

**COMPONENT SPECIFICATION****M402 SERIES CONNECTORS**

MAY 2009

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**COMPONENT SPECIFICATION**  
**M402 SERIES CONNECTORS**

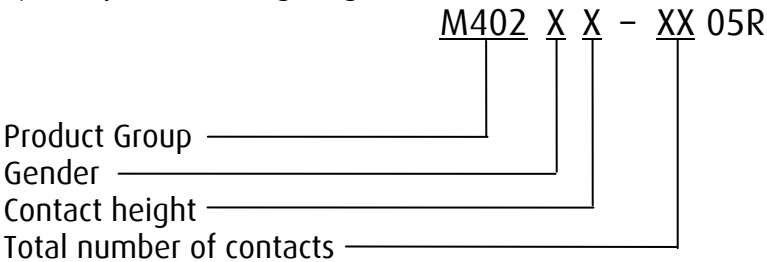
**1. DESCRIPTION OF CONNECTOR AND INTENDED APPLICATION.**

A selection of 0.50mm pitch connectors, comprising surface mount vertical headers sockets for parallel board-to-board applications. The connectors extend to 100 contacts, and can supply variable mating heights from 1.50mm up to 17.50mm.

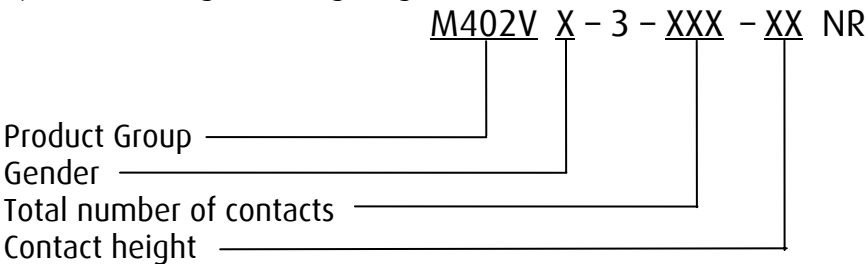
**2. MARKING OF THE CONNECTOR AND/OR PACKAGE (ORDER CODE).**

The marking (order code) shall appear on the package and shall be of the following styles:

a) Low profile mating height connectors – 1.50mm, 2.00mm, 2.50mm



b) Variable height mating height connectors – 2.00mm to 17.50mm



For height detail and connector availability, please consult the latest technical drawing.

The batch code and quantity shall also appear on the package

**3. RATINGS.**

**3.1. MATERIAL & FINISH.**

Materials:

M402 Mouldings .....	LCP, UL94V-0
M402V Mouldings .....	PA 9T, UL94V-0
Contacts .....	Phosphor Bronze

Finish:

M402 Contacts.....	Gold over Nickel
M402V contacts.....	1.3µm Tin over 2.5-4µm Nickel

**COMPONENT SPECIFICATION**  
**M402 SERIES CONNECTORS (continued)**

**3. RATINGS (CONTINUED).**

**3.2. ELECTRICAL CHARACTERISTICS.**

Current rating.....	0.5A max
Voltage rating .....	50V AC
Contact resistance (initial):	
M402.....	90mΩ max
M402V.....	50mΩ max
Contact resistance (after conditioning):	
M402.....	150mΩ max
M402V.....	70mΩ max
Insulation resistance:	
M402.....	1,000MΩ max
M402V.....	100MΩ max
Dielectric Withstanding Voltage:	
M402.....	150V AC rms for 1 minute
M402V.....	200V AC rms for 1 minute

**3.3. ENVIRONMENTAL CHARACTERISTICS.**

Temperature Range:	
M402.....	-40°C to +105°C (96 hours)
M402V.....	-40°C to +85°C (96 hours)
Vibration:	
M402V.....	10Hz to 55Hz over 1.5mm, duration 6 hours
Solderability:	
M402.....	245±5°C for 3±0.5 seconds
M402V.....	235±5°C for 3±0.5 seconds
Resistance to Soldering Heat:	
M402.....	245±5°C for 60±3 seconds
M402V.....	260±5°C for 10±0.5 seconds
Humidity:	
M402.....	90-95% RH, 40±3°C for 120 hours
M402V.....	90-95% RH, 40±2°C for 96 hours
Salt spray:	
M402.....	5% for 24 hours
M402V.....	5% for 48 hours

**3.4. MECHANICAL CHARACTERISTICS.**

Durability.....	50 cycles
Contact retention in moulding:	
M402.....	1.0N min
M402V.....	4.9N min
Insertion force per contact:	
M402.....	1.0N max
M402V.....	0.9N max
Withdrawal force per contact:	
M402.....	0.06N min
M402V.....	0.1N min

**COMPONENT SPECIFICATION**  
**M402 SERIES CONNECTORS (continued)**

**APPENDIX 1 - TEST METHODS AND PERFORMANCE – M402.**

**A1.1. APPEARANCE.**

A1.1.1. Examination of Product.

