------------------------|------------------------------------|-----------------------------------|--------------------------------|-------------------|
| | Variant 01 PP Jumper (Note 4) | Variant 02 PS Jumper (Note 5) | Variant 03 CBR Type (Note 6) | Variant 04 SMV Type (Note 7) | Variant 05 BS Type (Note 8) | Mating (Max) | Unmating (Min) |
| 09 | 3.8 | 3.8 | 1 | 0.4 | 0.9 | 17.55 | 0.99 |
| 15 | 6.2 | 6.2 | 1.1 | 0.5 | 1.1 | 29.25 | 1.65 |
| 21 | 7.4 | 7.4 | 1.2 | 0.6 | 1.2 | 40.95 | 2.31 |
| 25 | 8.8 | 8.8 | 1.4 | 0.7 | 1.3 | 48.75 | 2.75 |
| 31 | 10.9 | 10.9 | 1.6 | 0.9 | 1.5 | 60.45 | 3.41 |
| 37 | 12.9 | 12.9 | 1.8 | 1.1 | 1.6 | 72.15 | 4.07 |
| 51 | 17.3 | 17.3 | 2.4 | 1.7 | 2 | 99.45 | 5.61 |

NOTES:

1. See Figures 2.1, 2.3, 2.4 and 2.5.
2. For Variants 01 and 02, the specified weight includes the connectors and all their associated contacts and accessories, and wires of type ESCC 390101201B, all 50mm in length (Variant 01 of ESCC 3901/012 weighs 0.98g/m).
The weights specified allow for either jackscrew type (see Figure 2.2 and Para. 4.5.3.1).
The maximum weight of the optional backshell is specified in Para. 4.3.2 herein.
3. For Variants 03, 04 and 05, the weight includes the connector and all its associated contacts and accessories.
4. Variant description: Jumper, PP (2 2-row plugs), fitted with male non-removable crimp contacts.
5. Variant description: Jumper, PS (1 2-row plug and 1 2-row receptacle), fitted with male (in plug) and female (in receptacle) non-removable crimp contacts.
6. Variant description: CBR Type 2-row PCB receptacle, fitted with right-angled contacts.
7. Variant description: SMV Type 2-row PCB receptacle, fitted with vertical surface mount contacts.
8. Variant description: BS Type 2-row PCB receptacle, fitted with board straight contacts.

TABLE 1(b) – MAXIMUM RATINGS

| No. | Characteristics | Symbols | Maximum Ratings | Units | Remarks |
|-----|-----------------------------|-----------|-----------------|-------|--------------|
| 1 | Rated Working Voltage | U_R | 250 | Vrms | Note 1 |
| 2 | Rated Current | I_R | 1 | A | Note 2 |
| 3 | Operating Temperature Range | T_{op} | -55 to +150 | °C | T_{amb} |
| 4 | Storage Temperature Range | T_{stg} | -55 to +150 | °C | - |
| 5 | Mating Torque | T_{qe} | 0.12 | Nm | Note 3 |
| 6 | Soldering Temperature | T_{sol} | +260 | °C | PCB Contacts |

NOTES:

1. At sea level. Requires derating at altitudes above sea level. See Figure 1.
2. Applies to PCB contact tails and wires per ESCC [3901/012](#), Variants 01 and 51.
3. To avoid the risk of damaging the jackscrews, for electrical testing, the mating torque shall be 0.08Nm. The minimum in-service mating torque is 0.1Nm.

FIGURE 1 – PARAMETER DERATING INFORMATION

RATED WORKING VOLTAGE VERSUS ALTITUDE

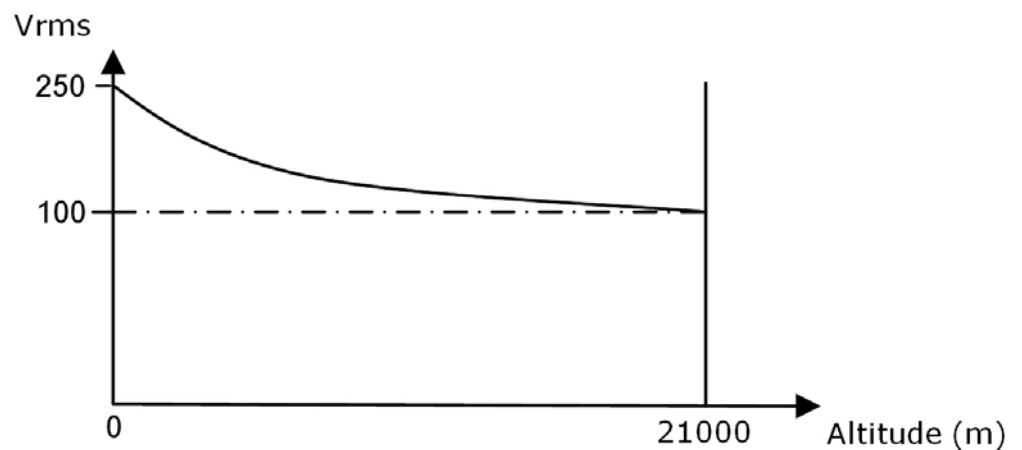
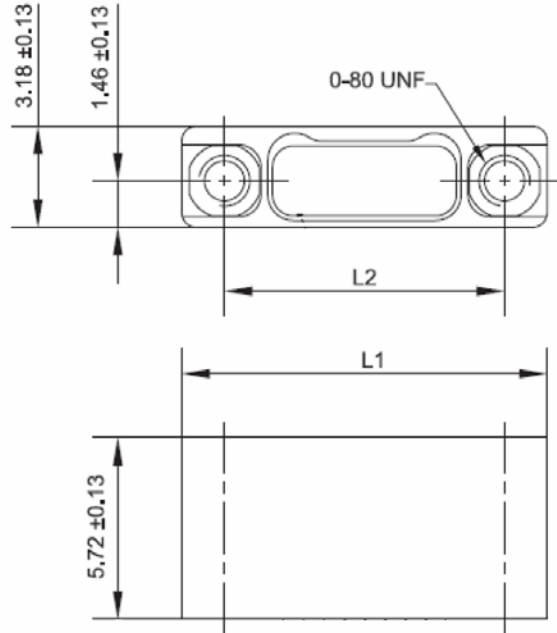


FIGURE 2 – PHYSICAL DIMENSIONS

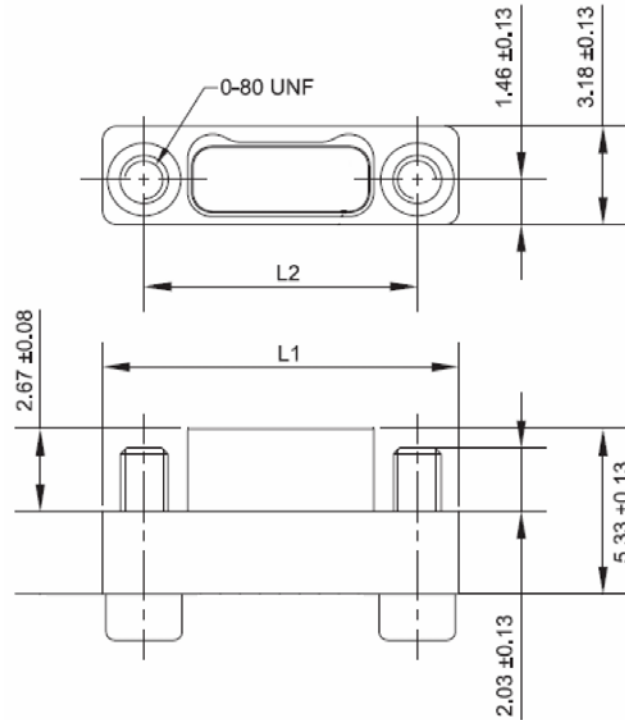
(all dimensions are in millimetres)

FIGURE 2.1(a) – JUMPER CONNECTOR SHELLS – RECEPTACLE



| Shell Size | Dimension L1 | | Dimension L2 | |
|------------|--------------|-------|--------------|-------|
| | Min | Max | Min | Max |
| 09 | 9.4 | 9.66 | 6.73 | 6.99 |
| 15 | 11.3 | 11.56 | 8.63 | 8.89 |
| 21 | 13.21 | 13.47 | 10.54 | 10.8 |
| 25 | 14.48 | 14.74 | 11.81 | 12.07 |
| 31 | 16.38 | 16.64 | 13.71 | 13.97 |
| 37 | 18.29 | 18.55 | 15.62 | 15.88 |
| 51 | 22.73 | 22.99 | 20.06 | 20.32 |

FIGURE 2.1(b) – JUMPER CONNECTOR SHELLS – PLUG (NOTE 1)

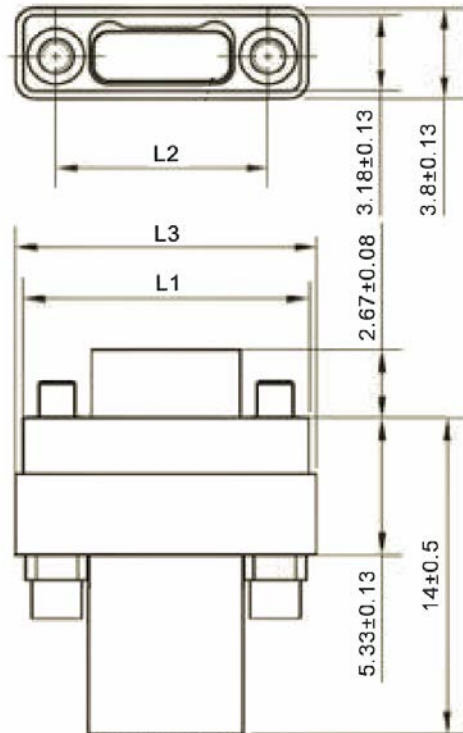


| Shell Size | Dimension L1 | | Dimension L2 | |
|------------|--------------|-------|--------------|-------|
| | Min | Max | Min | Max |
| 09 | 9.4 | 9.66 | 6.73 | 6.99 |
| 15 | 11.3 | 11.56 | 8.63 | 8.89 |
| 21 | 13.21 | 13.47 | 10.54 | 10.8 |
| 25 | 14.48 | 14.74 | 11.81 | 12.07 |
| 31 | 16.38 | 16.64 | 13.71 | 13.97 |
| 37 | 18.29 | 18.55 | 15.62 | 15.88 |
| 51 | 22.73 | 22.99 | 20.06 | 20.32 |

NOTES:

1. Example with non-removable jackscrews is shown. Plugs are also available with retractable jackscrews, see Figure 2.2 and Paras. 4.5.3.1.7 and 4.5.3.1.8 for hardware options.

