

# HyperGrip<sup>®</sup> Series

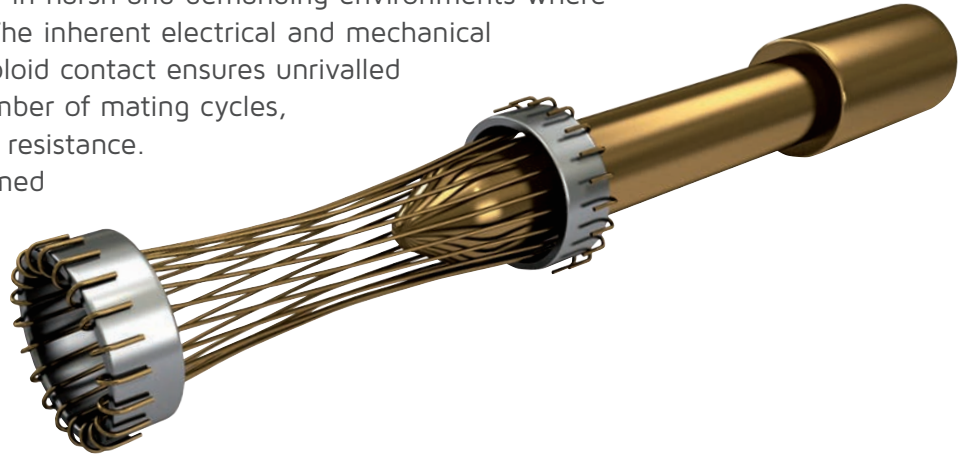
High Reliability Medical Circular Connectors



# Hypertac® Hyperboloid Technology

Smiths Interconnect offers an extensive range of superior contact technologies suitable for standard and custom solutions. Hypertac® (HYPERboloid conTACT) is the original superior performing hyperboloid contact technology designed for use in all applications and in harsh and demanding environments where high reliability and safety are critical. The inherent electrical and mechanical characteristics of the Hypertac hyperboloid contact ensures unrivalled performance in terms of reliability, number of mating cycles, low contact force and minimal contact resistance.

The shape of the contact sleeve is formed by hyperbolically arranged contact wires, which align themselves elastically as contact lines around the pin, providing a number of linear contact paths.



## Features

### Low insertion/extraction forces

The angle of the socket wires allows tight control of the pin insertion and extraction forces. The spring wires are smoothly deflected to make line contact with the pin.

### Long contact life

The smooth and light wiping action minimizes wear on the contact surfaces. Contacts perform up to 100,000 insertion/extraction cycles with minimal degradation in performance.

### Lower contact resistance

The design provides a far greater contact area and the wiping action of the wires insures a clean and polished contact surface. Our contact technology has about half the resistance of conventional contact designs.

### Higher current ratings

The design parameters of the contact (e.g., the number, diameter and angle of the wires) may be modified for any requirement. The number of wires can be increased so the contact area is distributed over a larger surface. Thus, the high current carried by each wire because of its intimate line contact, can be multiplied many times.

### Immunity to shock & vibration

The low mass and resultant low inertia of the wires enable them to follow the most abrupt or extreme excursions of the pin without loss of contact. The contact area extends 360° around the pin and is uniform over its entire length. The 3 dimensional symmetry of the Hypertac contact design guarantees electrical continuity in all circumstances.

## Benefits

### High density interconnect systems

Significant reductions in size and weight of sub-system designs. No additional hardware is required to overcome mating and unmating forces.

### Low cost of ownership

The Hypertac contact technology will surpass most product requirements, thus eliminating the burden and cost of having to replace the connector or the entire subsystem.

### Low power consumption

The lower contact resistance of our technology results in a lower voltage drop across the connector reducing the power consumption and heat generation within the system.

### Maximum contact performance

The lower contact resistance of the Hypertac contact reduces heat build-up; therefore Hypertac contacts are able to handle far greater current in smaller contact assemblies without the detrimental effects of high temperature.

### Reliability under harsh environments

Harsh environmental conditions require connectors that will sustain their electrical integrity even under the most demanding conditions such as shock and vibration. The Hypertac contact provides unmatched stability in demanding environments when failure is not an option.

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# HyperGrip® Series



HyperGrip Circular Connector Series is available with 5, 12, 19 or 33 pin positions and a user-configurable keying system. While competitive products require purchasing a different connector for each keying configuration needed, our advanced keying system allows customers to build connectors with six different keying options reducing lead time and inventory.

