# HYPERBOLOID CONNECTORS

**FOR SUPERIOR PERFORMANCE IN ALL APPLICATIONS**

**IEH CORPORATION ISO 9001:2000 SMALL BUSINESS-HUB-ZONE CERTIFIED**

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The HYPERBOLOID contact is an advanced design that satisfies performance requirements previously considered impossible. Radically different in concept, it is used in connectors having the highest standards of performance. The distinguishing feature of the HYPERBOLOID socket is the hyper-boloid-shaped sleeve formed by straight wires strung at an angle to the longitudinal axis. Viewed from the side, you see a curve defined by a series of apparent short straight line segments which are tangent lines to points along a hyperbolic curve. This geometry provides for a design which has a decreasing circumscribed circle when viewed from the entry. It begins larger than the pin acceptance diameter and is less than this same diameter at the center. When the pin is inserted into this sleeve, the wires stretch, well within elastic limits, to accommodate it. In so doing, the wires wrap themselves around the pin providing a number of continuous line contact paths. The illustration below will assist in visualization.

The actual physical construction of the contact involves several components. The wires are strung on an internal wire carrier (inner sleeve) which is subsequently capped or enclosed by a front outer ring (front sleeve) and rear ring which includes the termination configuration (terminal). All components to the assembly are completely finished with the specified electroplating prior to assembly. The wires are continuous process plated on reel before use. In this manner, interface finish requirements can be controlled very closely without the common problems of gradient, shadow, or other finish imperfections often appearing in alternative designs. Very often, this processing feature permits the specifier to reduce precious metal content with resultant savings. Joints are calculated interference fits, insuring gas tight interfaces between all elements of the HYPERBOLOID construction. An exploded view is provided next.

The unique geometry, precision processing, and careful attention to quality result in a highly desirable contact design which provides:

- **VLIF (Very Low Insertion Force):** Common sizes #22 and less average under one ounce per contact.
- **Extraordinary Resistance to Shock & Vibration:** Tests exceeding 300 g's without discontinuity.
- **Duty Cycle Exceeding 100,000 Mate/Demate:** The burnishing action of the wires on the pin surface is non-destructive. Unlike the "plow" and scrape action of common designs, HYPERBOLOID's gentle mating action enhances life.
- **Low, Low Contact Resistance:** The multiplicity of line contact, as opposed to point contact in other designs, provides an excellent interface exhibiting low contact resistance (often less than 1/2 of MIL spec. allowances). This characteristic also provides for a cooler running contact under load.
- **Improved Current Carrying Capacity:** The low contact resistance gives a lower °C rise from ambient under load. This feature often allows the user to operate the same size contact under higher load.
- **Highest Reliability:** In use for over 40 years under the most demanding conditions HYPERBOLOID has proven itself to be the leading design for integrity and reliability. On space platforms, ships and boats at sea, land vehicles, fighter and transport aircraft, missiles, torpedoes, medical and transplant electronics, industrial and environmental controls, rail, construction, ATE and test equipment, PGA sockets, test interface stations, and other applications, HYPERBOLOID has lived up to its promise of the highest reliability connector available.

# SPECIFICATIONS

## MATERIALS:

| | |
|---|---|
| Pin Contacts: | Brass per ASTM B16, B121, B453, B455 |
| Diameter: | 0.018” |
| Socket Contacts: | |
| Contact Wires: | BeCu PER ASTM B197/B197M-07, C17200 |
| Terminations & Support Elements: | Brass per ASTM B16, B121, B453, B455 |
| Hardware: | Corrosion resistant steel per ASTM A582 |
| Insulator: | |
| Pin Carrier: | GR Polyester, Disposable |
| Plug & Receptacle: | GR Polyphthalamide, V0 rated |

## FINISHES:

| | |
|---|---|
| Pin Contacts: | Gold per MIL-DTL-45204 Type II, Class 1 (.000050), Grade C over Nickel, 0.000050 min., per SAE-AMS-QQ-N-290 over Copper per SAE AMS 2418 |
| Socket Contacts: | |
| Contact Wires: | Gold per MIL-DTL-45204 Type II, Class 1 (.000050), Grade C over Nickel, 0.000050 min., per SAE-AMS-QQ-N-290 over Copper per SAE AMS 2418 |
| Terminations: | Gold per MIL-DTL-45204 Type II, Class 0.50 (.000020), Grade C over Nickel,0.000050 min., per SAE-AMS-QQ-N-290 over Copper per SAE AMS 2418 |
| Support Elements: | Nickel, 0.000050 min., per SAE-AMS-QQ-N-290 over Copper per SAE-AMS2418 |
| Hardware: | Passivate per SAE-AMS2700 |

