



# HARWIN

## Component Specification

**C02609**

**M40 Series Connectors  
November 2022**

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## 1. DESCRIPTION OF CONNECTOR AND INTENDED APPLICATION

A selection of 1.00mm pitch connectors, comprising vertical board to board surface mount plugs and sockets. This component specification does not cover the board-to-cable M40 connection system.

## 2. RATINGS – M40-310/320

### 2.1. Material & Finish

Housing Material.....	Glass-Filled PA6T, UL94V-0
Contact Material .....	Phosphor Bronze
Finish.....	See Individual Drawings

### 2.2. Environmental Characteristics

Temperature Range .....	-40°C to +105°C
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### 2.3. Electrical Characteristics

Current Rating .....	1.0A AC/DC
Voltage Rating .....	150V AC/DC
Contact Resistance.....	20mΩ max (initial), 30mΩ max (after conditioning)
Dielectric Withstanding Voltage.....	500V AC for 1 minute
Insulation Resistance.....	1,000MΩ min

### 2.4. Mechanical Characteristics

Contact Retention in Housing (M40-320) .....	1.47N min
Insertion force (per contact) .....	1.5N max
Withdrawal force (per contact) .....	0.1N min
Durability .....	300 cycles

## 3. RATINGS – M40-600/620

### 3.1. Material & Finish

Housing Material.....	LCP, UL94V-0
Contact Material .....	Phosphor Bronze
Retainer Material .....	Brass
Finish.....	See Individual Drawings

### 3.2. Environmental Characteristics

Temperature Range .....	-20°C to +125°C
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### 3.3. Electrical Characteristics

Current Rating .....	0.5A AC/DC
Voltage Rating .....	150V AC/DC
Contact Resistance.....	50mΩ max (initial), 75mΩ max (after conditioning)
Dielectric Withstanding Voltage.....	250V AC for 1 minute
Insulation Resistance.....	500MΩ min



### 3.4. Mechanical Characteristics

Contact Retention in Housing:

M40-600 ..... 4.9N min

M40-620 ..... 5.9N min

Retainer Retention in Housing ..... 7.8N min

Soldered Retainer Retention on PC Board ..... 29.4N min

Insertion force (per contact) ..... 2.7N max

Withdrawal force (per contact) ..... 0.4N min

Durability ..... 30 cycles



**APPENDIX 1 – TEST METHODS AND PERFORMANCE – M40-310/320****A1.1. Test Conditions**

Unless otherwise specified, all tests and measurements shall be performed under the conditions and in accordance with EIA 364.

**A1.2. Test Methods: Electrical****i) Contact Resistance (EIA-364-23)**

Solder a plug and a socket to PC Boards and mate them together. Measure the contact resistance between the two mated boards. Apply the low-level condition of 20mV max. for the open circuit voltage and 100mA max. for the closed circuit current. Contact resistance must not exceed the values stated in section 2.3.

**ii) Dielectric Withstanding Voltage (EIA-364-20)**

Mate a plug and socket together (not soldered to a PC Board). Apply between neighbouring contacts a 500V AC current for 1 minute in accordance with EIA 364-20. No creeping discharge, flash-over or insulator break-down is allowed. Current leakage must be less than 0.5mA.

**iii) Insulation Resistance (EIA-364-21)**

Mate a plug and socket together (not soldered to a PC Board). Apply between neighbouring contacts a 500V DC voltage for 1 minute. Measurement is taken in accordance with EIA 364-21. Insulation resistance must not be less than the value stated in section 2.3.

**A1.3. Test Methods: Mechanical****i) Contact Retention Force (EIA-364-29)**

Place a connector on a push-on/pull-off machine. Apply force onto the contact head and push the contact in the direction opposite to insertion. Measure the force when the contact dislodges from the moulding. Contact retention must conform to the figure stated in section 2.4.

**ii) Insertion/Withdrawal Force (EIA-364-13)**

Place a mated connector pair on a push-on/pull-off machine. Repeat insertion and withdrawal for 30 cycles, at a speed of 50mm/min. along the mating axis. Insertion and withdrawal forces before, during and after the test must conform to those stated in section 2.4.

**iii) Durability**

Place a mated connector pair on a push-on/pull-off machine. Repeat insertion and withdrawal for 300 cycles, at a speed of 200 cycles per hour, along the mating axis. Contact resistance before and after the test must meet the values stated in section 2.3.

