

# Amphenol

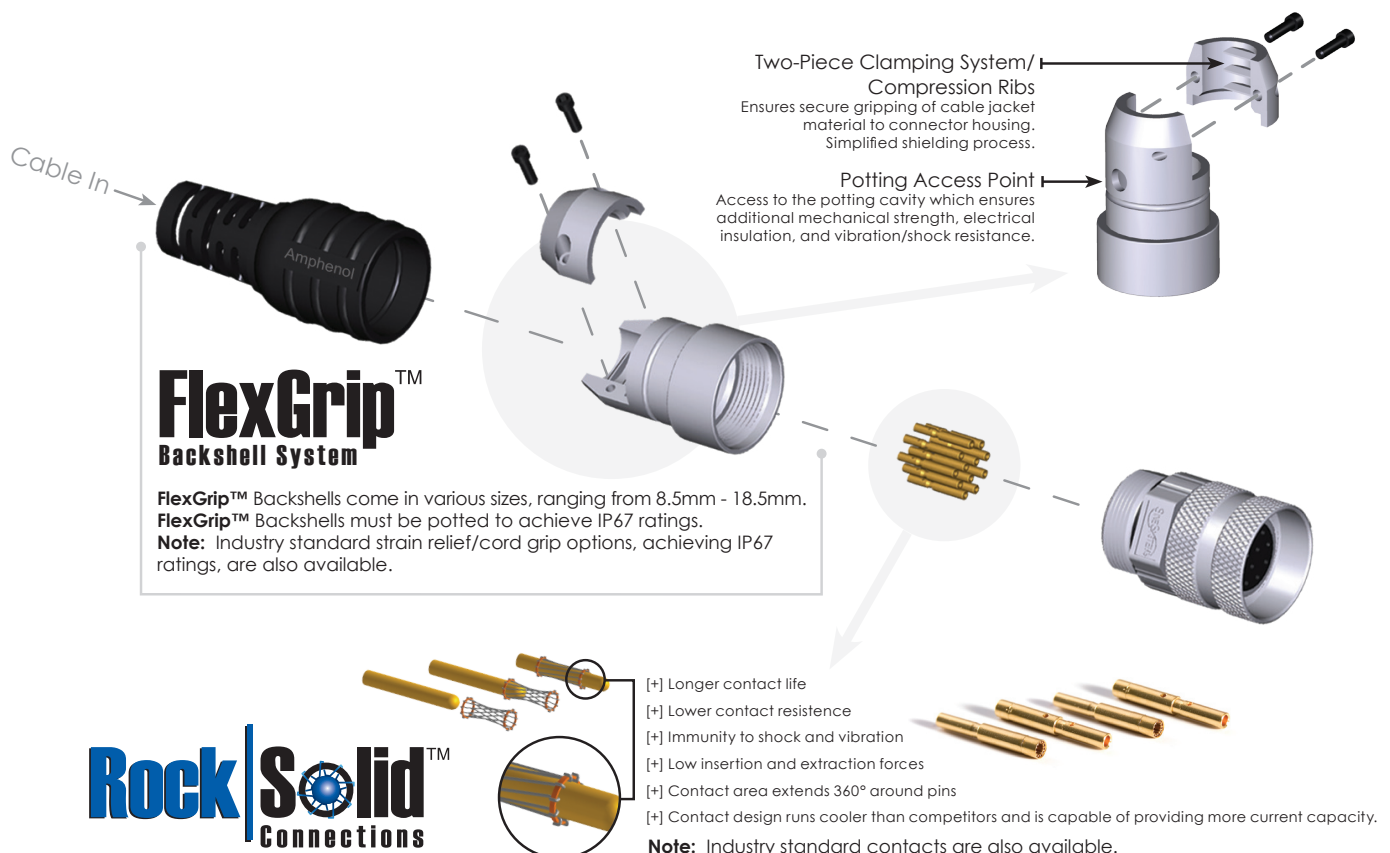
SINE SYSTEMS

## MotionGrade™ M23 and M40

Circular DIN Connectors & Cables



MotionGrade™ M23 Connectors are designed to excel in performance and reliability in our customers' most demanding environments. Our innovations and experience as an industry leader in connector technology and total interconnect solutions allow us to offer such additional features as our FlexGrip™ Backshell System and RockSolid™ Contacts. These features combined with a simplistic design approach reduce initial procurement and assembly cost, while ensuring compatibility to all other existing standard layouts. Amphenol's MotionGrade™ M23 products are ideally suited for advanced servo drive encoder feedback applications, packaging, robotic, printing, machine tool, medical and automation environments where control signal transmission or power are required in a robust and compact delivery system.



