

FG Series

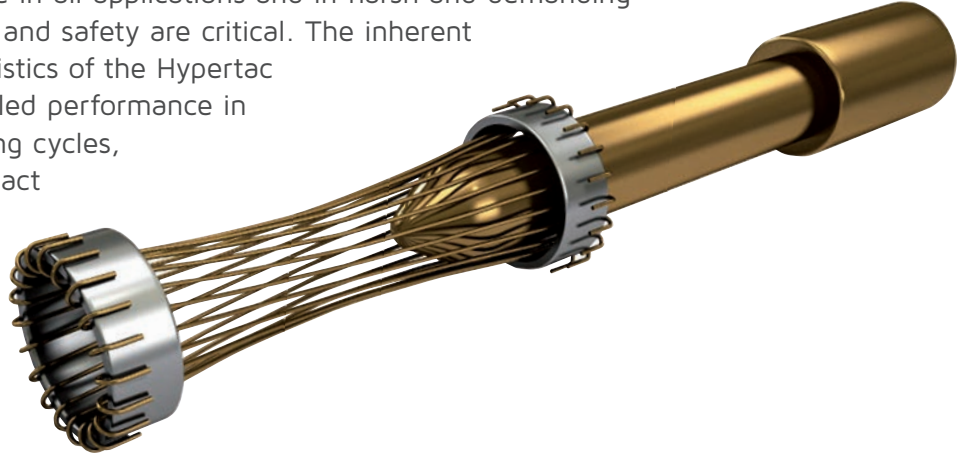
High speed Intercoach couplers

Heavy duty rectangular modular 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

Benefits

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.

High density interconnect systems

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

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.

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.

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.

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.

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.

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.

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.

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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FG Series

High speed Intercoach couplers



The high speed Intercoach couplers of Smiths Interconnect are heavy duty rectangular modular connectors designed to secure signal and power transmissions in the sensitive area located between the coaches of all types of rail vehicles, from high speed trains to metros and trams.

The connectors are equipped with modular inserts offering a combination of fibre optics, high speed (Ethernet, Can), coax, twinax, triax or quadrax, and standard hyperboloid signal and power contacts. The ruggedized aluminium shell guarantees an excellent resistance to the high levels of shocks and vibrations on-board of rail vehicles. The connectors also meet the requirements of harsh environments in terms of corrosion resistance and sealing.

The high speed Intercoach couplers accept multi-wires rigid cables and a large range of adapted shielded or unshielded cable glands enabling strong mechanical endurance under vibration. They also provide a high level of mechanical endurance of the cables (up to 1 million swaying cycles) through the use of anchoring cable glands.

High Speed Transmission

Features & Benefits

High Speed Ethernet

- High contacts density & management of separated modules (signal, power, high speed data) offering optimization of space on new Gangway for high speed & intercity trains
- Ethernet transmissions up to 1.2 GHz
- Rugged compact design replaces circular connectors format with higher contacts density for space saving

Reliable Solution

- Robust & Complete cable harness/jumpers shielded & non shielded solution increasing reliability & SIL4 applications
- Reducing maintenance and easy retrofit operation with removable & interchangeable modules & contacts
- Long life cycle in operation (1m balancing cycles)
- Corrosion resistance: 500 hours minimum
- Mating safety by guiding and coding pins
- Qualified acc. to SNCF NF F 61-030
- Complete solution with cable harnesses ensures high performance and reliability

How To Order



FG



1

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1 Series	FG [fixed]									
2 Connector type	P Plug E Receptacle									
3 Contacts	F Female contacts M Male contacts									
4 Number of frames	02 2 modules 06 2x3 modules									
5 Shielding degree	N Standard without shielding									
6 Configuration	On request									
7 Polarization	00 Not polarized 01 Polarized									
8 Hood	<table border="0"> <tr> <td>00 Without hood</td> <td>01 M12 vertical output</td> <td>02 M16 vertical output</td> </tr> <tr> <td>03 M20 vertical output</td> <td>04 M25 vertical output</td> <td>05 M32 vertical output</td> </tr> <tr> <td>06 M40 vertical output</td> <td>07 M50 vertical output</td> <td></td> </tr> </table>	00 Without hood	01 M12 vertical output	02 M16 vertical output	03 M20 vertical output	04 M25 vertical output	05 M32 vertical output	06 M40 vertical output	07 M50 vertical output	
00 Without hood	01 M12 vertical output	02 M16 vertical output								
03 M20 vertical output	04 M25 vertical output	05 M32 vertical output								
06 M40 vertical output	07 M50 vertical output									
9 Cable clamp	- Without cable clamp									

Note:
The connectors are adapted for flexible conduit and associated accessories.
Please contact Smiths Interconnect for more details.

Technical Characteristics

Electrical

Number of contact	Up to 120
Contact Ø	Ø 1 to Ø 3.50 mm
Current rating	5 to 60 A
Contact resistance	0.3 to 7.0 mΩ
Rated voltage	63 to 650 V depending on module
Insulation resistance	1x10 ³ MΩ or 5x10 ³ MΩ depending on module

Mechanical

Mating cycles	> 500
Balancing cycles	> 1 000 000
Locking system	By 2 screws (2 module version) By 4 screws (6 module version)
Housing material	Aluminium Alloy
Cable clamp	Stainless steel
Contact material	Brass, copper
Contact plating	Gold over Nickel
Insulator	Polyamide UL94VO; according to NF F 16-101, NF F 16-102 and EN45545

Environmental

Temperature range	-40° C to +100° C
Protection level	IP66 - IP67
Dry heat	96h
Salt spray	Housing opened: 96h - Housing closed: 720h
Damp heat	21 days (40° C 90-95% HR)
Conformity	NF F 61-030, EN50124, EN50467

High Speed Technology for Rail Applications



The High Speed contact system is designed for transmission of sensitive signals in railway applications. The inner contact uses the Hypertac® hyperboloid technology which guarantees an excellent signal integrity and high reliability, even under high levels of shock and vibrations. Its design is housed in a ruggedized shell which enables a reliable cabling and it is equipped with a pin locator to avoid mismatching between emission and reception pairs. The high speed contact system is available in Twinax, Triax and Quadrax versions. The High speed contact system meets the requirements of Ethernet Class F (CAT 7). It is compliant with Ethernet standards IEE802.3 and achieves more than 1.2 GHz. In addition, the contacts can be easily removed from the connector insulator with the appropriate tooling, enabling easy maintenance. The contact is designed for cables of an impedance of 100, 120 and 150 Ω and of sizes from Ø 6.5 mm to 13 mm.