## PERFORMANCE:

| | |
|---|---|
| Current Rating: | 2.5* ampere continuous (higher ratings may be supported-contact factory) |
| Insulation Resistance: | >5000 megohms |
| Contact Resistance: | <5 milliohm |
| Test Voltage (DWV): | >1000 VRMS |
| Operating Temperature: | -65°C to +125°C |
| Mating Force: | 0.5 oz. avg. |
| De-mating Force: | >0.2 oz. |
| Durability: | 100,000 mating cycles |
| Solderability: | IPC/EIA J-STD-002, Category 3 |

## DIMENSIONS:

Catalog product dimensions are nominal.
For linear and positional tolerances, contact factory.

* Ampacity ratings shown are derated in accordance with the published military specifications. For stand-alone, full service ratings, supported by test data, please refer to IEH’s Contacts Catalog, or contact the factory.

All information contained herein is believed to be reliable as of the date of publication, but is subject to change without notice. Current product drawings and specifications are available upon request from IEH.

IEH warrants its products to be free of defects affecting normal use. If any shipment is found to be defective we will accept return for repair or replacement at our option within one year of shipment. IEH is not responsible for incidental or consequential damages arising out of the use of our products.

# ORDERING CHART

| HG | C | 090 | MDG | 1 | X97 | E | 088 |
|---|---|---|---|---|---|---|---|

**Series**

| Type | |
|---|---|
| C | Carrier Male |
| C | Plug Male |
| S | Receptacle Female |

**Contact Capacity**
(Use All 3 Places)

| Body Style | |
|---|---|
| ***Carrier*** | |
| MDG | Dip Solder Straight |
| ***Plug*** | |
| MAH | Stacking |
| MDH | Dip Solder Straight |
| MSH | Solder Cup |
| MCH | Crimp |
| MEH | Dip Solder Right Angle |
| ***Receptacle*** | |
| FAH | Stacking |
| FDH | Dip Solder Straight |
| FSH | Solder Cup |
| FCH | Crimp |
| FEH | Dip Solder Right Angle |

**Variation Code - Factory Assigned**

| Mounting Style | |
|---|---|
| E | Threaded Stud |
| 0 | None |

| Hardware Arrangement | |
|---|---|
| X97* | 2 Male Guides |
| 000 | No Hardware |

*Hardware supplied loose in sub-pack with connector. Default location for guide hardware will be 1st and last contact position. Variation code will reflect actual number of usable contacts.

| Termination Length - "L" | | | | | |
|---|---|---|---|---|---|
| Code | MDG | MDH | MEH | FDH | FEH |
| 1 | .093 | .116 | .102 | .116 | .102 |
| 2 | .135 | .156 | | .160 | |
| 9 | User Defined | | | | |
| 0 | Solder Cup & Crimp | | | | |

# PIN CARRIER
## STYLE MDG

**NOTES:**

1. SEE APPENDIX FOR GUIDE HARDWARE OPTIONS. GUIDES ARE INSTALLED IN CONTACT LOCATIONS AND RESULT IN THE LOSS OF ONE CONTACT FOR EACH GUIDE; E.G. A 22 CONTACT SIZE CONNECTOR WITH 2 GUIDES WILL HAVE 20 CONTACTS. THIS WILL BE REFLECTED IN THE VARIATION CODE. EXAMPLE: HGC022MDG9---E020.

2. *SIZES BELOW 22 CONTACT WILL RESULT IN THE LOSS OF ONE OR MORE SOLDER RELIEF STANDOFFS UNLESS GUIDE PINS ARE EMPLOYED.

