Precision Pin and Socket Contacts

Tyco Electronics

Our commitment. Your advantage.

Introduction

As the world's leading manufacturer of electrical/electronic connecting devices, Tyco Electronics produces a wide assortment of connector contacts. Included in this catalog is an array of the most popular pin and socket type contacts for signal and power, for coaxial cable, and posted versions for backpanel wiring applications. Also included is information on available application tooling to meet your production requirement.

The contacts present in this catalog were specifically designed for AMP M Series, CPC (Circular Plastic Connectors), Circular Metal-Shell, Metrimate (True Metric Dimensions), and "G" Series connectors.

How to choose the correct connector/contact combination.

Choosing the correct connector/contact combination is essential to the proper function of any AMP connector. A customer must first evaluate each individual application with regards to wire size(s), number of circuits, available space, and fastening method. The customer must then consider the following factors to make the right selection of connector/contact/hardware:

a. Connector Type. This decision is based on the selected contact types, coupling method, circuit density requirements and, if posted connectors are desired, in-plant production capabilities of wiring connectors using hand tools or semiautomatic tooling.
b. Contact Type. This decision is based on wire size(s) and the reliability and cost requirements of an application, as well as the customer's in-plant production capabilities.
c. Hardware Selection. This decision is based on the connector type, and the application requirements for fastening, protection, shielding, guiding, strain relief and keying.

For specific information on these connectors and associated hardware, refer to the following catalogs:

1. Catalog 82003—AMP M Series Pin and Socket Connectors
2. Catalog 82021—AMP CPC (Circular Plastic) and Metal-Shell CPC Pin and Socket Connectors
3. Catalog 82045—AMP Metrimate Pin and Socket Connectors
4. Catalog 82046—"G" Series Modular Connectors

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Need more information?

Call Technical Support: 1-800-522-6752.

The Center is staffed with specialists well versed in all AMP products and application tooling. The Center can provide you with:

- Technical Support
- Catalogs
- Technical Documents
- Product Samples
- AMP FAX Service—Product Information Faxed Immediately
- Authorized Distributor Locations

■ **Produced under a Quality Management System certified to ISO 9001**

A copy of the certificate is available upon request.

Front Cover:
CPC Connectors, Metrimate Connectors, M Series Connectors, 20 DF Contacts, Type II Contacts, Type III+ Contacts, Subminiature Coaxial Contacts, Miniature Coaxial Contacts, Type I Contacts, Type XII Contacts, Size 8 Contacts

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Current Carrying Capabilities

Current Carrying Capabilities

The total current capacity of each contact in a given connector is dependent upon the heat rise resulting from the combination of electrical loads of the contacts in the connector arrangement and the maximum ambient temperature in which the connector will be operating. Caution must be taken to ensure that this combination of conditions does not cause the internal temperature of the connector to exceed the maximum operating temperature of the housing material. Several variables which must be considered when determining this maximum current capability for your application are:

- **Wire Size**—Larger wire will carry more current since it has less internal resistance to current flow and generates less heat. The wire also conducts heat away from the connector.
- **Connector Size**—In general, with more circuits in a connector, less current per contact can be carried.
- **Current Load Distribution**—Spreading those lines with greater current loads throughout the connector, particularly around the outer perimeter, will enhance heat dissipation.
- **Ambient Temperature**—With higher ambient temperatures, less current can be carried.

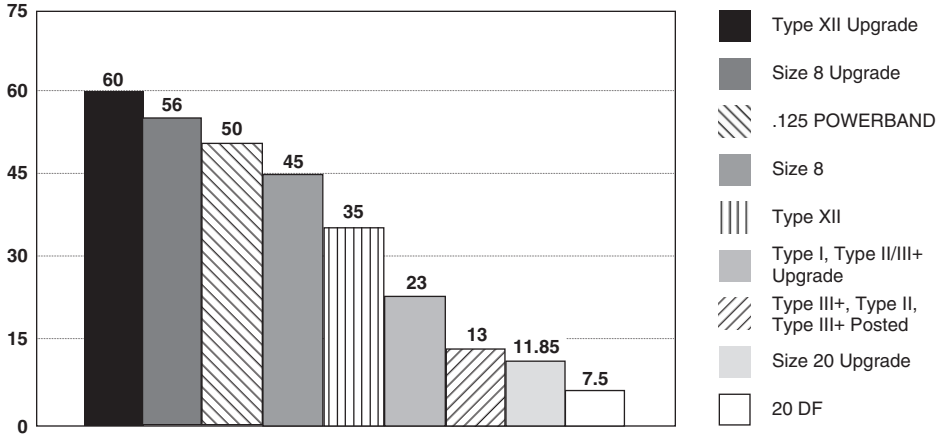
Current Rating Verification

Can a contact rated at 10 amperes carry 10 amperes?

