

2M Series Performance Specifications

Materials and Finishes



PERFORMANCE SPECIFICATIONS

Current Rating (Maximum)	Size #23 contact: 5 AMPS. Size #20 contact: 7.5 AMPS. Size #16 contact: 13 AMPS. Size #12 contact: 23 AMPS.
Test Voltage (Dielectric Withstanding Voltage) Mated Connectors	Size #23 contacts: 750 VAC RMS sea level, 400 VAC RMS 40,000 feet Size #20 contacts: 1800 VAC RMS sea level, 400 VAC RMS 40,000 feet Size #20HD contacts: 1000 VAC RMS sea level, 400 VAC RMS 40,000 feet Size #16 contacts: 1800 VAC RMS sea level, 1000 VAC RMS 40,000 feet Size #12 contacts: 1800 VAC RMS sea level, 1000 VAC RMS 40,000 feet
Insulation Resistance	5000 megohms minimum
Contact Resistance	Size #23 contact: 73 millivolt drop at 5 AMPS. test current Size #20 contact: 55 millivolt drop at 7.5 AMPS. test current Size #16 contact: 49 millivolt drop at 13 AMPS. test current Size #12 contact: 42 millivolt drop at 23 AMPS. test current
Operating Temperature	-65° C. to +150° C.
Immersion, Mated	1 meter water immersion for 1 hour (2M803 Series splash proof only)
Magnetic Permeability	2.0 μ maximum

MATERIALS AND FINISHES

Aluminum Shell, Barrel, and Coupling Nut	Aluminum alloy 6061 T6
Stainless Steel Shell, Barrel Coupling Nut	Passivated Stainless Steel, 200° C
Front and Rear Inserts	Polyphenylene Sulfide (PPS)
Contact Retention Clip	Beryllium copper, heat-treated
Grommet, Peripheral Seal and Interfacial Seal	Fluorosilicone Rubber
Contacts	Gold Plated Copper alloy
Socket Contact Hood	Passivated Stainless steel
Adhesives	Various Epoxies & RTV's
Potting Compound, PCB and Solder Cup Versions	High Strength Epoxy

Please refer to the comprehensive 2M Series Product Specification for additional parameters and test methods. Filter and Hermetic designs have different specifications. (Please refer to individual sections)