Technical Characteristics

Materials & Plating

Shell	Nickel, brass
Cable clamp	Brass
Insulator	Thermoplastic
Pin & socket body	Brass + NiAu
Female contact Wire Termination	Ni >0.2µm / Au >1µm Ni >1.27µm / Au >0.10µm
Male contact Pin	Ni >0.2µm / Au >1µm

Electrical

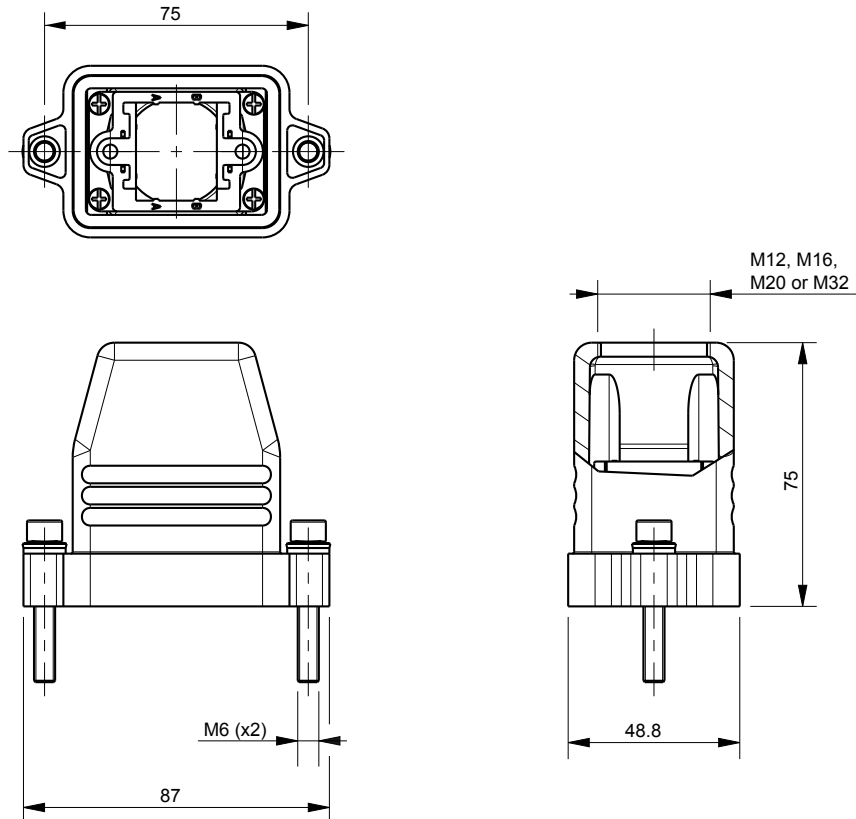
Current rating	7.5A
Contact resistance	>3.5mΩ
Withstanding voltage Contacts Contacts and ground	2000V 2000V

Environmental & Mechanical

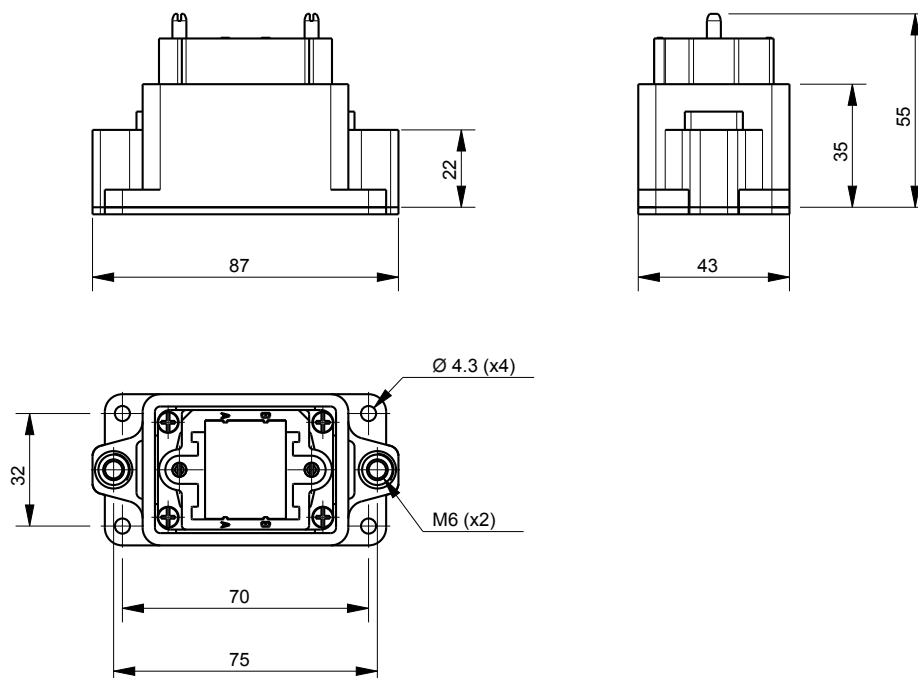
Temperature range	-55°C, +125°C, 5 cycles
Dry heat	1000h at 125°C (standard value: 96h)
Damp heat	56 days (40°C 90-95% HR)
Salt spray	96h (5% NaCl)
Fire & smoke	According to NF F 16-101, NF F 16-102
Auto threading screws	70 daN. cm
Contact retention	>250 N
Insulator mechanical resistance	>250 N
Mating cycles	>500

