

Amphenol
MILITARY & AEROSPACE



AMPHENOL NAVAL PRODUCTS

AMAO Naval Product Guide

AMPHENOL PRODUCT OVERVIEW

Amphenol Military & Aerospace Operations (AMAO) is the **largest supplier** of interconnect products in the military and aerospace markets.

Our cable assembly design teams will work jointly with your teams to provide custom wiring interconnection solutions or to develop next generation technology. No other connector manufacturer can match Amphenol's selection of cable connectors, accessories, and the guaranteed intermateability with the equipment receptacles. Amphenol's expertise, combined with 21 interconnect divisions throughout North America, Europe, and Asia, provides users a complete cable assembly solution for virtually any system.



D38999 Series III



Terrapin



Custom Hermetic Feedthrough



Circular Filter Connector Adapters

Circular Connectors:

Mil-Spec Connectors

D38999, M26482, M83723, M22992, M5015, M55116, M55181, M26500

Micro-Miniature Connectors

2M, Terrapin, TAC, Bantam, MRC, Grasshopper

Mil-Spec Derivatives

High-Power, Breakaways, High-Density,

Filter (EMI/EMP) and Hermetic Connectors

High Speed & Fiber Optics:

Mil-Spec Derivatives

RJ Field, LC Field, ARINC 801, D38999

TFOCA Connectors

TFOCA, TFOCA-II, TFOCA-III, TFOCA-XBT

High Speed Solutions

USB, Ruggedized Ethernet

Custom Designs



LC Field D38999



TFOCA-III



Rugged Ethernet RJ45



CTOS - Expanded Beam

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AMPHENOL ROHS COMPLIANT PLATINGS



Durmalon™ is Amphenol's answer to EU RoHS/ELV/Cadmium Free restrictions.

Commercial, industrial & military markets are rapidly moving away from restricted materials such as Cadmium (Cd) & Hexavalent Chromium (Cr(VI)). Both of these restricted materials are toxic and are known carcinogens. Amphenol is offering an alternative finish that complies with all customer requirements tied to these specifications.

MIL-DTL-38999, Rev L has established new service classes for alternative finishes addressing these requirements for Cadmium replacement. Amphenol is using this and European Union Directive 2002/95/EC RoHS (Regulation of Hazardous Substances) as a guide to qualification for all domestic, global, commercial, industrial, & military specifications requiring the reduction or elimination of these restricted materials.

Amphenol has qualified Durmalon, with internal part number coding "DT" finish, which meets or exceeds the 38999 designated class "T" finish, Nickel Fluorocarbon Polymer. Durmalon is also EU RoHS compliant and is Cadmium free, Lead free, and Hexavalent Chromium free.

Cadmium has been applied to numerous components of land, sea and air weapon systems and NASA systems for many years as it provides sacrificial corrosion protection and excellent lubricity for threaded applications.

The Defense Logistics Agency (DLA) has added the following cadmium alternative finishes to MIL-DTL-38999, Rev L (and other connector specs):

- Nickel Fluorocarbon Polymer
- Zinc-Nickel

Amphenol's DURMALON™

Durmalon, like Olive-Drab Cadmium plating (Class W), meets 500 hours of dynamic salt spray, combined with 500 mating cycles and meets specified millivolt drop shell-to-shell conductivity. Durmalon also meets a 200° C temperature rating. Durmalon has been proven to meet this requirement as well as Potassium Formate-Deicer fluid testing performed by Boeing.



Black Zinc Nickel is Amphenol’s second RoHS Compliant Plating Alternative to Cadmium.

Amphenol is now offering a new RoHS compliant alternative to Cadmium. Black Zinc Nickel is a non-reflective and conductive black finish approved for 500 hrs salt spray making it an excellent choice for harsh environments. Black Zinc Nickel has been qualified by the DLA, with internal part number coding “DZ” finish, which meets or exceeds the 38999 designated class “Z” finish. Black Zinc Nickel is compatible with other platings and available on a wide variety of connectors and accessories including all MIL-DTL-38999 Series III connectors.

Applications

Interest for non-hazardous alternative finishes are gaining momentum & many customers are currently using Black Zinc Nickel for a broad number of applications. Black Zinc Nickel is typically used on applications for commercial aerospace and military defense, who are now moving away from toxic Cadmium to more environmentally friendly options.

Testing

Amphenol Aerospace has performed extensive testing on numerous alternative platings including Black Zinc Nickel. For specific applications please contact Amphenol Aerospace.

Additional Requirements

- Corrosion Resistant (Salt Spray Referenced)
- EMI Shielding - 50 db @ 10 GHz spec Min
- Backwards compatible with Cadmium

Requirements	Cadmium	Durmalon™	Black Zinc Nickel
Coupling Torque Post 500 hr. salt	X	X	X
Shell to Shell Conductivity <2.5 millivolts	X	X	X
Cycles of Durability 500 mates	X	X	X
Salt Spray Dynamic 500 hours	X	X	X
Temperature Rating 175° C	X	X	X
Non-Reflective	X	X	X
EU RoHS/ELV Compliant*		X	X
Non-Magnetic	X	X	X
De-icing Fluid**		X	X

*Meets EU RoHS/ELV maximum concentration values (MCV) of 1000 ppm (0.1% w/w) or (0.01% w/w) per homogenous material.

**Potassium Formate/Acetate based de-icing fluids.

MILITARY RUGGED CIRCULAR CONNECTORS



Amphenol Aerospace is the D38999 connector industry leader and has the broadest, most expansive D38999 connector portfolio in the world.