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DESCRIPTION	REQUIREMENT	PROCEDURE																											
ELECTRICAL																													
Contact resistance	SAE AS39029 Table V <table border="1"> <thead> <tr> <th>Wire Size</th> <th>Test Current</th> <th>Max Voltage Drop</th> </tr> </thead> <tbody> <tr><td>12</td><td>23</td><td>42</td></tr> <tr><td>14</td><td>17</td><td>40</td></tr> <tr><td>16</td><td>13</td><td>49</td></tr> <tr><td>20</td><td>7.5</td><td>55</td></tr> <tr><td>22</td><td>5</td><td>73</td></tr> <tr><td>24</td><td>3</td><td>45</td></tr> <tr><td>26</td><td>2</td><td>52</td></tr> <tr><td>28</td><td>1.5</td><td>54</td></tr> </tbody> </table>	Wire Size	Test Current	Max Voltage Drop	12	23	42	14	17	40	16	13	49	20	7.5	55	22	5	73	24	3	45	26	2	52	28	1.5	54	EIA-364-06 Test current in amperes. Voltage drop in millivolts. Silver-coated copper wire, +25°C.
Wire Size	Test Current	Max Voltage Drop																											
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Low level contact resistance	<table border="1"> <thead> <tr> <th>Wire Size</th> <th>Max. Milliohms</th> </tr> </thead> <tbody> <tr><td>16</td><td>5</td></tr> <tr><td>20</td><td>9</td></tr> <tr><td>22</td><td>15</td></tr> <tr><td>24</td><td>20</td></tr> <tr><td>26</td><td>31</td></tr> <tr><td>28</td><td>50</td></tr> </tbody> </table>	Wire Size	Max. Milliohms	16	5	20	9	22	15	24	20	26	31	28	50	EIA-364-23 100 milliamperes maximum and 20 millivolts maximum open circuit voltage													
Wire Size	Max. Milliohms																												
16	5																												
20	9																												
22	15																												
24	20																												
26	31																												
28	50																												
Insulation resistance	5000 megohms minimum	EIA-364-21 500 volts DC ± 50 volts. Test between adjacent contacts and contacts to shell.																											
Dielectric withstanding voltage, sea level	No breakdown or flashover #23 contacts 500 volts #20HD contacts 750 volts #16 contacts 1800 volts #12 contacts 1800 volts	EIA-364-20 AC RMS 60 Hz. One minute dwell. Unmated or mated																											
Dielectric withstanding voltage, 40,000 feet altitude	No breakdown or flashover #23 contacts 100 volts #20HD contacts 150 volts #16 contacts 1000 volts #12 contacts 1000 volts	EIA-364-20 AC RMS 60 Hz. One minute dwell. mated condition																											
Current carrying capacity	<table border="1"> <thead> <tr> <th>Contact Size</th> <th>Max Current</th> </tr> </thead> <tbody> <tr><td>12</td><td>23</td></tr> <tr><td>16</td><td>13</td></tr> <tr><td>20</td><td>7.5</td></tr> <tr><td>23</td><td>5</td></tr> </tbody> </table>	Contact Size	Max Current	12	23	16	13	20	7.5	23	5	EIA-364-70 Method 1																	
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Shell-to-shell conductivity, Initial	<p>The maximum voltage drop across a mated pair shall not exceed the values shown.</p> <table border="1"> <thead> <tr> <th>Series</th> <th>Voltage Drop</th> </tr> </thead> <tbody> <tr> <td>2M801</td> <td>2.5</td> </tr> <tr> <td>2M803</td> <td>100</td> </tr> <tr> <td>2M804</td> <td>2</td> </tr> <tr> <td>2M805</td> <td>2</td> </tr> </tbody> </table>	Series	Voltage Drop	2M801	2.5	2M803	100	2M804	2	2M805	2	EIA-364-83 Electroless Nickel Plated Connectors																					
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2M801	2.5																																
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Shell-to-shell conductivity, after conditioning (48 hours salt spray)	<p>The maximum voltage drop across a mated pair shall not exceed the values shown.</p> <table border="1"> <thead> <tr> <th>Series</th> <th>Voltage Drop</th> </tr> </thead> <tbody> <tr> <td>2M801</td> <td>2.5</td> </tr> <tr> <td>2M803</td> <td>200</td> </tr> <tr> <td>2M804</td> <td>4</td> </tr> <tr> <td>2M805</td> <td>2</td> </tr> </tbody> </table>	Series	Voltage Drop	2M801	2.5	2M803	200	2M804	4	2M805	2	EIA-364-83 Electroless Nickel Plated Connectors																					
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Shielding effectiveness, low frequency (100MHz-1000 MHz)	<table border="1"> <thead> <tr> <th rowspan="2">Frequency</th> <th colspan="3">dB Min. Attenuation</th> </tr> <tr> <th>Series 2M801</th> <th>Series 2M803</th> <th>Series 2M804, 2M805</th> </tr> </thead> <tbody> <tr> <td>100 MHz</td> <td>75</td> <td>60</td> <td>90</td> </tr> <tr> <td>200 MHz</td> <td>70</td> <td>55</td> <td>88</td> </tr> <tr> <td>300 MHz</td> <td>65</td> <td>55</td> <td>88</td> </tr> <tr> <td>400 MHz</td> <td>63</td> <td>50</td> <td>87</td> </tr> <tr> <td>800 MHz</td> <td>58</td> <td>45</td> <td>85</td> </tr> <tr> <td>1000 MHz</td> <td>55</td> <td>40</td> <td>85</td> </tr> </tbody> </table>	Frequency	dB Min. Attenuation			Series 2M801	Series 2M803	Series 2M804, 2M805	100 MHz	75	60	90	200 MHz	70	55	88	300 MHz	65	55	88	400 MHz	63	50	87	800 MHz	58	45	85	1000 MHz	55	40	85	EIA-364-21 Electroless Nickel Plated Connectors
Frequency	dB Min. Attenuation																																
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100 MHz	75	60	90																														
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Shielding effectiveness, high frequency (1GHz-10GHz)	<table border="1"> <thead> <tr> <th rowspan="2">Frequency</th> <th colspan="2">dB Min. Attenuation</th> </tr> <tr> <th>Series 2M801, 2M804</th> <th>Series 2M805</th> </tr> </thead> <tbody> <tr> <td>1 GHz</td> <td>55</td> <td>85</td> </tr> <tr> <td>3 GHz</td> <td>50</td> <td>69</td> </tr> <tr> <td>5 GHz</td> <td>45</td> <td>66</td> </tr> <tr> <td>19 GHz</td> <td>40</td> <td>65</td> </tr> </tbody> </table>	Frequency	dB Min. Attenuation		Series 2M801, 2M804	Series 2M805	1 GHz	55	85	3 GHz	50	69	5 GHz	45	66	19 GHz	40	65	EIA-364-66 Electroless Nickel Plated Connectors														
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MECHANICAL		
Vibration, Sine	No discontinuity of greater than 1 microsecond, no cracking, breaking or loosening of parts, plug shall not become disengaged from receptacle. Connectors shall meet electrical requirements after vibration test.	MIL-STD-202 Method 204, test Condition G 12 sweep cycles per axes, 20 min. per 10-2000-10Hz @ temp. 2M801/2M805 - 60 g 2M803/2M804 - 30 g
Vibration, Random	No discontinuity of greater than 1 microsecond, no cracking, breaking or loosening of parts, plug shall not become disengaged from receptacle. Connectors shall meet electrical requirements after vibration test.	EIA-364-28 Test Condition V Letter I 100 milliamp test current 50- 2,000 Hz @ temp. 2M801/2M805 - 43.9 g RMS 2M803/2M804 - 37.80 g RMS
Gunfire Vibration	No discontinuity of greater than 1 microsecond, no cracking, breaking or loosening of parts, plug shall not become disengaged from receptacle. Connectors shall meet electrical requirements after vibration test.	MIL-STD-810F Method 519.5
Mechanical Shock	No discontinuity of greater than 1 microsecond, no cracking, breaking or loosening of parts, plug shall not become disengaged from receptacle. Connectors shall meet electrical requirements after shock test.	EIA-364-27 Condition D 300 G, halvesine, 3ms, 3 axes
Mechanical durability, at ambient temperature	No deterioration which will adversely affect the connector after 2000 cycles (where applicable) of mating and unmating. Connectors shall meet contact resistance, insulation resistance, shell-to-shell resistance, DWV, and mating and unmating force.	EIA-364-09
Solderability, PC tail contacts	95% solder coverage. Smooth, bright and even finish.	EIA-364-52 Category 3 8 hours steam aging prior to test 245° C, 4-5 sec. dwell 10X magnification
Resistance To Soldering Heat	No damage to connector. Connectors shall meet insulation resistance and waterproof sealing requirements.	EIA-364-56 260° C, 10 seconds (PC tail)