Maybe yes, but probably not. The reason lies in the test conditions used to rate the contact. If these conditions do not adequately reflect the application conditions, the actual allowable current levels may be lower than specified levels. For example, many manufacturers, including Tyco, test a single contact in air. This gives an accurate measure of the basic current-carrying capacity of the contact. Use the contact alone in air and it can certainly carry 10 amperes. Use it in a multi-position connector surrounded by other current-carrying contacts or in high ambient temperatures, and the contact should carry less current.

Similarly, as the contact ages and stress relaxation, environmental cycling, and other degradation factors take their toll, the contact's current-carrying capacity decreases. A prudent design must set current levels for such end-of-design-life (EODL) conditions.

CONTACT CURRENT GUIDE Maximum Current (Amperes) for Largest Wire Size



Practical current-carrying capacity is not an absolute, but an application-dependent condition.

New Method Simplifies Ratings

To help the designer set the appropriate current level, Tyco Electronics has developed a method of specifying current-carrying capacity. This method takes into account the various application factors that influence current rating.

The method can be summarized as follows:

- The contact is aged to EODL conditions by durability cycling, thermal cycling, and environmental exposure.
- The contact's resistance stability is verified.
- The current necessary to produce the specified temperature rise is measured. This T-rise is usually 30°C.
- A rating factor is determined to allow derating of multiple contacts in the same housing and for different conductor sizes.

Temperature

One other factor influencing current levels is the maximum operating temperature, for example, 105°C. If the application has a high ambient temperature (over 75°C) the contact's T-rise is limited by the maximum operating temperature. For example, an application temperature of 90°C limits the contact T-rise to 15°C. Since current produces heat (the I^2R law), the current must be lowered to limit the T-rise.

A contact's T-rise depends not only on its I^2R Joule heating, but also on its ability to dissipate the heat. Consider a contact in a multi-contact housing. Joule heating in multiple contacts will raise the local ambient temperature. Since the contact will not be able to dissipate its own heat as well by convection, the maximum T-rise will be realized at a lower current level. Consequently, the allowable current level must be lower to maintain an acceptable T-rise.

For a given connector, the current level will be set by the loading density. A connector containing 50% current-carrying contacts will permit higher currents (per contact) than a connector will at 75% loading. The loading percentage assumes an even distribution of contacts within the housing. If all 10 contacts are grouped together in one section of a 20-position connector, the loading density may approach 100%.

The Importance of EODL

As stated, T-rise in a contact depends on both resistance and current. As it ages, a contact's resistance will increase. The contact designer will specify a maximum resistance for the contact, this level is the end-of-design-life resistance. Before the contact is tested for current, Tyco subjects it to a sequence of tests that exercises the major failure mechanisms and thereby simulates EODL conditions. Conditioning includes mating cycling, industrial mixed-flowing gases, humidity and temperature cycling, and vibration to sequentially introduce wear, corrosion, stress relaxation, and mechanical disturbance.

Presentation

The presentation of current-carrying capacity in AMP product specifications includes two parts:

- First, a base curve showing current levels versus T-rise for a single circuit and the largest wire size. This represents the maximum current capacity of the contact. The curve is usually flat up to 75°C ambient and then drops off. Up to 75°C, the 30°C T-rise limits the amount of current, and above 75°C the current must be reduced to keep the combination of ambient temperature and T-rise from exceeding the maximum operating temperature of 105°C.

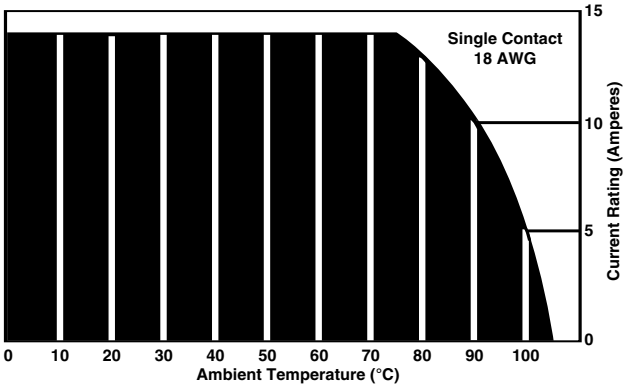


Figure 1

Graph shows the relationship between base current, ambient temperature, and contact T-rise.

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Current Carrying Capabilities (Continued)

- Next are rating factors, a table of multipliers to account for connector loading and for smaller wire sizes. The designer first determines the base current for the ambient conditions of the application; then multiplies this base current by the rating factors to find the current level for the application's loading factor and wire size.