Requirement: Product shall conform to the requirements of the applicable product drawing and application specification.

Procedure: Visually, dimensionally and functionally inspected per applicable inspection plan.

**A1.2. ELECTRICAL.**

A1.2.1. Contact Resistance (low level).

Requirement: 90mΩ max.

Procedure: The socket and plug were mated. Low-level current was applied and resistance measurements were taken.

Test Method: EIA-RS-364-23A

A1.2.2. Insulation Resistance.

Requirement: 1,000MΩ min.

Procedure: Measurements taken of insulation resistance on unmated connectors. A potential of 500V DC was applied between all contacts.

Test Method: EIA-RS-364-21A

A1.2.3. Dielectric Withstanding Voltage.

Requirement: 150V AC<sub>rms</sub> for 60 seconds – no damage must be apparent.

Procedure: The potential was applied between adjacent contacts of the connector for 60 seconds.

Test Method: EIA-RS-364-20A

**A1.3. MECHANICAL.**

A1.3.1. Durability.

Requirement: No evidence of physical damage. Contact resistance at end of test = 150mΩ max.

Procedure: Mate and unmate samples for 50 cycles, at maximum rate of 200 cycles per hour.

Test Method: EIA-RS-364-09A

A1.3.2. Contact Retention Force.

Requirement: 100gf min per pin.

Procedure: A force applied along the axial direction as the contact is pulled at the speed rate of 25±3mm per minute.

Test Method: EIA-RS-364-29A

A1.3.3. Mating Force.

Requirement: 100gf max per pin – see table below.

Procedure: Measure force necessary to mate printed circuit board to samples using free floating fixtures at maximum rate of 25±3mm per minute.

Test Method: EIA-RS-364-13A

**COMPONENT SPECIFICATION**  
**M402 SERIES CONNECTORS (continued)**

**APPENDIX 1 - TEST METHODS AND PERFORMANCE – M402 (continued).**

**A1.3. MECHANICAL (continued).**

A1.3.4. Unmating Force.

Requirement: 6gf min per pin – see table below.

Procedure: Measure force necessary to unmate printed circuit board to samples using free floating fixtures at maximum rate of 25±3mm per minute.

Test Method: EIA-RS-364-13A

Number of contacts	Mating force (kgf)			Unmating force (kgf)		
	1 <sup>st</sup>	6 <sup>th</sup>	30 <sup>th</sup>	1 <sup>st</sup>	6 <sup>th</sup>	30 <sup>th</sup>
10	1.00	1.10	1.10	0.06	0.050	0.050
12	1.20	1.30	1.30	0.072	0.065	0.065
14	1.40	1.50	1.50	0.084	0.075	0.075
16	1.60	1.70	1.70	0.096	0.085	0.085
20	2.00	2.10	2.10	0.120	0.110	0.110
22	2.20	2.30	2.30	0.132	0.120	0.120
24	2.40	2.50	2.50	0.144	0.135	0.135
30	3.00	3.10	3.10	0.180	0.170	0.170
34	3.40	3.50	3.50	0.204	0.195	0.195
40	4.00	4.10	4.10	0.240	0.230	0.230
50	5.00	5.10	5.10	0.300	0.290	0.290
60	6.00	6.10	6.10	0.360	0.350	0.350
70	7.00	7.10	7.10	0.420	0.400	0.400
80	8.00	8.10	8.10	0.480	0.470	0.470
90	9.00	9.10	9.10	0.540	0.530	0.530
100	10.00	10.10	10.10	0.600	0.590	0.590

**A1.4. ENVIRONMENTAL.**

A1.4.1. Solderability.

Requirement: More than 95% of the solderable area shall be covered with solder – no damage must be apparent.

Procedure: After 5-10 seconds deep flux. Subject the connector lead to solder bath (63% Sn) at +245±5°C for 3±0.5 seconds.

Test Method: MIL-STD-202F, Method 208

A1.4.2. Resistance to Solder Heat.

Requirement: No evidence of defect on surface.

Procedure: The specimens shall be placed in a chamber and subjected to a temperature of +245±5°C for 60±3 seconds, then placed in ambient temperature for more than 10 minutes.