FIGURE 2.1(c) – JUMPER CONNECTOR SHELLS – PLUG WITH BACKSHELL



| Shell Size | Dimension L1 | | Dimension L2 | | Dimension L3 | |
|------------|--------------|-------|--------------|-------|--------------|-------|
| | Min | Max | Min | Max | Min | Max |
| 09 | 9.4 | 9.66 | 6.73 | 6.99 | 10.03 | 10.29 |
| 15 | 11.3 | 11.56 | 8.63 | 8.89 | 11.93 | 12.19 |
| 21 | 13.21 | 13.47 | 10.54 | 10.8 | 13.84 | 14.1 |
| 25 | 14.48 | 14.74 | 11.81 | 12.07 | 15.11 | 15.37 |
| 31 | 16.38 | 16.64 | 13.71 | 13.97 | 17.01 | 17.27 |
| 37 | 18.29 | 18.55 | 15.62 | 15.88 | 18.92 | 19.18 |
| 51 | 22.73 | 22.99 | 20.06 | 20.32 | 23.36 | 23.62 |

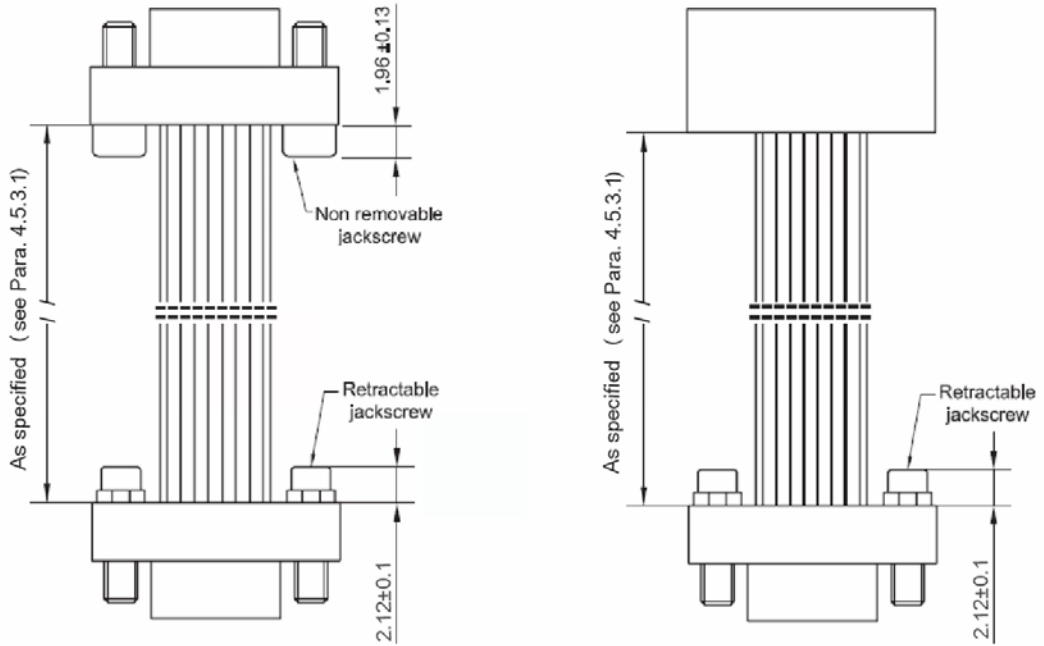
NOTES:

1. See Paras. 4.5.3.1.7 and 4.5.3.1.8 for Backshell options.

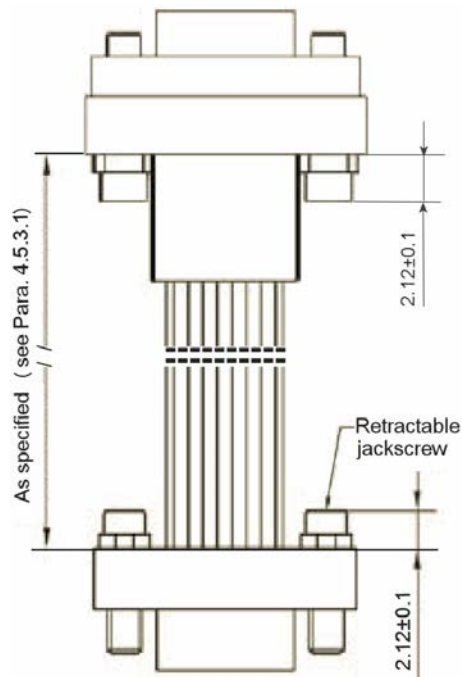
FIGURE 2.2 – JUMPER HARDWARE AND WIRING (VARIANTS 01, 02)

Variant 01: PP Jumper

Variant 02: PS Jumper (Note 1)



Variant 01: PP Jumper with Optional Backshell (Note 1)

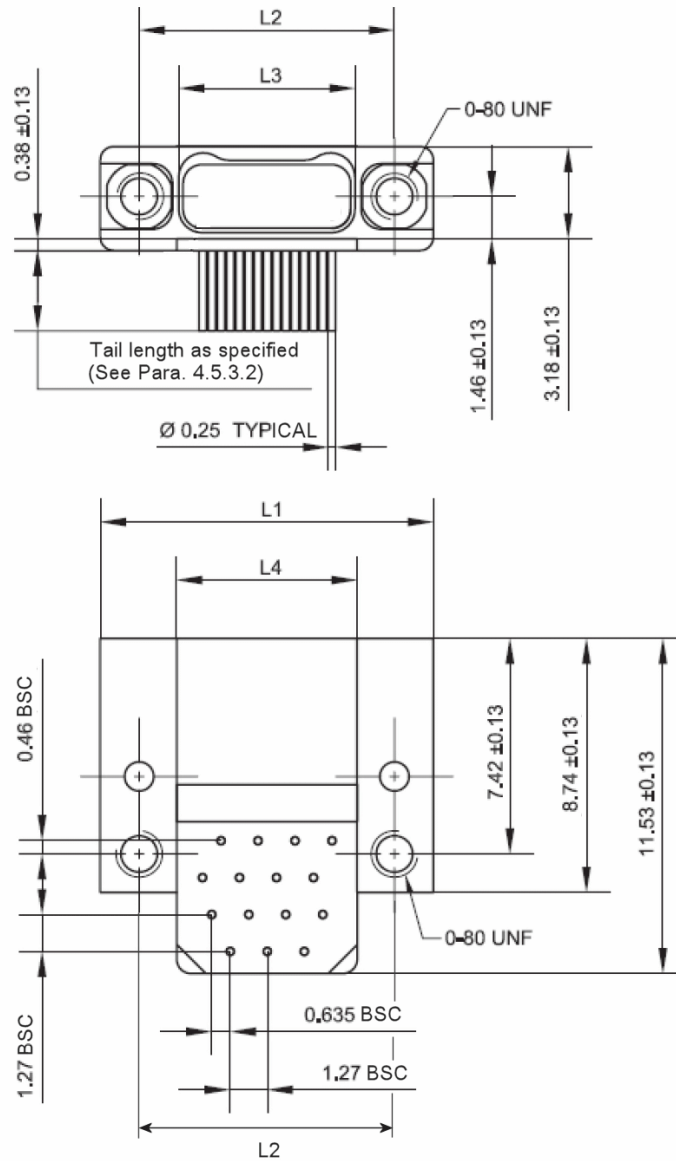


NOTES:

1. Although not shown, Variant 01 may be specified with a backshell fitted to each plug and Variant 02 may be specified with a backshell fitted to the plug. See Paras. 4.5.3.1.7 and 4.5.3.1.8 for Backshell options.

FIGURE 2.3 – CBR TYPE RECEPTACLE (VARIANT 03)

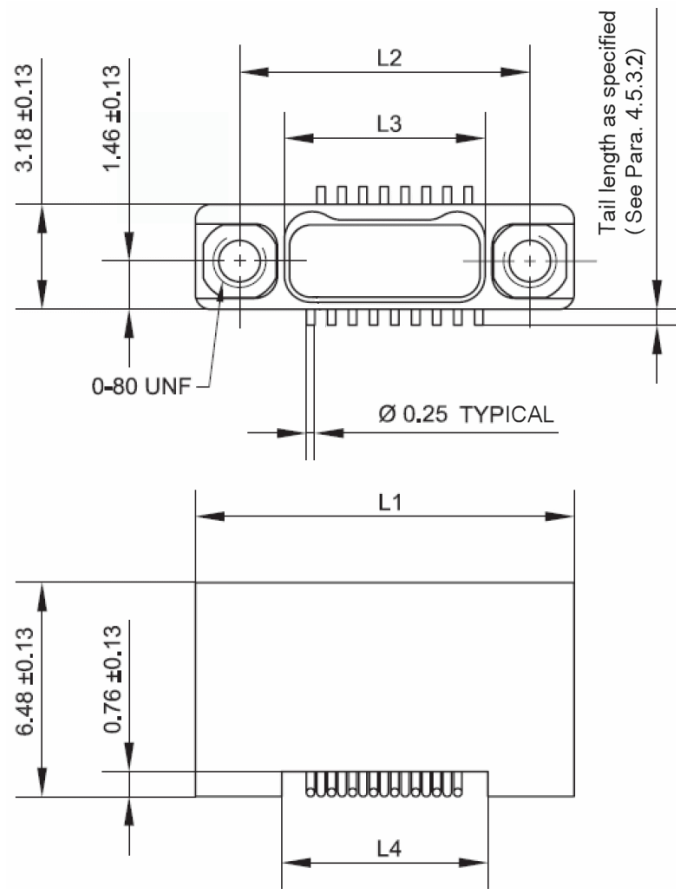
(Shell size 15 is shown for illustrative purposes only)



| Shell Size | Dimensions | | | | | | | |
|------------|------------|-------|-------|-------|-------|-------|-------|-------|
| | L1 | | L2 | | L3 | | L4 | |
| | Min | Max | Min | Max | Min | Max | Min | Max |
| 09 | 9.4 | 9.66 | 6.73 | 6.99 | 4.01 | 4.27 | 4.19 | 4.45 |
| 15 | 11.3 | 11.56 | 8.63 | 8.89 | 5.92 | 6.18 | 6.09 | 6.35 |
| 21 | 13.21 | 13.47 | 10.54 | 10.8 | 7.82 | 8.08 | 8 | 8.26 |
| 25 | 14.48 | 14.74 | 11.81 | 12.07 | 9.09 | 9.35 | 9.27 | 9.53 |
| 31 | 16.38 | 16.64 | 13.71 | 13.97 | 10.99 | 11.25 | 11.17 | 11.43 |
| 37 | 18.29 | 18.55 | 15.62 | 15.88 | 12.9 | 13.16 | 13.08 | 13.34 |
| 51 | 22.73 | 22.99 | 20.06 | 20.32 | 17.35 | 17.61 | 17.52 | 17.78 |