Practical Values

The current-rating method gives designers practical values applicable to their applications. While the specified current levels for a contact may be lower than for other testing methods, they are more realistic and simplify the system design process.

"Spec-manship" is replaced by a realistic assessment of the current-carrying capacity of a contact under varying conditions of temperature, connector loading, and wire size.

Connector/Contact Acceptability

As previously stated, choosing the correct connector/contact combination is fundamental to the successful function of all connectors. The Selection Chart shown below, is designed to simplify your choice of connectors and their acceptable contacts. Once you have selected the wire size, current-carrying capacity need, number of positions required, and the type of contacts needed in your choice of connector, refer to this matrix for a quick look at exactly what is acceptable in a given connector type.

An Example:

To demonstrate the method of specifying current, consider the following application conditions; an ambient temperature of 65°C, a 50% loading of contacts in the housing, and 20 AWG [0.6mm²] wire.

- From Figure 1, the base current rating is 14 ampere with 18 AWG [0.8mm²] wire.
- Figure 2, the rating factor for 50% loading and 20 AWG [0.6mm²] wire is 0.68.
- The specific rating for this application is the product of the base rating and the rating factor:
  14 x 0.68 = 9.5 ampere
- Each of the contacts can carry 9.5 ampere.
- However, if the ambient temperature is 80°C the allowable T-rise becomes 25°C. The base current must be lowered to 12.8 ampere so that the 105°C maximum operating temperature is not exceeded. The current rating then becomes:
  12.8 x 0.68 = 8.7 ampere.

Technical Documents

Technical Documents consist of *Product Specifications* and *Application Specifications*. *Product Specifications* define the performance characteristics of the product; i.e., Current Rating, Temperature Rating, etc. They are intended for the Design or Component Engineer. *Application Specifications* describe how the product is to be applied; i.e., Crimping, Assembling, etc. They are intended for Manufacturing and Operation/ Set Up Personnel. Where Application Specifications are not available, an Instruction Sheet is provided. Additional Instruction Sheets on the product may be available. Please contact Technical Support: 1-800-522-6752.

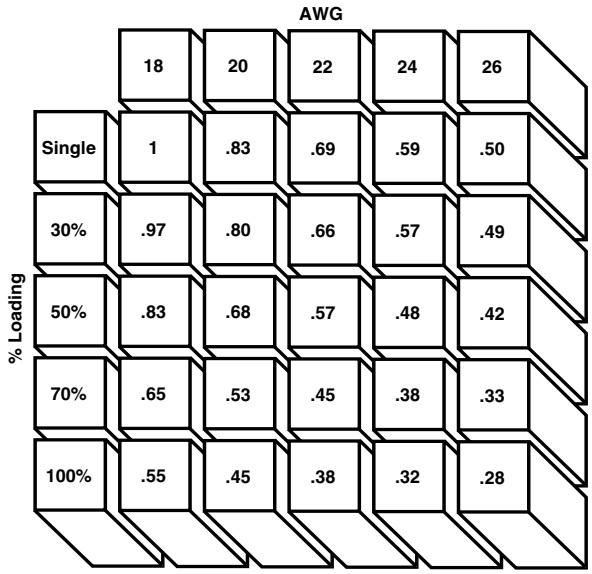

Figure 2

Rating factors allow the base current to be adjusted for various connector loading and wire sizes.

Technical Document Selection Chart

Contact Type	Product Specifications	Application Specifications	Instruction Sheet
20 DF	108-40005	114-10000 114-40030	—
Type I	108-10108	114-10037	—
Type II	108-10039	114-10026	—
Type III+	108-10042	114-10004	—
Type VI	108-10038	114-10007	—
Type XII	108-10037	114-10005	—
M Series Posted	108-10042	—	408-09155
.125 POWERBAND	—	114-10043	—
Size 8	108-01317	114-10014	—
Size 8 Upgrade	108-1449	—	—
Mini Coax	108-12021	—	408-1770
Sub-Mini Coax	108-12008 108-12011	—	408-2024-3

Contact Selection Chart

Connector Type	20 DF & Size 20 Upgrade	Type I	Type II	Type III+ & Type II/III+ Upgrade	Posted Type III+	Type XII & Type XII Upgrade	.125 POWERBAND	Size 8 & Size 8 Upgrade	Mini-Coax	Sub-Mini Coax
Metrimate			✔	✔	✔					
Metrimate Drawer			✔	✔	✔			✔		
Metrimate Drawer (.125 POWERBAND)							✔			
CPC Series 1			✔	✔	✔					✔
CPC Series 2	✔									
CPC Series 3						✔				
CPC Series 4			✔	✔		✔				✔
CPC Series 5							✔			
CPC Series 6			✔	✔			✔			
M Series			✔	✔	✔					✔
M Series Special		✔	✔	✔	✔	✔			✔	✔
"G" Series		✔	✔	✔		✔			✔	