Test Method: EIA-RS-364-56

A1.4.3. Thermal Shock Resistance.

Requirement: No damage, contact resistance = 150mΩ max, insulation resistance = 100MΩ min.

Procedure: Connector shall be subjected to 5 cycles under the following conditions: -40°C +0/-3°C for 30 minutes; +25°C +10/-5°C for 5 minutes max; +105°C +3/-0°C for 30 minutes; +25°C +10/-5°C for 5 minutes max. Then contact resistance and insulation resistance shall be measured.

Test Method: EIA-RS-364-56

**COMPONENT SPECIFICATION**  
**M402 SERIES CONNECTORS (continued)**

**APPENDIX 1 - TEST METHODS AND PERFORMANCE – M402 (continued).**

**A1.4. ENVIRONMENTAL (continued).**

A1.4.4. Hydrogen Sulphide (H<sub>2</sub>S) Resistance.

Requirement: No damage, contact resistance = 150mΩ max.

Procedure: Bath temperature = +40±2°C, gas concentration = 3±1ppm, humidity = 75-80% RH, duration = 48 hours.

A1.4.5. Temperature Life (Heat Ageing).

Requirement: No damage, contact resistance = 180mΩ max.

Procedure: The specimens shall be subjected to a temperature of +105±2°C for 96 hours, and then placed in ambient temperature for more than 3 hours.

Test Method: MIL-STD-1344A, Method 1005.1.

A1.4.6. Resistance to Cold.

Requirement: No damage, contact resistance = 180mΩ max.

Procedure: The specimens shall be subjected to a temperature of -55±2°C for 96 hours, and then placed in ambient temperature for more than 3 hours.

Test Method: MIL-STD-1344A, Method 1005.1.

A1.4.7. Humidity.

Requirement: No damage, contact resistance = 180mΩ max.

Procedure: The specimens shall be placed in a chamber and subjected to a relative humidity of 90-95% and a temperature of +40±5°C for 120 hours, then placed in ambient temperature for more than 1 hour.

Test Method: EIA-RS-364-31A

A1.4.8. Salt Spray.

Requirement: No damage, contact resistance = 180mΩ max.

Procedure: The specimens shall be subjected to a salt water spray (concentration = 5%) at a temperature of +35±2°C for 24 hours, then placed in ambient temperature for more than 1 hour.

Test Method: EIA-RS-364-26A

**COMPONENT SPECIFICATION**  
**M402 SERIES CONNECTORS (continued)**

**APPENDIX 2 - TEST METHODS AND PERFORMANCE –M402V.**

**A2.1. TEST SEQUENCE AND GROUPING.**

	Test	Test Group										
		A	B	C	D	E	F	G	H	I	J	K
1	Examination of product	1, 9	1, 9	1, 5	1, 5	1, 5	1, 4	1, 5	1, 3	1, 3	1, 5	
2	Contact Resistance	2, 6	2, 5	2, 4	2, 4	2, 4		2, 4			2, 4	
3	Insulation Resistance	3, 7										
4	Dielectric Withstanding Voltage	4, 8										
5	Insertion and Withdrawal Force		3									
6	Contact Retention Force											1
7	Durability		4									
8	Vibration			3								
9	Heat Resistance				3							
10	Cold Resistance					3						
11	Humidity		5									
12	Solderability						3		2			
13	Resistance to Soldering Heat									2		
14	Steam Ageing						2					
15	Salt Spray							3				
16	Temperature Cycling										3	

**A2.2. ELECTRICAL.**

A2.2.1. Contact Resistance.

Requirement: 50mΩ max

Current: 100mA max

Voltage: 20mV max

Test Method: MIL-STD-202F, Method 303

A2.2.2. Insulation Resistance.

Requirement: 500MΩ min (initial), 100MΩ min (after conditioning)

Voltage: 100V AC

Duration: 1 minute

Test Method: MIL-STD-202, Method 302

A2.2.3. Dielectric Withstanding Voltage.

Requirement: No breakdown

Voltage: 200V AC

Duration: 1 minute

Test Method: MIL-STD-202, Method 301

**A2.3. MECHANICAL.**

A2.3.1. Insertion and Withdrawal Forces.

Requirement: Insertion force = 90gf max per pin, Withdrawal force = 10gf min per pin

Speed: 25±3mm per minute

Test Method: MIL-STD-1344A, Method 2016

A2.3.2. Contact Retention Force.

Requirement: 500gf min per pin.