**A1.4 Test Methods: Environmental****i) Solderability (EIA-364-52 Category 3)**

Steam Aging Temperature..... 90 to 96°C  
 Steam Aging Duration ..... 8 Hours ± 5 minutes  
 Soldering Temperature..... 245±5°C  
 Soldering Time..... 4 to 5 seconds  
 Result: More than 95% of the surface must have continuous solder coating.

**ii) Vibration (EIA-364-28, Condition V, Test letter A)**

Test Condition ..... Random  
 Frequency ..... 50–2,000Hz  
 PSD Value..... 3.13 G<sub>rms</sub> min  
 Directions ..... Three mutually perpendicular directions  
 Duration ..... 15 minutes/axis.

Contact resistance before and after testing must meet the values specified in section 2.3. No electrical discontinuity greater than 1µs must occur during testing. Looseness amongst parts, chipping, breakage or other detrimental damage must not occur.

**iii) Shock (EIA-364-27, Condition H)**

Wave form.....Half-sinusoidal  
 Peak acceleration.....30G (294m/s<sup>2</sup>)  
 Shock Duration .....11 milliseconds  
 Directions .....Three mutually perpendicular directions  
 Test Duration.....3 shocks in each direction, totalling 18 shocks  
 Contact resistance before and after testing must meet the values specified in section 2.3. No electrical discontinuity greater than 1µs must occur during testing. Looseness amongst parts, chipping, breakage or other detrimental damage must not occur.

**iv) Humidity (EIA-364-31, Method III, Test Condition A)**

Temperature.....25°C to 65°C  
 Humidity.....90% to 95% RH  
 Duration .....96 Hours  
 Contact resistance before and after the test must meet the values stated in section 2.3. There must be no evidence of damage.

**v) Thermal Shock (EIA 364-32, Test Condition I)**

Temperature.....-55°C to +85°C  
 Cycles .....5  
 Exposure times at temperature extremes .....30 Minutes  
 Contact resistance before and after the test must meet the values stated in section 2.3. There must be no evidence of damage.

**vi) Salt Spray (EIA364-26, Test Condition A)**

Temperature.....35±1.1°C  
 Humidity.....95 to 98% RH  
 PH Value.....6.5 to 7.2  
 Duration .....8 Hours  
 Contact resistance before and after the test must meet the values stated in section 2.3. There must be no evidence of damage.

**vii) Heat Resistant (EIA-364-17, Test Condition 3, Method A)**

Temperature.....85±2°C  
 Duration .....96 Hours  
 Contact resistance before and after the test must meet the values stated in section 2.3. There must be no evidence of damage.

**viii) Resistance to Soldering Heat (EIA-364-56, Procedure 3, Test Condition C)**

Temperature.....260±5°C  
 Time.....5 to 10 seconds  
 Contact resistance before and after the test must meet the values stated in section 2.3. There must be no evidence of damage. Mechanical performance before and after the test must meet the values stated in section 2.4.

IR Reflow Temperature profile .....220°C, 225°C, 230°C, 240°C, 265°C  
 Speed.....8mm/second

At 217°C, the connector needs to stay in the IR Reflow oven for 90 seconds min.

At 260°C, the connector needs to stay in the IR Reflow oven for 5 seconds min.

Contact resistance before and after the test must meet the values stated in section 2.3. There must be no evidence of damage. Mechanical performance before and after the test must meet the values stated in section 2.4.

**APPENDIX 2 – TEST METHODS AND PERFORMANCE – M40-600/620****A2.1 Test Conditions**

Unless otherwise specified, all tests and measurements shall be performed under the following conditions in accordance with EIA-364 Standards:

Temperature.....	15°C to 35°C
Humidity.....	45% to 75% RH
Atmospheric pressure.....	650 to 850mmHg

**A2.2 Test Methods: Electrical****i) Contact Resistance (EIA-364-06B)**

Solder a plug and a socket to PC Boards and mate them together. Measure the contact resistance using the 4-terminal method as shown in Figure 1. Apply 10mV DC max. at a current of 10mA in accordance with EIA-364-06B for the closed circuit current. Contact resistance must not exceed the values stated in section 3.3.