Specifically designed to meet medical industry requirements, the HyperGrip connector's sleek, robust body delivers superior performance in the most crucial applications. Not only does the standard sealing offer IP65 protection when mated to prevent electrical shorts, but the available shielding feature supplies EMI/RFI protection providing the highest degree of safety and reliability.

By utilizing the unparalleled performance of Hypertac® hyperboloid contact technology, HyperGrip connectors are able to provide high cycle life, low power consumption, low insertion force, reliability under harsh conditions, maximum contact performance and excellent wiping action.

HyperGrip connectors are color-coded and range from 12.5 to 22.5mm in diameter. The five available color options, along with our innovative keying system, make recognition effortless and incorrect mating impossible. This becomes essential for medical instrumentation applications where multiple connector interfaces are required.

Smiths Interconnect offers custom options in order to meet application specific requirements. The flexible design of HyperGrip connectors allows for the use of alternate technologies including Fiber Optic (expanded beam or butt joint termini), Coaxial and Spring Probe contacts. Custom inserts, cable mount receptacles and cable assemblies (available in select sizes) can also be provided to optimize your connector solution.

## Designed to meet medical industry requirements

### Features & Benefits

- **Push/Pull latching feature, quick connect**  
Simple one-hand mating/unmating
- **Innovative customer keyability**  
Easily keyed in 6 standard positions to prevent mismatching
- **Available with 5 color code options**  
Visually intuitive mating
- **Sleek, robust body**  
Designed to aesthetically complement medical devices
- **Sealing to IP65 when mated**  
Meets or exceeds typical medical sealing requirements
- **Fingerproof**  
Meets requirements of IEC 60601-1 specifications
- **Multiple contact technologies available**  
Flexibility for superior performance in high reliability, high speed, high density, high frequency and/or hybrid solutions
- **Shielding option available in HG2, HG3 and HG4**  
Protection against EMI/RFI interference
- **Autoclave, EtO and Sterrad®<sup>1)</sup> sterilizable**  
Meets typical medical sterilization Requirements
- **UL94 V-0 flammability rated materials**  
Meets medical industry safety requirements
- **Integrated strain relief**  
Prevents cable wire fatigue due to bending
- **Contacts shipped unloaded**  
Easier termination for reduced cost of Ownership: crimp and poke termination eliminates the need to pre-tin, solder, and shrink boot

1) Sterrad® is a registered trademark of Advanced Sterilization Products (ASP) division of Ethicon US, LLC, a Johnson & Johnson Company.

# How To Order



HG					G					R	
1	2	3	4	5	6	7	8	9	10	11	12

<b>1 Series</b>	HG Series
<b>2 Size</b>	0 HG0 2 HG2 3 HG3 4 HG4
<b>3 Type</b>	P Plug E Receptacle/Panel C Receptacle/Cable (Available on HG2 only)
<b>4 Connector options</b>	1 Sealed 2 shielded (Unsealed) HG2, HG3, HG4 only / plugs "P" and panel receptacles "E" only
<b>5 Strain relief size</b> (Cable diameter ranges)	0 No strain relief (Panel receptacles only) 4 4.50 - 6.50 mm (HG2 only) 6 9.00 - 11.00 mm (HG4 only) (Shielded: 9.50 - 11.00 mm) 1 2.08 - 3.10 mm (HG0 only) 5 7.00 - 9.00 mm (HG3 only)
<b>6 Outer shell color</b> (Fixed)	G Light gray
<b>7 Color coding</b> (Strain relief or panel seal only)	G Light gray (Standard) D Blue R Red V Green Y Yellow
<b>8 Positions</b>	5 HG0 12 HG2 19 HG3 33 HG4
<b>9 Contact diameter</b>	03 0.3mm (HG0) 04 0.4mm (HG2, HG3, HG4)
<b>10 Contact gender</b>	F Female sockets (Receptacles only) M Male pins (Plugs only)
<b>11 Termination</b> (Fixed)	R Crimp/Solder (26-28 AWG*) (Contacts are shipped unloaded, may be crimped or soldered, then inserted into insulator. For more information, please see Assembly Instructions.)
<b>12 Plating</b> (Pins: Gold over nickel Sockets: Gold over nickel on contact surfaces, gold flash on terminations)	G HG2, HG3, HG4 pins H HG0 pins ANH HG2, HG3, HG4 sockets AH HG0 sockets

\*Available tooling: Crimp Tool: AFM8 or M22520/2-01, Crimp Positioner: K1775 (HG0) or T2030 (HG2, HG3, HG4), Insertion Tool: T2080

# Technical Characteristics

	HG0	HG2	HG3	HG4
Number of contacts	5	12	19	33
Contact diameter	0.012 (0.30)	0.016 (0.40)	0.016 (0.40)	0.016 (0.40)