Connector dimensions - 2 modules

Plug



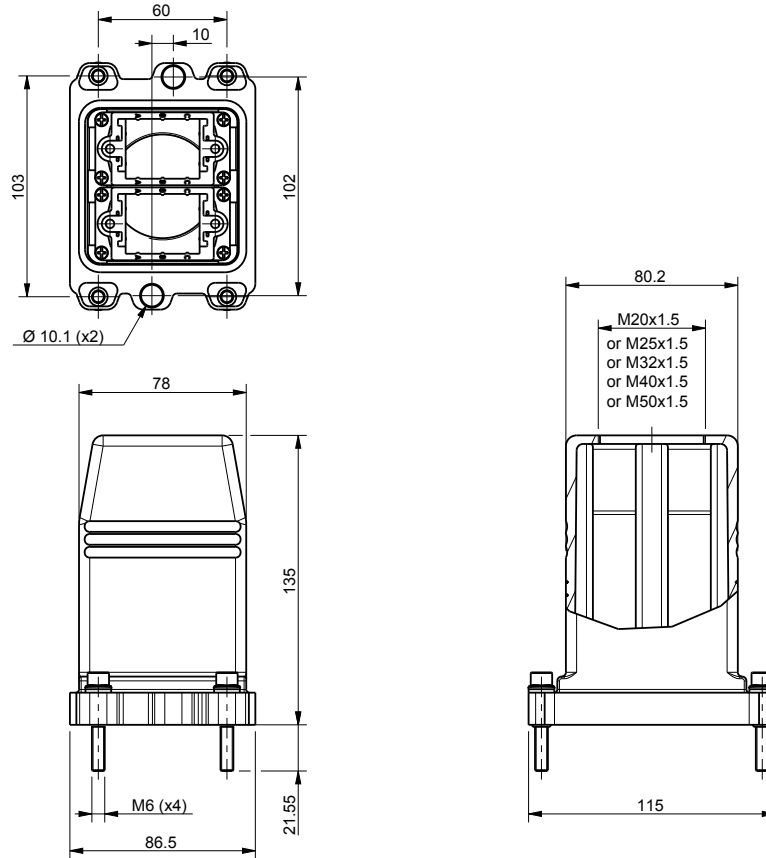
Receptacle



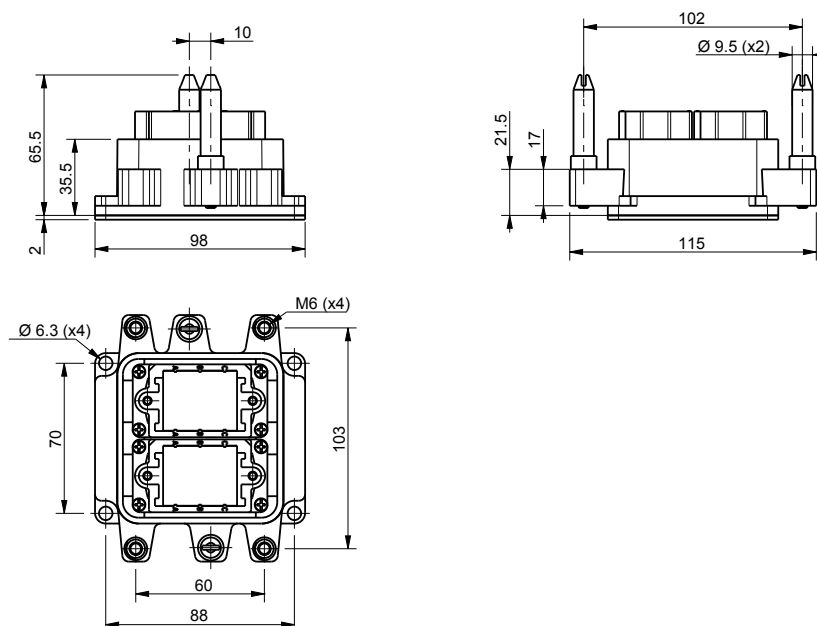
Dimensions are in mm.

Connector dimensions - 6 modules

Plug



Receptacle

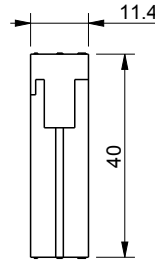
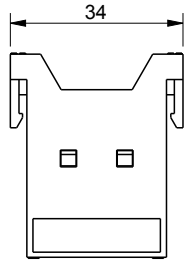


Dimensions are in mm.

Modules & Contacts

20 x Ø 1.00

Socket



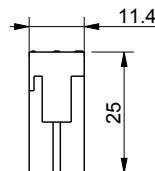
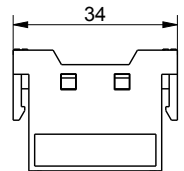
Insulator without contacts
Conductor size AWG28-24
Conductor size AWG24-20

0.08-0.20 mm²
0.20-0.62 mm²

Ref: **VOF** (without contacts)
Ref: **VAF** (AWG 28-24)
Ref: **VEF** (AWG 24-20)

P/N **20210**
P/N **19999**

Pin



Insulator without contacts
Conductor size AWG28-24
Conductor size AWG24-20

0.08-0.20 mm²
0.20-0.62 mm²

Ref: **VOM** (without contacts)
Ref: **VAM** (AWG 28-24)
Ref: **VEM** (AWG 24-20)

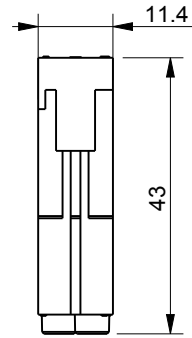
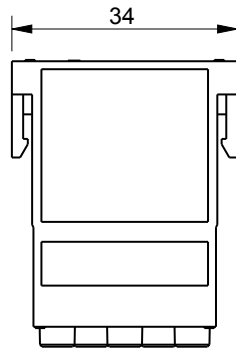
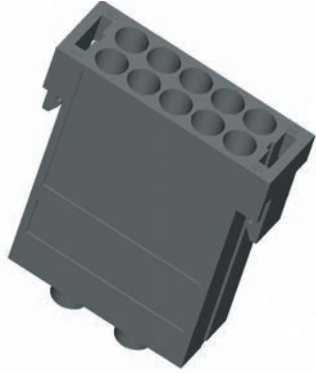
P/N **20211**
P/N **19997**

	DIN 0110	NF F 61-030
Rated voltage	63 V	30 V
Rated impulse withstanding voltage	1.5 kV	1.5 kV
Current rating (max wire ref. 25° C)	9 A	5 A
Creepage distance	1.8 mm	2.5 mm
Clearance distance	2.5 mm	2.5 mm

Modules & Contacts

10 x Ø 1.50

Socket



Insulator without contacts
Conductor size AWG24-14

0.22-1.91 mm²

Ref: **BOF** (without contacts)
Ref: **BEF** (AWG 24-14)

P/N 015 090 2-20R GO

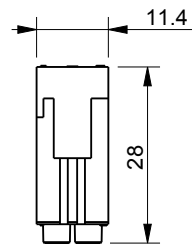
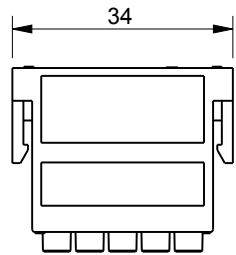
Insulator without contacts
Conductor size AWG24-20
Conductor size AWG20-16

0.20-0.62 mm²
0.62-1.30 mm²

Ref: **DOF** (without contacts)
Ref: **DAF** (AWG24-20)
Ref: **DEF** (AWG-20-16)

P/N 20212
P/N 19996

Pin



Insulator without contacts
Conductor size AWG24-14

0.22-1.91 mm²

Ref: **BOM** (without contacts)
Ref: **BEM** (AWG 24-14)

P/N 015 160 1-20X OG

Insulator without contacts
Conductor size AWG24-20
Conductor size AWG20-16

0.20-0.62 mm²
0.62-1.30 mm²

Ref: **DOM** (without contacts)
Ref: **DAM** (AWG 24-20)
Ref: **DEM** (AWG 20-16)

P/N 20213
P/N 19994

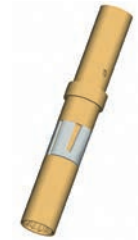
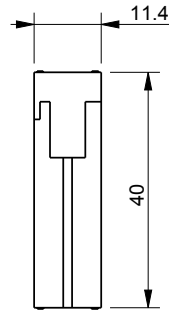
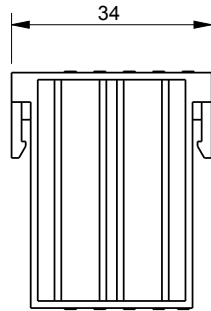
	BOF, BEF, BOM, BEM		DOF, DAF, DEF, DOM, DAM, DEM	
	DIN 0110	NF F 61-030	DIN 0110	NF F 61-030
Rated voltage	220 V	30 V	630 V	220 V
Rated impulse withstanding voltage	4 kV	1.5 kV	4 kV	2.5 kV
Current rating (max wire ref.)	20 A	8 A	20 A	8 A
Creepage distance	3.60 mm	3.60 mm	9.25 mm	9.25 mm
Clearance distance	3.60 mm	3.60 mm	3.60 mm	3.60 mm

Dimensions are in mm.

Modules & Contacts

5 x Ø 2.50

Socket



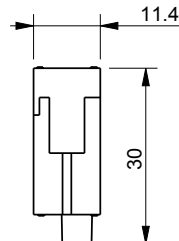
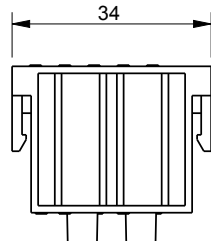
Insulator without contacts
Conductor size AWG20-16
Conductor size AWG16-14
Conductor size AWG14-10

0.50-1.22 mm²
1.22-2.10 mm²
2.10-5.40 mm²

Ref: **COF** (without contacts)
Ref: **CAF** (AWG 20-16)
Ref: **CEF** (AWG 16-14)
Ref: **CIF** (AWG 14-10)

P/N **20214**
P/N **20215**
P/N **20035**

Pin



Insulator without contacts
Conductor size AWG20-16
Conductor size AWG16-14
Conductor size AWG14-10

0.50-1.22 mm²
1.22-2.10 mm²
2.10-5.40 mm²

Ref: **COM** (without contacts)
Ref: **CAM** (AWG 20-16)
Ref: **CEM** (AWG 16-14)
Ref: **CIM** (AWG 14-10)

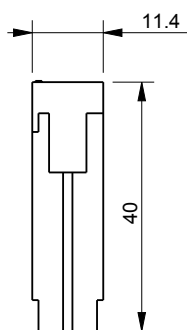
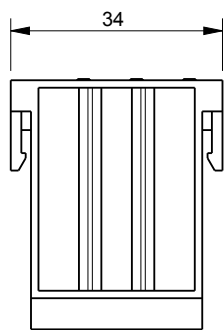
P/N **20216**
P/N **025 041 1-20X OG**
P/N **025 040 1-21X OG**

	DIN 0110	NF F 61-030
Rated voltage	400 V	30 V
Rated impulse withstanding voltage	4 kV	2.55 kV
Current rating (max wire ref.)	30 A	16 A
Creepage distance	4.5 mm	4.5 mm
Clearance distance	3.5 mm	3.5 mm

Modules & Contacts

3 x Ø 3.50

Socket



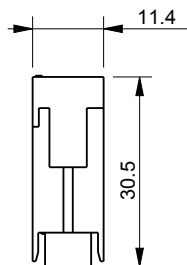
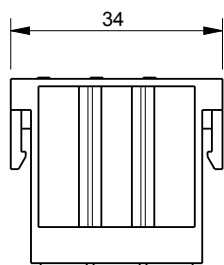
Insulator without contacts
Conductor size AWG12-10
Conductor size AWG8

3.0-5.4 mm²
10 mm²

Ref. **TOF** (without contacts)
Ref. **TAF** (AWG 12-10)
Ref. **TEF** (AWG 8)

P/N 20412
P/N 20409

Pin



Insulator without contacts
Conductor size AWG12-10
Conductor size AWG8

3.0-5.4 mm²
10 mm²

Ref. **TOM** (without contacts)
Ref. **TAM** (AWG 12-10)
Ref. **TEM** (AWG 8)

P/N 20218
P/N 19987

	DIN 0110	NF F 61-030
Rated voltage	630 V	30 V
Rated impulse withstanding voltage	8 kV	2.55 kV
Current rating (max wire ref. 25° C)	60 A	25 A
Creepage distance	5 mm	5 mm
Clearance distance	5 mm	5 mm

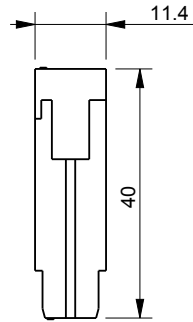
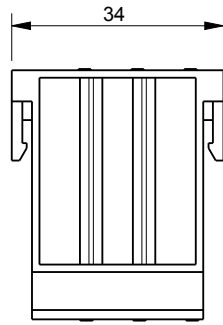
Modules & Contacts

