

# **SQUBA 1.8**

# Wire to Wire INTERCONNECT SYSTEMS

| Female Crimp Terminal | Male Crimp Terminal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                       | A STATE OF THE STA |
| Series: <u>204301</u> | Series: <u>204226</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

| Receptacle            | Plug                  |
|-----------------------|-----------------------|
|                       |                       |
| Series: <u>204220</u> | Series: <u>204223</u> |

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| Receptacle Weather Cap | Plug Weather Cap |
|------------------------|------------------|
|                        |                  |
| Series: 220424         | Series: 220423   |

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# PRODUCT SPECIFICATION

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#### 1.0 SCOPE

This Product Specification covers the performance requirements for the Squba 1.8 Sealed Wire-To-Wire, 1.80mm pitch single row connector series which uses copper terminals with tin plated contact interface terminated with 22 to 24 AWG wire using Molex crimp technology. The mated system meets IP68 requirements.

#### 2.0 PRODUCT DESCRIPTION

#### 2.1 PRODUCT NAME AND SERIES NUMBER (S)

| Description                             | Series Number |
|-----------------------------------------|---------------|
| Squba 1.8, Female Crimp Terminal        | <u>204301</u> |
| Squba 1.8, Male Crimp Terminal          | <u>204226</u> |
| Squba 1.8, Receptacle assembly          | <u>204220</u> |
| Squba 1.8, Plug assembly                | <u>204223</u> |
| Squba 1.8, Plug assembly with Clip slot | <u>204223</u> |
| Squba Plug Weather Cap                  | <u>220423</u> |
| Squba Receptacle Weather Cap            | <u>220424</u> |

#### 2.2 DIMENSIONS, MATERIALS, PLATING AND MARKINGS

Dimensions & Plating: See individual sales drawings.

Material: RoHS compliant materials\*.

\*Refer to the "Product Environmental Compliance" section in Molex.com to know the individual PN RoHS compliance status

#### 2.3 SAFETY AGENCY APPROVALS

UL / cUL File Number: E29179

| UL-cUL Rating                              | ıs .  |
|--------------------------------------------|-------|
| 150 volts AC/DC – 4 Amps with 22 AWG leads | 105°C |

IEC 61984 Compliant

| UL-IEC ratings                                        |                  |  |
|-------------------------------------------------------|------------------|--|
| 150 volts AC/DC – 4 Amps with 22 AWG and 24 AWG leads | -40°C to + 105°C |  |

NRTL type examination certificate available from Molex upon request

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#### 3.0 APPLICABLE DOCUMENTS AND SPECIFICATION

#### 3.1 MOLEX DOCUMENTS

Squba 1.8 Interconnect System Connectors Test summary 2042200000-TS-000

Squba 1.8 Interconnect System Connectors Test summary 2042200100-TS-000

Squba 1.8 Interconnect System Connectors Application summary 2042200000-AS-000

Molex Quality Crimping Handbook Order No. 63800-0029

Molex Moisture Technical Advisory AS-45499-001

Molex Package Handling Specification 454990100-PK

ATS - Application Tooling Specification\*

\*Application Tooling Specification for terminals is not provided in this document. ATS for terminals can be available from respective terminal part number page in Molex.com

#### 3.2 INDUSTRY DOCUMENTS

EIA-364-1000 UL-60950-1 IEC / EN 61984 SAE/USCAR-2 Revision 7

#### 4.0 ELECTRICAL PERFORMANCE RATINGS

#### 4.1 VOLTAGE

125 VAC RMS or DC

#### 4.2 APPLICABLE WIRES

Stranded Wire Gauge: 22 to 24 AWG Insulation Diameter: 0.95 mm – 1.4 mm

#### 4.3 MAXIMUM CURRENT RATING (Amperes)\*\*

\*\*Note: Ratings shown represent *MAXIMUM* current carrying capacity of a fully loaded connector with all circuits powered in still air. Ratings are based on a 30°C maximum temperature rise limit over ambient (room temperature). Current rating is application dependent and below charts are intended as a guideline. Appropriate de-rating is required depending on factors such as higher ambient temperature, gross heating from adjacent modules or components and other factors that influence connector performance.