## Materials

Body	Polyetherimide
Insulators	Liquid crystal polymer
Seals	Silicone

## Contact Materials & Plating

Sockets	Beryllium copper wires Brass body components Gold over nickel plating on mating surface
Pins	Gold flash over nickel on termination Phosphor bronze Gold over nickel plated

## Terminations

Crimp (Pin & Socket)	26 to 28 AWG <i>Optional terminations, including solder cup and straight-dip pc tails (for panel mount receptacles), are special order only. Please contact factory for availability.</i>
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## Shielding (Optional)

Effectiveness	Up to 3 GHz
Attenuation	50 dB maximum at 3 GHz

## Mechanical

Mating cycle life	Up to 20,000
Contact extraction force	0.50 to 1.60 oz. per contact

## Electrical

Current Rating (A) per contact, with all contacts energized	5.5	3	2.5	1
Contact Resistance	< 8.0 mΩ			
Breakdown Voltage Between Contacts	1,000 V max.			
Dielectric Withstanding Voltage	750 V			
Insulation Resistance	> 5x10 <sup>4</sup> MΩ at 500 VDC			

## Physical & Environmental

Operating Temperature Rating	-40° to 125° C
Processing Temperature Range	Up to 185° C
Flammability	Materials meet the requirements of UL94 V-0
Sterilization	Steam Autoclave, EtO, Sterrad <sup>®2)</sup>
Fingerproofing	Meets IEC 60601-1 requirements
Sealing mated condition	IP65

### Notes:

- 1) HyperGrip is patented under US patent numbers: 7,326,091B2; 7,661,995B2; D596,127S; 7,938,670; D615,932; D616,825
- 2) Sterrad<sup>®</sup> is a registered trademark of Advanced Sterilization Products (ASP) division of Ethicon US, LLC, a Johnson & Johnson Company. Dimensions are in inches (mm)

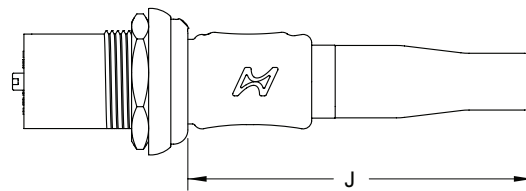
# Dimensions

(Standard HyperGrip® connectors)

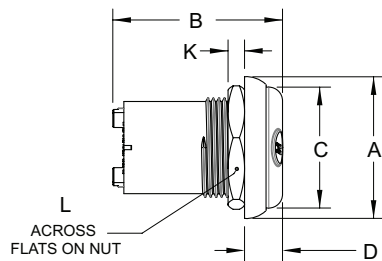
## Standard Plug & Receptacle

For HG0, HG2, HG3 and HG4

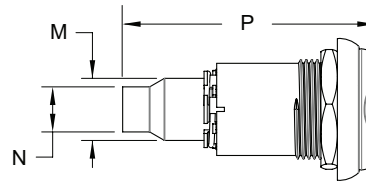
**PLUG & RECEPTACLE MATED PAIR**  
with strain relief



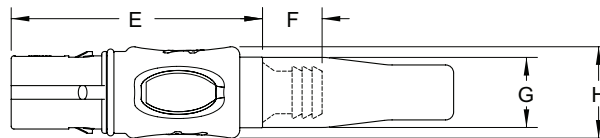
**[E] RECEPTACLE**



**[E] RECEPTACLE**  
with shielding option



**[P] PLUG**



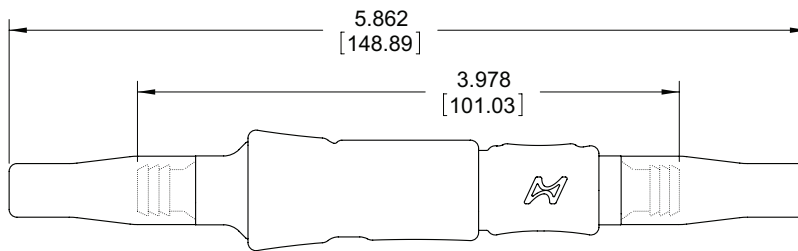
**Dimensions**

	A	B	C	D	E	F	G	H	J	K	L	M	N	P
<b>HG0</b>	Ø0.807 (20.50)	0.728 (18.50)	Ø0.630 (16.00)	0.285 (7.25)	1.040 (26.38)	0.343 (8.71)	Ø0.370 (9.40)	Ø0.486 (12.34)	1.415 (35.94)	0.118 (3.00)	0.689 (17.50)	—	—	—
<b>HG2</b>	Ø1.014 (25.76)	1.220 (30.88)	Ø0.866 (22.00)	0.272 (6.91)	1.808 (45.92)	0.427 (10.84)	Ø0.502 (12.75)	Ø0.656 (16.66)	2.390 (60.65)	0.118 (3.00)	0.823 (20.90)	Ø0.433 (11.00)	Ø0.197 (5.00)	1.704 (43.27)
<b>HG3</b>	Ø1.172 (29.77)	1.220 (30.88)	Ø1.007 (25.59)	0.272 (6.91)	2.170 (55.07)	0.354 (9.00)	Ø0.650 (16.50)	Ø0.800 (20.36)	2.730 (69.33)	0.118 (3.00)	0.980 (24.90)	Ø0.535 (13.60)	Ø0.378 (9.60)	1.961 (49.82)
<b>HG4</b>	Ø1.250 (31.77)	1.220 (30.88)	Ø1.090 (27.80)	0.272 (6.91)	2.170 (55.07)	0.354 (9.00)	Ø0.710 (18.15)	Ø0.880 (22.47)	2.730 (69.33)	0.118 (3.00)	1.060 (26.90)	Ø0.610 (15.50)	Ø0.378 (9.60)	2.124 (53.95)

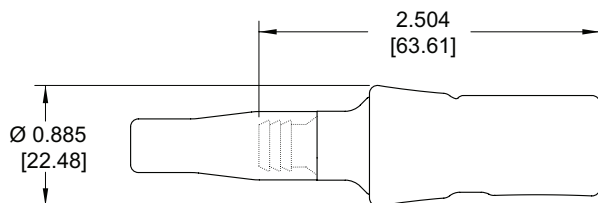
Dimensions are in inches (mm)

## HG2 Plug & Cable Receptacle

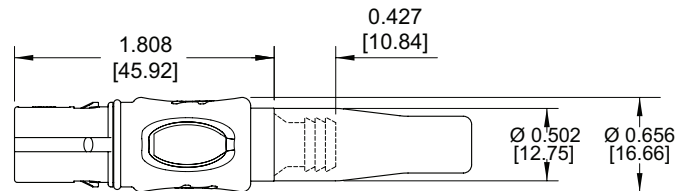
### HG2 PLUG & CABLE RECEPTACLE MATED PAIR with strain relief



### [C] HG2 CABLE RECEPTACLE



### [P] HG2 PLUG





# Keying & Mounting

(User information)

## Receptacle Keying

HG2 shown

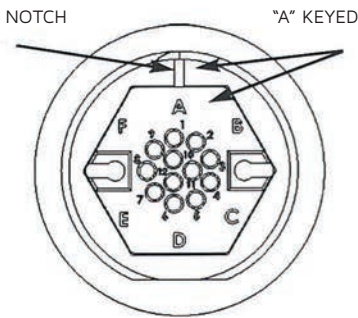
HG0, HG3 and HG4 are keyed in the same fashion

6 different keying positions possible - A through F

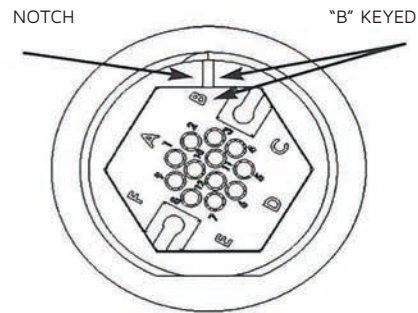
See Assembly Instructions for receptacle keying information<sup>(1)</sup>:

- S50386: Panel Receptacles
- S50431: Cable Receptacles

**KEYING POSITION A**  
Receptacle Wiring End

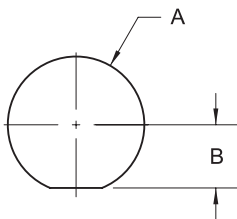


**KEYING POSITION B**  
Receptacle Wiring End



## Panel Cutouts

All sizes



	<b>A</b> +0.002 -0.001 (+0.050 -0.030)	<b>B</b> ±0.001 (±0.030)
<b>HG0</b>	∅0.555 (14.10)	0.240 (6.10)
<b>HG2</b>	∅0.711 (18.06)	0.329 (8.36)
<b>HG3</b>	∅0.870 (22.10)	0.393 (9.98)
<b>HG4</b>	∅0.949 (24.10)	0.430 (10.92)

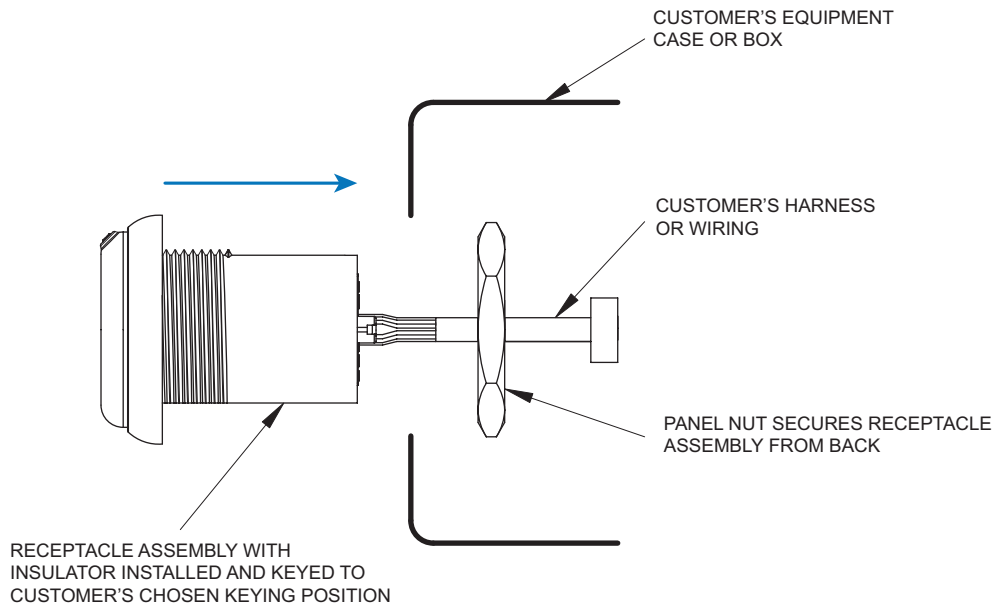
Dimensions are in inches (mm)

**Notes:**

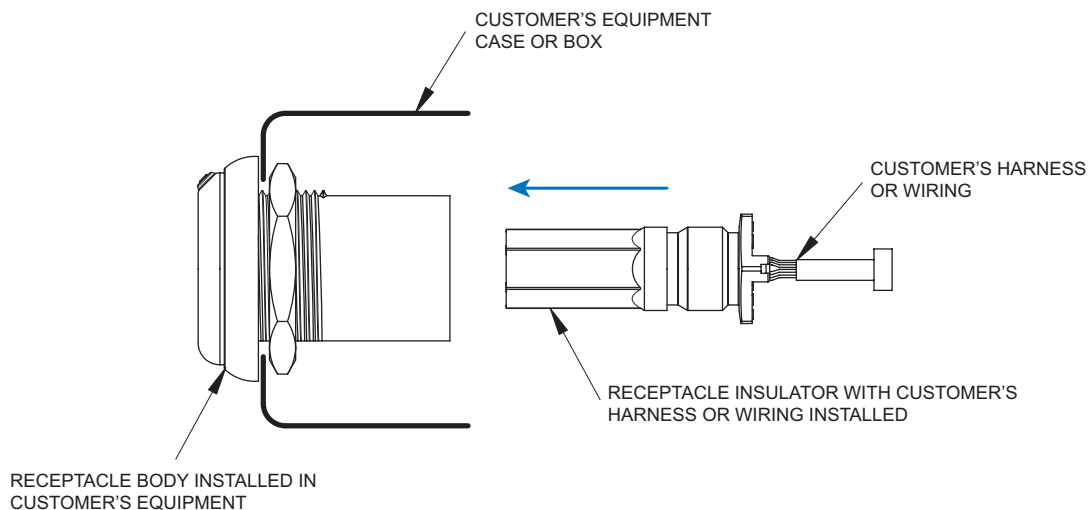
1) Assembly Instructions also include plug keying information: S50387

## Receptacle Mounting Options

### 1 Assembly outside panel then install

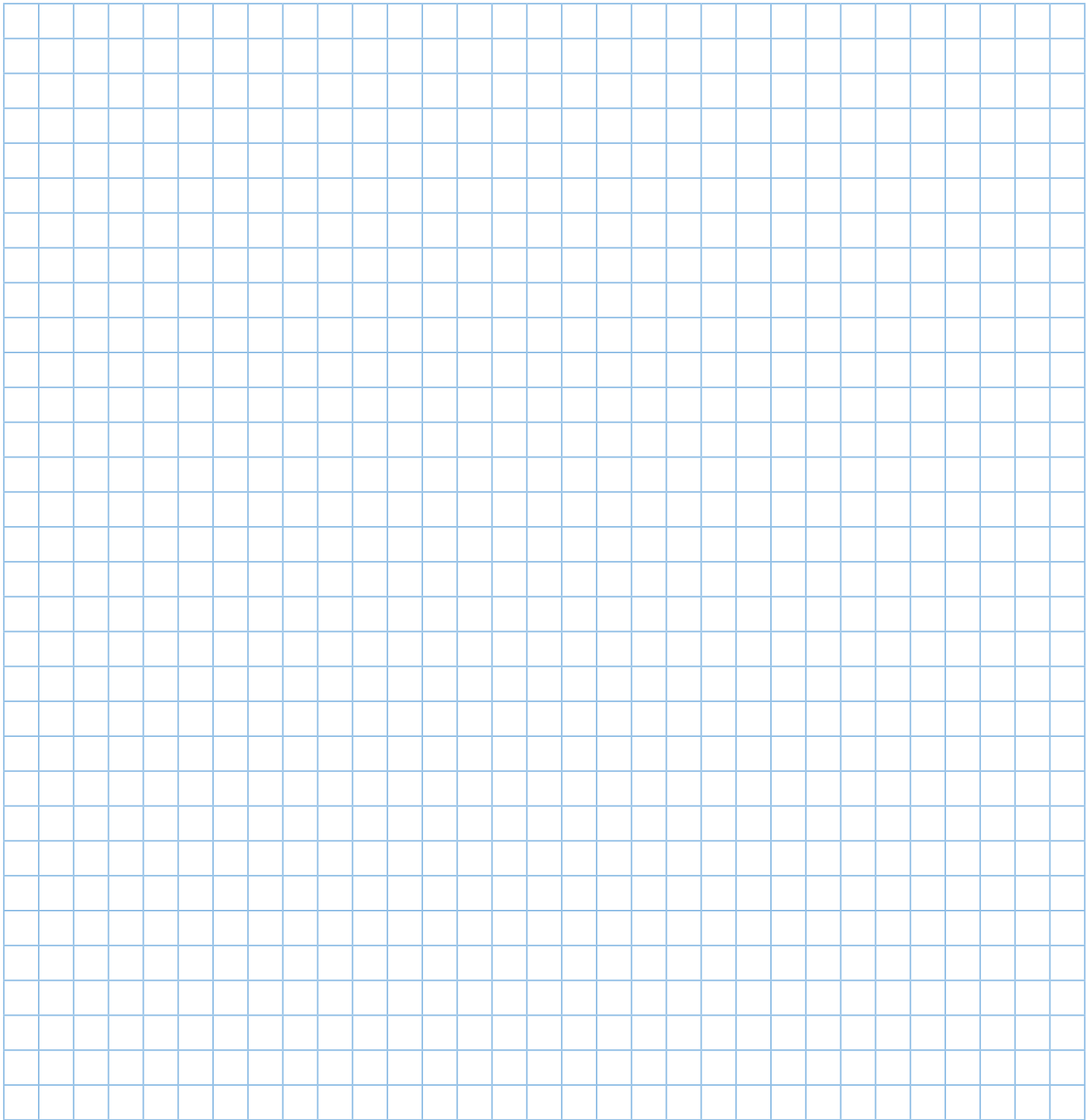


### 2 Install receptacle body then assemble inside panel



#### Notes:

Recommended tightening torque for panel mount receptacle for HG2, HG3 and HG4 is 0.452 to 0.678 N•m. For HG0 is 0.226 to 0.339 N•m.



Notes:

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# Available Contact Technologies

## (Features & Benefits)

### Hypertac® Hyperboloid

- **Long Contact Life**  
Industry-leading mating cycles provide low cost of ownership
- **Low Insertion / Extraction Forces**  
Ergonomic mating without cost and size of mate assist hardware
- **Lower Contact Resistance**  
Low power consumption / lower voltage drop across connector
- **Higher Current Ratings**  
Smaller contacts needed to carry power for reduced size and weight
- **Immunity to Shock & Vibration**  
Reliability under harsh environmental conditions
- **360° Contact Wipe**  
Self-cleaning contacts assure uninterrupted connection



### Coaxial

- **50Ω Characteristic Impedance**  
Meets application requirements for most RF interconnects
- **Crimp Termination for RG-405 Flex Cable**  
Faster termination to cable reduces applied costs
- **Low VSWR up to 40 GHz**  
Offers improved signal integrity
- **Magnetic Permeability:  $30 \times 10^{-5} \mu$**   
Prevents image distortion in MRI environment applications
- **Immunity to Shock & Vibration**  
Reliability under harsh environmental conditions
- **Up to 20K Mating Cycles**  
Reduces cost of ownership in high cycle life applications