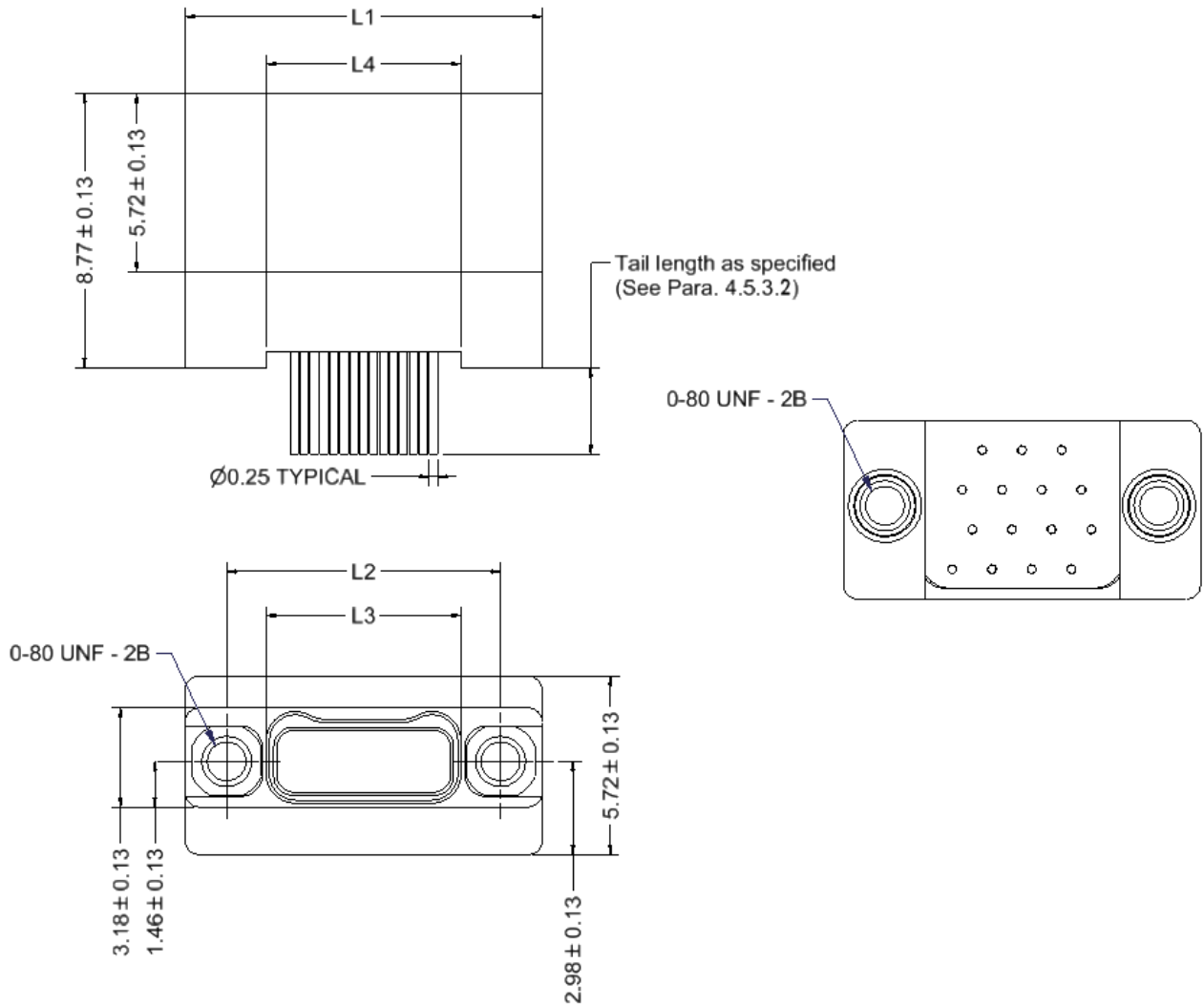
FIGURE 2.4 – SMV TYPE RECEPTACLE (VARIANT 04)

(Shell size 15 is shown for illustrative purposes only)



| Shell Size | Dimensions | | | | | | | |
|------------|------------|-------|-------|-------|-------|-------|-------|-------|
| | L1 | | L2 | | L3 | | L4 | |
| | Min | Max | Min | Max | Min | Max | Min | Max |
| 09 | 9.4 | 9.66 | 6.73 | 6.99 | 4.01 | 4.27 | 4.19 | 4.45 |
| 15 | 11.3 | 11.56 | 8.63 | 8.89 | 5.92 | 6.18 | 6.09 | 6.35 |
| 21 | 13.21 | 13.47 | 10.54 | 10.8 | 7.82 | 8.08 | 8 | 8.26 |
| 25 | 14.48 | 14.74 | 11.81 | 12.07 | 9.09 | 9.35 | 9.27 | 9.53 |
| 31 | 16.38 | 16.64 | 13.71 | 13.97 | 10.99 | 11.25 | 11.17 | 11.43 |
| 37 | 18.29 | 18.55 | 15.62 | 15.88 | 12.9 | 13.16 | 13.08 | 13.34 |
| 51 | 22.73 | 22.99 | 20.06 | 20.32 | 17.35 | 17.61 | 17.52 | 17.78 |

FIGURE 2.5 – BS TYPE RECEPTACLE (VARIANT 05)
 (Shell size 15 is shown for illustrative purposes only)

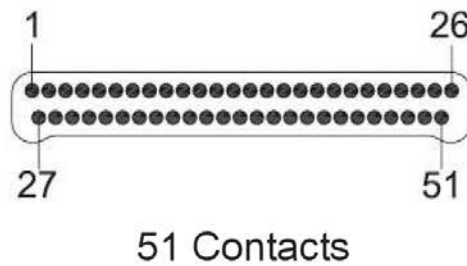
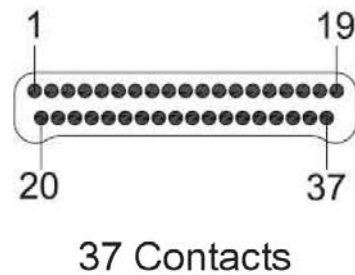
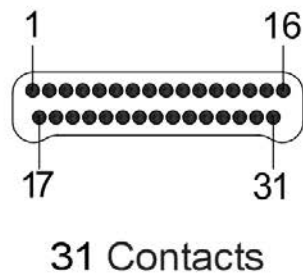
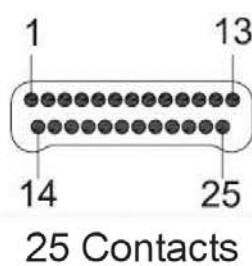
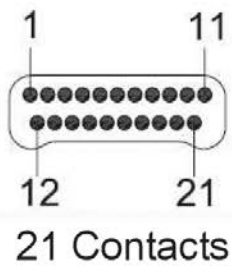
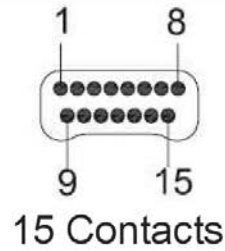
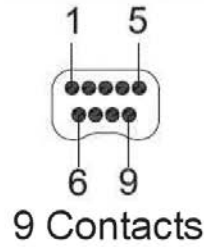


| Shell Size | Dimensions | | | | | | | |
|------------|------------|-------|-------|-------|-------|-------|-------|-------|
| | L1 | | L2 | | L3 | | L4 | |
| | Min | Max | Min | Max | Min | Max | Min | Max |
| 09 | 9.4 | 9.66 | 6.73 | 6.99 | 4.01 | 4.27 | 4.19 | 4.45 |
| 15 | 11.3 | 11.56 | 8.63 | 8.89 | 5.92 | 6.18 | 6.09 | 6.35 |
| 21 | 13.21 | 13.47 | 10.54 | 10.8 | 7.82 | 8.08 | 8 | 8.26 |
| 25 | 14.48 | 14.74 | 11.81 | 12.07 | 9.09 | 9.35 | 9.27 | 9.53 |
| 31 | 16.38 | 16.64 | 13.71 | 13.97 | 10.99 | 11.25 | 11.17 | 11.43 |
| 37 | 18.29 | 18.55 | 15.62 | 15.88 | 12.9 | 13.16 | 13.08 | 13.34 |
| 51 | 22.73 | 22.99 | 20.06 | 20.32 | 17.35 | 17.61 | 17.52 | 17.78 |

FIGURE 3 – CONTACT ARRANGEMENTS AND SPACING

FIGURE 3.1 – MATING FACE OF THE PLUG'S INSERT

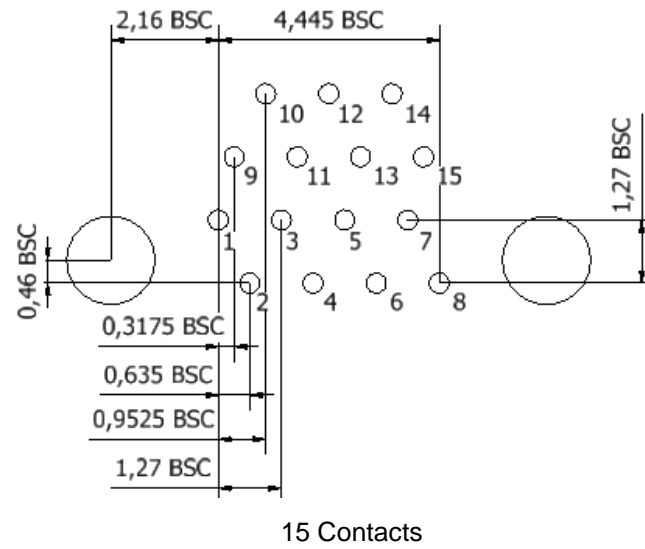
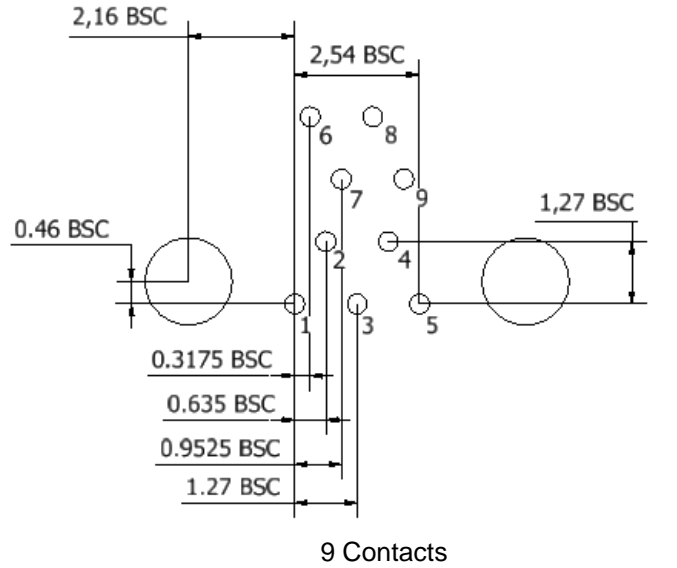
(USE MIRROR VIEW FOR THE MATING FACE OF THE RECEPTACLE'S INSERT)

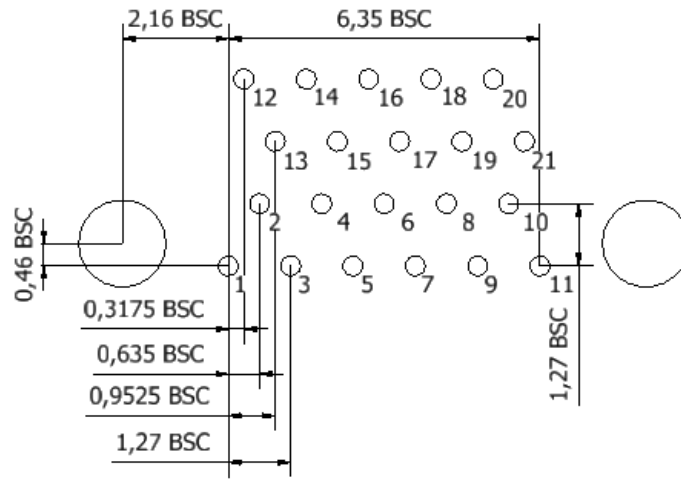


NOTES:

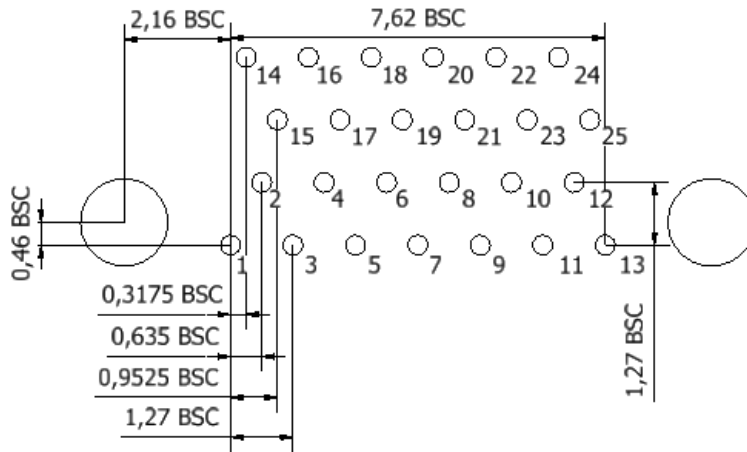
1. Only the outside contact cavities on each row are identified in the drawings; the remaining cavities are sequentially numbered.
2. The spacing between contact centres (adjacent contacts on the same row) is 0.635mm typical.
3. The spacing between the row centrelines is 1.016mm typical.

FIGURE 3.2 – CBR TYPE RECEPTACLE (VARIANT 03)
PCB TAIL ARRANGEMENTS AND SPACING
 (VIEWING THE TOP OF THE RECEPTACLE)
 (all dimensions are in millimetres)