Speed: 25±3mm per minute

**COMPONENT SPECIFICATION**  
**M402 SERIES CONNECTORS (continued)**

**APPENDIX 2 - TEST METHODS AND PERFORMANCE –M402V (continued).**

**A2.3. MECHANICAL (continued).**

A2.3.3. Durability.

Requirement: Contact resistance (initial) = 50mΩ max, contact resistance (after conditioning) = 70mΩ max

Procedure: The contacts of the connector are subjected to 50 cycles of mating and unmating.

**A2.4. ENVIRONMENTAL.**

A2.4.1. Vibration.

Requirement: No damage, contact resistance = 70mΩ max, discontinuity = 1μs max

Amplitude: 1.5mm

Frequency: 10 to 55 to 10Hz in 1 minute

Duration: 2 hours in each X, Y and Z axis, 6 hours total

Current: 100mA

Test Method: MIL-STD-202F, Method 201

A2.4.2. Heat Resistance.

Requirement: No damage, contact resistance = 70mΩ max

Temperature: +80±2°C

Duration: 96 hours

Test Method: MIL-STD-202, Method 108

A2.4.3. Cold Resistance.

Requirement: No damage, contact resistance = 70mΩ max

Temperature: -40±2°C

Duration: 96 hours

Test Method: JIS C60068-2-1

A2.4.4. Humidity.

Requirement: No damage, contact resistance = 70mΩ max, insulation resistance = 100MΩ min, dielectric withstanding voltage as B.2.3.

Temperature: +40±2°C

Relative Humidity: 90-95%

Duration: 96 hours

Test Method: MIL-STD-202F, Method 103

A2.4.5. Solderability.

Requirement: Solder Flux, 95% of immersed area must show no voids or pin holes

Solder Time: 3±0.5 seconds

Solder Temperature: +235±5°C

Test Method: MIL-STD-202F, Method 208

A2.4.6. Resistance to Solder Heat.

Requirement: No damage

Solder Time: 10±0.5 seconds

Solder Temperature: +260±5°C

Test Method: MIL-STD-202F, Method 210A

**COMPONENT SPECIFICATION**  
**M402 SERIES CONNECTORS (continued)**

**APPENDIX 2 - TEST METHODS AND PERFORMANCE –M402V (continued).**

**A2.4. ENVIRONMENTAL (continued).**

A2.4.7. Steam Ageing.

Requirement: No damage, Solder Flux, 95% of immersed area must show no voids or pin holes

Steam Ageing Temperature:  $+98\pm 2^{\circ}\text{C}$

Duration: 8 hours

Solder Temperature:  $+235\pm 5^{\circ}\text{C}$

Solder Time:  $3\pm 0.5$  seconds

Test Method: MIL-STD-202F, Method 208

A2.4.8. Salt Spray.

Requirement: No damage, contact resistance =  $70\text{m}\Omega$  max

Chamber Temperature:  $+35\pm 2^{\circ}\text{C}$

Air Tank Temperature:  $+47\pm 1^{\circ}\text{C}$

Salt Solution:  $5\pm 0.5\%$

Duration: 48 hours

Test Method: MIL-STD-202F, Method 101D

A2.4.9. Temperature Cycling.

Requirement: No damage, contact resistance =  $70\text{m}\Omega$  max

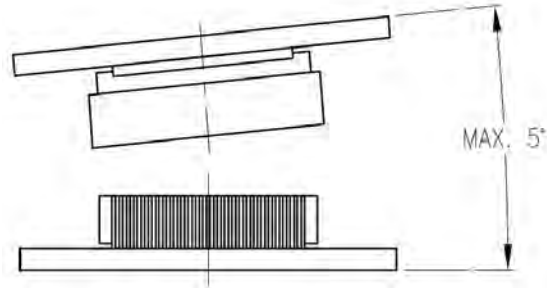
Procedure: 5 cycles of:  $-55\pm 3^{\circ}\text{C}$  for 30 minutes;  $+25\pm 3^{\circ}\text{C}$  for 30 minutes;  $+85\pm 2^{\circ}\text{C}$  for 30 minutes

Test Method: JIS C0025

**COMPONENT SPECIFICATION**  
**M402 SERIES CONNECTORS (continued)**

**APPENDIX 3 – HANDLING ADVICE.**

- a) Under all possible conditions, connectors should be mated or unmated parallel to the mating connector.
- b) During mating, please do not exert heavy force if you encounter resistance. Both halves should be guided during mating.
- c) Mating done obliquely should only be carried out at a maximum of 5°:



- d) When unmating, please do not separate connectors at a slanted position. The connectors should be separated parallel to each other:

