

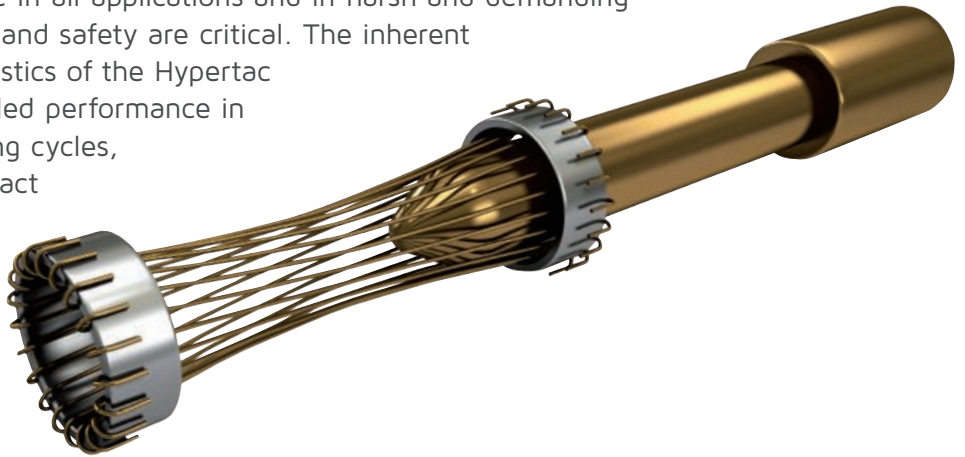
HBB Series

High Power, Quick Release 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

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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Single pole

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HBB Series - single pole

High Power Circular Connectors



The Smiths Interconnect's HBB single pole, circular connectors Series combines high current handling capability with small size and exceptional performance in harsh environments.

Designed for use in all types of high-power applications, the HBB Series is particularly suitable for electric drives used in fighting vehicles, unmanned vehicles, rail transport and industrial applications.

High currents can be easily transmitted with the smallest possible size: Size 17, single-pole, attains 350A and size 21, single-pole, 500A with high reliability and excellent integrity. Using the Hyperboloid contact technology, HBB connectors produce contact resistance figures as low as 0.05 mΩ, which help in reducing resistive losses. This both eases the task of thermal management and allows better power handling in a smaller space with a lower overall mass.

HBB connectors combine a simple push-on mating process with a more traditional bayonet un-mating mechanism. The connectors are designed to lock simply by pushing the plug until the user hears a click, which is combined with tactile feedback, giving confirmation that the plug is locked. To un-mate the connector, the user simply twists the sleeve of the plug and pulls. The connectors are marked with red points, making it easier for the user to visually line up the plug for mating.

Offered in a black zinc-nickel shell, the connectors are sealed to IPx7 and feature 360° EMI/RFI shielding.

They have a polarized design with options that ease assembly, allowing simple maintenance and quick changeover. Configurations are available in cable or panel mount, straight or right angle back shells which allow users to simplify their cable management architecture, further increasing reliability and reducing the likelihood of interconnection failures.

**Designed for use
in high-power
applications**

Features & Benefits

High Reliability Solution

- 350A and 500A High power handling in a smaller space
- 5000 mating cycles
- Low contact resistance, less than 0.05 mΩ
- Shock and vibration immunity

Easy of assembly and of use

- Gender reversible
- Polarised system
- Minimal component count
- Quick release latching mechanism
- Simple maintenance and speedy changeover

Ideal for harsh environment conditions

- 360° EMI/RFI shielding
- Sealed IPx7 and IP6K9K when mated
- Safe solution with finger protection

Smart and flexible design

- RoHS compliant Black Zinc Nickel, zinc-cobalt plated or nickel plated shells
- Cable and panel mount variants
- Ergonomic, low weight design

How To Order



	H	B	B									
	1	2	3	4	5	6	7	8	9	10	11	
1 Series	H B B Series [fixed]											
2 Shell gender	P Plug R Receptacle											
3 Standard variations	O O O Non variant (1) O C O Rear mount receptacle with conductive panel o-ring O M O Front mount receptacle with conductive panel o-ring O M S Front mount receptacle with short lug/busbar contact and conductive panel o-ring O N O Front mount receptacle with non-conductive panel o-ring O N S Front mount receptacle with short lug/busbar contact and non-conductive panel o-ring											
4 Shell material	A High strength aluminium alloy body, zinc-cobalt olive drab plated B High strength aluminium alloy body, electroless nickel plated E High strength aluminium alloy body, black zinc-nickel (2)											
5 Shell size	1 7 Size 17 (350 Amp) 2 1 Size 21 (500 Amp)											
6 Contact type	H Hypertac® hyperboloid											
7 Nominal current rating	1 3 0 1 pole / 350 Amp 1 5 0 1 pole / 500 Amp											
8 Contact termination options	* Contact to accept cable crimped directly on contact axis. (See table "Straight exit crimp contacts" D, H, K, Q, S, V on following page) L Contact to accept bolted termination e.g. lugged cable (lug ordered separately, see "Accessories - Crimp lug codes") or busbar. Also order this option for a plug with right angle backshell											
9 Contact gender	X Pin, gold plated (ISO 27874/Au 99.9%, AMS-C-26074 Class 1) Y Socket, gold plated (ISO 27874/Au 99.9%, AMS-C-26074 Class 1)											
10 Shell polarising	A Polarised code A, contact cap black B Polarised code B, contact cap orange C Polarised code C, contact cap blue											
11 Backshell options	O No backshell A Right-angle backshell (plug only) B Straight backshell, available on plugs with crimp contact only											

Note:

(1) Non variant receptacle is rear mount with non-conductive panel O-ring

(2) Please consider that Black Zinc Nickel is by default the standard shell material and more readily available

Straight exit crimp contacts

Crimp contact size codes				
Code	Size 17 - 350 Amp connector		Size 21 - 500 Amp connector	
	Connector size (mm ²)	Crimp barrel bore (mm ²)	Connector size (mm ²)	Crimp barrel bore (mm ²)
D	25	7.9	50	11.0
H	–	–	70	13.0
K	35	9.2	–	–
Q	–	–	95	14.5
S	50	11.0	–	–
V	–	–	120	15.0

Notes

Standard, more readily available variants are shown in this catalogue.

Please contact your local sales representatives for full range of HBB products or to enquiry about a a circular multi-pole option or about our harness solutions and other power products.