3. **DIMENSIONS ARE FOR THE 90 CONTACT VERSION AND ARE SUPPLIED TO SHOW LOCATION OF SOLDER RELIEF STANDOFFS.

| SIZE* | A | B |
|---|---|---|
| 22 | 1.14 | 1.000 |
| 24 | 1.22 | 1.100 |
| 26 | 1.32 | 1.200 |
| 28 | 1.42 | 1.300 |
| 30 | 1.52 | 1.400 |
| 32 | 1.62 | 1.500 |
| 34 | 1.72 | 1.600 |
| 36 | 1.82 | 1.700 |
| 38 | 1.92 | 1.800 |
| 40 | 2.02 | 1.900 |
| 42 | 2.12 | 2.000 |
| 44 | 2.22 | 2.100 |

| SIZE* | A | B |
|---|---|---|
| 46 | 2.32 | 2.200 |
| 48 | 2.42 | 2.300 |
| 50 | 2.52 | 2.400 |
| 52 | 2.62 | 2.500 |
| 54 | 2.72 | 2.600 |
| 56 | 2.82 | 2.700 |
| 58 | 2.92 | 2.800 |
| 60 | 3.02 | 2.900 |
| 62 | 3.12 | 3.000 |
| 64 | 3.22 | 3.100 |
| 66 | 3.32 | 3.200 |
| 68 | 3.42 | 3.300 |

| SIZE* | A | B |
|---|---|---|
| 70 | 3.52 | 3.400 |
| 72 | 3.62 | 3.500 |
| 74 | 3.72 | 3.600 |
| 76 | 3.82 | 3.700 |
| 78 | 3.92 | 3.800 |
| 80 | 4.02 | 3.900 |
| 82 | 4.12 | 4.000 |
| 84 | 4.22 | 4.100 |
| 86 | 4.32 | 4.200 |
| 88 | 4.42 | 4.300 |
| 90 | 4.54 | 4.400 |

# PLUG, STACKING
## STYLE MAH

**NOTES:**

1. SEE APPENDIX FOR GUIDE HARDWARE OPTIONS. GUIDES ARE INSTALLED IN CONTACT LOCATIONS AND RESULT IN THE LOSS OF ONE CONTACT FOR EACH GUIDE; E.G. A 22 CONTACT SIZE CONNECTOR WITH 2 GUIDES WILL HAVE 20 CONTACTS. THIS WILL BE REFLECTED IN THE VARIATION CODE. EXAMPLE: HGC022MDG9---E020.

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| 82 | 4.12 | 4.000 |
| 84 | 4.22 | 4.100 |
| 86 | 4.32 | 4.200 |
| 88 | 4.42 | 4.300 |
| 90 | 4.54 | 4.400 |

# PLUG, STRAIGHT
## STYLE MDH, MSH, MCH

**NOTES:**

1. SEE APPENDIX FOR GUIDE HARDWARE OPTIONS. GUIDES ARE INSTALLED IN CONTACT LOCATIONS AND RESULT IN THE LOSS OF ONE CONTACT FOR EACH GUIDE; E.G. A 22 CONTACT SIZE CONNECTOR WITH 2 GUIDES WILL HAVE 20 CONTACTS. THIS WILL BE REFLECTED IN THE VARIATION CODE. EXAMPLE: HGC022MDG9---E020.

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| 80 | 4.02 | 3.900 |
| 82 | 4.12 | 4.000 |
| 84 | 4.22 | 4.100 |
| 86 | 4.32 | 4.200 |
| 88 | 4.42 | 4.300 |
| 90 | 4.54 | 4.400 |

# PLUG, RIGHT ANGLE
## STYLE MEH

**NOTES:**

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| 82 | 4.12 | 4.000 |
| 84 | 4.22 | 4.100 |
| 86 | 4.32 | 4.200 |
| 88 | 4.42 | 4.300 |
| 90 | 4.54 | 4.400 |

# RECEPTACLE, STACKING
## STYLE FAH

**NOTES:**

1. SEE APPENDIX FOR GUIDE HARDWARE OPTIONS. GUIDES ARE INSTALLED IN CONTACT LOCATIONS AND RESULT IN THE LOSS OF ONE CONTACT FOR EACH GUIDE; E.G. A 22 CONTACT SIZE CONNECTOR WITH 2 GUIDES WILL HAVE 20 CONTACTS. THIS WILL BE REFLECTED IN THE VARIATION CODE. EXAMPLE: HGC022MDG9---E020.