| Wire |       |        | Ckt Size |       |       |
|------|-------|--------|----------|-------|-------|
| AWG  | 2     | 4      | 6        | 8     | 10    |
| 22   | 6.5 A | 5.25 A | 5.0 A    | 5.0 A | 5.0 A |
| 24   | 5.5 A | 4.5 A  | 4.25 A   | 4.0 A | 4.0 A |

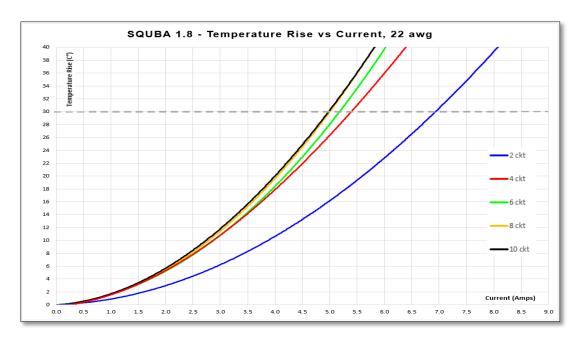
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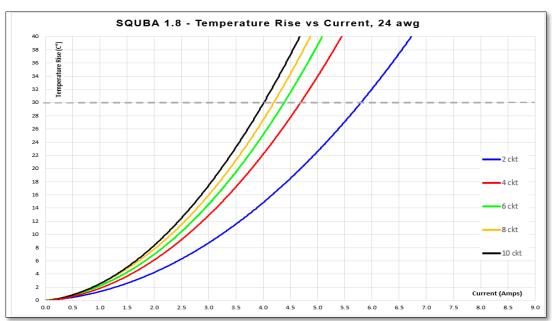
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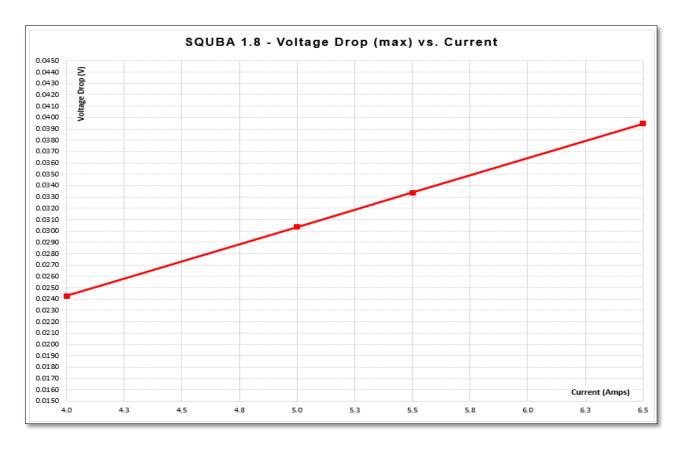
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#### 4.4 VOLTAGE DROP AT RATED CURRENT



#### 4.5 TEMPERATURE

Operating Range (including T-rise from applied current): - 40°C to + 105°C Non-operating Range: - 40°C to + 105°C

Field Temperature and Field Life: 60°C for 10 years (based EIA-364-1000, table 8)

Note: Temperature life test duration (section 6.3. item 17) assumes that the contact spends its entire life at the rated field maximum temperature (based on EIA-364-1000, section 7).

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#### 4.6 **DURABILITY**

Tin plated: 10 mating cycles

As tested in accordance with EIA-364-1000 test method (see sec 6.2 of this specification). Durability per EIA-364-09

#### **QUALIFICATION** 5.0

Laboratory condition, sample selection and test sequences are in accordance with EIA-364-1000.