Technical Characteristics

Materials

Shells and backshells	Aluminium alloy
Latch ring	Aluminium alloy
Insulators	Insulators - glass reinforced PPS Finger proof components - glass reinforced Nylon 66
Contacts	Copper alloy
Socket wires	Copper beryllium alloy
Crimp lugs	Copper alloy
EMI shielding	Conductive fluorosilicone seal
Latch pins and springs	Stainless steel
Fasteners	Stainless steel
O rings & seals	Fluorosilicone elastomer
Transit caps	Vinyl

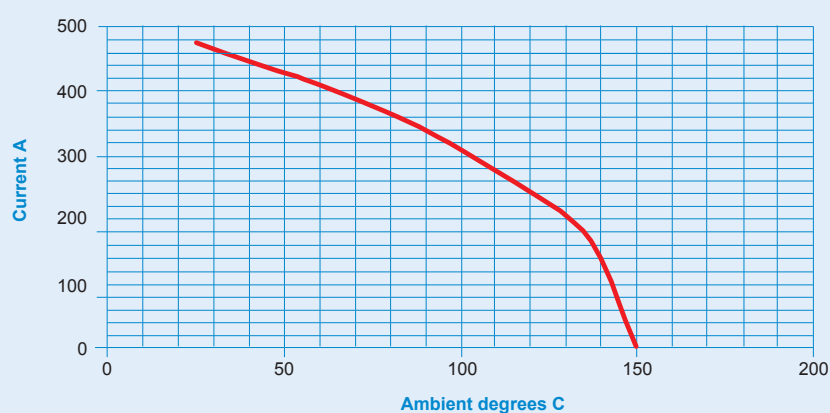
Protective finishes

Contacts	Gold over Electroless Nickel 3 - 5µm; ISO 27874, AMS-C-26074 Class 1
Stainless steel parts	Passivated, SAE-AMS-QQ-P-35
Shells	Zinc/cobalt, ASTM-B-840 Grade 6 Type C, over AMS-C-26074 class 4 grade B or Electroless nickel, AMS-C-26074 class 4 grade B or Zinc nickel black, ASTM-B-841 Class 1, Grade 10, over AMS-C-26074 class 4 grade B
Latch ring	Sulphuric acid anodised and dyed black. Defence standard O3-25/3
Crimp lugs	5 - 10µm tin, MIL-T-10727C over 0.25µm copper MIL-C-14550

Electrical performance and current derating

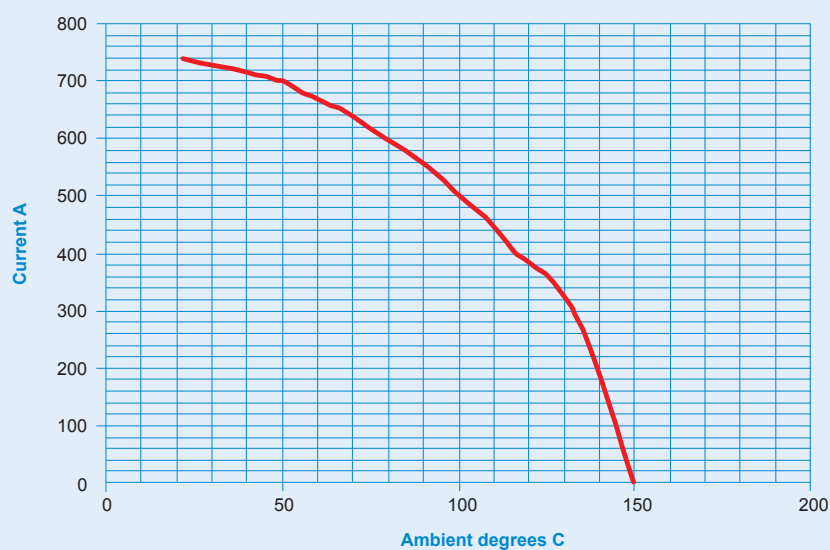
	Size 17 - 350 Amp connector	Size 21 - 500 Amp connector
Dielectric Withstand Voltage @ sea level, volts dc	2250	
Voltage rating @ sea level, volts dc	750	
Current rating, continuous, Amps	350	500
Surge current	6 kA for 1 second	10 kA for 1 second
Contact resistance (EIA-364-06C), mΩ max	0.1	0.05
Insulation resistance, GΩ minimum	5	

HBB size 17 - 350 A derating



Data from test using connectors each cabled with 1.2 metre length of 70 sq mm cable. Further derating may be necessary depending on the application. Derating curves generated according to EIA-364-70B Method 2.

HBB size 21 - 500 A derating



Data from test using connectors each cabled with 1.2 metre length of 120 sq mm cable. Further derating may be necessary depending on the application. Derating curves generated according to EIA-364-70B Method 2.

Mechanical performance

	Size 17 - 350 Amp connector	Size 21 - 500 Amp connector
Connector mating / unmating force (N max)	350	350
Endurance (mating & unmating cycles, min)	5000 cycles	

Enviromental performance

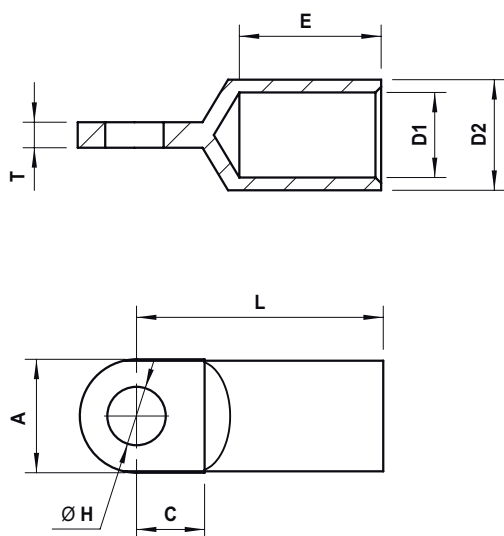
Temperature range (operational & storage)	-55 to +150 deg C
Humidity (days @ 90/95 % RH at 40 °C)	56
Salt spray (hours)	ZnCo plated – 300 ZnNi plated – 500 Electroless nickel plated – 48
Temperature life (hrs @ °C)	1000 at 125°C
Sealing, mated	BS EN 60529 IPx7 ISO 20653:2006 IP6K9K
Panel sealing level	BS EN 60529 IPx7
Random vibration (EIA-364-28E)	Test Condition V, Test Condition Letter E (0.2 g ² /Hz), duration 1.5 hours
Mechanical shock (EIA-364-27B)	25g, 11ms, half sine wave

Accessories

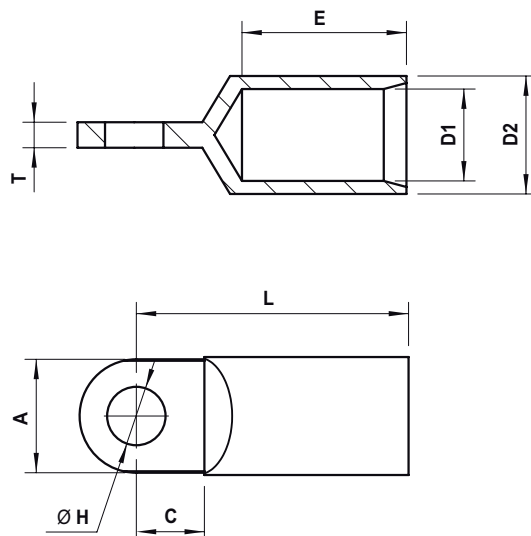
If required, the following accessories must be ordered separately; they are not supplied with connectors.