# Amphenol vs. Intercontec

## GENERAL SPECIFICATIONS

Technical Data for  
Standard Signal  
Circular Connectors

	A Series 12, 16 and 17 Position 1.0mm Contacts Only		B Series 6, 8 and 9 Position 1.0mm Contacts 2.0mm Contacts		C Series 6 and 8 Position 2.0mm Contacts 3.6mm Contacts	
	Amphenol	Intercontec	Amphenol	Intercontec	Amphenol	Intercontec
Operating Temperature	-20 °C to +130°C	-20 °C to +130°C	-20 °C to +130°C	-20 °C to +130°C	-20 °C to +130°C	-20 °C to +130°C
Degree of Protection	IP66/67 (plugged)	IP66/67 (plugged)	IP66/67 (plugged)	IP66/67 (plugged)	IP66/67 (plugged)	IP66/67 (plugged)

### Electrical Data - Contacts

Maximum Current (max. wire guage)	max. 9A	max. 9A	1.0mm: max. 9A	1.0mm: max. 9A	2.0mm: max. 28A (6 contacts) max. 30A (8-/9 contacts)	2.0mm: max. 28A (6 contacts) max. 30A (8-/9 contacts)
Maximum Voltage	125V (AC/DC)	125V (AC/DC)	1.0mm: 125V (AC/DC)	1.0mm: 125V (AC/DC)	Both: 630V (AC/DC)	Both: 630V (AC/DC)
Test Voltage (between contacts)	2500V	2500V	1.0mm: 2500V	1.0mm: 2500V	Both: 6000V	Both: 6000V
Contact Resistance	<5mΩ	<5mΩ	Both: <5mΩ	Both: <5mΩ	2.0mm: <5mΩ	2.0mm: <5mΩ
Mating Cycles	>50	>50	Both: >50	Both: >50	Both: >50	Both: >50



### Data According to VDE 0110/EN61984, Part 6.19.2.2

Pollution Degree	3	3	3	3	3	3
Overvoltage Category	III	III	III	III	III	III
Max. Operating Height	-	-	-	-	2000m	2000m

### Materials

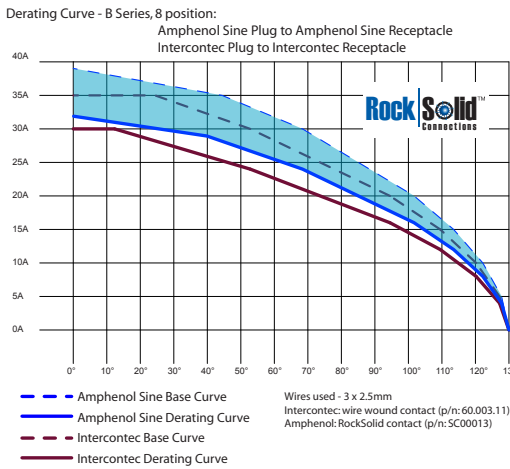
Housing	Zinc Die Cast	Zinc Die Cast/Brass (Stainless Steel Option)	Zinc Die Cast	Zinc Die Cast/Brass (Stainless Steel Option)	Zinc Die Cast	Magnesium Die Cast/ Aluminum
Connecting Nut (some designs)	Brass, Nickel-plated	Brass, Nickel-plated	Brass, Nickel-plated	Brass, Nickel-plated	Brass, Nickel-plated	Brass, Nickel-plated

## FEATURES AND BENEFITS

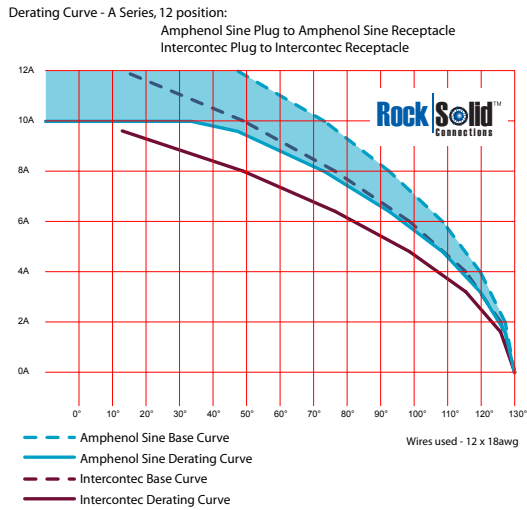
<b>Lowest Installed Cost</b>	By providing enhanced performance and advancements to existing standard systems with improvements such as our FlexGrip™ design, these cost conscious innovations will increase the reliability & performance of one of the most dependable interconnect offerings available today.
<b>Superior Shielding</b>	First quality components coupled with a simplistic design provide maximum EMI/RFI shielding capabilities while reducing assembly preparation times.
<b>Assembly/Disassembly</b>	Overall design construction allows for one step process of contact extraction versus complete connector disassembly found within other brands. An integrated contact locking system ensures ease of use and definitive contact integrity upon insertion.
<b>Cable Strain Relief</b>	Your choice of either the innovative design features of FlexGrip™ or traditional cable strain relieving similar to existing standard systems.
<b>Fluid Resistance and Sealing</b>	In combination with our strain relief systems, Amphenol utilizes advanced sealing technologies & materials to ensure highest reliability when subjected to the harshest environments.
<b>Contacts</b>	By creating a 360° mating surface around the pin, Amphenol's RockSolid™ contact offering ensures longer contact life, lower contact resistance, immunizes against shock and vibration all while maintaining low insertion and extraction forces. Additionally, industry standard contacts are also available made with gold plated surfaces and high quality Copper alloys.
<b>RoHS Compliant</b>	 All materials meet the requirements of the European Directive 2002/95/EC, Issue 13.2.2003.
<b>Add'l Approvals</b>	 ISO 9001/2000

## PERFORMANCE ANALYSIS

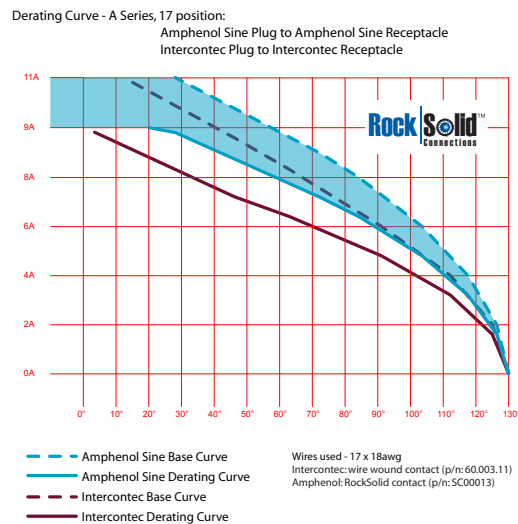
### Derating Curves - 8 pos.



### Derating Curves - 12 pos.

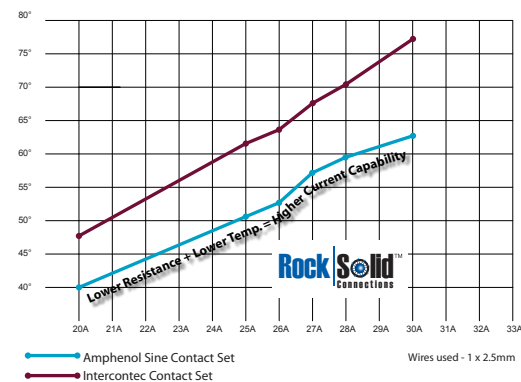


### Derating Curves - 17 pos.

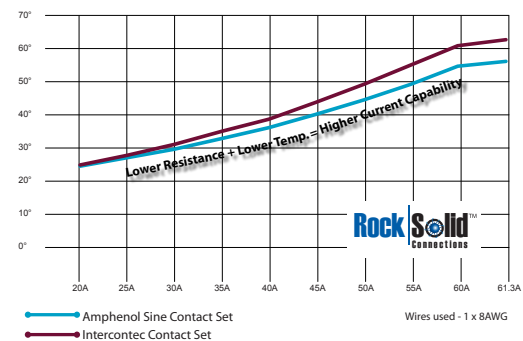


## Temperature Variance

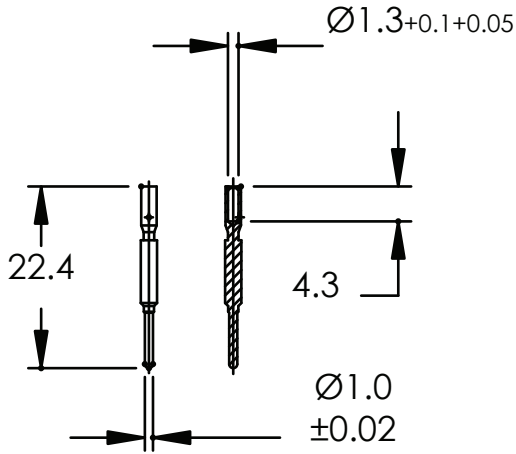
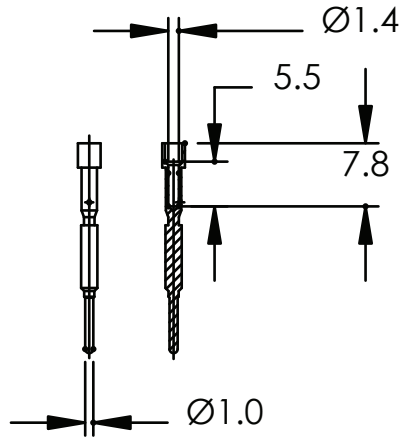
Temperature Variance of M23 2mm Power Contacts

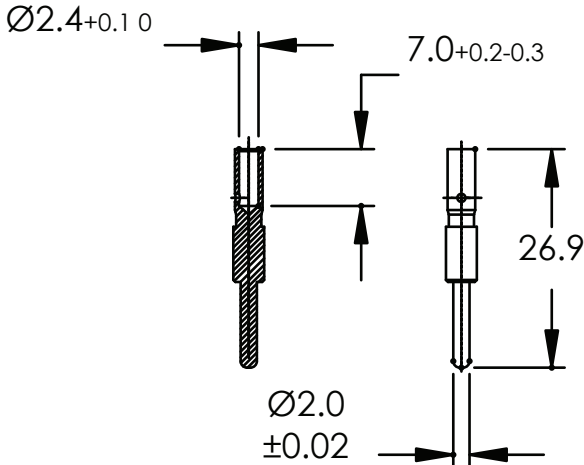
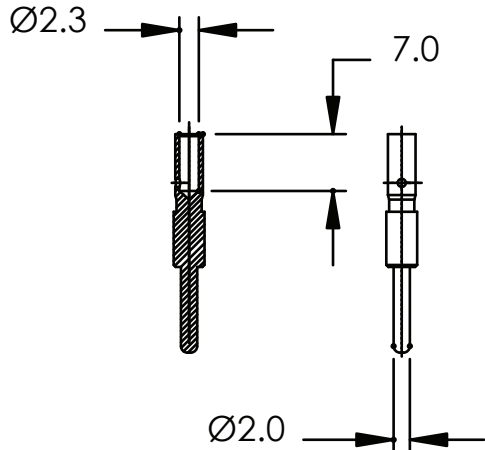


Temperature Variance of M40 3.6mm Power Contacts



## M23 TECHNICAL SPECIFICATIONS

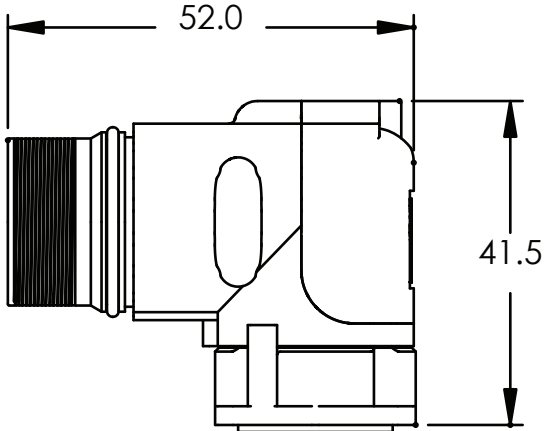
Amphenol Sine Systems		Intercontec
Ø1.0mm Contact		
Gold - 10u"	Plating	Gold
Contacts are Intermateable but not Interchangeable		
		

Amphenol Sine Systems		Intercontec
Ø2.0mm Contact		
Gold - 10u"	Plating	Gold
Contacts are Intermateable but not Interchangeable		
		

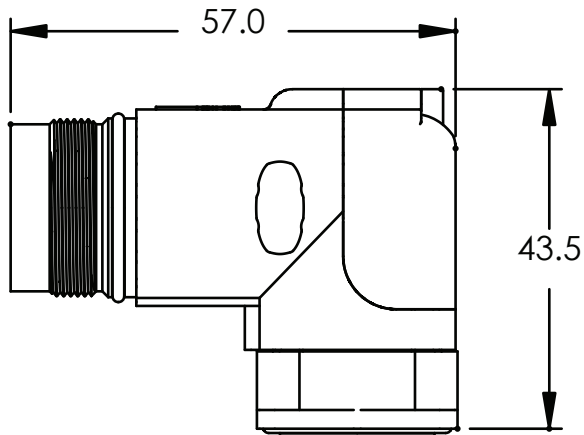
# M23 TECHNICAL SPECIFICATIONS

## Amphenol Sine Systems

### M23 A Series

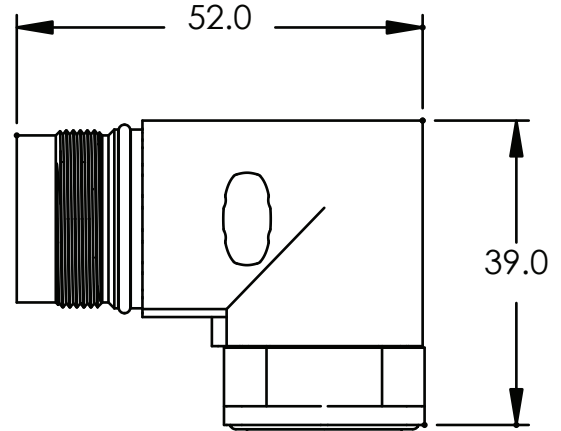


### M23 B Series

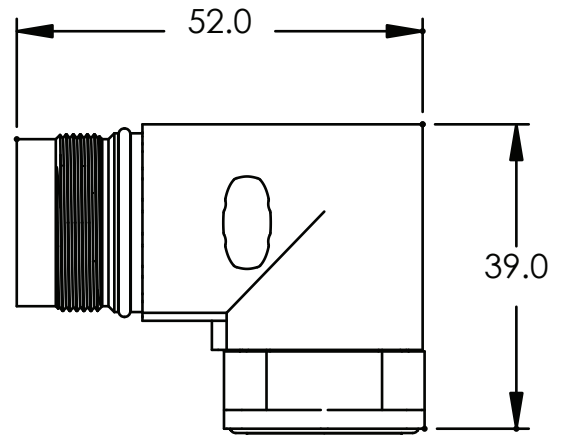


## Intercontec

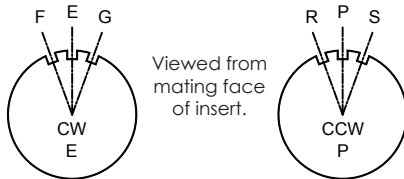
### M23 A Series



### M23 B Series



## Coding Keys



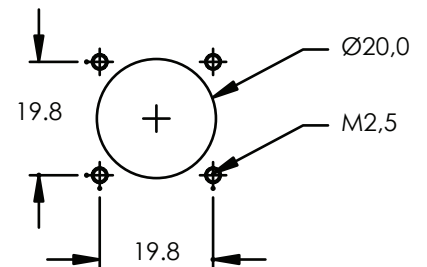
### ALL M23 A SERIES INSERTS COME WITH 3 CODING KEYS.

To order the connector with the correct insert coding, change the 6th digit in the catalog part number per the coding letter desired (see figure above).

Examples: MA1CAE1200 for "E" coding, MA1CAF1200 for "F" coding, MA1CAG1200 for "G" coding, MA1CAP1200 for "P" coding, MA1CAR1200 for "R" coding, MA1CAS1200 for "S" coding

If you are ordering an "E" type connector, coding options are only: E, F & G. Normal coding is identified as "E".

If you are ordering a "P" type connector, coding options are only: P, R & S. Normal coding is identified as "P".



### MOUNTING HOLE PATTERN:

SAME FOR M23 A & B SERIES, AMPHENOL SINE SYSTEMS & INTERCONTEC

**M23 TECHNICAL SPECIFICATIONS****Connector Temperature Rise test Results****TEST 1                      12 pin - Sine Plug to Sine Recp**

Current (A)	Temperature		
	Connector (tb)	Ambient (tu)	tb-tu
0	0	0	0
2	25.9	23.1	2.8
4	35	24.8	10.2
6	48.7	27.3	21.4
8	68.2	30.9	37.3
10	92.5	35.8	56.7
12	124.9	42.3	82.6

**TEST 14                      12 pin - InterContec Plug to InterContec Recp**

Current (A)	Temperature		
	Connector (tb)	Ambient (tu)	tb-tu
0	0	0	0
2	26.9	22.7	4.2
4	38.3	23.7	14.6
6	58.3	26.9	31.4
8	84.9	31.3	53.6
10	117.3	36.3	81
12	161.8	44.7	117.1

**TEST 3                      17 pin - Sine Plug to Sine Recp**

Current (A)	Temperature		
	Connector (tb)	Ambient (tu)	tb-tu
0	0	0	0
2	27.1	23.5	3.6
4	37.7	25.3	12.4
6	55	28.6	26.4
8	78.8	33.1	45.7
9	93.8	36.1	57.7

**TEST 15                      17 pin - InterContec Plug to InterContec Recp**

Current (A)	Temperature		
	Connector (tb)	Ambient (tu)	tb-tu
0	0	0	0
2	28.2	23.2	5
4	42.8	25	17.8
6	68.5	29.6	38.9
8	103	36	67
9	123.6	39.9	83.7

**TEST 10                      9 pin - Sine Plug to Sine Recp**

Current (A)	Temperature		
	Connector (tb)	Ambient (tu)	tb-tu
0	25	23.1	1.9
5	24.9	22.8	2.1
10	31	23.7	7.3
15	41	25.4	15.6
20	55.5	28.3	27.2
30	96.5	35.7	60.8
35	125.2	41.4	83.8

**TEST 13                      9 pin - InterContec Plug to InterContec Recp**

Current (A)	Temperature		
	Connector (tb)	Ambient (tu)	tb-tu
0	21.6	21.6	0
5	24	22.3	1.7
10	31	23.4	7.6
15	44.1	25.1	19
20	59.1	26.8	32.3
30	103.5	33.7	69.8
35	131.6	38.5	93.1

Operating Temperature

Degree Of Protection

Maximum Voltage

Maximum Current

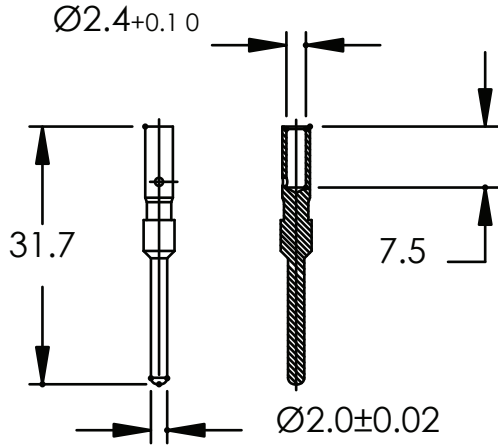
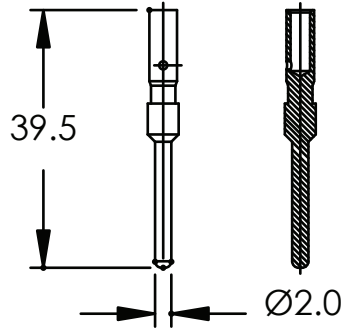
Contact Resistance

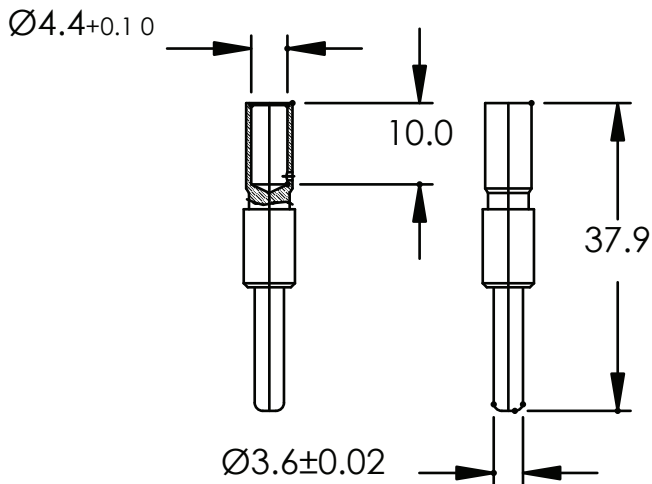
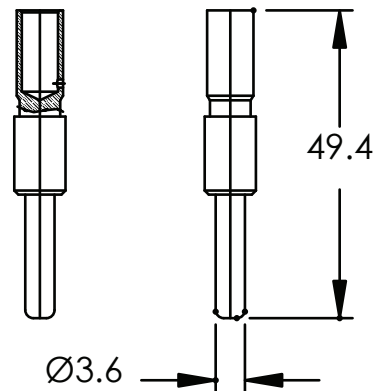
Mating Cycles

Pollution Degree

**Amphenol and Intercontec**  
are  
Equivalent.

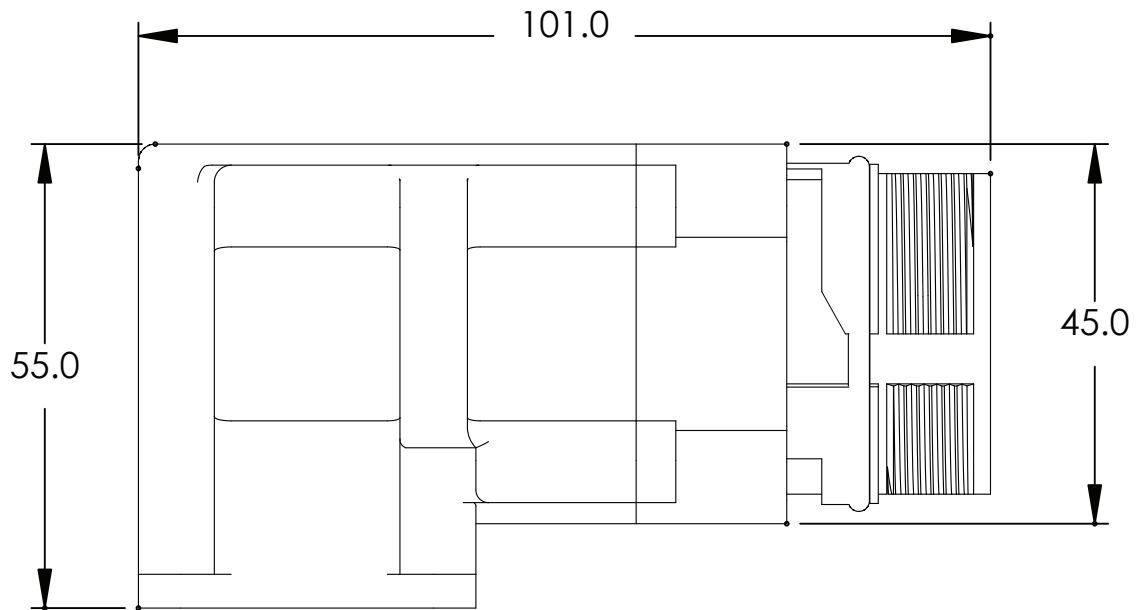
## M40 TECHNICAL SPECIFICATIONS

Amphenol Sine Systems		Intercontec
Ø2.0mm Contact (M40)		
Gold - 10u"	Plating	Gold
Contacts are Intermateable but not Interchangeable		
		

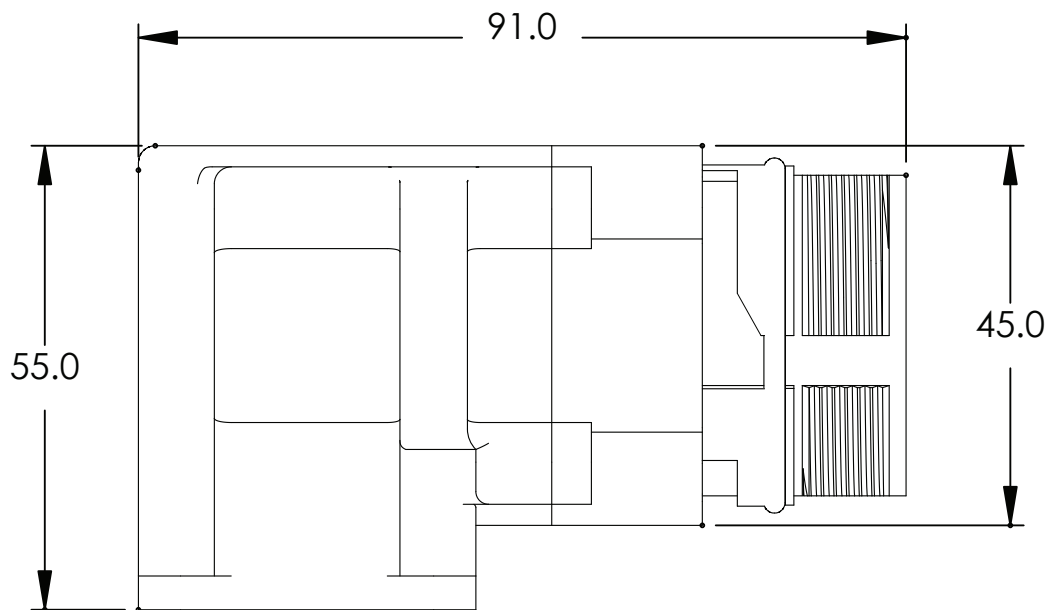
Amphenol Sine Systems		Intercontec
Ø3.6mm Contact (M40)		
Gold - 10u"	Plating	Gold
Contacts are Intermateable but not Interchangeable		
		

**M40 TECHNICAL SPECIFICATIONS****Amphenol Sine Systems**

M40 C Series

**Intercontec**

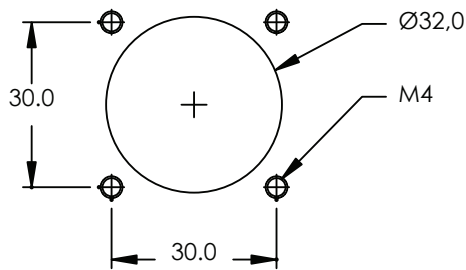
M40 C Series





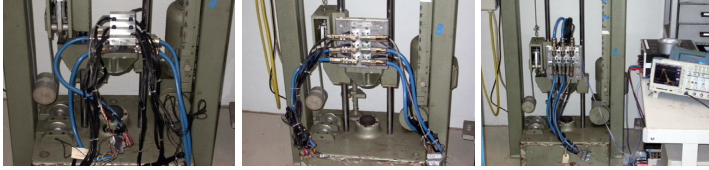
**M40 TECHNICAL SPECIFICATIONS****Contact (Ø3.6mm) Temperature Rise Test Results**

Ø3.6mm M40 Contact with 8AWG Wire	Ambient °C	3.6mm Contact Current	Amphenol Sine Systems			Intercontec			Difference
			Sine °C	C-UL Max Temp Target	Pass/ Fail ?	Intercontec °C	C-UL Max Temp Target	Pass/ Fail ?	
Sample 1 Test 1	22.9	20A	25.9	52.9	Pass	26.3	52.9	Pass	0.4
	22.9	25A	28.1	52.9	Pass	29	52.9	Pass	0.9
	22.9	30A	30.5	52.9	Pass	32.1	52.9	Pass	1.6
	22.9	35A	33.6	52.9	Pass	35.7	52.9	Pass	2.1
	22.9	40A	37	52.9	Pass	39.4	52.9	Pass	2.4
	22.9	45A	40.5	52.9	Pass	44.2	52.9	Pass	3.7
	22.9	50A	44.8	52.9	Pass	49.4	52.9	Pass	4.6
	22.9	55A	49.1	52.9	Pass	54.6	52.9	Fail	5.5
	22.9	60A	54.3	52.9	Fail	60.2	52.9	Fail	5.9
	22.9	61.3A	55.6	52.9	Fail	62	52.9	Fail	6.4

**MOUNTING HOLE PATTERN:**

SAME FOR M40 C SERIES,  
AMPHENOL SINE SYSTEMS  
& INTERCONTEC

### 3RD PARTY PRODUCT TESTING



#### Shock Test #1

This test is conducted for the purpose of determining the suitability of connectors and connector assemblies when subjected to shocks such as those that may be expected as a result of rough handling, transportation and operational conditions. This test differs from other shock tests in that the design of the shock machine is not specified, but the half-sine and sawtooth shock pulse waveforms are specified with tolerances. The frequency response of the measuring systems is also specified with tolerances.

##### Products Tested:

**8 pos. Plug** (MB1CKN0800), **RockSolid™ Contacts** (SC000013, 14) and **FlexGrip™ Strain Relief** (MB4FSR-B10.3)

##### Test Requirement:

Standard: GJB1217-2004 (China) / EIA-364-27B Condition A (USA)

##### Test Method A: Shock

Sample condition: Connectors in normal conditions before testing.  
 Pulse Shape: Half Sine  
 Peak Acceleration: 49g  
 Pulse Duration: 11ms  
 Shock Direction:  $\pm X$ ,  $\pm Y$  and  $\pm Z$  axis  
 Number of Shocks: 3X in each direction, (18 times total)

**Test Result:** No intermittent disconnection occurred during the test.

**Test Conclusion:** Pass

#### Shock Test #2

This test is conducted for the purpose of determining the suitability of connectors and connector assemblies when subjected to shocks such as those that may be expected as a result of rough handling, transportation and operational conditions. This test differs from other shock tests in that the design of the shock machine is not specified, but the half-sine and sawtooth shock pulse waveforms are specified with tolerances. The frequency response of the measuring systems is also specified with tolerances.