Signal Contacts

Type III+, Crimp, Snap-In, Size 16

Precision formed pin and socket contacts in Size 16. They are used in M Series, Special M Series, “G” Series, Metrimate, Metrimate Drawer, and CPC Series 1 and 4 connectors. Contacts feature a high normal force which provides a low resistance in significant applications such as dry circuit signal conditions. Mating entry is closed-ended to prevent damage from stubbing due to misalignment. Stainless steel spring provides superior normal force and retention in the housing. Tyco Electronics proprietary gold plating process is designed so that specified plating thicknesses are controlled on the inside of the socket, which is the critical contact mating area. The contacts are formed from brass. Single contact rating is 13 amperes at 30°C T-Rise.

See page 9 for product details.

Type III+, Solder Type, Size 16

As with the crimp snap-in Type III+, these precision formed solder-type contacts are also used in M Series, Special M Series, Metrimate, Metrimate Drawer, and CPC Series 1 and 4 connectors. Contacts feature a high normal force which provides a low resistance in significant applications, such as dry circuit conditions. A preformed wire barrel accepts both stranded and solid wire, while the preformed insulation barrel provides strain relief for various wire insulation thicknesses. Mating entry is closed-ended to prevent damage from stubbing due to misalignment. A stainless steel spring provides superior normal force and retention in the housing. Tyco Electronics proprietary gold plating process is designed so that specified plating thicknesses are controlled on the inside of the socket, which is the critical contact area. Single contact current rating is 13 amperes at 30°C Temperature Rise.

See page 10 for product details.

Type III+, Solder Tab, Size 16

A companion contact style to the crimp snap-in and solder-type, the Type III+ Solder Tab is compatible with the same AMP connector families, and features high normal forces to provide a low resistance in significant applications. A pre-crimped solder tab with slot accepts various sizes of solid and stranded wire. Mating entry is closed-ended to prevent stubbing due to misalignment. A stainless steel spring provides superior normal force and retention in the housing. Tyco Electronics proprietary gold plating process is designed so that specified plating thicknesses are controlled on the inside of the socket, which is the critical contact area. Single contact current rating is 13 amperes at 30°C Temperature Rise.

See page 11 for product details.

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Signal Contacts (Continued)

Type III+, Posted Version, Size 16

The last member of the Type III+ family of contacts, the posted version is compatible with M Series, Special M Series, Metrimate, Metrimate Drawer, and CPC Series 1 connectors. Precision formed, they are pre-crimped to various post configurations including those that accept TERMI-POINT Clip or wire-wrap type terminations. Contacts feature high normal force which provides a low resistance in significant applications. Mating entry is closed-ended to prevent damage from stubbing due to misalignment. A stainless steel spring provides superior normal force and retention in the housing. Tyco Electronics proprietary gold plating process is designed so that specified plating thicknesses are controlled on the inside of the socket, which is the critical contact mating area. Contacts are formed from brass. Single contact current rating is 13 amperes at 30°C Temperature Rise.

See page 12 for product details.

Type II, Crimp, Snap-In, Size 16

Precision screw-machined pin and socket contacts, they are used in M Series, Special M Series, “G” Series, Metrimate, Metrimate Drawer, and CPC Series 1 and 4 connectors. Contacts feature high normal force which provides a low resistance in significant applications such as dry circuit signal conditions. Mating entry is closed-ended to prevent damage from stubbing due to misalignment. A stainless steel spring provides superior normal force and retention in the housing. The contact bodies are machined from solid brass. Single contact current rating is 13 amperes at 30°C Temperature Rise.

See page 13 for product details.

Size 20 DF, Crimp, Snap-In

Precision formed lance-less pin and socket, crimp, snap-in contacts in Size 20. These contacts are used in CPC Series 2 and AMPLIMITE Subminiature D connectors (see catalog 82068 for AMPLIMITE connectors). Contacts feature a low mating force to facilitate high pin counts in the connector housings. Tulip entry design on socket and generous lead-in on pin prevents contact stubbing. Pin contacts are formed from brass, whereas socket contacts are formed from phosphor bronze providing excellent spring properties. Contacts are available with or without insulation support. Single contact current rating is 7.5 amperes at 30°C Temperature Rise.