Crimp lug codes and dimensions

Lug for standard cable (suffix -A-68)



Lug for fine stranded cable (suffix -B-68)



Important

These are special pattern lugs which must be used on all connectors with right-angle backshells. They are also recommended for use on plug connectors with bolted contact terminations and no backshells.

Receptacle connectors where no boot is fitted can accept any other suitable lug.

Crimp lugs are tin plated (suffix -68).

Lugs require crimp tooling; see page 10 **Spares and special tools** section.

Lug codes and dimensions for size 17 - 350 A range

Cable area, sq mm	Part number	Dimensions							
		A (max)	C (nom)	D1 (nom)	D2 (nom)	E (nom)	H (nom)	L (nom)	T (ref)
25	HBB-950-8-25-A-68	18.1	10.0	7.0	10.0	25.0	8.3	38.1	4.0
25	HBB-950-8-25-B-68	18.1	10.0	7.9	11.0	27.0	8.3	40.4	4.0
35	HBB-950-8-35-A-68	18.1	10.0	8.5	12.0	25.0	8.3	39.0	4.0
35	HBB-950-8-35-B-68	18.1	10.0	9.2	12.5	27.0	8.3	41.0	4.0
50	HBB-950-8-50-A-68	18.1	10.0	10.0	14.0	25.0	8.3	39.6	4.0
50	HBB-950-8-50-B-68	18.1	10.0	11.0	15.0	27.0	8.3	41.9	4.0
70	HBB-950-8-70-A-68	18.1	10.0	12.0	16.5	25.0	8.3	40.5	4.0
70	HBB-950-8-70-B-68	18.1	10.0	13.0	17.0	27.0	8.3	42.5	4.0

Lug codes and dimensions for size 21 - 500 A range

Cable area, sq mm	Part number	Dimensions							
		A (max)	C (nom)	D1 (nom)	D2 (nom)	E (nom)	H (nom)	L (nom)	T (ref)
50	HBB-950-10-50-A-68	20.1	12.0	10.0	14.0	25.0	10.3	41.5	4.5
50	HBB-950-10-50-B-68	20.1	12.0	11.0	15.0	27.0	10.3	43.8	4.5
70	HBB-950-10-70-A-68	20.1	12.0	12.0	16.0	25.0	10.3	42.1	4.5
70	HBB-950-10-70-B-68	20.1	12.0	13.0	17.0	27.0	10.3	44.4	4.5
95	HBB-950-10-95-A-68	20.1	12.0	13.5	18.0	25.0	10.3	42.8	4.5
95	HBB-950-10-95-B-68	20.1	12.0	14.5	19.0	27.0	10.3	45.1	4.5
120	HBB-950-10-120-A-68	20.1	12.0	15.0	19.5	25.0	10.3	43.4	4.5
120	HBB-950-10-120-B-68	20.1	12.0	16.2	21.0	27.0	10.3	45.8	4.5

For AWG cable sizes, see page 14

Heat shrink boots

Connectors are designed to accept the following moulded lipped heat shrink boots which conform to specification number VG95343:

	Straight boot for bare connector	90° boot	Boot for right angle backshell	Boot for straight backshell
350 A plug	N/A	HBO-0009-E004A (note A)	N/A	N/A
350 A receptacle	N/A	N/A	N/A	HMO-0008-B005A (note B)
500 A plug	HBO-0008-C001A (note C)	HBO-0009-E005A (note D)	HBO-0008-C001A (note C)	HBO-0008-C001A (note C)
500 A receptacle	N/A	N/A	N/A	HBO-0008-C001A (note C)

Notes

A: VG spec = VG 95343 T18 E004A
C: VG spec = VG 95343 T18 C001A

B: VG spec = VG 95343 T18 B005A
D: VG spec = VG 95343 T18 E005A

It is the user's responsibility to ensure that boot material and adhesive / epoxy meet the requirements of their application. For further application details see **Workshop Manual – single-pole HBB range** available from website or Smiths Interconnect technical services.

Heat shrink tubes

On the following connector types or connector-boot combinations, an insulating sleeve must be fitted to the crimp lugs or crimp barrels. Thick-walled adhesive-lined heat shrink tube meeting VG95343 is the recommended material for this application. Sleeves must be fitted prior to fitting one of the above heat shrink boots. Tubing must cover the entire crimp barrel and seal to the cable outer jacket.

	Smiths Interconnect pt. no.
500A plug, all options with 50 sq mm cable all options with cable >50 sq mm	HBO-0007-D006A-0070 HBO-0007-D007A-0070

Tubing ordered according to this table is made from a self-extinguishing elastomer, internally coated with high-performance epoxy. The material/adhesive combination is rated to 150 degrees C. It is the user's responsibility to ensure that tube material and adhesive/epoxy meet the requirements of their application.

For further application details see **Workshop Manual – single-pole HBB range** available from website or Smiths Interconnect technical services.

Band-It[®], stainless steel, passivated

Band-it clamp suitable for	Smiths Interconnect pt. no.
350 A connector with straight or right angle backshell	HBO-0005
500 A connector with straight or right angle backshell	HBO-0005

Band-It clamps require an installation tool; see Spares and special tools section for tool order codes.

Constant force spring clamp, stainless steel, pre-stressed and heat treated

Costant force clamp suitable for	Smiths Interconnect pt. no.
350 A connector with straight or right angle backshell	HBB-971
500 A connector with straight or right angle backshell	HBB-971

No tooling is required for constant force clamps. These clamps are removable and re-useable.

Spares and special tools

Receptacle interface o-rings

	Smiths Interconnect pt. no.
Conductive o-ring for 350 A receptacle	HR-01717-0178-D-70
Conductive o-ring for 500 A receptacle	HR-02352-0178-D-70

The interface o-ring is a service part, to be replaced as required.