##### Products Tested:

**12 pos. Mated Set** (Plug: MA1CAE1200 w/ RockSolid™ Contacts and Recept: MA1RAE1200);  
**17 pos. Mated Set** (Plug: MA1CAE1700 w/ RockSolid™ Contacts and Recept: MA1RAE1700);  
**8 pos. Mated Set** (Plug: MB1CKN0800 w/ RockSolid™ Contacts and Recept: MB1RJN0800)

**12 pos. Mated Set** (Plug: ASTA021FR01610035000 and Recept: EGA052MR04000012000);  
**17 pos. Mated Set** (Plug: ASTA035FR01610035000 and Recept: EGA113MR04000012000);  
**8 pos. Mated Set** (Plug: BSTA078FR05580047000 and Recept: BEDC089MR13000005000)

##### Test Requirement:

According to the standard: MIL-STD202G, Test Condition A/IEC 60068-2-28 Eb

##### Test Condition: Shock

Pulse Shape: Half sine  
 Acceleration: 50g  
 Pulse Duration: 11ms  
 Shock Direction:  $\pm X$ ,  $\pm Y$  and  $\pm Z$  axis  
 Number of Shocks: 3X in each direction, (18 times total)

**Test Result:** No discontinuity > 1  $\mu$  sec.  
 No locking or unmating  
 No loose parts.

**Test Conclusion:** Pass

#### Sinusoidal Vibration Test #1

This standard test procedure details a method to assess the ability of electrical connector components to withstand specified severities of vibration. The object of this test is to determine the effects of vibration within the predominant or random vibration frequency ranges and magnitudes that may be encountered during the life of the connector.

##### Products Tested:

**12 pos. Plug** (MA1CAE1200), **RockSolid™ Contacts** (SC000013) and **FlexGrip™ Strain Relief** (MAFSR-A12.8)

##### Test Requirement and Acceptance Criteria:

Standard: GJB1217-2005 (China) / EIA-364-28D Method IV (USA)

##### Test Method IV: Vibration

**Sample condition:** Connectors in normal conditions before testing.  
 (Ambient Temp: 23°C to 24°C; Relative Humidity: 53% to 62%)

Sweep Frequency: (10~55~2000) Hz  
 Amplitude: 1.5mm at (10~55) Hz  
 Acceleration: 19.6g at (55~2000) Hz  
 Vibration Axis: X, Y AND Z axis  
 Test Time: 4 hour / axis  
 Sweep Rate: 1 oct/min

**Test Result:** No intermittent disconnection occurred during the test.

**Test Conclusion:** Pass

#### Sinusoidal Vibration Test #2

This standard test procedure details a method to assess the ability of electrical connector components to withstand specified severities of vibration. The object of this test is to determine the effects of vibration within the predominant or random vibration frequency ranges and magnitudes that may be encountered during the life of the connector.

##### Products Tested:

**12 pos. Mated Set** (Plug: MA1CAE1200 w/ RockSolid™ Contacts and Recept: MA1RAE1200)  
**17 pos. Mated Set** (Plug: MA1CAE1700 w/ RockSolid™ Contacts and Recept: MA1RAE1700)  
**8 pos. Mated Set** (Plug: MB1CKN0800 w/ RockSolid™ Contacts and Recept: MB1RJN0800)

**12 pos. Mated Set** (Plug: ASTA021FR01610035000 and Recept: AEGA052MR04000012000)  
**17 pos. Mated Set** (Plug: ASTA035FR01610035000 and Recept: AEGA113MR04000012000)  
**8 pos. Mated Set** (Plug: BSTA078FR05580047000 and Recept: BEDC089MR13000005000)

##### Test Requirement and Acceptance Criteria: Standard: IEC 60068-2-6 Fc

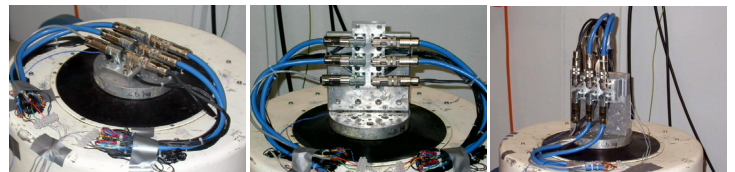
Test Condition: Vibration, Endurance (sine)

Frequency: (10~2000~10) Hz  
 Double Amplitude: 0.060 in.  
 Acceleration: 20g  
 Linearly Sweep: 12 sweeps @ 20 min.  
 (4 hours per axis)

Vibration Axis: X, Y AND Z axis

**Test Result:** No discontinuity > 1  $\mu$  sec.

**Test Conclusion:** Pass



Kate Wilton, Program Development Manager

Direct: 1.863.676.9416, Ext. 420 / Toll Free: 1.800.394.7732 Ext. 8668

kate@sineco.com

Amphenol Sine Systems . 44724 Morley Drive . Clinton Township, MI . 48036 . USA . [www.sineco.com](http://www.sineco.com)