3 Coax Contacts

Socket



Insulator without contacts
Insulator with contacts



Ref. **TOX** (without contacts)
Ref. **TAX** (with contacts)

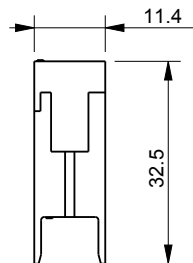
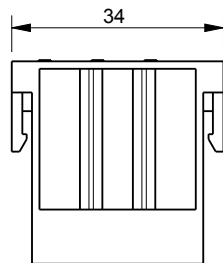


P/N 18024/1

Pin



Insulator without contacts
Insulator with contacts



Ref. **TOY** (without contacts)
Ref. **TAY** (with contacts)



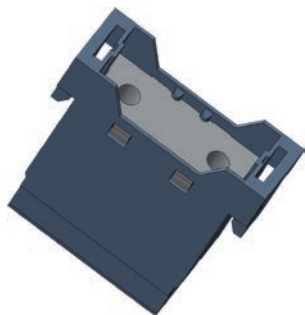
P/N 18024/2

Characteristic impedance	50 Ω
Working frequency	
• Optimum	0-10 GHz
• Maximum	30 GHz

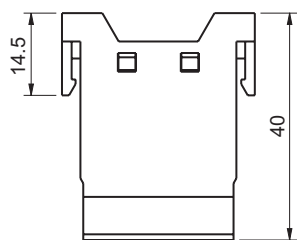
Modules & Contacts

2 fiber optic contacts

Socket



Insulator without contacts

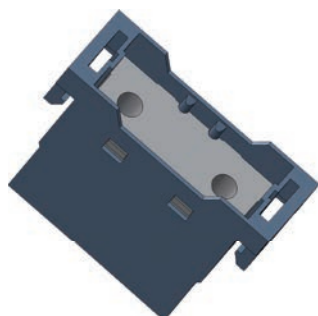


Ref: FG_65336-00 (without contacts)

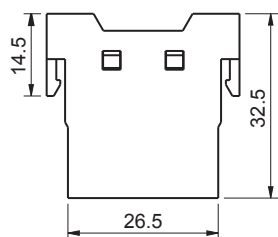


P/N FG_65376-00

Pin



Insulator without contacts



Ref: FG_65335-00 (without contacts)



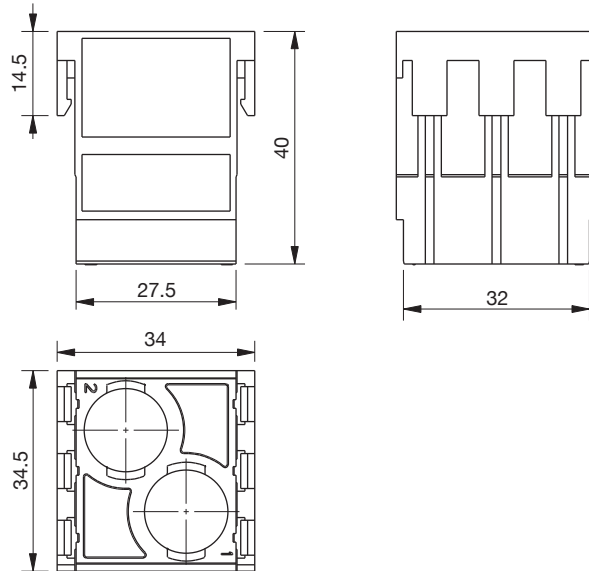
P/N FG_65377-00

Type	Termini AWG 16 (MIL-T-29504/6)
Fiber	Multimode 50/125 or 62.5/125 μm
Cable	Glass fiber
Diameter max	\varnothing 2.2 mm
Conformity	MIL-C-83527 (MPX), ARINC 600 (NSX)

Modules & Contacts

High speed quadrax contacts

Socket

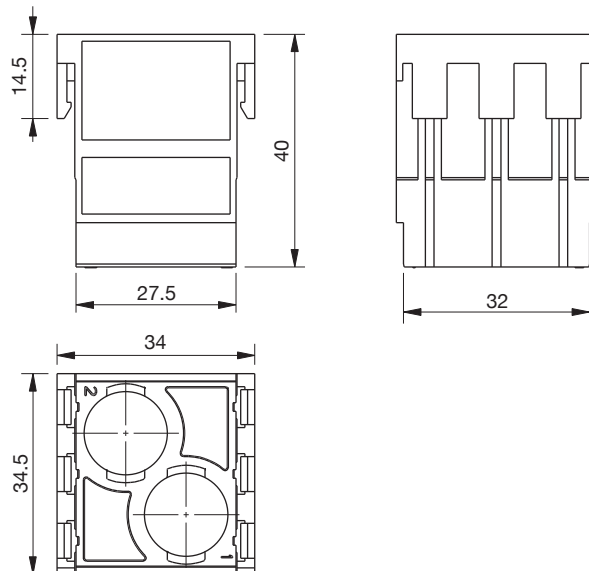


Insulator without contacts

Ref: FG_65070-00 (without contacts)

P/N 123 009 2- QAR 01
P/N 123 011 2- QAR 01

Pin



Insulator without contacts

Ref: FG_65069-00 (without contacts)

P/N 123 009 1- QAR 01
P/N 123 011 1- QAR 01

Rated voltage	30 V
Current rating	3 A
Creepage distance	1.169 mm
Clearance distance	1.169 mm

Note:
The quadrax modules shown on this page can only be inserted into the plug and receptacle for 6 modules (shown on page 7).
Dimensions are in mm.

Cabling Tools

High Speed Quadrax, Coax and Power

	Contacts		Crimping tools			Tools	
	Number Part	Type	Crimping tool	Tool turret	Position & Wire section	Insertion	Extraction
High Speed Quadrax contact	123 009 2- QAR 01	Socket	Astro-Tool TGV 101	TGV 210	2 (AWG 24) 3 (AWG 22) 4 (AWG 20) 5 (AWG 18)	S_069	S_056 S_069
	123 011 2- QAR 01		Daniels FT8	TP 945			
	123 009 1- QAR 01	Pin	Astro-Tool TGV 101	TGV 210	2 (AWG 24) 3 (AWG 22) 4 (AWG 20) 5 (AWG 18)	S_069	S_056 S_069
	123 011 1- QAR 01		Daniels FT8	TP 945			
Coax contact	18024/1	Socket	HXA M22502/5-01	Smiths Interconnect M0577	Consult Smiths Interconnect	-	M0578
	18024/2	Pin	HXA M22502/5-01	Smiths Interconnect M0577	Consult Smiths Interconnect	-	M0578
Power contact	070 041 2- 24R	Socket	Mecatraction TR461 Jack TR462N SU210K	-	Die: TN70V20 Die hold number: S21	Mecatraction TR461 Jack TR462N SU210K	SD- 070 00 00 00 3
	070 040 2- 23R				Die: TN50V20 Die hold number: S21		
	070 039 2- 22R				Die: U13HCU50 Die hold number: U-21 / U13		
	070 039 1- 24R	Pin	Mecatraction TR461 Jack TR462N SU210K	-	Die: TN70V20 Die hold number: S21	Mecatraction TR461 Jack TR462N SU210K	SD- 070 00 00 00 3
	070 038 1- 23R				Die: TN50V20 Die hold number: S21		
	070 037 1- 22R				Die: U13HCU50 Die hold number: U-21 / U13		

Contacts

Fiber optic

Contacts		Diameter	Extraction tools
Number part	Type		
FG_65377-00	Socket	Ø 2.2 mm max	M81969/1-03
FG_65376-00	Pin	Ø 2.2 mm max	M81969/1-03

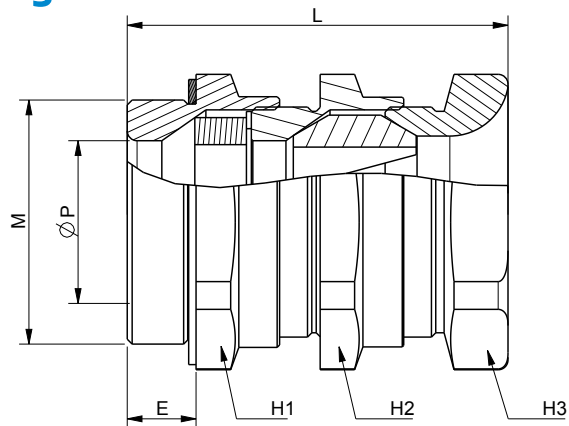
Cabling Tools

Signal

Contacts			Crimping tools			Tools
Size	Type	Number Part	Crimping tool	Tool turret	Position & Wire section	Extraction
Ø 1.00 mm	Socket	20210 19999	Daniels AFM8	Smiths Interconnect M0572	4 - 0.08 mm ² (28 AWG) 5 - 0.14 mm ² (26 AWG) 6 - 0.20 mm ² (24 AWG) 6 - 0.38 mm ² (22 AWG) 7 - 0.62 mm ² (20 AWG)	20264
	Pin	20211 19997	Daniels AFM8	Smiths Interconnect M0572		20264
Ø 1.50 mm	Socket	015 090 2- 20R GO	Astro-tool TGV 101	TGV201 Red	2 - 0.22 mm ² (24 AWG) 4 - 0,50 to 0.75 mm ² (22-20 AWG) 5 - 1 mm ² (18 AWG) 6 - 1.50 mm ² (16 AWG) 7 - 2.50 mm ² (14 AWG)	SD-0150000005
			Daniels FT8	SH 462 Red		
	Pin	015 160 1- 20X OG	Astro-tool TGV 101	TGV201 Red		SD-0150000008
			Daniels FT8	SH 462 Red		
Socket	20212 19996	Daniels AF8	Smiths Interconnect M0573	2 - 0.20 mm ² (24 AWG) 3 - 0.50 mm ² (22 AWG) 4 - 0.62 mm ² (20 AWG) 5 - 0.75 mm ² (20 AWG) 6 - 1 mm ² (18 AWG) 6 - 1.30 mm ² (16 AWG)	20265	
Pin	20213 19994	Daniels AF8	Smiths Interconnect M0573	20265		
Ø 2.50 mm	Socket	20214 20215 20035	Daniels M310	Smiths Interconnect M0574	2 - 0.50 mm ² (20 AWG) 3 - 1.00 mm ² (18 AWG) 4 - 1.22 mm ² (16 AWG) 5 - 2.10 mm ² (14 AWG) 5 - 3.00 mm ² (12 AWG) 6 - 5.40 mm ² (10 AWG)	20266
	Pin	20216 025 041 1-20X OG 025 040 1-21X OG	Daniels M20218 1998710	Smiths Interconnect M0574	20421	
Ø 3.50 mm	Socket	20412	Daniels WA 23-2	Consult us	3 mm ² - 5.40 mm ² (12-10 AWG)	20267
		20409	Smiths Connectors 20490	Smiths Interconnect M0601	10 mm ² (7 AWG)	
	Pin	20218	Daniels WA 23-2	Daniels WA 23-9	3 mm ² - 5.40 mm ² (12-10 AWG)	20266
		19987	Smiths Connectors 20490	Smiths Interconnect M0575	10 mm ² (7 AWG)	

Accessories

Cable gland

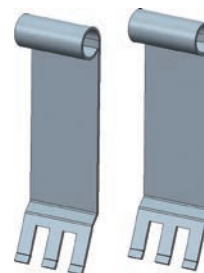


Reference	Clamping	Color cone	M	Ø P	E	H1	H2	H3	L	Weight
FH_65388-03	23 - 26	Black	M50x1.50	33	14	55	55	55	73	599.00
FH_65850-00	25 - 31		M50x1.50	33	14	55	55	55	75	608.00
FH_65388-02	25.50 - 30	Red	M50x1.50	33	14	55	55	55	73	599.00
FH_65388-01	28.50 - 32	Yellow	M50x1.50	33	14	55	55	55	73	599.00
FH_65388-00	30 - 36	Green	M50x1.50	39.50	14	60	60	60	78	636.00
FH_65851-00	34 - 37		M63x1.50	39.50	16	70	60	60	94	1056.00

Extraction tools for modules

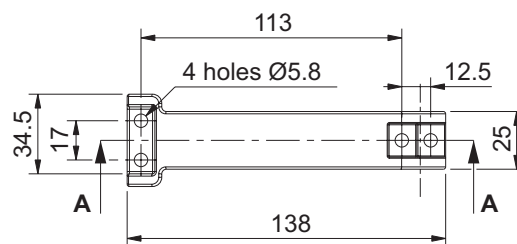
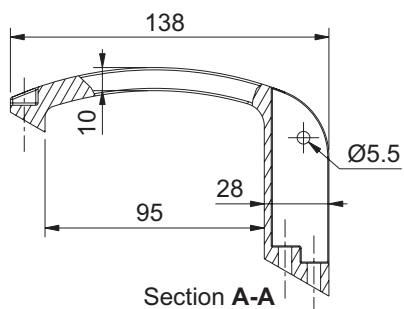


Extraction tool for 1x11.40 mm pitch
Ref: 20367



Extraction tool for 3x11.40 mm pitches
Ref: S_140

Grip handle

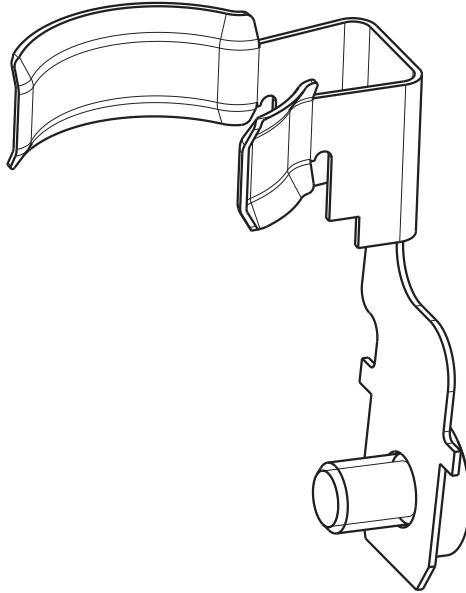


Ref: FH_64486-00

Note:
The connectors are adapted for flexible conduit and associated accessories.
Please contact Smiths Interconnect for more details.
Dimensions are in mm.

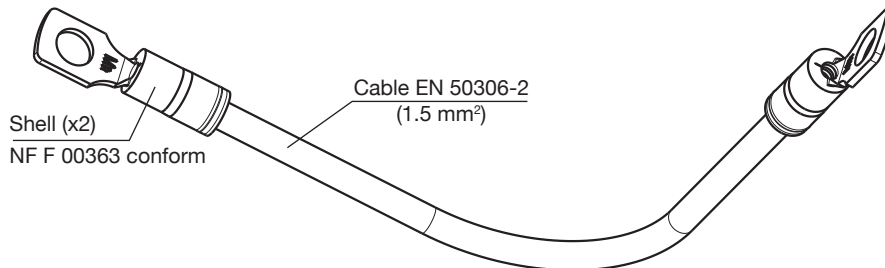
Accessories

Shielding kit

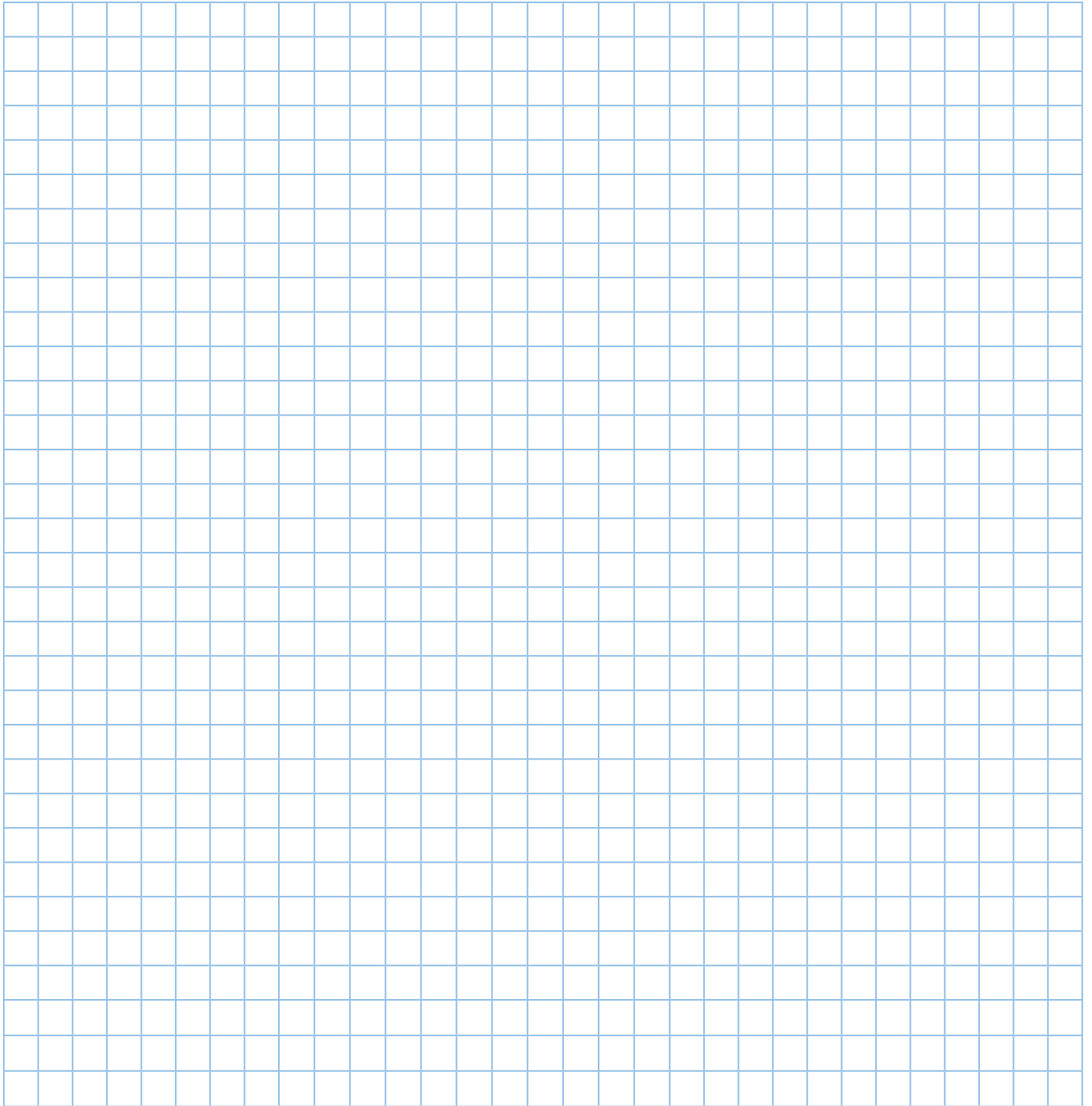


3 HD shielding kits
Ref.: FG 65407-00

Grounding cable



1 grounding cable, cable lengths 200mm
Ref.: FG 66387-00



Notes:

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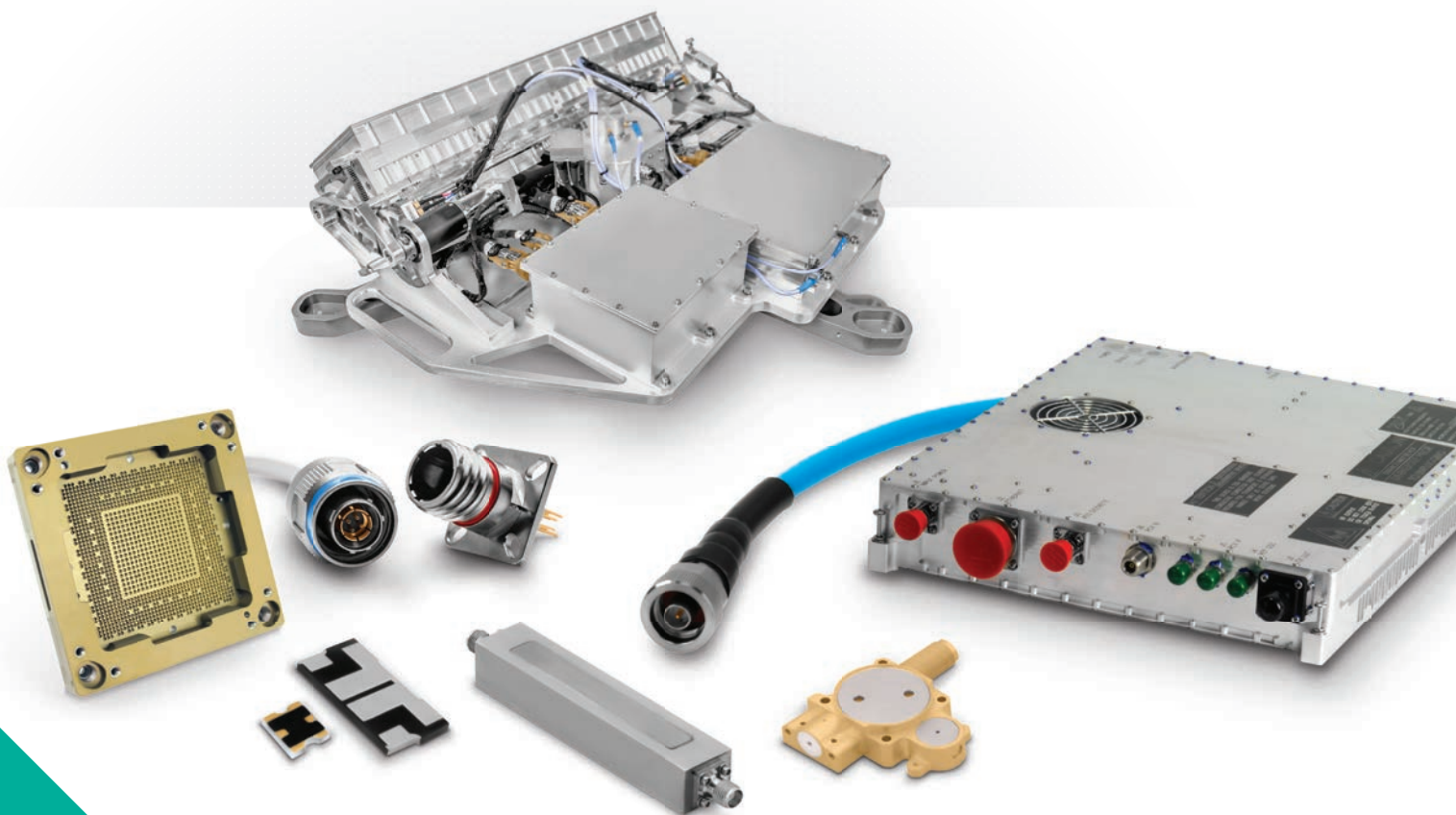
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Global Support

UK Headquarters

London, UK
+44 20 7004 1600
info.uk@smithsinterconnect.com

US Headquarters

Stuart, FL
+1 772 286 9300
info.us@smithsinterconnect.com

Americas

Costa Mesa, CA
+1 714 371 1100
info.us@smithsinterconnect.com

Milpitas, CA
+1 408 957 9607 x 1125
info.us@smithsinterconnect.com

Stuart, FL
+1 772 286 9300
info.us@smithsinterconnect.com

Hudson, MA
+1 978 568 0451
info.us@smithsinterconnect.com

Northampton, MA
+1 413 582 9620
info.northampton@smithsinterconnectinc.com

Tampa, FL
+1 813 901 7200
info.tampa@smithsinterconnectinc.com

Kansas City, KS
+1 913 342 5544
info.us@smithsinterconnect.com

Salisbury, MD
+1 800 780 2169
info.us@smithsinterconnect.com

Thousand Oaks, CA
+1 805 267 0100
info.thousandoaks@smithsinterconnectinc.com

Europe

Deggendorf, Germany
+49 991 250 120
info.de@smithsinterconnect.com

Genoa, Italy
+39 0 10 60361
info.it@smithsinterconnect.com

Dundee, UK
+44 1382 427 200
info.dundee@smithsinterconnect.com

Rouen, France
+33 2 32 96 91 76
info.fr@smithsinterconnect.com

Elstree, UK
+44 20 8236 2400
info.uk@smithsinterconnect.com

Asia

Shanghai, China
+86 21 2283 8008
info.asia@smithsinterconnect.com

Suzhou, China
+86 512 6273 1188
info.asia@smithsinterconnect.com

Singapore
+65 6846 1655
info.asia@smithsinterconnect.com

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