Panel o-rings

	Smiths Interconnect pt. no.
Fluorosilicone o-ring for 350 A receptacle	HR-02987-0178-F-70
Fluorosilicone o-ring for 500 A receptacle	HR-03782-0178-F-70
Conductive o-ring for 350 A receptacle	HR-02987-0178-D-70
Conductive o-ring for 500 A receptacle	HR-03782-0178-D-70

Backshell cap o-rings

	Smiths Interconnect pt. no.
Fluorosilicone o-ring for 350 A right angle backshell	HR-02195-0178-F-70
Fluorosilicone o-ring for 500 A right angle backshell	HR-02670-0178-F-70

Band-It® tooling

	Smiths Interconnect pt. no.
Hand tool for Band-It screen braid clamps	HBO-0006

Crimp tooling

Klauke crimp tooling is recommended for terminating cables to connector crimp barrels and terminal lugs. Battery powered tool (mini electro-hydraulic) = EK354. Crimp tools and dies listed in the following tables are available from Smiths Interconnect.

Crimp dies by code/lug and cable size – 350 A range

Termination code or lug ref	Cable CSA (mm ²)	Crimp barrel ID (mm)	Crimp style	No. of crimps	Die for use with EK354 tool
D	25	7.9	Hex	2	HR425
K	35	9.2	Hex	2	HR435
S	50	11.0	Hex	2	HR450
HBB-950-8-25-A-68	25	7.0	Hex	2	HR425
HBB-950-8-25-B-68	25	7.9	Hex	2	HR425
HBB-950-8-35-A-68	35	8.5	Hex	2	HR435
HBB-950-8-35-B-68	35	9.2	Hex	2	HR435
HBB-950-8-50-A-68	50	10.0	Hex	2	HR450
HBB-950-8-50-B-68	50	11.0	Hex	2	HR450
HBB-950-8-70-A-68	70	12.0	Hex	2	HR470
HBB-950-8-70-B-68	70	13.0	Hex	2	HR470

Crimp dies by code/lug and cable size – 500 A range

Termination code or lug ref	Cable CSA (mm ²)	Crimp barrel ID (mm)	Crimp style	No. of crimps	Die for use with EK354 tool
D	50	11.0	Hex	2	HR450
H	70	13.0	Hex	2	HR470
Q	95	14.5	Hex	2	HR495
V	120	15.0	Hex	2	HD4120
HBB-950-10-50-A-68	50	10.0	Hex	2	HR450
HBB-950-10-50-B-68	50	11.0	Hex	2	HR450
HBB-950-10-70-A-68	70	12.0	Hex	2	HR470
HBB-950-10-70-B-68	70	13.0	Hex	2	HR470
HBB-950-10-95-A-68	95	13.5	Hex	2	HR495
HBB-950-10-95-B-68	95	14.5	Hex	2	HR495
HBB-950-10-120-A-68	120	15.0	Hex	2	HR4120
HBB-950-10-120-B-68	120	16.2	Hex	2	HD4120

For further details refer to the HBB Workshop Manual.

AWG cable crimps

Termination code or lug ref	Cable AWG	Crimp Barrel ID (mm)	Crimp style	No. of crimps	Tool & Die Set
HBB-950-8-35-A-68	2	8.5	Hex	2	Klauke EK354, HR435
HBB-950-8-50-A-68	1/0	10.0	Hex	2	Klauke EK354, HR450
HBB-950-8-70-A-68	2/0	12.0	Hex	2	Klauke EK354, HR470
HBB-950-10-70-B-68	3/0	13.0	Hex	2	Klauke EK354, HR470
HBB-950-10-120-B-68	4/0	16.2	Hex	1	Klauke EK12032CFB; 120 DIE SET

HBB crimp barrels and lugs are designed and validated for use with metric cable, however AWG cable can also be used.

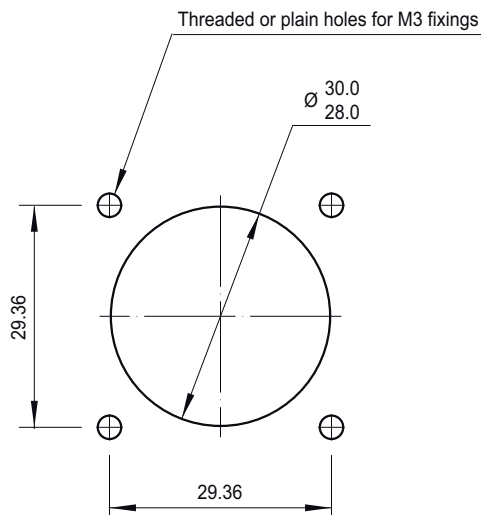
The table below provides a rough guide of lug and tooling combinations that could be compatible with various AWG cable sizes, but due to the wide variety of cable types available, customer validation testing is recommended.

Subject to testing suitable alternative crimp tooling may be used, but it is important to note that HBB crimps are designed for use with hex dies only.

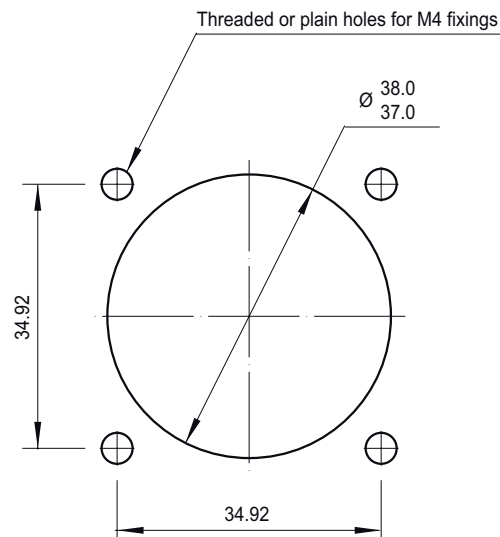
Panel preparation for receptacles

Standard rear mount *(connector mounted behind panel / inside box)*

Size 17 - 350 Amp



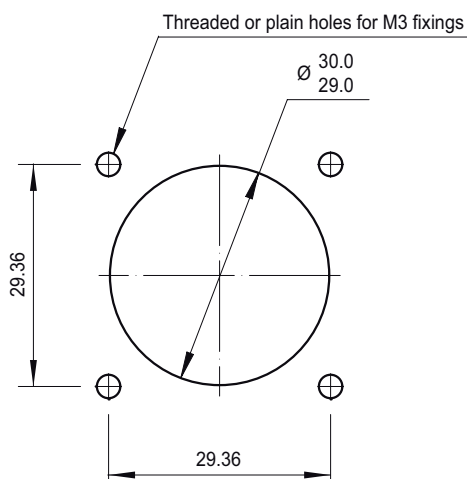
Size 21 - 500 Amp



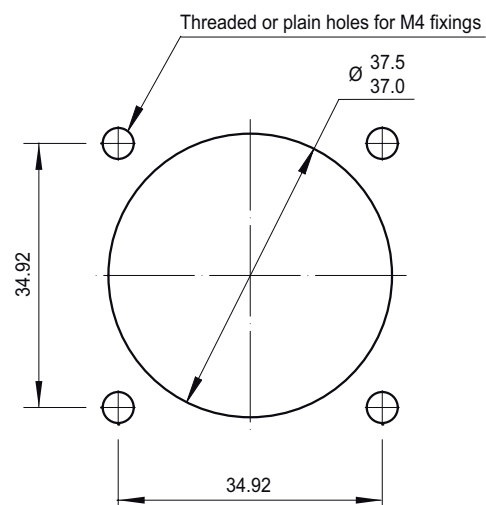
Recommended maximum panel thickness = 5.0 mm. If panel is more than 3.0 mm thick then fixing screws may need to be recessed to give clearance for mating connector.

Front mount *(connector mounted in front of panel / outside box)*

Size 17 - 350 Amp

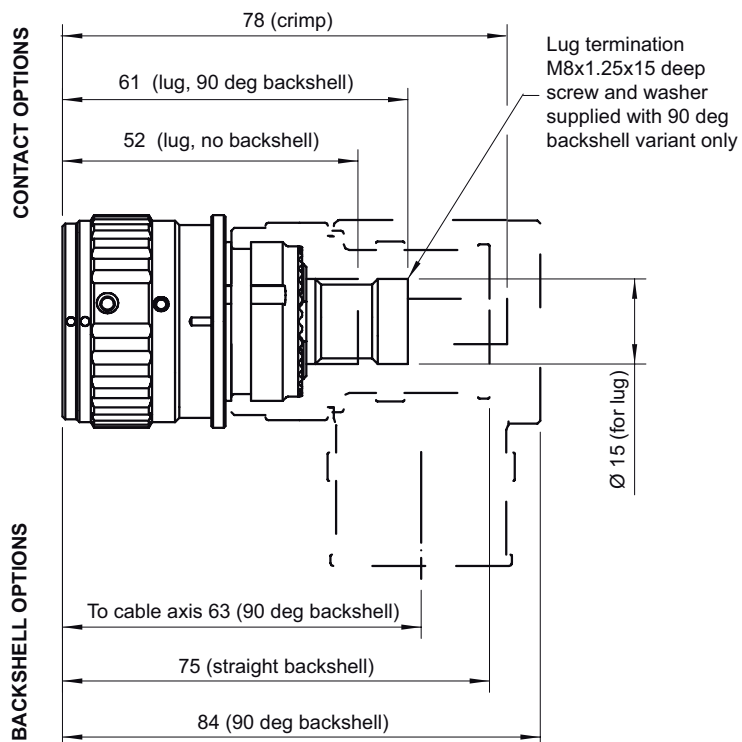
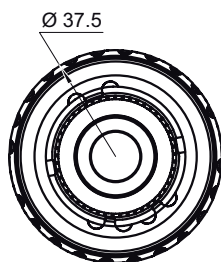


Size 21 - 500 Amp

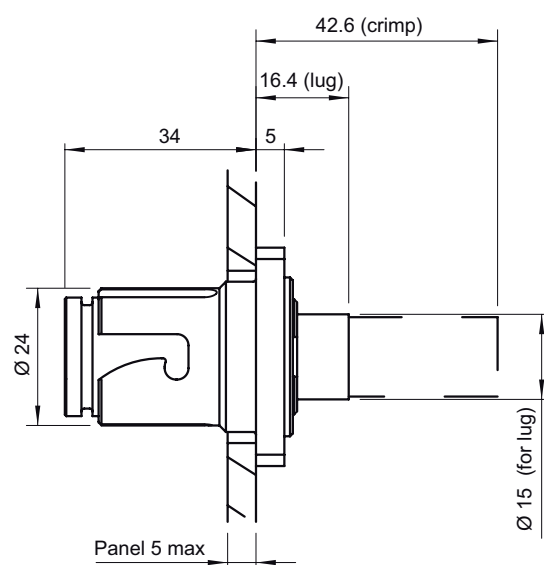
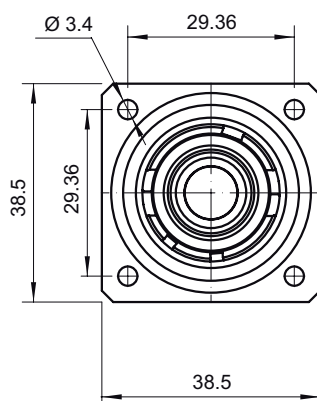