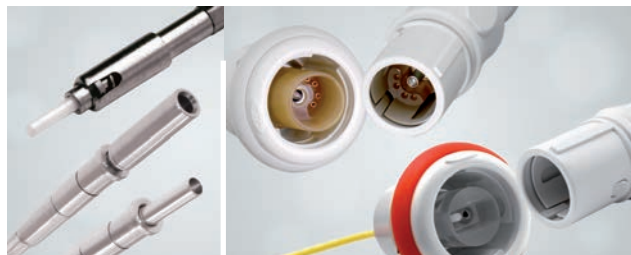
### Spring Probe

- **Extremely High Density**  
Allows for connectors as dense as 2mm, while maintaining 0.5mm of compliance
- **Shock & Vibration Resistant**  
Ensures stable connection in rough handling
- **Exceptional Misalignment Tolerance**  
Simplifies connector design, reducing cost of limited use side
- **High Cycle Life**  
Maintains electrical continuity for life of the device
- **Z-Axis Compliance**  
Ideal for blind mate engagement

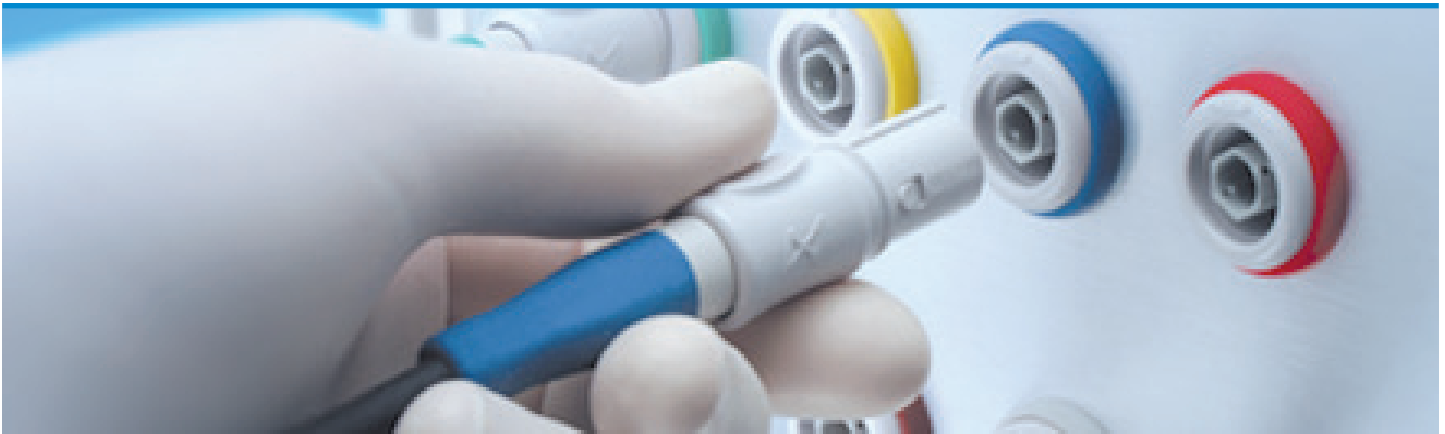


### Fiber Optic

- **Two Standard Types**  
Size 16 Butt-Joint and Size 12 Expanded-Beam (EB) termini
- **Low Insertion Loss**  
Transmit high speed signals over longer distances without repeaters
- **Hermaphroditic Contacts (Butt Joint)**  
Same contact on both sides reduces total cost of ownership
- **Multi & Single-Mode Fiber Compatible (EB)**  
Ideal for high band width and voice signals
- **Low Susceptibility to Contamination (EB)**  
Reduced influence from dirt and debris across the connection
- **Immunity & Reliability**  
Resistant to EMI / RFI and crosstalk



# Markets & Applications



## Catheter

- Disposable
- High density spring probe contacts
- High cycle life
- Low contact resistance
- Minimal insertion/extraction forces



## Home healthcare

- Hyperboloid and USB signal contacts
- IP65 sealing
- Simple operation
- Ergonomic, ideal for in-home patient use



## MRI/CT scanning

- Quick push/pull latching
- Hyperboloid signal contacts
- ESD finger-proof protection
- Multiple keying options



## Patient monitoring

- Hyperboloid signal contacts
- Custom creepage and clearance
- High reliability
- Cost effective
- Patient friendly



## Portable therapeutic

- Custom cable solution
- Superior reliability for critical application
- Color coded
- Multiple keys to prevent mismatching
- Intuitive design