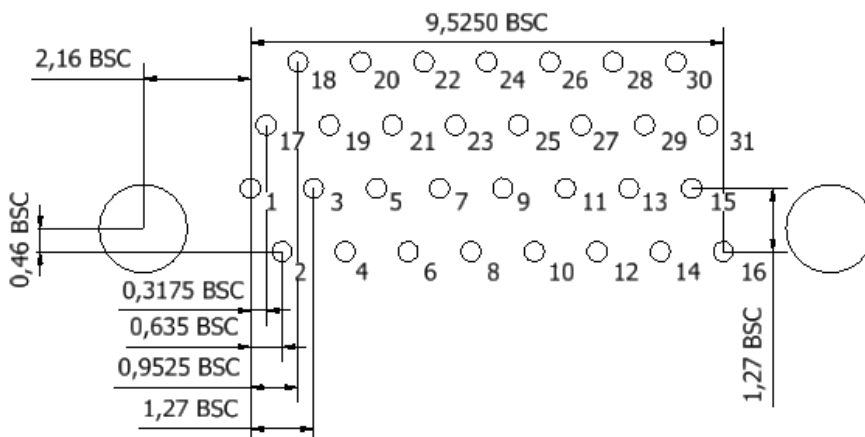




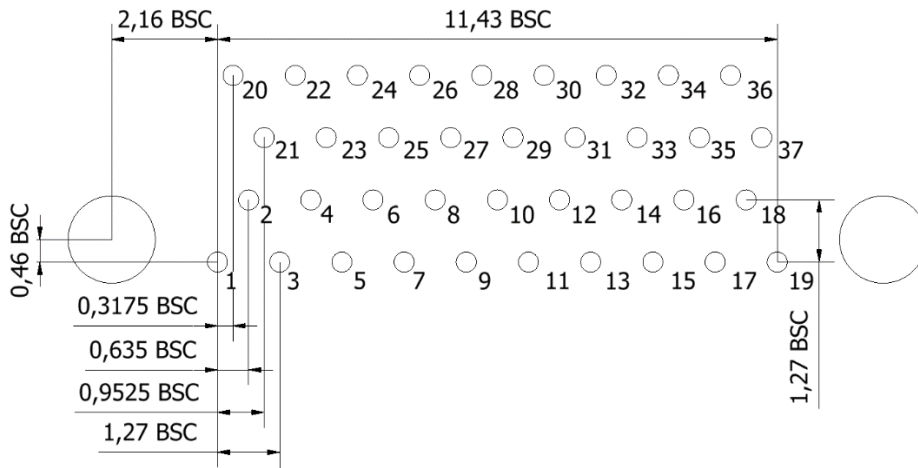
21 Contacts



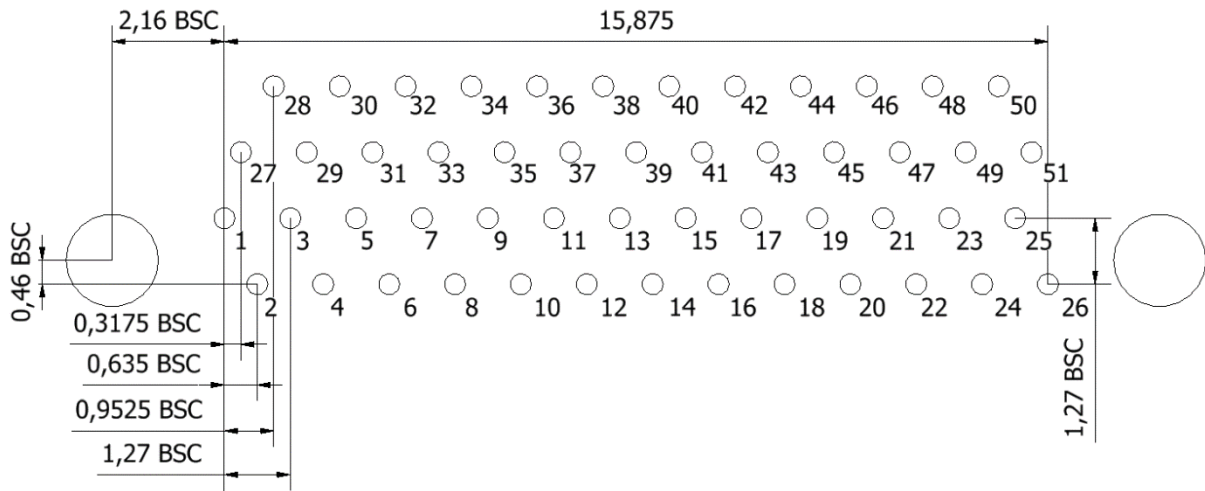
25 Contacts



31 Contacts

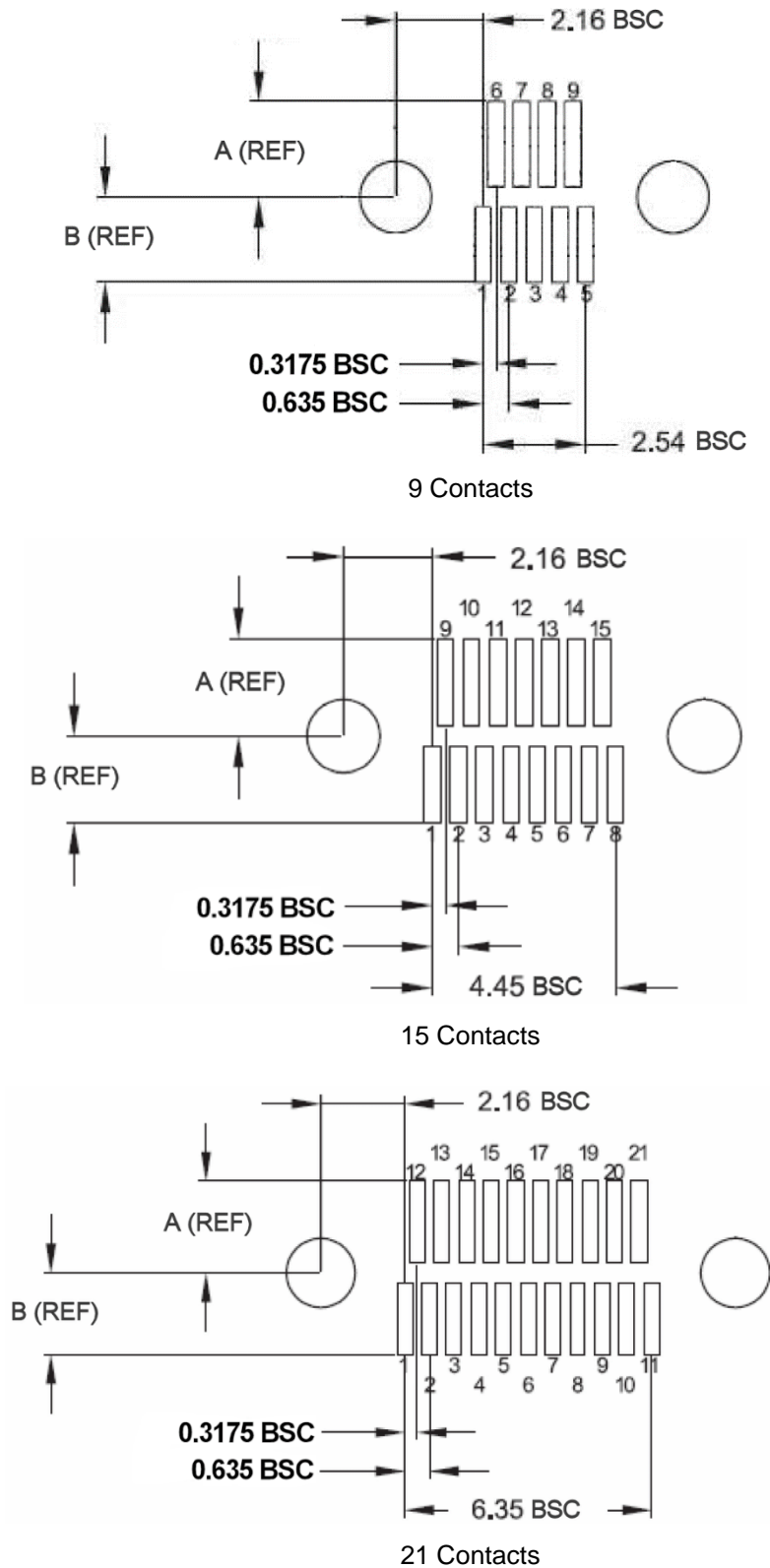


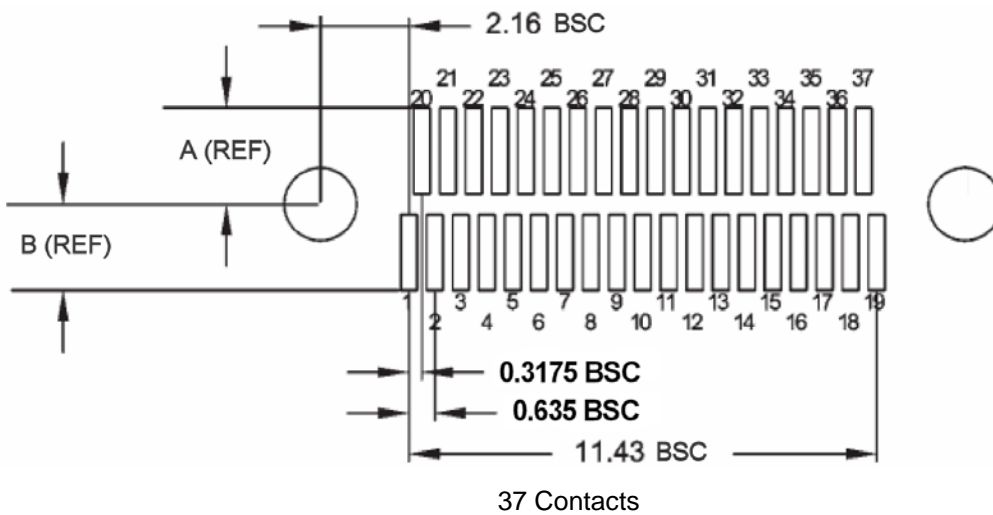
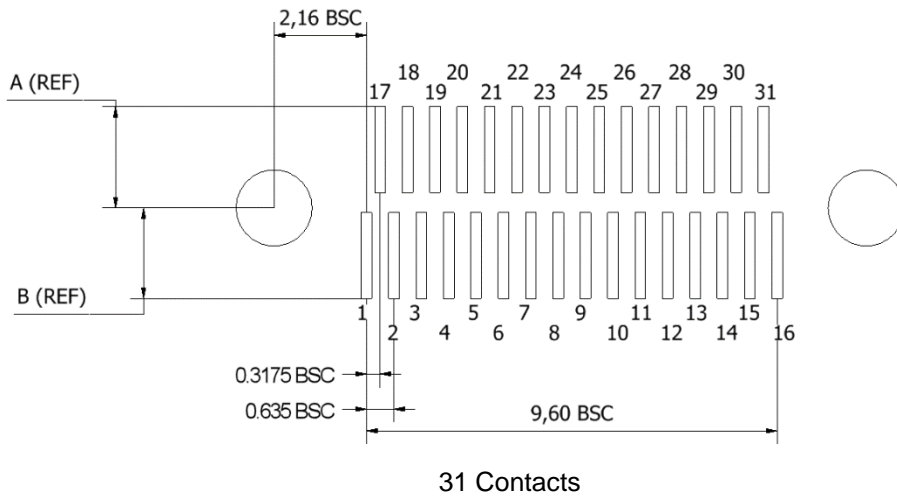
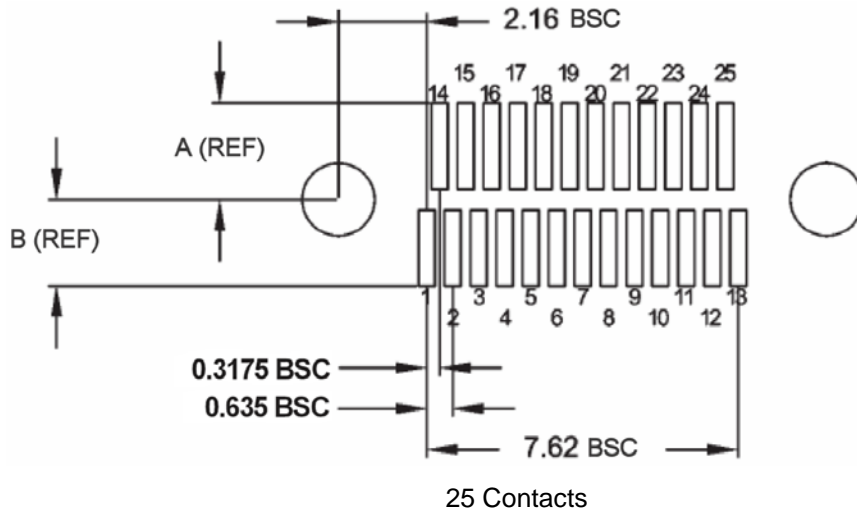
37 Contacts

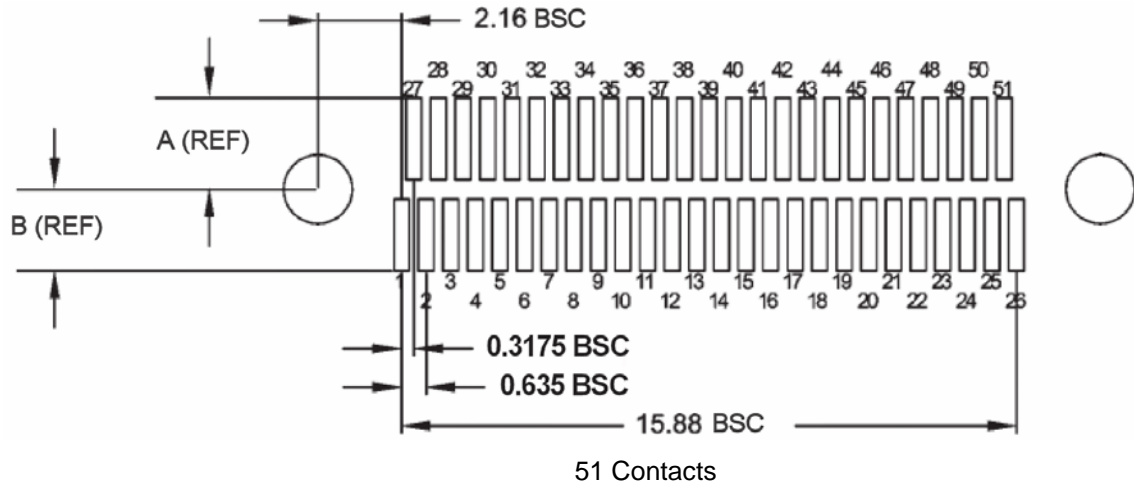


51 Contacts

FIGURE 3.3 – SMV TYPE RECEPTACLE (VARIANT 04)
PCB TAIL ARRANGEMENTS AND SPACING
 (VIEWING THE BOTTOM FACE OF THE RECEPTACLE)
 (all dimensions are in millimetres)

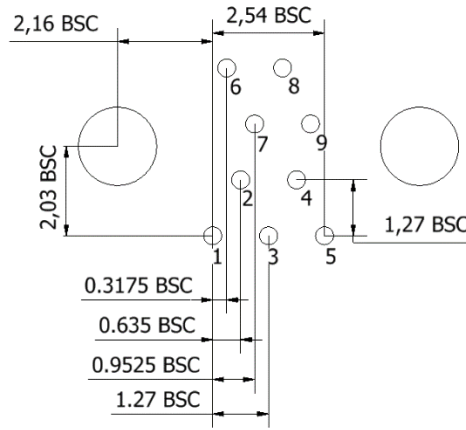




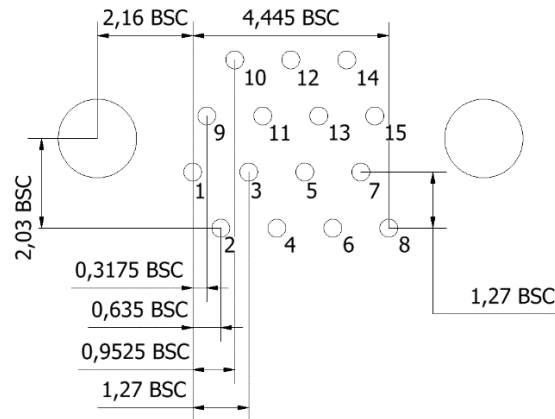


| Symbols | Tail Length 0.51mm Code 5 (see Para. 4.5.3.2.6) | Tail Length 1.02mm Code 6 (see Para. 4.5.3.2.6) |
|---------|---|---|
| A | 2.36 | 2.56 |
| B | 2.11 | 2.31 |

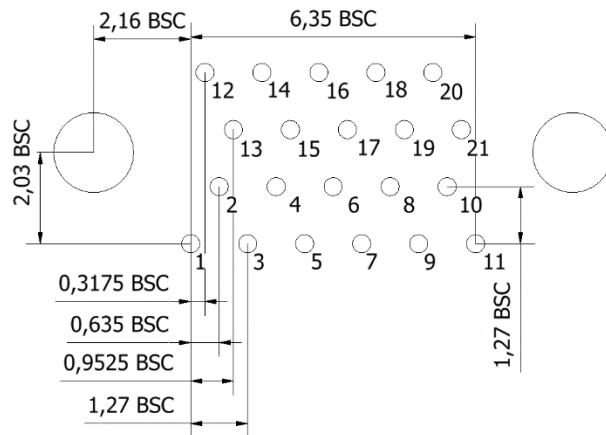
FIGURE 3.4 – BS TYPE RECEPTACLE (VARIANT 05)
PCB TAIL ARRANGEMENTS AND SPACING
 (VIEWING THE BOTTOM FACE OF THE RECEPTACLE)
 (all dimensions are in millimetres)



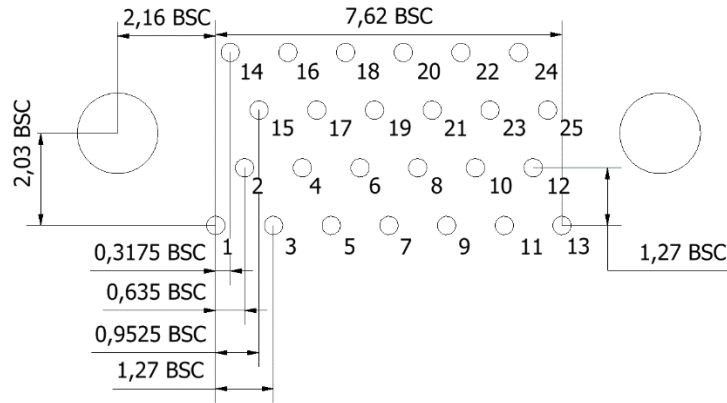
9 Contacts



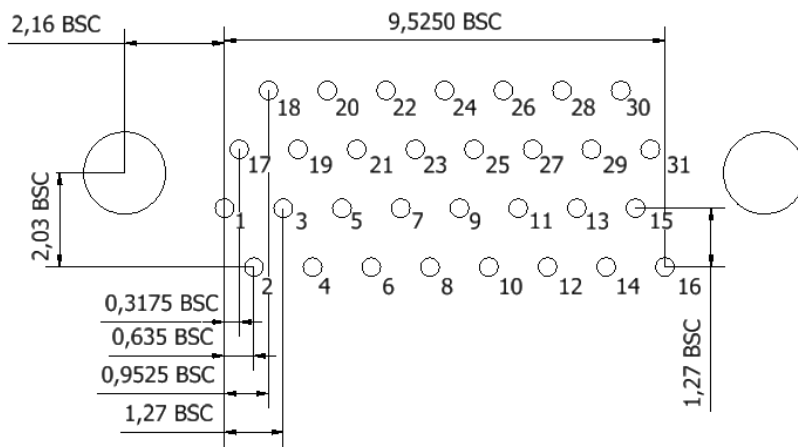
15 Contacts



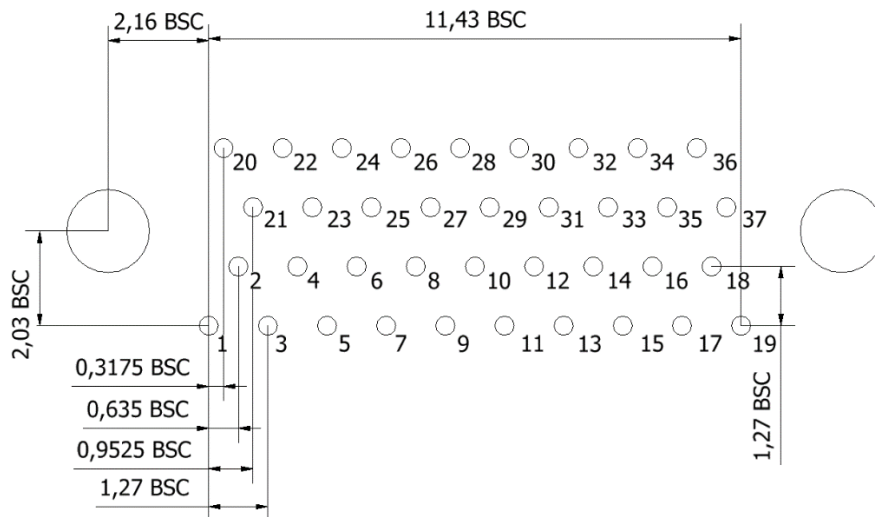
21 Contacts



25 Contacts



31 Contacts



37 Contacts

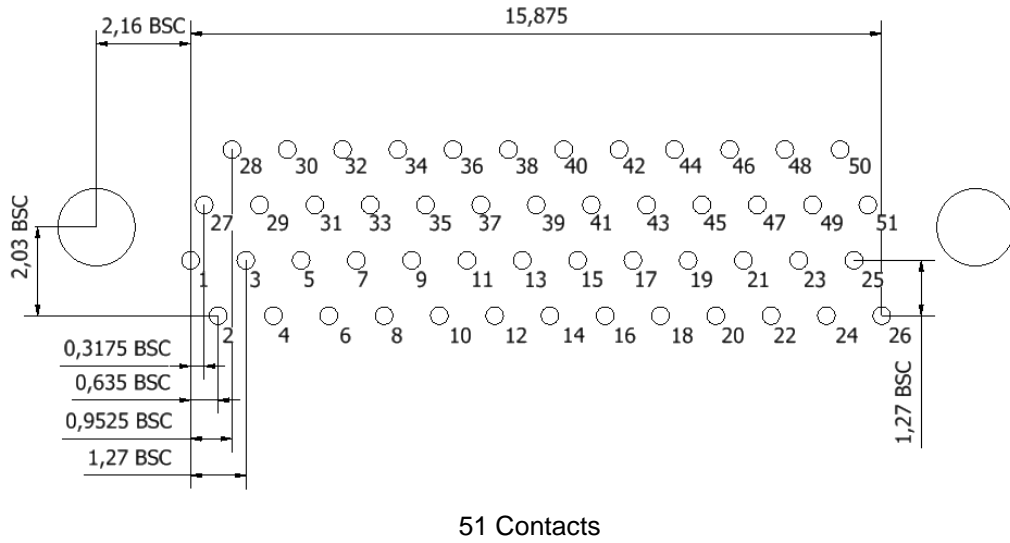


FIGURE 4 – CONTACT POSITIONS

FIGURE 4.1 – MOUNTING CONDITION

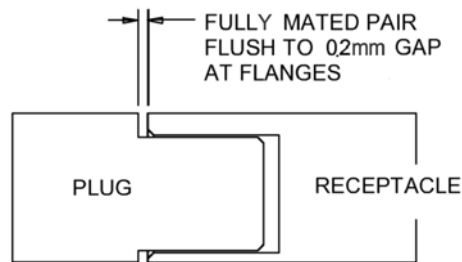


FIGURE 4.2 – PLUG MALE CONTACT

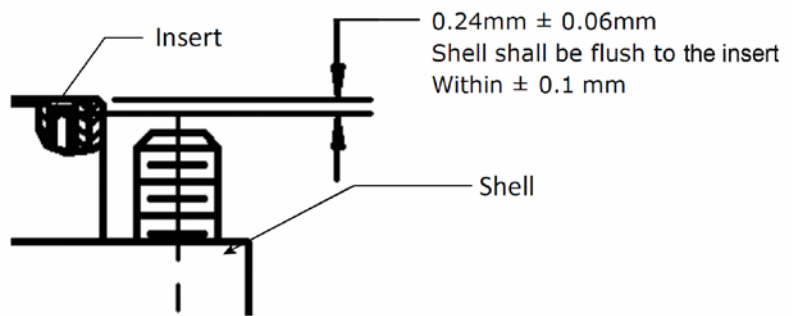
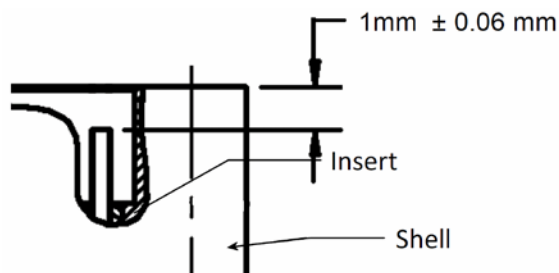


FIGURE 4.3 – RECEPTACLE FEMALE CONTACT



4 REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the components specified herein shall be as stated in this specification and ESCC Generic Specification No. 3401. Deviations from the Generic Specification, applicable to this specification only, are detailed in Para. 4.2.

Deviations from the 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) Para. 5.2.4, Crimping Capability: The test shall be performed on Variants 01 and 02 only in accordance with ECSS-Q-ST-70-26 during assembly. The wire used shall be ESCC 3901/012 Variant 01 and the minimum tensile strength of the wire is 1N.

4.2.2 Deviations from Final Production Tests (Chart II)

- (a) Para. 9.1.1.1, Insulation Resistance: The test voltage shall be 250Vdc.
- (b) Para. 9.1.1.3, Contact Resistance:
- For Variants 03, 04 and 05, the resistance is measured per MIL-DTL-32139 Para. 4.7.9. 152.4 ±3mm of ESCC 3901/012 Variant 01 wire is used.
 - For Variants 01 and 02, the resistance must be deduced from the length of cable as per ESCC 3401 Para. 9.1.1.3, Figure I(a).
- (c) Para. 9.4, Contact Capability: Only applicable to male contacts.
- (d) Para. 9.9, Seal Test: Not applicable.
- (e) Para. 9.8, Installation of Contacts into Insert: Not applicable.
- (f) Para. 9.5, Magnetism Level: Not applicable.
- (g) Additional Radiographic Inspection: Jumpers shall be subjected to the radiographic inspection of each connector (100% test).

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. 9.1.1.1, Insulation Resistance: The test voltage shall be 250Vdc.
- (b) Para. 9.1.1.3, Contact Resistance:
- For Variants 03, 04 and 05, the resistance is measured per MIL-DTL-32139 Para. 4.7.9. 152.4 ±3mm of ESCC 3901/012 Variant 01 wire is used.
 - For Variants 01 and 02, the resistance must be deduced from the length of cable as per ESCC 3401 Para. 9.1.1.3, Figure I(a).
- (c) Para. 9.9, Seal Test: Not applicable.
- (d) Para. 9.14, Plating Thickness: Only applicable to female contacts.
- (e) Para. 9.17, Contact Retention (in Insert): Only applicable to female contacts.
- (f) Para. 9.18, Endurance: The number of cycles shall be 200.
- (g) Para. 9.27, Maintenance Aging: Not applicable.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

- (a) Para. 9.1.1.1, Insulation Resistance: The test voltage shall be 250Vdc.
- (b) Para. 9.1.1.3, Contact Resistance:
 - For Variants 03, 04 and 05, the resistance is measured per MIL-DTL-32139 Para. 4.7.9. 152.4 ±3mm of ESCC 3901/012 Variant 01 wire is used.
 - For Variants 01 and 02, the resistance must be deduced from the length of cable as per ESCC 3401 Para. 9.1.1.3, Figure I(a).
- (c) Para. 9.9, Seal Test: Not applicable.
- (d) Para. 9.17, Contact Retention (in Insert): Only applicable to female contacts.
- (e) Para. 9.18, Endurance: The number of cycles shall be 50.
- (f) Para. 9.27, Maintenance Aging: 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 Figures 2 and 3 of this specification.

4.3.2 Weight

The maximum weights of the connectors and their associated contacts and accessories specified herein are specified in Table 1(a).

The maximum weight of each optional backshell is as follows:

| Shell Size | Maximum weight of one backshell (g) Note 1 |
|------------|---|
| 09 | 0.4 |
| 15 | 0.5 |
| 21 | 0.55 |
| 25 | 0.6 |
| 31 | 0.65 |
| 37 | 0.7 |
| 51 | 0.85 |

NOTES:

1. For Variant 01 (PP Jumper), the weight of two backshells may need to be taken into account. See Paras. 4.5.3.1.7 and 4.5.3.1.8.

4.3.3 Contact Capability (Applicable to Male Contacts Only)

For the purpose of this test, the pick-up and drop weights shall be as follows:

| Measurements | Pick-Up Weight | Drop Weight |
|---------------------------|----------------|---------------|
| Weight (g) | 10 | 80 |
| Inner Gauge Diameter (mm) | 0.337 – 0.342 | 0.322 – 0.327 |
| Insertion Depth (mm) | ≥ 1.15 | ≥ 1.15 |

4.3.4 Contact Retention (in Insert)

Contact retention within the insert shall be 2.2N minimum. There shall be no displacement of the contact.

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)

The connector inserts shall withstand a pressure of 34.4N/cm² applied from the mating side to the rear side.

4.3.7 Jackscrew Retention

Jumpers supplied with non-removable jackscrews (see Paras. 4.5.3.1.7 and 4.5.3.1.8.) shall be subjected to a jackscrew retention test. The conditions are as follows:

- Test load: ≤ 40N.
- Rate of increase of load: 1N/s.
- Period of application of test load: 10s.

4.3.8 Contact Insertion and Withdrawal Forces

Not applicable.

4.3.9 Engagement and Separation Forces

The engagement and separation forces of the male twist-pin contacts are measured as follows:

- The contacts are engaged and separated 3 times with a minimum diameter (0.317 ±0.005mm) test sleeve.
- The engagement forces shall be recorded during the third cycle.
- The separation forces shall then be recorded using a maximum diameter (0.332 ±0.005mm) test sleeve.

Engagement force: 1.39N maximum.

Separation force: 0.11N minimum.

4.3.10 Oversize Pin Exclusion

Not applicable.

4.3.11 Probe Damage

Not applicable.

4.3.12 Solderability

Not applicable to Variants 01 and 02.

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, Backshells

Shells and backshells shall be made of aluminium alloy. The plating shall be 15µm minimum of electroless nickel.

4.4.2 Inserts

Inserts shall be made of glass-fibre-filled liquid crystal polymer in accordance with MIL-M-24519.

4.4.3 Accessories

Accessories (Jackscrews, Jackposts, Retainers) shall be made of passivated stainless steel, type 303.

4.4.4 Contacts

4.4.4.1 *Female Contacts (Applicable to Variant 02 Only)*

The contacts shall be made of either 18K gold alloy in accordance with ASTM-B541 or beryllium copper in accordance with ASTM-B194. The plating shall be gold, electrodeposited, in accordance with ASTM-B488, Type II, Class 1 (1.27µm minimum), Code C, over nickel underplate in accordance with SAE-AMS-QQ-N-290 Class 2 (1.27µm to 3.81µm).

4.4.4.2 *Female Contacts (Applicable to Variants 03, 04 and 05)*

The contacts shall be made of beryllium copper or leaded brass alloy CuZn9Pb2. The female contact end shall be plated with a minimum of 1.27µm gold in accordance with ASTM-B488 Type II, Code C, with nickel underplating in accordance with SAE-AMS-QQ-N-290, Rev. A, Class 1 (1.27µm minimum). The uninsulated solid wire PCB tail shall be plated with either tin-lead alloy 63/37 (1µm minimum) (code T) or gold (1.27µm minimum) (code G) as required; see Para. 4.5.3.2.5.

4.4.4.3 *Male Contacts (Applicable to Variants 01 and 02)*

Male contacts shall be twist-pin contacts. The contact bundle shall consist of strands of gold alloy in accordance with ASTM-B541. The contact body shall be made of gold.

4.4.5 Insulated Wire (Applicable to Variants 01 and 02)

The materials and finishes of the insulated wire used (single wire: ESCC [3901/012](#), Variant 01, and shielded twisted pair: ESCC [3901/012](#), Variant 51) shall be in accordance with the requirements specified in Para. 4.4 of ESCC Detail Specification No. [3901/012](#).

4.4.6 Rear Potting

The rear potting shall be made of epoxy resin.

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.

The primary packaging of each component shall be marked in respect of:

- (a) The ESCC qualified components symbol (for ESCC qualified components only).
- (b) The ESCC Component Number (including characteristics).
- (c) Traceability Information.

4.5.2 The ESCC Component Number

The ESCC Component Number shall be constituted and marked as follows:

Example: 340108601B25PPIW1950LL

- Detail Specification Number: 3401086
- Type Variant Number (see Table 1(a)): 01 (as required)
- Testing Level: B
- Characteristics (see Para. 4.5.3): 25PPIW1950LL (as required and applicable)

4.5.3 Characteristics

4.5.3.1 *Characteristics Applicable to Variants 01 and 02 (Jumpers)*

The information shall be constituted and marked as follows

Example: 25 PP I W1 9 50 L L

- Shell Size (as applicable): 25
- Jumper Type: PP
- Wiring Method: I
- Wire Type: W1
- Wire Colour: 9
- Length of Wire (in cm): 50
- Hardware for 1st Connector: L
- Hardware for 2nd Connector: L

4.5.3.1.1 Shell Size

The shell size signifies the number of contacts. Shell sizes 09, 15, 21, 25, 31, 37 and 51 are available.

4.5.3.1.2 Jumper Type

PP is mandatory marking for Variant 01 and PS is mandatory marking for Variant 02.

4.5.3.1.3 Wiring Method

Two wiring methods are available; they are codified and indicated as follows:

| Code Letter | Wiring Method |
|-------------|-----------------|
| I | Indirect Wiring |
| D | Direct Wiring |

Note that indirectly-wired PP Jumpers and directly-wired PS Jumpers have straight, “flat”, wiring and therefore have no cross-overs.

The table below details the wiring configurations for indirectly-wired PP Jumpers:

| Shell Size | Connector | Pin Numbers | | | | | | | | | | | | | | | |
|------------|---------------------------|-------------|----|----|-----|-----|----|----|----|----|----|----|-----|-----|----|----|----|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | | | | | | | |
| 9 | 1 st Connector | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | | | | | | | |
| | 2 nd Connector | 5 | 4 | 3 | 2 | 1 | 9 | 8 | 7 | 6 | | | | | | | |
| 15 | 1 st Connector | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | |
| | 2 nd Connector | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | |
| 21 | 1 st Connector | 1 | 2 | 3 | ... | ... | 9 | 10 | 11 | 12 | 13 | 14 | ... | ... | 19 | 20 | 21 |
| | 2 nd Connector | 11 | 10 | 9 | ... | ... | 3 | 2 | 1 | 21 | 20 | 19 | ... | ... | 14 | 13 | 12 |
| 25 | 1 st Connector | 1 | 2 | 3 | ... | ... | 11 | 12 | 13 | 14 | 15 | 16 | ... | ... | 23 | 24 | 25 |
| | 2 nd Connector | 13 | 12 | 11 | ... | ... | 3 | 2 | 1 | 25 | 24 | 23 | ... | ... | 16 | 15 | 14 |
| 31 | 1 st Connector | 1 | 2 | 3 | ... | ... | 14 | 15 | 16 | 17 | 18 | 19 | ... | ... | 29 | 30 | 31 |
| | 2 nd Connector | 16 | 15 | 14 | ... | ... | 3 | 2 | 1 | 31 | 30 | 29 | ... | ... | 19 | 18 | 17 |
| 37 | 1 st Connector | 1 | 2 | 3 | ... | ... | 17 | 18 | 19 | 20 | 21 | 22 | ... | ... | 35 | 36 | 37 |
| | 2 nd Connector | 19 | 18 | 17 | ... | ... | 3 | 2 | 1 | 37 | 36 | 35 | ... | ... | 22 | 21 | 20 |
| 51 | 1 st Connector | 1 | 2 | 3 | ... | ... | 24 | 25 | 26 | 27 | 28 | 29 | ... | ... | 49 | 50 | 51 |
| | 2 nd Connector | 26 | 25 | 24 | ... | ... | 3 | 2 | 1 | 51 | 50 | 49 | ... | ... | 29 | 28 | 27 |

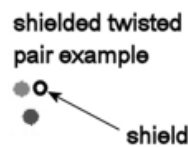
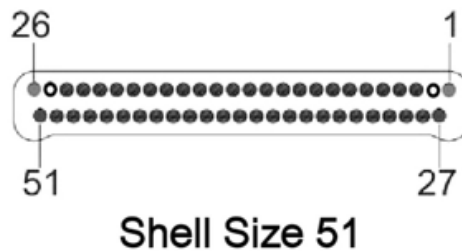
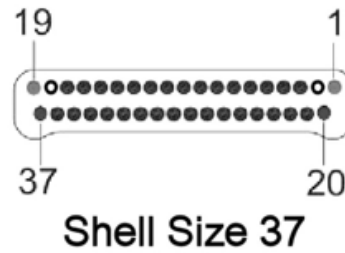
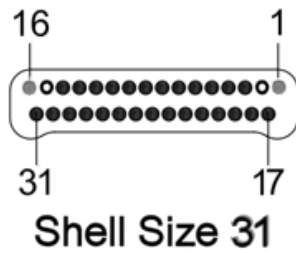
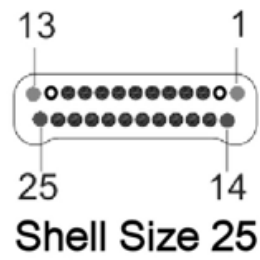
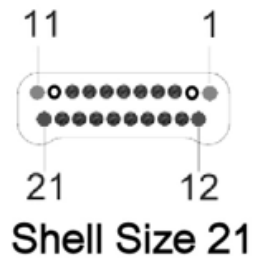
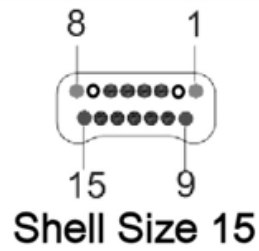
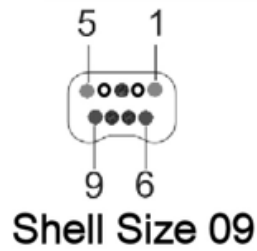
4.5.3.1.4 Wire Type

Two wire types are available; they are codified and indicated as follows:

| Code | Description of Wire Type |
|------|---|
| W1 | Single wire per ESCC 3901/012, Variant 01 |
| W2 | Two shielded twisted pairs per ESCC 3901/012, Variant 51, with the remaining wiring being single wire per ESCC 3901/012, Variant 01 |

Jumper Wiring For Wire Type Code W2

(shown viewing the mating face of the receptacle)



4.5.3.1.5 Wire Colour

All wires on each Jumper shall be supplied in one of four colours, specified by means of the following codes:

| Code | Colour |
|------|--------|
| 9 | White |
| 0 | Black |
| 1 | Brown |
| 2 | Red |

4.5.3.1.6 Length of Wire

A wire length must be specified, in centimetres, and must be 5cm or longer. The tolerance on the length (L) is as follows:

- $5 \leq L \leq 10$: -0 / +0.5cm
- $10 < L \leq 100$: -0 / +3cm
- $L > 100$: -0 / +5cm

4.5.3.1.7 Hardware for 1st Connector

The hardware to be supplied with the 1st connector of the Jumper (plug) shall be specified by means of the following codes:

| Code Letter | Description of Hardware |
|-------------|---|
| L | Non-removable jackscrews, #0-80 UNF, with hex socket head |
| R | Retractable jackscrews, #0-80 UNF, with hex socket head |
| V | Retractable jackscrews, #0-80 UNF, with hex socket head plus a backshell (for pre-tensioning) |

4.5.3.1.8 Hardware for 2nd Connector

The hardware to be supplied with the 2nd connector of the Jumper shall be specified by means of the following codes:

| Code Letter | Connector Gender | Description of Hardware |
|-------------|------------------|---|
| L | Plug | Non-removable jackscrews, #0-80 UNF, with hex socket head |
| R | Plug | Retractable jackscrews, #0-80 UNF, with hex socket head |
| V | Plug | Retractable jackscrews, #0-80 UNF, with hex socket head plus a backshell (for pre-tensioning) |
| P | Receptacle | Threaded inserts (non-removable jackposts), #0-80 UNF |

4.5.3.2 *Characteristics Applicable to Variants 03, 04 and 05 (Receptacles)*

The information shall be constituted and marked as follows:

Example: 25 S SMV P T 1

- Shell Size (as applicable): 25
- Code for Receptacle: S
- Receptacle Type: SMV
- Hardware: P
- Tail Plating: T
- Tail Length (protrusion): 1

4.5.3.2.1 Shell Size

The shell size signifies the number of contacts. Shell sizes 09, 15, 21, 25, 31, 37 and 51 are available.

4.5.3.2.2 Code for Receptacle

The code letter S indicates that the connector is a receptacle.

4.5.3.2.3 Receptacle Type

The receptacle type is either CBR (see Table 1(a), Variant 03), SMV (see Table 1(a), Variant 04) or BS (see Table 1(a), Variant 05).

4.5.3.2.4 Hardware

The code letter P signifies the receptacle has threaded inserts (non-removable jackposts) #0-80 UNF.

Note that the receptacle is also supplied with #0-80 UNF screws, 6.35 ±0.1mm long, for PCB mounting.

4.5.3.2.5 Tail Plating

Two PCB tail plating options are available; they are codified and indicated as follows:

| Code Letter | Plating (Para. 4.4.4.2 refers) |
|-------------|--------------------------------|
| T | Tin-Lead Alloy |
| G | Gold |

4.5.3.2.6 Tail Length (protrusion)

Various PCB tail lengths are available depending on receptacle type; they are codified and indicated as follows (see Figures 2.3, 2.4, 2.5):

| Variant (Receptacle Type) | Code | Tail Length (protrusion) (mm) |
|---------------------------|------|-------------------------------|
| 03 (CBR), 05 (BS) | 1 | 2.77 ±0.38 |
| 03 (CBR), 05 (BS) | 2 | 3.56 ±0.38 |
| 03 (CBR), 05 (BS) | 3 | 4.37 ±0.38 |
| 03 (CBR), 05 (BS) | 4 | 2.29 ±0.38 |
| 04 (SMV) | 5 | 0.51mm ±0.38 each side |
| 04 (SMV) | 6 | 1.02mm ±0.38 each side |

4.5.4 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 at room temperature are scheduled in Table 2. Unless otherwise specified, measurements shall be performed at $T_{amb} = +22 \pm 3^{\circ}\text{C}$. The mating torque for the jackscrews (where fitted) is given in Table 1(b).

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

Not applicable.

4.6.3 Circuits for Electrical Measurements (Figure 4)

Not applicable.

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

Not applicable.

TABLE 2 – ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE

| No. | Characteristics | Symbols | Test Method and Conditions | Limits | | Units |
|-----|---|----------|---|--------|-----|-----------|
| | | | | Min | Max | |
| 1 | Insulation Resistance | R_i | ESCC 3401, Para. 9.1.1.1 and Para. 4.2 of this spec. | 1000 | - | $M\Omega$ |
| 2 | Voltage Proof Leakage Current | I_L | ESCC 3401, Para. 9.1.1.2 400Vrms | - | 5 | mA |
| 3 | Mated Shell Conductivity (Voltage Drop) | V_D | ESCC 3401, Para. 9.1.1.4 | - | 10 | $m\Omega$ |
| 4 | Contact Resistance (Low Level Current) | R_{cl} | ESCC 3401, Para. 9.1.1.3 and Para. 4.2 of this spec. | - | 71 | $m\Omega$ |
| 5 | Contact Resistance (Rated Current) | R_{cr} | ESCC 3401, Para. 9.1.1.3 and Para. 4.2 of this spec. (Note 1) | - | 71 | $m\Omega$ |

NOTES:

1. The test current shall be the rated current specified in Table 1(b).

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 are scheduled in Table 6. Unless otherwise specified, the measurements shall be performed at $T_{amb} = +22 \pm 3^{\circ}\text{C}$.

- 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 are scheduled in Table 6. Unless otherwise specified, the measurements shall be performed at $T_{amb} = +22 \pm 3^{\circ}\text{C}$.
- 4.8.4 Conditions for Operating Life (Part of Endurance Testing) (Table 5)
Not applicable.
- 4.8.5 Electrical Circuit for Operating Life Test (Figure 5)
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 6 – MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL AND ENDURANCE TESTS

| 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 | Visual Examination | ESCC No. 20500 | - | - | - | |
| | | | Contact Resistance (Low Level Current) | Table 2, Item 4 | R_{cl} | Table 2, Item 4 | mΩ | |
| | | | Contact Resistance (Rated Current) | Table 2, Item 5 | R_{cr} | Table 2, Item 5 | 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 | |
| 03 | Vibration | Para. 9.11 | Initial Measurements | ESCC 3401 Para. 9.11 | T _{qe} | Record Values | | Nm |
| | | | Coupling screw(s) Unlocking Torque | | | | | |
| | | | During Test | | - | - | - | |
| | | | Monitoring | | | | | |
| | | | Final Measurements | | $\Delta T_{qe}/T_{qe}$ | -30 | +30 | % |
| Full Engagement Coupling screw(s) Unlocking Torque Drift | | | | | | | | |
| | | | Visual Examination | ESCC No. 20500 | - | - | - | |

| 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 | |
| 04 | Shock | Para. 9.12 | Initial Measurements Coupling screw(s) Unlocking Torque During Test Monitoring Final Measurements Full Engagement Coupling screw(s) Unlocking Torque Drift Visual Examination | Para. 9.11 of ESCC 3401 ESCC No. 20500 | Tqe - ΔTqe/Tqe - | Record Values - - -30 +30 - - | Nm - % - | |
| 05 | Climatic Sequence | Para. 9.13 | Initial Measurements Visual Examination Voltage Proof Leakage Current Insulation Resistance Dry Heat Insulation Resistance Low Air Pressure Voltage Proof Leakage Current Damp Heat Insulation Resistance Final Measurements Visual Examination Voltage Proof Leakage Current Insulation Resistance | ESCC No. 20500 Table 2, Item 2 Table 2, Item 1 Table 2, Item 1 Table 2, Item 2, except test voltage = 100Vrms Table 2, Item 1 ESCC No. 20500 Table 2, Item 2 Table 2, Item 1 | - I _L R _i R _i I _L R _i - I _L R _i | - - Table 2, Item 2 Table 2, Item 1 10 - Table 2, Item 2 100 - - - Table 2, Item 2 Table 2, Item 1 | - mA MΩ MΩ mA MΩ - mA MΩ | |
| 06 | Plating Thickness | Para. 9.14 & Para. 4.2 of this Spec. | Thickness | - | - | Para. 4.4.4 of this Spec. | μm | |
| 07 | Joint Strength | Para. 9.15 | Tensile Strength of Crimped Joints | Para. 9.15.3 of ESCC 3401 | - | 6 - | N | |
| 08 | Rapid Change of Temperature | Para. 9.16 | During Test Monitoring Final Measurements Visual Examination Insulation Resistance Voltage Proof Leakage Current | No discontinuities - 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. 4.2 of this Spec. | Contact Displacement | - | - | Para. 4.3.4 of this Spec. | N | |

| 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 & Para. 4.2 of this Spec. | Initial Measurements Visual Examination Contact Resistance (Low Level Current) Mating and Unmating Forces Final Measurements Mating and Unmating Forces Contact Resistance Drift (Low Level Current) Contact Resistance (Rated Current) Insulation Resistance Voltage Proof Leakage Current | ESCC No. 20500 Table 2, Item 4 Para. 9.20 of ESCC 3401 Para. 9.20 of ESCC 3401 Table 2, Item 4 Table 2, Item 5 Table 2, Item 1 Table 2, Item 2 | - R_{cl} F ΔR_{cl} R_{cr} R_i I_L | - - Table 2, Item 4 Para. 4.3.5 of this Spec. Para. 4.3.5 of this Spec. -5 +5 Table 2, Item 5 Table 2, Item 1 Table 2, Item 2 | - $m\Omega$ N N $m\Omega$ $m\Omega$ $M\Omega$ mA | |
| 11 | Permanence of Marking | Para. 9.19 | Marking Permanence | Para. 9.19 of ESCC 3401 | - | - | - | |
| 12 | Mating and Unmating Forces | Para. 9.20 | Mating and Unmating Forces | Para. 9.20 of ESCC 3401 | F | Para. 4.3.5 of this Spec. | N | |
| 13 | High Temperature Storage | Para. 9.21 | Initial Measurements Visual Examination Contact Resistance (Low Level Current) Mated Shell Conductivity Final Measurements Visual Examination Mating and Unmating Forces Contact Resistance Drift (Low Level Current) Contact Resistance (Rated Current) Voltage Proof Leakage Current Insulation Resistance Contact Retention (in Insert) | ESCC No. 20500 Table 2, Item 4 Table 2, Item 3 ESCC No. 20500 Para. 9.20 of ESCC 3401 Table 2, Item 4 Table 2, Item 5 Table 2, Item 2 Table 2, Item 1 Para. 9.17 of ESCC 3401 and Para. 4.2 of this Spec. | - R_{cl} V_D - F ΔR_{cl} R_{cr} I_L R_i - | - - Table 2, Item 4 Table 2, Item 3 - - Para. 4.3.5 of this Spec. -5 +5 Table 2, Item 5 Table 2, Item 2 Table 2, Item 1 Para. 4.3.4 of this Spec. | - $m\Omega$ $m\Omega$ - N $m\Omega$ mA $M\Omega$ N | |
| 14 | Corrosion | Para. 9.22 | Initial Measurements Visual Examination Contact Resistance (Low Level Current) Final Measurements Visual Examination Contact Resistance Drift (Low Level Current) | ESCC No. 20500 Table 2, Item 4 ESCC No. 20500 Table 2, Item 4 | - R_{cl} - ΔR_{cl} | - - Table 2, Item 4 - - -5 +5 | - $m\Omega$ - $m\Omega$ | |

| 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 | |
| 15 | Insert Retention (in Shell) | Para. 9.23 and Para. 4.3.6 of this Spec. | Displacement of the insert | - | - | Para. 4.3.6 of this Spec. | | N/cm ² |
| 16 | Jackscrew Retention | Para. 9.24 and Para. 4.3.7 of this Spec. | Retention of Captivated Jackscrews | Para. 9.24 of ESCC 3401 | - | Para. 4.3.7 of this Spec. | | g |
| 17 | High Temperature Measurements | Para. 9.25 | Insulation Resistance | Table 2, Item 1 | R _i | 1 | - | MΩ |
| 18 | Overload Test | Para. 9.26 | Internal Temperature | - | T | - | +150 | °C |
| | | | Contact Resistance (Rated Current) | Table 2, Item 5 | R _{cr} | Table 2, Item 5 | | 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 |
| 19 | Maintenance Aging | Para. 9.27 and Para. 4.2 of this Spec. | Not applicable | | | | | |
| 20 | Engagement and Separation Forces | Para. 9.28 and Para. 4.3.9 of this Spec. | Force | - | F | Para. 4.3.9 of this Spec. | | N |
| 21 | Oversize Pin Exclusion | Para. 9.29 and Para. 4.3.10 of this Spec. | Not applicable | | | | | |
| 22 | Probe Damage | Para. 9.30 and Para. 4.3.11 of this Spec. | Not applicable | | | | | |
| 23 | Solderability | Para. 9.31 and Para. 4.3.12 of this Spec. | Where applicable | Para. 9.31 of ESCC 3401 | - | ESCC 3401 Para. 9.31 | | - |

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 AXON' CABLE SAS (F)

| ITEMS AFFECTED | DESCRIPTION OF DEVIATIONS |
|----------------|---|
| Para. 4.3.12 | Solderability is not applicable for CBR, SMV and BS Types (Variants 03, 04 and 05). |