Connector outline drawings

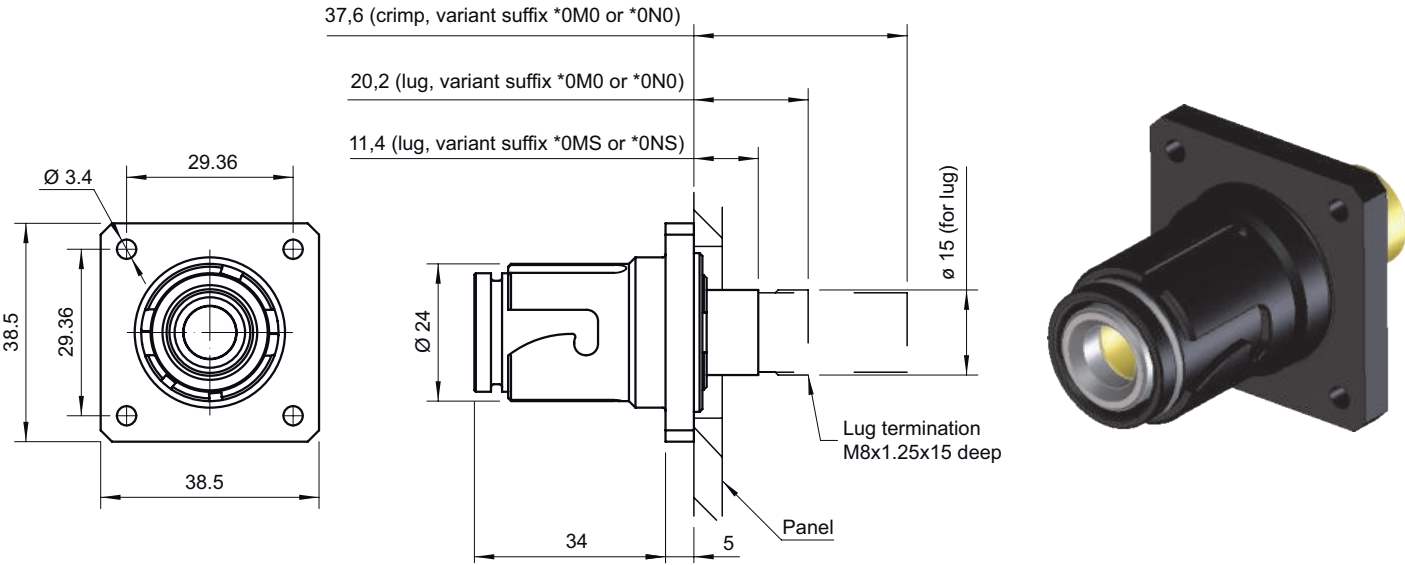
Size 17 - 350 Amp plug



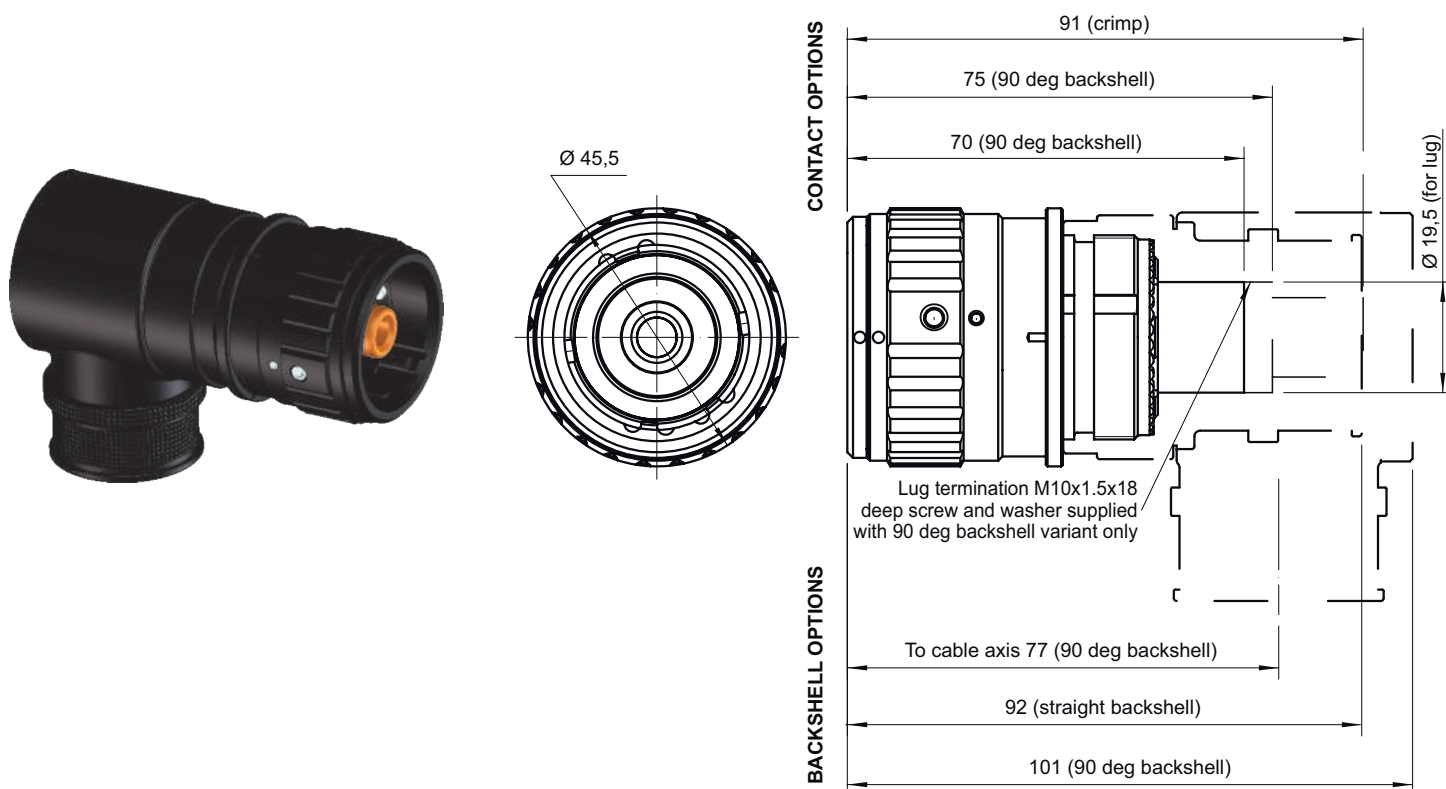
Size 17 - 350 Amp receptacle, rear mounting



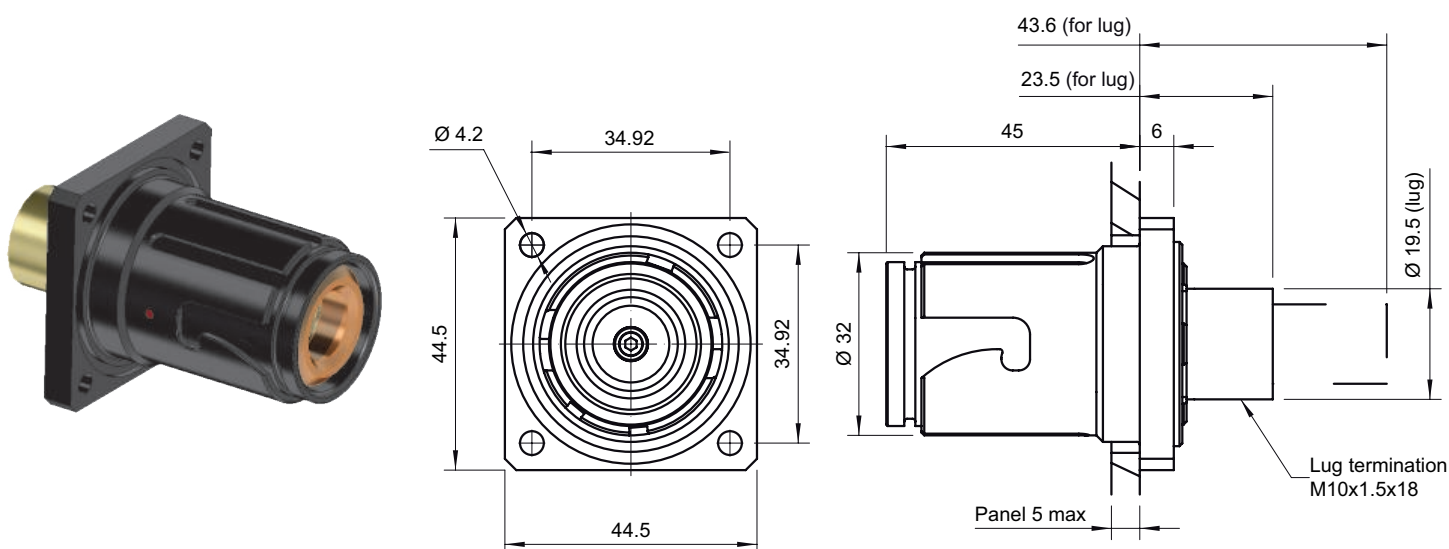
Size 17 - 350 Amp receptacle, front mounting