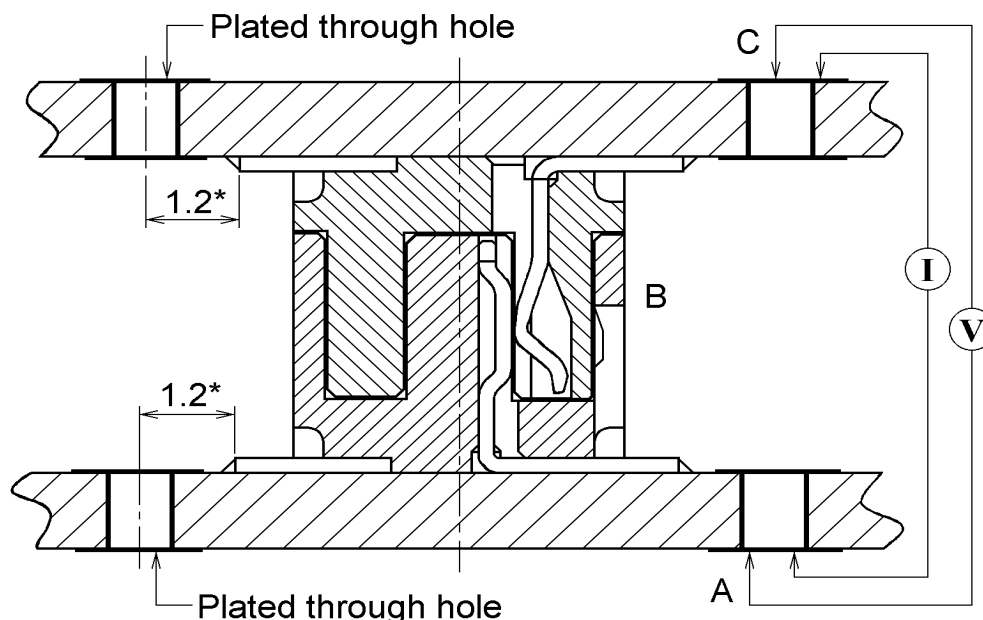


Figure 1: Contact Resistance

Note: Contact resistance is defined as  $R_{ABC}$ , i.e. the electrical resistance from point A on the back face of the lower PCB, through contact point B, to point C on the back face of the upper PCB. \* = 2.7mm on the next line.

**ii) Dielectric Withstanding Voltage (EIA-364-20B)**

Mate a plug and socket together (not soldered to a PC Board). Apply between neighbouring contacts a 250V AC<sub>rms</sub> current for 1 minute in accordance with EIA-364-20B. No creeping discharge, flash-over or insulator break-down is allowed.

**iii) Insulation Resistance (EIA-364-21C)**

Mate a plug and socket together (not soldered to a PC Board). Apply between neighbouring contacts a 100V DC voltage. Measurement is taken in accordance with EIA-364-21C. Insulation resistance must not be less than the value stated in section 3.3.

### A2.3. Test Methods: Environmental

#### i) Heat Resistant

Solder a plug and a socket to PC Boards and mate them together. Expose the mated connectors to the following environment:

Temperature..... +80±3°C

Duration ..... 500±12 hours

Contact resistance before and after the test must meet the values stated in section 3.3.

#### ii) Cold Resistant

Solder a plug and a socket to PC Boards and mate them together. Expose the mated connectors to the following environment:

Temperature..... -30±3°C

Duration ..... 500±12 hours

Contact resistance before and after the test must meet the values stated in section 3.3.

#### iii) Thermal Shock

Solder a plug and a socket to PC Boards and mate them together. Expose the mated connectors to the following environment:

Temperature..... -30° (30 mins), Ambient (5 mins),  
+70°C (30 mins), Ambient (5 mins)

Transition time ..... 5 minutes max.

Number of cycles ..... 5

Contact resistance before and after the test must meet the values stated in section 3.3.

Detrimental damage affecting the performance must not occur.

#### iv) Humidity (MIL-STD-202, Method 103 Condition B)

Solder a plug and a socket to PC Boards and mate them together. Expose the mated connectors to the following environment in accordance with MIL-STD-202, Method 103 Condition B:

Temperature..... 40±2°C

Humidity..... 90% to 95% RH

Duration ..... 500±12 hours

Contact resistance before and after the test must meet the values stated in section 3.3.

#### v) Salt Spray (MIL-STD-202, Method 101 Condition B)

Solder a plug and a socket to PC Boards and mate them together. Expose the mated connectors to the following environment in accordance with MIL-STD-202, Method 101 Condition B:

Temperature..... 35°C

Salt water density ..... 5% (by weight)

Duration ..... 48 hours

Contact resistance before and after the test must meet the values stated in section 3.3.

Detrimental damage affecting the performance must not occur.