## Surgical imaging

- Expanded beam Fiber Optic contact
- Easy cleaning and low susceptibility to contamination
- Fiber Optic video connection for easy mating to HD display system
- High speed data transmission



## Disclaimer 2020

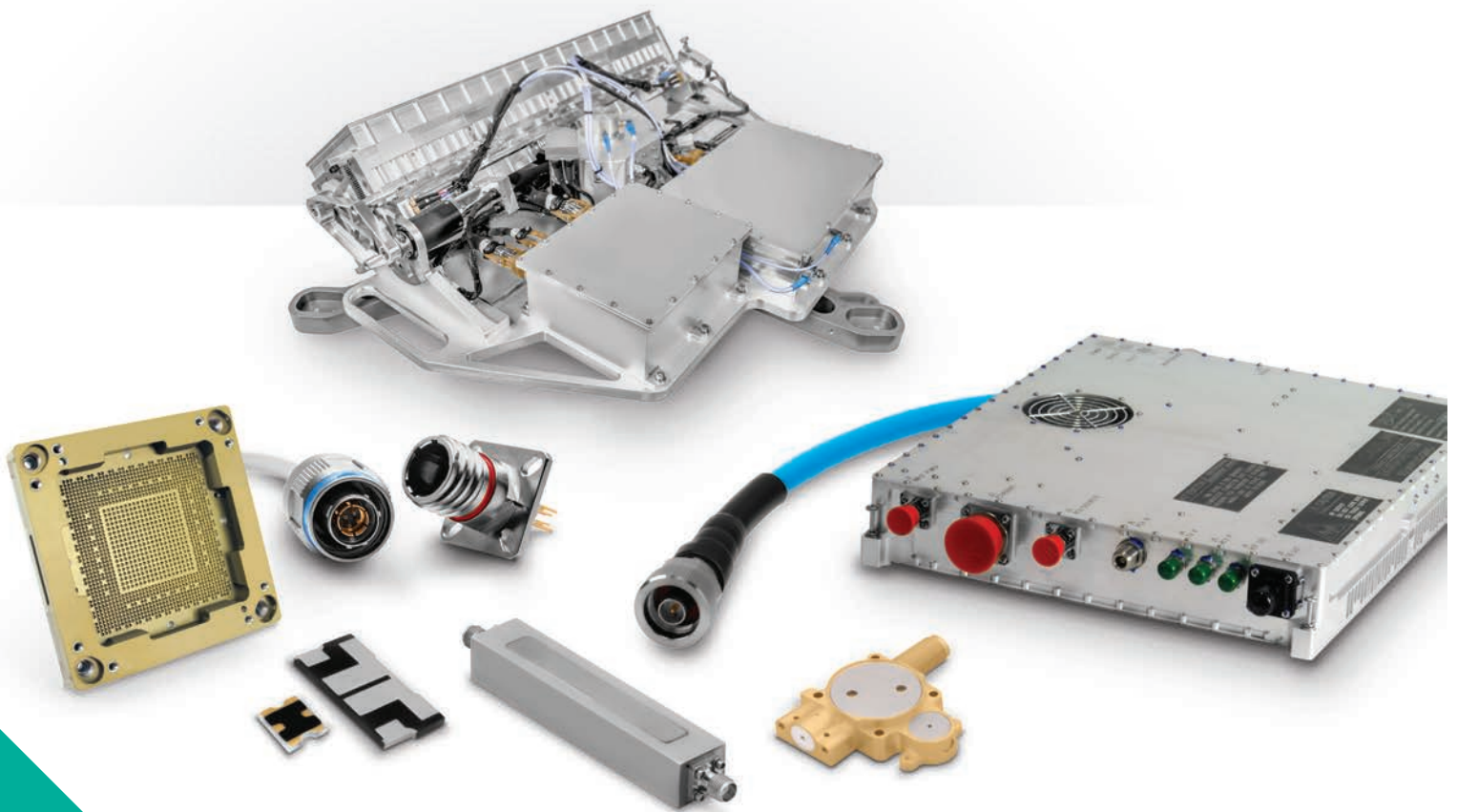
All of the information included in this catalogue is believed to be accurate at the time of printing. It is recommended, however, that users should independently evaluate the suitability of each product for their intended application and be sure that each product is properly installed, used and maintained to achieve desired results.

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# Product Portfolio



- Antenna Systems
  - Cable Assemblies
  - Connector Solutions
  - Ferrite Components & Assemblies
  - RF Filter Components & Assemblies
  - Integrated Microwave Assemblies
  - Millimeter-Wave Solutions
  - RF Components
    - Test Sockets and WLCSP Probe Heads
    - Time & Frequency Systems



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