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### 6.0 PERFORMANCE

#### 6.1 ELECTRICAL PERFORMANCE

| ITEM | DESCRIPTION                                       | TEST CONDITION                                                                                                                                       | REQUIREMENT                                                 |
|------|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| 1    | Contact<br>Resistance<br>(Low Level)              | Per EIA 364-23  Mate connectors: apply a maximum voltage of 20 mV and a current of 100 mA. Wire resistance shall be removed from the measured value. | 10 milliohms<br>MAXIMUM<br>[initial]                        |
| 2    | Insulation<br>Resistance                          | Per EIA-364-21<br>Mate connectors: apply a voltage of 500<br>VDC between adjacent terminals and<br>between terminals to ground.                      | 100 Megohms<br>MINIMUM                                      |
| 3    | Dielectric<br>Withstanding<br>Voltage             | Per EIA 364-20 (initial only) Mate connectors: apply a voltage of 1250 VAC for 1 minute between adjacent terminals and between terminals to ground.  | No breakdown.<br>Current leakage < 5 mA                     |
| 4    | Temperature<br>Rise<br>(via current<br>profiling) | Per EIA 364-70B                                                                                                                                      | Temperature rise:<br>+30°C MAXIMUM<br>See chart section 4.3 |
| 5    | Voltage Drop<br>(at rated current)                | Per EIA 364-70B<br>Mate connectors. Apply the rated current.                                                                                         | See chart section 4.4                                       |
| 6    | Contact Resistance<br>@ Rated Current             | Mate connectors: Apply a maximum voltage of 20mV at rated current. Wire resistance shall be removed from the measured value.                         | 10 milliohms Max (Initial)                                  |
| 7    | Contact Resistance of Wire Termination            | Terminate the applicable wire to the terminal and measure wire using a voltage of 20mV and a current of 100mA                                        | 10 milliohms Max (Initial)                                  |

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#### 6.2 **MECHANICAL PERFORMANCE**

| ITEM | DESCRIPTION                                                          | TEST CONDITION                                                                                                         | REQUIREMENT                                                            |
|------|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| 8    | Connector Mate<br>Forces<br>(w/o thumb latch)                        | Insert and withdraw (male to female) at a rate of 25 $\pm$ 6 mm (1 $\pm$ $\frac{1}{4}$ inch) per minute.               | 45 N (16.9 lbf) MAX                                                    |
| 9    | Connector<br>Un-mate Forces<br>(w/o thumb latch)                     | Insert and withdraw (male to female) at a rate of 25 $\pm$ 6 mm (1 $\pm$ $\frac{1}{4}$ inch) per minute.               | 35 N (13.5 lbf) MAX                                                    |
| 10   | Connector Un-mate<br>Force w/ Thumb<br>Latch Locked<br>(destructive) | Mate loaded connectors fully. Pull connectors apart at a rate of 25 $\pm$ 6mm (1 $\pm$ $\frac{1}{4}$ inch) per minute. | 75 N (10.12 lbf) MIN                                                   |
| 11   | Crimp Terminal<br>Insertion Force<br>(into Housing)                  | Apply an axial insertion force on the terminal at a rate of 25 $\pm$ 6 mm (1 $\pm$ $\frac{1}{4}$ inch).                | 5 N (1.1 lbf)<br>MAX insertion force                                   |
| 12   | Crimp Terminal<br>Retention Force                                    | Axial pullout force on the terminal in the housing at a rate of 25 $\pm$ 6 mm (1 $\pm$ $\frac{1}{4}$ inch) per minute. | 30 N (4.5 lbf)<br>MIN retention force                                  |
| 13   | Durability<br>(w/o thumb latch)                                      | Per EIA-364-09<br>Mate/un-mate connectors 10 cycles at a<br>maximum rate of 10 cycles per minute                       | 10 milliohms MAX<br>(change from initial)                              |
| 14   | Durability<br>(pre-conditioning)                                     | Per EIA-364-09<br>Mate/un-mate connectors 5 cycles at a<br>maximum rate of 10 cycles per minute                        | 10 milliohms MAX<br>(change from initial)                              |
| 15   | Vibration                                                            | Per EIA-364-28 test condition VII-D<br>Mate connectors and vibrate for 15 minutes<br>each axis.                        | 10 milliohms MAX (change from initial) & Discontinuity < 1 microsecond |
| 16   | Wire Crimp<br>Pullout Force<br>(Axial)                               | Apply an axial pullout force on the wire at a rate of 25 $\pm$ 6 mm (1 $\pm$ $\frac{1}{4}$ inch).                      | 22 awg = 35.6 N (8 lbf)<br>24 awg = 22.3 N (5 lbf)                     |
| 17   | Thumb Latch<br>Operation Force                                       | Depress latch at a rate of 25 $\pm$ 6mm (1 $\pm$ $\frac{1}{4}$ inch) per minute.                                       | 15 N (3.37 lbf) MAX                                                    |
| 18   | Re-seating                                                           | Perform 3 mate / un-mate cycles                                                                                        | 10 milliohms MAX<br>(change from initial)                              |

