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| TITLE MicroSpace™ connector | | PAGE 1 of 9 | REVISION F |
| | | AUTHORIZED BY VALLIERE Jérôme | DATE 03/10/2024 |
| | | CLASSIFICATION UNRESTRICTED | |

1.0 Objective

This specification defines the performance, test, quality and reliability requirements of the MicroSpace™ product.

2.0 Scope


This specification is applicable to the termination characteristics of the MicroSpace™ family of products which provides a unique design enables LV214 Severity-2 and performs at 1.8, 1.5 and 1.27mm pitch. MicroSpace™ will be available in single (Side-To-Side or Staggered) and double row versions, with top and side latch configuration.

3.0 Ratings

- 3.1 Operating Voltage Rating = 12V-48V (For customer specification and more details, please contact us)
- 3.2 Operating Current Rating =
 - 1.27mm pitch: 4A max, T° rise : 30°C max
 - 1.5mm pitch: 3A max, T° rise : 30°C max
 - 1.8mm pitch: 2A max, T° rise : 30°C max
- 3.3 Operating Temperature Range = -40°C to +130°C (to 105°C for HDT plated CTW)

4.0 Applicable Documents

- 4.1 AFCI Specifications
 - 4.1.1 Engineering drawings
 - 4.1.2 Process drawings
 - 4.1.3 Application specification(s)
 - GS-20-0513 : MicroSpace™ CTW application specification
 - 4.1.4 Material specification(s)
- 4.2 Industry or Trade Association standards
 - 4.2.1 VW 75174: Motor Vehicle Connectors – Test Specification
 - 4.2.2 VW 60330: Crimp Connections – Solderless Electrical Connections
- 4.3 National or International Standards
 - 4.3.1 Flammability: UL94V-0 or similar applicable specification
 - 4.3.2 EIA 364: Electrical Connector/Socket Test Procedures Including Environmental Classifications.
- 4.4 AFCI Laboratory Reports - Supporting Data
- 4.5 Safety Agency Approvals

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5.0 Requirements

5.1 Qualification

Connectors furnished under this specification shall be capable of meeting the qualification test requirements specified herein.

5.2 Material

The material for each component shall be as specified herein or equivalent.

- Contacts – High Conductivity Copper alloy
- Housing – High Temperature Thermoplastic Glass Filled, UL 94V-0


5.3 Finish

The finish for applicable components shall be as specified herein or equivalent.

- Full Tin Plated over Nickel underlayer
- Selective Gold Plated over Nickel underlayer
- Hot-dip Tinned plated over copper alloy (CTW)


5.4 Design and Construction

Connectors shall be of the design, construction, and physical dimensions specified on the applicable product drawing. There shall be no cracks, burrs, or other physical defects that may impair performance.


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6.0 Electrical, Mechanical and Environmental Tests


| ITEM | TESTS | REQUIRMENTS | PROCEDURES |
|------|--|---|------------|
| 6.1 | PG0 Inspection of as-received condition | <ul style="list-style-type: none"> - Visual inspection - Contact resistance < 30mΩ - Insulation resistance > 100 MΩ | VW 75174 |
| 6.2 | PG1 Dimensions | <ul style="list-style-type: none"> - Visual inspection - Measurement reports | VW 75174 |
| 6.3 | PG2 Material and surface analysis, contacts | <ul style="list-style-type: none"> - Visual inspection - Material specifications of contacts parts | VW 75174 |
| 6.4 | PG3 Material and surface analysis, housings and single-wire seals | <ul style="list-style-type: none"> - Visual inspection - Material specifications of housings and single-wire seals | VW 75174 |
| 6.5 | PG4 Contact engagement length | <ul style="list-style-type: none"> - Visual inspection - Contacts engagement length > 1mm - Clearance > 0mm (worst case) | VW 75174 |
| 6.6 | PG5 Mechanical and thermal relaxation behavior | <ul style="list-style-type: none"> - Visual inspection - Contact opening variation - Normal contact force variation | VW 75174 |