#### vi) Gas

Solder a plug and a socket to PC Boards and mate them together. Expose the mated connectors to the following environment:

Chamber temperature ..... 25±2°C

Gas..... H<sub>2</sub>S, 10ppm

Duration ..... 24 hours

Contact resistance before and after the test must meet the values stated in section 3.3.

Detrimental damage affecting the performance must not occur.

**vii) Vibration (EIA-364-28D)**

Solder a plug and a socket to PC Boards and mate them together. Place the mated connectors on a vibrator machine, and apply the following vibration in accordance with EIA-364-28D. Care should be taken to fix the boards firmly to the vibrator machine to avoid any unnecessary resonance of the boards. During the testing, run a 100mA DC current to check for any electrical discontinuity. The test cycle must cover the following parameters:

Frequency ..... 10-55-10Hz over 1 minute approx.  
 Directions ..... Three mutually perpendicular directions  
 Total amplitude ..... 1.5mm  
 Sweep duration ..... Two hours each direction, totalling 6 hours  
 Contact resistance before and after testing must meet the values specified in section 3.3. No electrical discontinuity greater than 10µs must occur during testing. Looseness amongst parts, chipping, breakage or other detrimental damage must not occur.

**viii) Shock (EIA-364-27B)**

Solder a plug and a socket to PC Boards and mate them together. Place the mated connectors on a shock machine, and apply the following shock in accordance with EIA-364-27B. Care should be taken to fix the boards firmly to the shock machine to avoid any unnecessary resonance of the boards. During the testing, run a 100mA DC current to check for any electrical discontinuity. The test cycle must cover the following parameters:

Maximum shock ..... 50G (490m/s<sup>2</sup>)  
 Standard duration ..... 11 milliseconds  
 Wave form ..... Half-sinusoidal  
 No electrical discontinuity greater than 10µs must occur during testing. Looseness amongst parts, chipping, breakage or other detrimental damage must not occur.

**ix) Solderability (MIL-STD-202, Method 208)**

Dip the solder tine of a plug and socket connector in a flux of RMA or R type for 5 to 10 seconds. Then dip the tine into a solder bath (210±5°C) for 5±0.5 seconds. More than 90% of the dipped surface must be evenly wet.

**x) Soldering Heat Resistance (Surface Mount)**

Subject a surface mount connector to the following reflow soldering profile, no more than twice:

Pre-heat ..... 150-216°C for 30-90 seconds  
 Reflow solder ..... 235±5°C (220°C min. within 20 seconds,  
 240°C max. within 5 seconds)

Detrimental damage affecting the performance of the connector must not occur.

**xi) Soldering Heat Resistance (Hand-soldered)**

Hand-solder a plug and a socket connector to a PC Board, using a temperature of 350°C for no more than 3 seconds. Detrimental damage affecting the performance of the connector must not occur.

**A2.4. Test Methods: Mechanical****i) Contact Retention Force.**

Place a connector on a push-on/pull-off machine. Apply force onto the contact head and push the contact in the direction opposite to insertion, at a speed of 25±3mm/min. Measure the force when the contact dislodges from the moulding. Plug and socket contact retention must conform to the figures stated in section 3.4.

**ii) Retainer Retention Force.**

Place a connector on a push-on/pull-off machine. Apply force onto the retainer in the direction opposite to insertion, at a speed of 25±3mm/min. Measure the force when the retainer dislodges from the connector. Retainer retention must conform to the figure stated in section 3.4.

**iii) Soldered Retainer Retention Force.**

Solder a connector to a PC Board, using only the retainers. Place the board onto a push-on/pull-off machine. Pull the connector at a speed of 25±3mm/min. Measure the force when the retainer breaks away from the board. Soldered retainer retention must conform to the figure stated in section 3.4.



**iv) Repeated Insertion/Withdrawal Force.**

Solder a plug and a socket to PC Boards. Place the boards onto a push-on/pull-off machine. Repeat insertion and withdrawal for 30 cycles, at a speed of  $25\pm 3$ mm/min. along the mating axis. Insertion and withdrawal forces before, during and after the test must conform to those stated in section 3.4.

**v) Electrical Continuity Durability.**

Solder a plug and a socket to PC Boards. Place the boards onto a push-on/pull-off machine. Repeat insertion and withdrawal for 30 cycles, at a speed of  $25\pm 3$ mm/min. along the mating axis. Contact resistance before and after the test must meet the values stated in section 3.3.