See pages 15 & 16 for product details.

Size 20 DF, Solder Cup, Snap-In

Precision formed lance-less pin and socket, solder contacts in Size 20. These contacts are used in CPC Series 2 and AMPLIMITE Subminiature D Connectors (see catalog 82068 for AMPLIMITE connectors). Contacts feature a low mating force to facilitate high pin counts in the connector housings. Tulip entry design on socket and generous lead-in on pin prevents contact stubbing. Pin contacts are formed from brass, whereas sockets are formed from phosphor bronze providing excellent spring properties. Contacts may be soldered to solid or stranded wire up to 18 AWG [0.8 mm^2] maximum. Single contact current rating is 7.5 amperes at 30°C Temperature Rise.

See page 17 for product details.

Power Contacts

Type I, Crimp, Snap-In, Size 12

Precision screw-machined pin and socket, Size 12 contacts, they are used in Special M Series and "G" Series connectors, and are inserted into the same cavities as Miniature Coaxial contacts. These contacts feature a high normal force which provides a low resistance in significant applications. Mating entry is closed-ended to prevent damage from stubbing due to misalignment. Beryllium copper springs are used to provide contact normal force and are assisted by a stainless steel hood which provides anti-overstress assurance. Single contact current rating is 23 amperes at 30°C Temperature Rise.

See page 18 for product details.

.125 POWERBAND, Crimp, Snap-In

Specifically designed for AMP CPC Connectors (Series 5 and 6) and Metrimate .125 POWERBAND Drawer Connectors, the new .125 POWERBAND contact offers the performance of a MIL-Spec screw machine contact with the economy of a stamped and formed, strip-feed contact. Contacts are formed from copper with beryllium copper springs. Single contact current rating is 50 amperes at 30°C Temperature Rise.

See page 20 for product details.

Size 8, 4/8 Indent Crimp

Precision screw-machined pin and socket, Size 8 contacts, they are used in Metrimate Drawer Connectors, and other AMP product lines, which require high current carrying capability in a small size. Pins are made from a solid high conductivity copper alloy, and the sockets are machined from solid beryllium copper, a material which exhibits excellent spring properties. Industry standard 4/8 indent crimp offers higher reliability and ease of termination. Single contact current rating is 45 amperes at 30°C Temperature Rise.

See page 21 for product details.

Type XII, Crimp-Type

Precision formed male and female contacts used in CPC Series 3 and 4, Special M Series and "G" Series connectors, these contacts offer a low cost power option which provides additional applied cost savings when terminated with semiautomatic application equipment. The contact body is made from 100% copper, which provides for excellent conductivity. Spring characteristics are derived from a captive stainless steel spring which assists the dual cantilever spring members of the female contact. Single contact current rating is 35 amperes at 30°C Temperature Rise.

See page 23 for product details.

High Current Upgrades

Precision screw-machined pin and socket contacts have increased current capability. All upgraded contacts use the high amperage Louvertac contact band. The design of this contact allows for increased current in the same form factor. For example, Type II/Type III+ upgraded contacts increase the current from 13 amperes free air to 23 amperes free air at a 30°C Temperature Rise.

See pages 19, 22, and 24 for further details.

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Coaxial Contacts

Subminiature, Crimp, Snap-In, Size 16

Precision screw-machined pin and socket, Size 16 contacts, they are used in M Series, Special M Series, and CPC Series 1 and 4. They provide cost effective solutions in applications where mixtures of signal, power, and coaxial cable terminations are desired. The contact outer shell is made from brass, while the center pin conductor is beryllium copper, and the socket is brass. Both the pin and socket center conductor are gold plated for maximum corrosion resistance and minimum contact resistance. The retention spring is stainless steel, while the ferrule is tin-lead plated copper. Contact design offers application of coaxial cable, shielded conductors, and twisted pair wire with a voltage rating of up to 200 VRMS, and a current rating of 1.0 ampere at 30°C Temperature Rise.

See pages 25 & 26 for product details.

Miniature, Crimp, Snap-In, Size 12

Precision screw-machined, Size 12 pin and socket contacts, they are used in Special M Series and “G” Series connectors. They provide cost effective solutions in applications where a mixture of signal, power, and coaxial cable terminations is desirable. Contact body and center wire conductor are made from brass, and are gold plated for maximum corrosion resistance and minimum contact resistance. The retention spring is beryllium copper, and the ferrule is tin-lead plated copper. Contact design offers application of coaxial cable, shielded conductors, and twisted pair wire with a voltage rating of up to 325 VRMS, and a current rating of 7.5 amperes at 30°C Temperature Rise.

See pages 27 & 28 for product details.