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| 6.7 | PG6 Interaction between contact and housing | <ul style="list-style-type: none"> - Visual inspection - Drop test - Primary lock/latch play - Secondary lock/latch play <ul style="list-style-type: none"> TPA opening (correct assembled terminals) > 50N (Fo) TPA closing (correct assembled terminals) < 50N (Fs) TPA closing (improperly assembled terminals) > 100N or > 3xFs | VW 75174 |
| 6.8 | PG7 Handling and functional reliability of the housing | <ul style="list-style-type: none"> - Visual inspection - Keying efficiency > 80N or > 3xFe - Polarizing efficiency > 80N or > 3xFi - Positive locking retention > 60N - Insertion/actuation force < 75N (Fi) | VW 75174 |
| 6.9 | PG8 Insertion and retention forces of the contact parts in the housing | <ul style="list-style-type: none"> - Visual inspection - Terminal insertion force < 3N - Terminal retention force <ul style="list-style-type: none"> 1st locking only > 10N ⁽²⁾ 2nd locking only > 35N ⁽¹⁾ | VW 75174 |
| 6.10 | PG9 Pin insertion inclination/misuse safe | <ul style="list-style-type: none"> - Examination is performed using CAD | VW 75174 |
| 6.11 | PG10 Contacts: conductor pull- out strength | <ul style="list-style-type: none"> - Visual inspection - Conductor pull-out strength : <ul style="list-style-type: none"> AWG 22 : > 50N ⁽¹⁾ AWG 24 : > 35N ⁽²⁾ AWG 26 : > 25N ⁽²⁾ AWG 28 : > 15N ⁽²⁾ | VW 75174 |

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| 6.12 | PG11 Contacts: Insertion and removal forces, mating cycle frequency | <ul style="list-style-type: none"> - Visual inspection - Mating cycles : 20 - Contact opening variation - Plugging/Removal force variation | VW 75174 |
| 6.13 | PG12 Current heating, derating | <ul style="list-style-type: none"> - Visual inspection - Derating curve | VW 75174 |
| 6.14 | PG13 Housing influence on the derating | <ul style="list-style-type: none"> - Visual inspection - Derating curve | VW 75174 |
| 6.15 | PG14 Thermal time constant (current excess temperature at n times rated current) | <ul style="list-style-type: none"> - Visual inspection - Rating curve | VW 75174 |
| 6.16 | PG15 Electrical stress test | <ul style="list-style-type: none"> - Visual inspection - Contact opening variation - Contact resistance < 30mΩ - Derating curve - HDT CTW -40°C to 105°C / 4Amp | VW 75174 |
| 6.17 | PG16 Friction corrosion | <ul style="list-style-type: none"> - Visual inspection - Contact resistance variation | VW 75174 |
| 6.18 | PG17 Dynamic load | <ul style="list-style-type: none"> - Visual inspection - Tin (Pre plated) : Severity : 1 - Tin (Post plated) & Gold : Severity : 3 - Contact resistance < 30mΩ | VW 75174 |
| 6.19 | PG18A Coastal climate load | <ul style="list-style-type: none"> - Visual inspection - Contact resistance < 30mΩ | VW 75174 |
| 6.20 | PG19 Environmental simulation | <ul style="list-style-type: none"> - Visual inspection | VW 75174 |

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| | | - Contact resistance < 50mΩ ⁽¹⁾ | |
| 6.21 | PG20 Climate load of the housing | - Visual inspection - Insulation resistance > 100 MΩ | VW 75174 |
| 6.22 | PG21 Long-term temperature aging | - Visual inspection - Contact resistance < 30mΩ - Drop test - Conductor pull-out strength : AWG 22 : > 50N ⁽¹⁾ AWG 24 : > 35N ⁽²⁾ AWG 26 : > 25N ⁽²⁾ AWG 28 : > 15N ⁽²⁾ | VW 75174 |
| 6.23 | PG22A Resistance to chemicals | - Visual inspection - Insulation resistance > 100 MΩ - No functionally significant structural or dimensional change | VW 75174-2 |
| 6.24 | PG24 Impenetrability to paint | - Visual inspection | VW 75174-2 |
| 6.25 | PG28 Latching noise | - L _{Apeak} ≥ 50 dB(A) ⁽²⁾ | VW 75174-2 |
| 6.26 | PG31 Holding forces for contact pins | - F ₍₀₎ = 7 N ⁽²⁾ | VW 75174-2 |
| 6.27 | Slow Motion Bending Test | - Crimp measurement - Contact resistance variation | VW 75174-2 |
| 6.28 | Breaking Voltage Test | - Visual inspection - Voltage : 500VAC - Time : 1min | EIA-364-20 |

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| 6.29 | Tin Whisker Formation | <ul style="list-style-type: none"> - Visual inspection - There shall be no evidence of whiskers higher than 50µm | AFCI GS-19-028C |
| 6.30 | Solderability | <ul style="list-style-type: none"> - Visual inspection - Section 4.5 (SMT version) | AFCI GS-19-037 |
| 6.31 | Resistance to solder heat | <ul style="list-style-type: none"> - Visual inspection - Reflow 260°C | AFCI GS-22-011 |
| 6.32 | Retention on PCB (soldered) | <ul style="list-style-type: none"> - Visual inspection - Retention force (parallel to the plane of the board) > 100N - Retention force (normal to the plane of the board) > 50N | IEC 60950 Chapter 4.23 & 4.24 |
| 6.33 | MSL test | <ul style="list-style-type: none"> - Test Condition – Level 1 under 260°C Max - There shall be no evidence of tin reflowing and discoloration on power pins | JEDEC J-STD-020E |

⁽¹⁾ : VW 75174-2018-06 standard.

⁽²⁾ : Dedicated value. MicroSpace™ connector

7.0 QUALITY ASSURANCE PROVISIONS

7.1 Equipment Calibration

All test equipment and inspection facilities used in the performance of any test shall be maintained in a calibration system in accordance with ANSI Z-540 and ISO 9000.


7.2 Inspection Conditions

Unless otherwise specified herein, all inspections shall be performed under the following ambient conditions:

- a. Temperature: 25 +/- 5 deg C
- b. Relative Humidity: 30% to 60%
- c. Barometric Pressure: Local ambient

7.3 Sample Quantity And Description

Refer to called standards.

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7.4 Acceptance

7.4.1 Electrical and mechanical requirements placed on test samples as indicated in paragraphs 6.0 shall be established from test data using appropriate statistical techniques or shall otherwise be customer specified, and all samples tested in accordance with this product specification shall meet the stated requirements.

7.4.2 Failures attributed to equipment, test setup, or operator error shall not disqualify the product. If product failure occurs, corrective action shall be taken and samples resubmitted for qualification.


7.5 Qualification Testing

Qualification testing shall be performed on sample units produced with equipment and procedures normally used in production. The test sequences shall be as shown in the qualification test table. Data shall be provided with the samples noting production history: production lot codes for components and assemblies, components and assemblies produced to print revision __, verification of plating composition and thickness, etc.

7.6 Re-Qualification Testing

If any of the following conditions occur, the responsible product engineer shall initiate requalification testing consisting of all applicable parts of the qualification test matrix.

- a. A significant design change is made to the existing product which impacts the product form, fit or function. Examples of significant changes shall include, but not be limited to, changes in the plating material composition or thickness, contact force, contact surface geometry, insulator design, contact base material, or contact lubrication requirements.
- b. A significant change is made to the manufacturing process which impacts the product form, fit or function.
- c. A significant event occurs during production or end use requiring corrective action to be taken relative to the product design or manufacturing process.

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REVISION RECORD

| Rev | Page | Description | EC# | Date |
|------------|---------------|--|------------|-------------|
| A | ALL | Release | | 07/07/2017 |
| B | 3, 4, 5, 6 | Modification of requirements : Contact resistance, 2 nd locking retention force, Retention force on PCB | | 19/01/2018 |
| C | 1, 4, 5, 6 | Modification of requirements : Resistivity, pull out force, 2 nd locking retention force | | 28/06/2018 |
| D | 4, 6 | Modification of pull out force for AWG24, AWG26 and AWG28 PG22A, PG24, PG28 and PG31 added | F-36938 | 07/05/2020 |
| E | 1, 3, 4, 5 | Section 3.2 : Operating current rating details Section 5.3 : Gold update PG7 positive locking retention modification PG17 Gold update | F-48314 | 25/03/2024 |
| F | 1,2,5 | Add HDT CTW SPEC & TG, update voltage rating | F-53077 | 03/10/2024 |