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| 82 | 4.12 | 4.000 |
| 84 | 4.22 | 4.100 |
| 86 | 4.32 | 4.200 |
| 88 | 4.42 | 4.300 |
| 90 | 4.54 | 4.400 |

# RECEPTACLE, STRAIGHT
## STYLE FDH, FSH, FCH

**NOTES:**

1. SEE APPENDIX FOR GUIDE HARDWARE OPTIONS. GUIDES ARE INSTALLED IN CONTACT LOCATIONS AND RESULT IN THE LOSS OF ONE CONTACT FOR EACH GUIDE; E.G. A 22 CONTACT SIZE CONNECTOR WITH 2 GUIDES WILL HAVE 20 CONTACTS. THIS WILL BE REFLECTED IN THE VARIATION CODE. EXAMPLE: HGC022MDG9---E020.

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| 78 | 3.92 | 3.800 |
| 80 | 4.02 | 3.900 |
| 82 | 4.12 | 4.000 |
| 84 | 4.22 | 4.100 |
| 86 | 4.32 | 4.200 |
| 88 | 4.42 | 4.300 |
| 90 | 4.54 | 4.400 |

# RECEPTACLE, RIGHT ANGLE
## STYLE FEH

**NOTES:**

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| SIZE* | A | B |
|---|---|---|
| 22 | 1.14 | 1.000 |
| 24 | 1.22 | 1.100 |
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| 28 | 1.42 | 1.300 |
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| 44 | 2.22 | 2.100 |

| SIZE* | A | B |
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| 46 | 2.32 | 2.200 |
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| 50 | 2.52 | 2.400 |
| 52 | 2.62 | 2.500 |
| 54 | 2.72 | 2.600 |
| 56 | 2.82 | 2.700 |
| 58 | 2.92 | 2.800 |
| 60 | 3.02 | 2.900 |
| 62 | 3.12 | 3.000 |
| 64 | 3.22 | 3.100 |
| 66 | 3.32 | 3.200 |
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| 70 | 3.52 | 3.400 |
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| 80 | 4.02 | 3.900 |
| 82 | 4.12 | 4.000 |
| 84 | 4.22 | 4.100 |
| 86 | 4.32 | 4.200 |
| 88 | 4.42 | 4.300 |
| 90 | 4.54 | 4.400 |

# PLUG, STRAIGHT
## HGC042MDH90000000

## PWB PATTERN
### VIEWED FROM COMPONENT FACE

## RECEPTACLE, STRAIGHT
### HGS042FDH90000000

## PWB PATTERN
### VIEWED FROM COMPONENT FACE

# TERMINATION STYLE
## 2 ROW

# HARDWARE STYLE & PWB PATTERN
## 2 ROW

| SIZE* | B |
|---|---|
| 22 | 1.000 |
| 24 | 1.100 |
| 26 | 1.200 |
| 28 | 1.300 |
| 30 | 1.400 |
| 32 | 1.500 |
| 34 | 1.600 |
| 36 | 1.700 |
| 38 | 1.800 |
| 40 | 1.900 |
| 42 | 2.000 |
| 44 | 2.100 |
| 46 | 2.200 |
| 48 | 2.300 |
| 50 | 2.400 |
| 52 | 2.500 |
| 54 | 2.600 |
| 56 | 2.700 |

| SIZE* | B |
|---|---|
| 58 | 2.800 |
| 60 | 2.900 |
| 62 | 3.000 |
| 64 | 3.100 |
| 66 | 3.200 |
| 68 | 3.300 |
| 70 | 3.400 |
| 72 | 3.500 |
| 74 | 3.600 |
| 76 | 3.700 |
| 78 | 3.800 |
| 80 | 3.900 |
| 82 | 4.000 |
| 84 | 4.100 |
| 86 | 4.200 |
| 88 | 4.300 |
| 90 | 4.400 |

# PIN CARRIER APPLICATION INSTRUCTIONS
## 2 ROW

1. INSTALL GUIDE PINS ON PRINTED WIRING BOARD. ASSEMBLE NUTS “FINGER” TIGHT ONLY.

2. POSITION THE LOADED PIN CARRIER ONTO THE BOARD, USING THE GUIDES FOR ALIGNMENT. TORQUE NUTS ON GUIDE HARDWARE. THEN SOLDER THE CONTACTS ON UNDER SIDE OF BOARD.

3. CARRIER MAY NOW BE REMOVED FOR MATING WITH A RECEPTACLE OR LEFT IN PLACE AS A PIN PROTECTOR.

4. WHEN MATED WITH A RECEPTACLE, ASSEMBLY CAN BE COMPLETED IN THE LEAST AMOUNT OF SPACE (.240 INCHES).

**IEH CORPORATION**

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