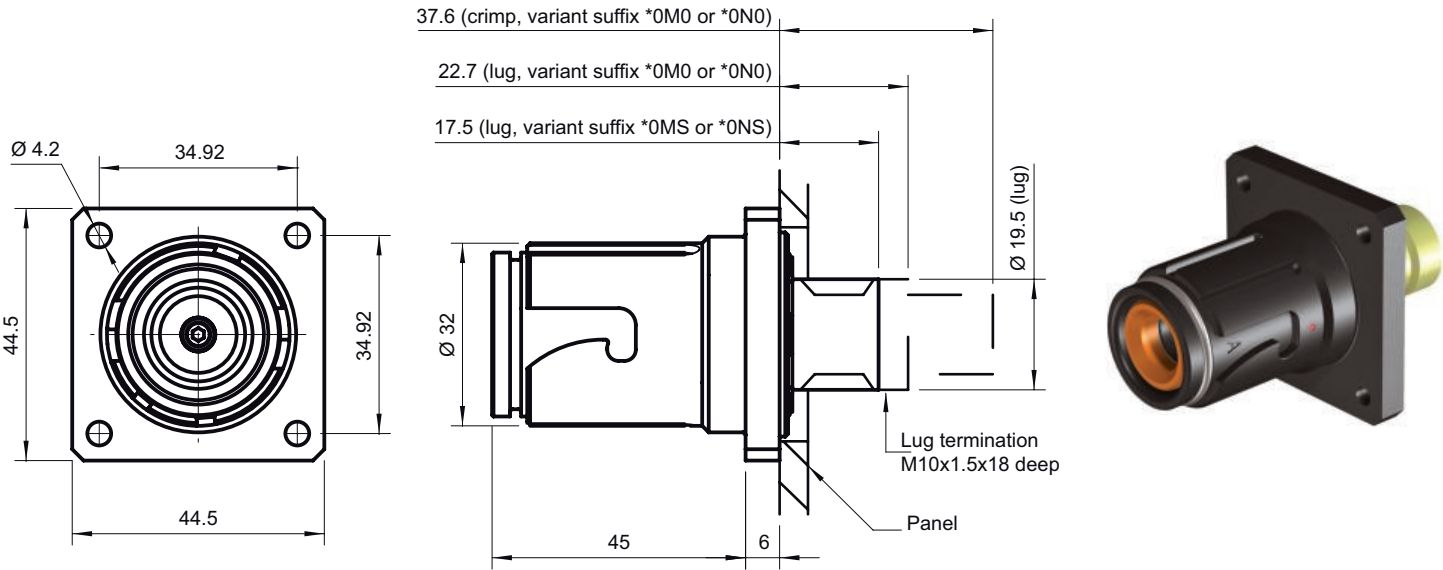
Size 21 - 500 Amp plug



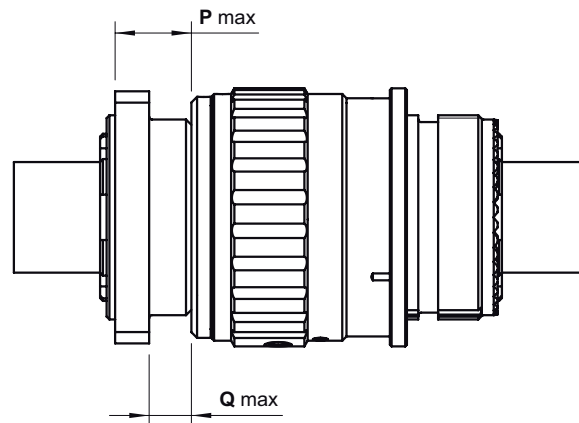
Size 21 - 500 Amp receptacle, rear mounting



Size 21 - 500 Amp receptacle, front mounting

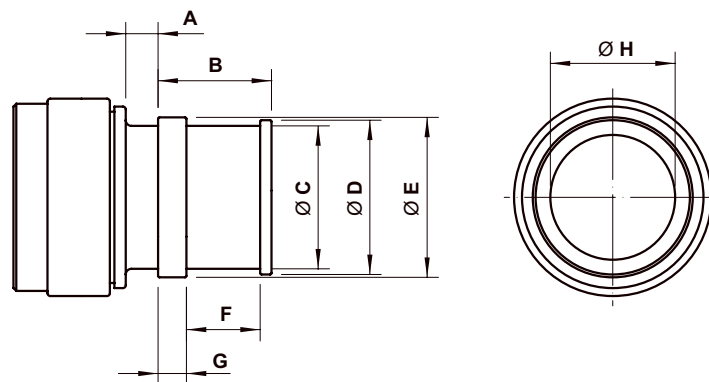


Mated dimensions



Dimension when fully mated (mm)	P (max)	Q (max)
Size 17 - 350 A	12.0	7.0
Size 21 - 500 A	13.5	7.5