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Impact	No impairment of function. Connector shall meet contact resistance, insulation resistance and waterproof sealing.	EIA-364-42 1 meter 8 drops																														
Contact retention	<table border="1"> <thead> <tr> <th>Contact Size</th> <th>Min. Pounds</th> <th>Min. Newtons</th> </tr> </thead> <tbody> <tr> <td>23</td> <td>10</td> <td>45</td> </tr> <tr> <td>20</td> <td>15</td> <td>67</td> </tr> <tr> <td>20HD</td> <td>10</td> <td>45</td> </tr> <tr> <td>16</td> <td>25</td> <td>111</td> </tr> <tr> <td>12</td> <td>25</td> <td>111</td> </tr> </tbody> </table>	Contact Size	Min. Pounds	Min. Newtons	23	10	45	20	15	67	20HD	10	45	16	25	111	12	25	111	EIA-364-29												
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Contact separation force	<table border="1"> <thead> <tr> <th>Contact Size</th> <th>Min. Ounces</th> <th>Min. Newtons</th> </tr> </thead> <tbody> <tr> <td>23</td> <td>0.5</td> <td>0.14</td> </tr> <tr> <td>20</td> <td>0.7</td> <td>0.19</td> </tr> <tr> <td>16</td> <td>2.0</td> <td>0.56</td> </tr> <tr> <td>12</td> <td>3.0</td> <td>0.83</td> </tr> </tbody> </table>	Contact Size	Min. Ounces	Min. Newtons	23	0.5	0.14	20	0.7	0.19	16	2.0	0.56	12	3.0	0.83	SAE AS39029															
Contact Size	Min. Ounces	Min. Newtons																														
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Coupling torque	<p>Threaded coupling connector coupling torque shall not exceed the following requirements.</p> <table border="1"> <thead> <tr> <th colspan="3">Shell Size</th> </tr> <tr> <th>Series 2M801</th> <th>Series 2M805</th> <th>Inch Pounds</th> </tr> </thead> <tbody> <tr> <td>5, 6, 7</td> <td>8, 9</td> <td>8</td> </tr> <tr> <td>8, 9</td> <td>10, 11</td> <td>9</td> </tr> <tr> <td>10</td> <td>12</td> <td>12</td> </tr> <tr> <td>12, 13</td> <td>15</td> <td>16</td> </tr> <tr> <td>14, 15</td> <td>18</td> <td>28</td> </tr> <tr> <td>16, 17</td> <td>19</td> <td>24</td> </tr> <tr> <td>21</td> <td></td> <td>32</td> </tr> <tr> <td></td> <td>23</td> <td>36</td> </tr> </tbody> </table>	Shell Size			Series 2M801	Series 2M805	Inch Pounds	5, 6, 7	8, 9	8	8, 9	10, 11	9	10	12	12	12, 13	15	16	14, 15	18	28	16, 17	19	24	21		32		23	36	
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Unmating force (Series 2M804)	<p>Series 2M804 push/pull connectors</p> <table border="1"> <thead> <tr> <th>Contact Arrangement</th> <th>Pounds</th> </tr> </thead> <tbody> <tr> <td>5-3</td> <td>10.6</td> </tr> <tr> <td>6-4</td> <td>10.8</td> </tr> <tr> <td>6-7</td> <td>11.4</td> </tr> <tr> <td>7-10</td> <td>12.0</td> </tr> <tr> <td>8-13</td> <td>12.6</td> </tr> <tr> <td>9-19</td> <td>13.8</td> </tr> <tr> <td>10-26</td> <td>15.2</td> </tr> <tr> <td>12-37</td> <td>17.4</td> </tr> <tr> <td>14-55</td> <td>21.0</td> </tr> </tbody> </table>	Contact Arrangement	Pounds	5-3	10.6	6-4	10.8	6-7	11.4	7-10	12.0	8-13	12.6	9-19	13.8	10-26	15.2	12-37	17.4	14-55	21.0											
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Insert retention	No impairment of function. Connector shall meet contact resistance, insulation resistance and waterproof sealing.	EIA-365-35			
	Shell Size				
	Series 2M803, 2M804		Series 2M801	Series 2M805	Min. Force in Pounds
	5		5		100
	6		6	8	100
	7		7	9	100
	8		8	10	100
	9		9	11	100
	10		10	12	100
	12		13	15	100
	14	16	18	100	
	15	17	19	100	
		21	23	100	
Magnetic Permeability	2 μ maximum.	EIA-364-54			
ENVIRONMENTAL					
Operating temperature	-65° to +150°C				
Water immersion, mated	No evidence of water penetration into mated connectors. $\geq 100\Omega$ insulation resistance.	MIL-STD-810F Method 512.4 1 meter immersion 1 hour			
Water immersion, open face panel mount receptacles with non-removable printed circuit board or solder cup contacts	Connectors with waterblock potting process. 1 X 10 ⁻⁴ cc/second maximum helium leak rate at 1 atmosphere pressure differential following thermal shock conditioning.	EIA-365-02 3 cycles thermal shock -57°C to +71°C 75 min. dwell 5 minute transfer rate			
Humidity, cyclic (damp heat, cyclic) (moisture resistance)	No deterioration which will adversely affect the connector. 100 megohms minimum insulation resistance during the final cycle. Following the recovery period, connectors shall meet contact resistance, shell-to-shell resistance and DWV requirements.	EIA-364-31 Condition B Method III 80-98% RH 10 cycles (10 days) +25° C to +65° C Step 7b vibration deleted. 24 hour recovery period.			

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21 day humidity (damp heat, long term)	No deterioration which will adversely affect the connector. Following the drying period, connectors shall meet 100 megohms minimum, contact resistance, shell-to-shell resistance, DWV, mating and unmating requirements.	EIA-364-31 Condition C Method II 90-95% RH 40° C Apply 100 volts DC during test. 4 hours drying time at ambient temperature prior to final measurements.
Thermal shock	No mechanical damage or loosening of parts. Following thermal shock, connector shall meet contact resistance, DWV, insulation resistance and shell-to-shell resistance requirements.	EIA-364-32 Test Condition IV 5 cycles consisting of -65° C 30 minutes, +25° C 5 minutes max., +150° C 30 minutes, +25° C 5 minutes max.
Corrosion (salt mist)	No exposure of base metal. Connectors shall meet DWV and contact resistance requirements following the test.	EIA-364-26 5% salt solution 35° C Unmated connectors Code C: 48 hours Code M: 48 hours Code MT: 500 hours Code NF: 500 hours Code 500 hours Code ZNU: 500 hours
Sand and dust	Mated connectors shall withstand the effects of blowing sand and dust	MIL-STD-810F, Method 510.4
Fungus	Connector materials shall be fungus inert.	MIL-STD-810F, Method 508.5
Fluid immersion	No visible damage from immersion in various fuels and oils. Connector shall meet coupling torque and dielectric withstanding voltage requirements.	EIA-364-10 Unmated connectors
Altitude immersion	No evidence of moisture on connector interface or contacts. Connector shall meet dielectric withstanding voltage.	EIA-364-03

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