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#### **MECHANICAL PERFORMANCE (Continued)**

| ITEM | DESCRIPTION                                          | TEST CONDITION                                                                                                            | REQUIREMENT                             |
|------|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| 19   | Mechanical Shock                                     | Mate connectors and shock at 50g's with ½ sine wave (11 milliseconds) shocks in ±x, ±Y, ±z axes (18 shocks total)         | 10 milliohms max                        |
| 20   | Clip Engage and<br>Disengage Force                   | Per SAE/USCAR-2 Rev 7 section 5.4.5                                                                                       | 60N Max Insertion<br>110N Min Disengage |
| 21   | Connector Mounting<br>Feature Mechanical<br>Strength | Per SAE/USCAR-2 Rev 7 Section 5.4.11                                                                                      | 50N Min F1 to F4, F6                    |
| 22   | Thumb Latch Yield<br>Strength                        | Insert and withdraw fully loaded connector housings (10 times) and pull apart at a speed rate of 25 +/- 6mm / minute      | 70N Minimum                             |
| 23   | Plug weather Cap<br>Mate/Unmate                      | Insert and withdraw (male to female) at a rate of $25 \pm 6$ mm (1 $\pm \frac{1}{4}$ inch) per minute.                    | Mate: 70N Max<br>Unmate: 4N Min         |
| 24   | Receptacle Weather<br>Cap Mate/Unmate                | Insert and withdraw (male to female) at a rate of 25 $\pm$ 6 mm (1 $\pm$ ½ inch) per minute.                              | Mate: 35N Max<br>Unmate: 50N Min        |
| 25   | Vibration (Weather cap)                              | Per EIA-364-28 test condition VII-G<br>Mate connectors halves to respective Caps and<br>vibrate for 15 minutes each axis. | Weather Cap should not unmate           |

\*refer appendix A for directions F1 to F6

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#### 6.3 ENVIRONMENTAL PERFORMANCE

| ITEM | DESCRIPTION                         | TEST CONDITION                                                                                                                                                                  | REQUIREMENT                                                       |
|------|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 26   | Temperature Life                    | Per EIA-364-17<br>Mate Connectors, expose to 108 hours at<br>105°C                                                                                                              | 10 milliohms MAX<br>(Change from initial)                         |
| 27   | Temperature Life (pre-conditioning) | Per EIA-364-17<br>Mate Connectors, expose to 66 hours at<br>105°C                                                                                                               | 10 milliohms MAX<br>(Change from initial)                         |
| 28   | Thermal Shock                       | Per EIA-364-32<br>Mate connectors: expose for 5 cycles<br>Between temperatures –40 and 105° C.<br>Dwell 0.5 hours at each temperature.                                          | 10 milliohms MAX<br>(Change from initial)<br>Visual: No Damage    |
| 29   | Cyclic Temperature and Humidity     | Per EIA-364-31 method 3<br>Mate connectors: expose to 24 cycles from<br>25 °C / 80% RH to 65 °C / 50% RH                                                                        | 10 milliohms MAX<br>(Change from initial)                         |
| 30   | IPX8 Continuous<br>Water Immersion  | IEC 60529, Ed. 2.1. Mate connectors/ weather caps and immerse in water at a depth of 1.5 meter from the water surface for 30 minutes.                                           | No signs of water indicating ingress inside the connector system  |
| 31   | IP6X Dust<br>Exposure               | IEC 60529, Ed. 2.1,<br>Connectors: Category 1 Enclosure,8-hour<br>duration.<br>Weather Caps: Category 2 Enclosure,8-hour<br>duration.                                           | No deposit of dust indicating ingress inside the connector system |
| 52   | Humidity (Steady<br>State)          | Mate Connectors: expose to a temperature of 40 ± 2°C with a relative humidity of 90-95% for 96 hours  Note: Remove surface moisture and air dry for 1hour prior to measurements | 10 milliohms Max (change<br>from initial)                         |
| 33   | Cold Resistance                     | Mate Connectors:<br>Duration: 96 hours;<br>Temperature: -40 ± 3°C                                                                                                               | 10 milliohms Max (change<br>from initial)                         |
| 34   | Salt Spray                          | Mate Connectors: Duration: 48 hours exposure; Atmosphere: Salt spray from a 5% solution; Temperature: 35 +1/-2°C                                                                | 10 milliohms Max (change<br>from initial)                         |
| 35   | Thermal Cycling                     | Cycle the connector between 15° ± 3°C and 85° ± 3°C, 500 cycles. Humidity is not controlled.  EIA-364-1000, Table 5                                                             | 10 milliohms Max (change<br>from initial)                         |

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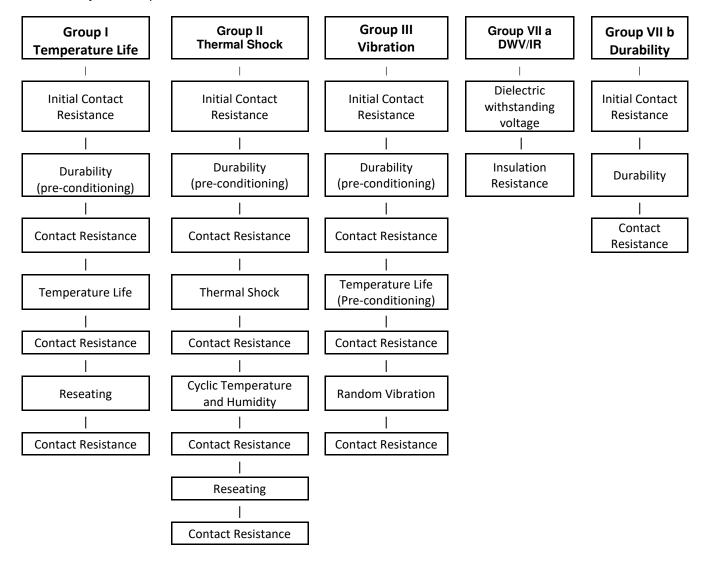
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## PRODUCT SPECIFICATION

#### 7.0 TEST SEQUENCE GROUPS

Reliability Test Sequences Per EIA-364-1000



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## PRODUCT SPECIFICATION

**Temperature** Rise

T-rise profiling

Water Sealing Characterization (IPX8)

Visual

**IPX8** Leak Test

Visual

**Dust Sealing** Characterization (IP6X)

Visual

**IP6X Dust Test** 

Visual

**Voltage Drop** 

Voltage drop

Steady State

Voltage Drop

Connector Mate / Un-mate Force

Crimp Terminal Insertion force

**Individual Tests** 

Crimp Terminal Retention force

Thumb Latch Operation Force

Wire Pullout force (Axial)

Thumb Latch Operation Force

Thumb Latch Yield Strength

Connector Mounting Feature Mechanical Strength

Clip Engage and Disengage Force

Weather Cap Mate/Unmate **Forces** 

Vibration (Weather caps)

Steady State Temperature Rise

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REVISION:

EC No: 732935 DATE: 2022/12/22

**ECR/ECN INFORMATION:** 

PRODUCT SPECIFICATION **Squba 1.8 Interconnect System** 

DOCUMENT NUMBER:

2042200000-PS

CREATED / REVISED BY: **VENKAS5** 

TITLE:

CHECKED BY: **VENKAS5** 

APPROVED BY: **MRAMAKRISHNA** 

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#### 8.0 PACKAGING

Parts shall be packaged to protect against damage during normal handling, transit and storage. See Packaging specification listed below for Squba 1.8 System –

| Receptacle Assembly Packaging Specification          | 2042200000-PK |
|------------------------------------------------------|---------------|
| Plug Assembly Packaging Specification                | 2042230000-PK |
| Receptacle Crimp Terminal Packaging Specification    | 2042200000-PK |
| Plug Crimp Terminal Packaging Specification          | 2042230000-PK |
| Plug Assembly with Clip slot Packaging Specification | 2042230100-PK |
| Plug Weather Cap Packaging Specification             | 2204230000-PK |
| Receptacle Weather Cap Packaging Specification       | 2204240000-PK |

#### 9.0 OTHER INFORMATION

#### 9.1 CRIMP APPLICATION TOOLING

| Terminal Series | AWG   | Description      | Order<br>Number | Crimp Spec Document Number |
|-----------------|-------|------------------|-----------------|----------------------------|
| 204301          | 22-24 | Crimp Applicator | 638083700       | 638083700                  |
| 204301          |       | Crimp Hand Tool  | 2002180400      | 2002180400                 |
|                 | 22    | Crimp Applicator | 2130690510      | 2130690510                 |
| 204226          |       | Crimp Hand Tool  | 2002180400      | 2002180400                 |
| 204220          |       | Crimp Applicator | 2130690500      | 2130690500                 |
|                 |       | Crimp Hand Tool  | 2002180400      | 2002180400                 |

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#### 9.2 CABLE TIE AND/ OR TWIST LOCATION

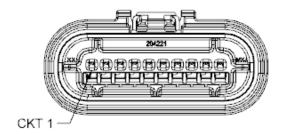
| CKT Size | Dim T Min.       |
|----------|------------------|
| 2-6      | 50.8 mm (2.00")  |
| 8        | 76.2 mm (3.00")  |
| 10       | 101.6 mm (4.00") |



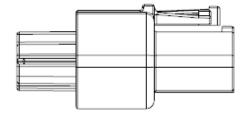
The "T" dimension defines a "free" length of wire, or a length of wire that is not subject to significant bias by external factors such as a wire tie, wire twisting, or other means of bending or deforming of the wires that repositions them from their natural relaxed state or location where they enter the housing. Wires are to be dressed in such a manner to allow the terminals to float freely in the pocket. This dimension is general recommendation and may need to be adjusted for different wire gauges and wire type and insulation thickness and insulation material.

#### 10.0 POLARIZATION AND KEYING OPTIONS

#### 10.1 Squba 1.8, Receptacle Assembly (Series: 204220)







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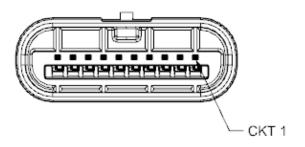
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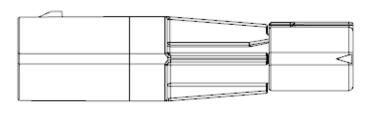
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10.2 Squba 1.8, Plug Assembly (Series: 204223)





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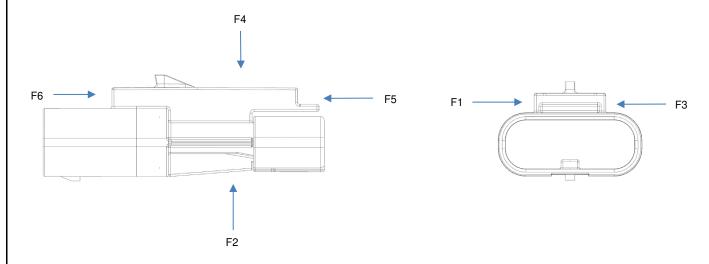
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#### **APPENDIX A**

**Connector Mounting Feature Mechanical Strength: Force Application Directions** 

(Per SAE/USCAR-2 Rev 7 Section 5.4.11)



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