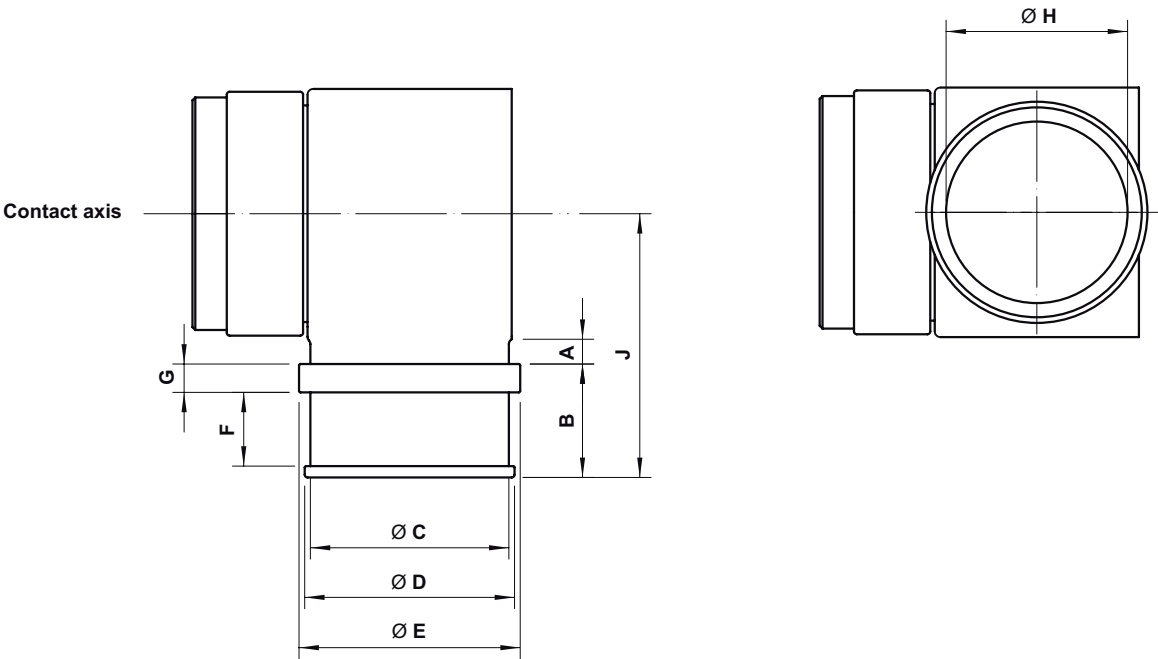
Backshell - Straight option



Dimensions (mm)	A	B	$\varnothing C$	$\varnothing D$	$\varnothing E$	F	G	$\varnothing H$
Size 17 - 350 A straight	6	20	25	27	28	13	5	22
Size 21 - 500 A straight	9.5	20	34	36	38	13	5	30

$\varnothing C$ and $\varnothing E$ are knurled (DIN 82 RGV).

Backshell - Right-angle option



Dimensions (mm)	A	B	Ø C	Ø D	Ø E	F	G	Ø H	J
Size 17 - 350 A right angle	5	20	30	32	33	13	5	27	43
Size 21 - 500 A right angle	4	20	35	37	39	13	5	32	47

Internal features in the backshell allow it to be locked in position in 9 degree (500 amp) or 11.25 degree (350 amp) steps around the axis of the plug contact Ø C and Ø E are knurled (DIN 82 RGV).

General range information

Transit packaging

Connectors are supplied with non-sealing vinyl caps to protect plated finishes.

Sealed protective caps

Protective caps meeting recognised sealing specifications are available; consult your local sales representative.

Feedthrough versions

Pin to pin feedthrough versions are available; consult your local sales representative.

Harness solutions

Please contact your local sales representative to inquire about our harness solutions.

Disclaimer

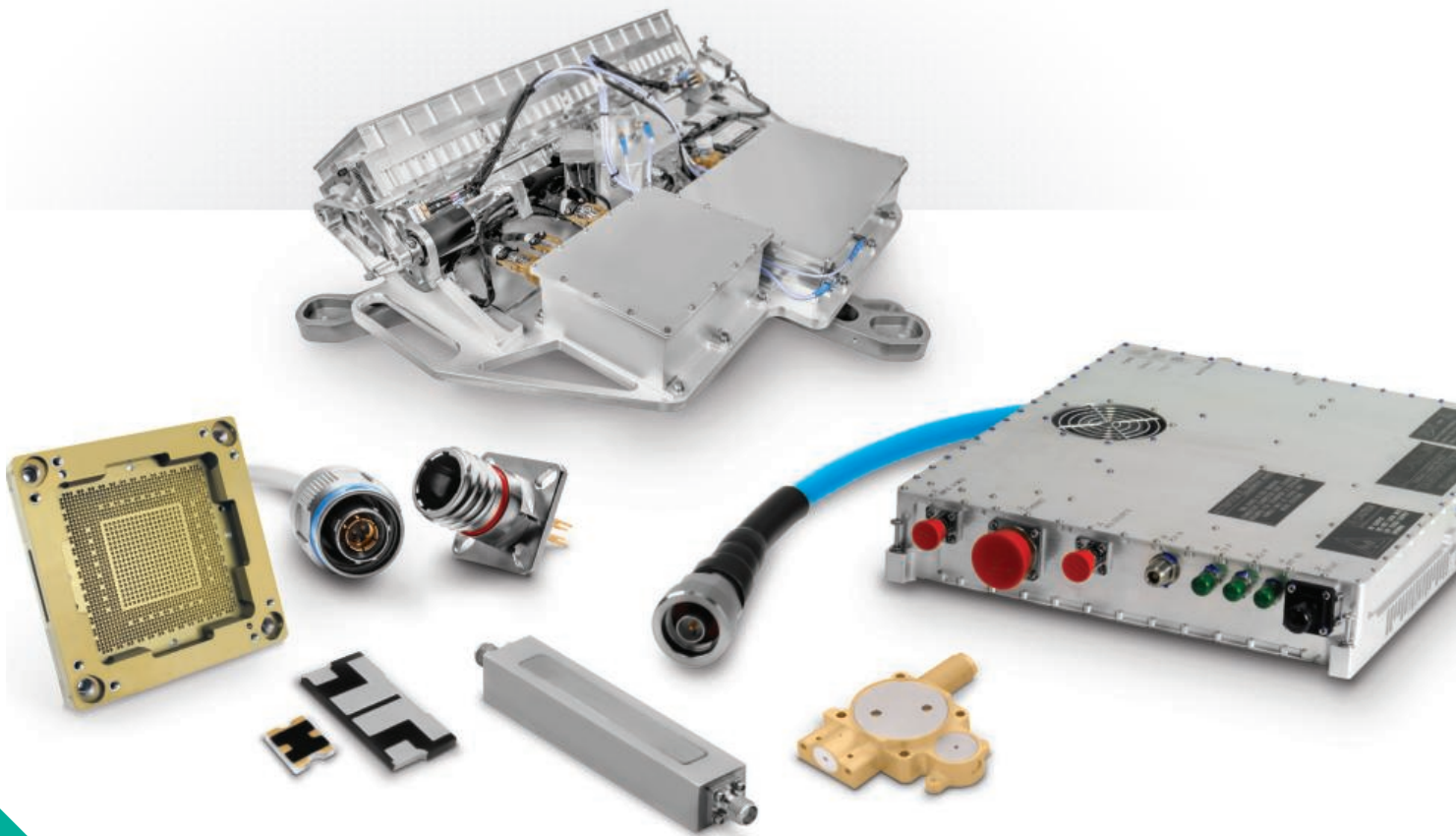
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