From legacy Series II connectors to the latest in high-speed solutions, Amphenol Aerospace offers a wide variety of options for virtually any system. Whether powering vital control systems, initiating countermeasures, or transmitting critical communication data; Amphenol's broad product offerings and high reliability ensure a safe and successful mission. We take pride in supporting the Naval market and will continue to provide our highest level of technology, quality, and service to do so.

- Communications
- Power Generation/Distribution
- Lighting/Habitability
- Hydraulic/Control Systems
- Navigation/Sonar/Fire Control
- Fuel Management



Marine Bronze 38999

Amphenol range of Nickel Aluminium Bronze circular connectors was developed for marine applications as this tough shell material offers a high degree of corrosion resistance. The rugged un-plated finish also offers excellent resistance to sand and dust in desert environments, and excellent water resistance in humid conditions. Derived from the MIL-DTL-38999 Series III specification, the connectors are completely intermateable and interchangeable with other Series III products.



VG - Connectors

VG-standards are military technical standards, which have the same status as DIN standards. They include technical and techno-economic requirements for products and processes of the defense sector, and which are not achievable in civil standards. They are developed by experts from the defense area and the relevant industry.



D38999 Series

Amphenol Tri-Start MIL-DTL-38999 Series III / EN3645 thread coupling connectors offer the highest performance capabilities for both general duty and severe environment applications. Different versions are available : “TV” metal versions (aluminum, stainless steel or marine bronze) as well as “CTV” composite versions, which offer a lightweight, corrosion resistant connector with the same high performance features as its metal counterpart.



D38999 High Speed Contacts

Amphenol offers a very wide range of contacts that provide high speed transmission and operate in high frequency conditions. You can be assured of interconnection compatibility when you come to Amphenol for your contact needs as well as your connector needs. The Octonet is a superior Ethernet contact system for MIL-DTL-38999, Series III. Eight strategically spaced inner contacts form four 100 Ohm matched impedance differential pairs. The OCS is the oval contact system for high speed data transmission.



Dualok

Dualok is an enhanced anti-decoupling mechanism designed to perform under severe vibration environments – far exceeding the performance of MIL-DTL-38999 Series III plugs. The Dualok system is proven to mitigate the negative effects of high vibration operation by eliminating connector back-off and reducing conditions that can cause fretting corrosion. Dualok is compatible with all D38999 Series III receptacle interfaces and has been qualified to Boeing Specification BACC63EK.



Hermetic Sealing

Amphenol offers superior electrical performance plus the rugged design of a glass-sealed or epoxy-sealed connector. Amphenol glass-sealed hermetic connectors are available in a wide variety of Mil-Spec and custom configurations. Amphenol epoxy-sealed connectors are a lightweight alternative to glass-sealed hermetic connectors.



2M

The 2M Micro38999 Connector Series product line is designed for interconnect applications requiring high performance and reduced size and weight. This smaller, high density, lightweight connector far exceeds the competition in quality and performance levels. The 2M Series is a superior and versatile connector designed and tested to mil-spec standards, comparable to MIL-DTL-38999, while being 50% smaller and 70% lighter. 2M is intermateable with Glenair’s Mighty Mouse connectors.

POWER SOLUTIONS



Ensuring power distribution is reliable, versatile, and user-friendly under the toughest conditions.

Technology needs include high-voltage/high amperage capacity, the ability to withstand the harshest environments, high vibration, and shock, space and weight savings without sacrificing power, ease-of-use interconnect solutions, and RoHS compliant finishes like Nickel-teflon and Black-zinc nickel.



MIL-STD 5015

Amphenol Aerospace's MIL-DTL-5015 with crimp rear release contacts provides an alternative to the older MIL-C-5015 solder type. It bridges the gap between an old connector standard and the high performance needs of current technologies.



Class L, MIL-DTL-22992

The Amphenol Class "L" 22992 heavy duty connectors are the largest size cylindricals. They are available only in the specific configurations prescribed by MIL-DTL-22992 for either military or industrial applications. This rigid configuration control assures correct interconnection of electrical circuits for maximum safety and reliability.



Radsok and Temper Grip

Amphenol has increased its standard power connector offering with advanced contact technology and new contact termination methods resulting in unrivaled catalog customization. Socket contact options include the low resistance Radsok® technology and Amphenol's new Temper-Grip contact for high current carrying capability at over 200°C



GT 5015 Reverse Bayonet

Designed with MIL-DTL-5015 insert patterns in mind, this circular reverse bayonet connector has roots in the military market. With a vast variety of shell styles, insert configurations, and backshells, the GT connector offers a robust possibility of design choices.



PowerLok

Amphenol PowerLok™ Series is the lowest cost cylindrical interconnect solution. Utilizing Amphenol's RADSOK® technology, PowerLok is designed with compactness and robustness in mind. Low insertion force/high cycle durability with secondary lock, prevents unintentional loosening of the contact. Suitable for applications up to 1000V ranging from 70A-500A.



Rhino 38999 Series

Rhino combines the benefits of field proven MIL-DTL-38999 Series III circular connectors with low resistance hyperbolic RADSOK® power contacts. Rhino is intended to satisfy market requirements for high power & voltage applications in harsh environments.

RUGGED ETHERNET RJ FIELD SOLUTIONS



Our Rugged Solutions product line offers a solution for every harsh environment application.

Featuring a variety of configurations – Ethernet, RJ45, USB 2.0 & 3.0, Memory flash drives, Network Ethernet switches, and μ Com-10Gb+ Series (MicroCom) – in many different formats, styles and plating's. All connector solutions provide an IP68 seal, tool less assembly, and are in-field installable in 30 seconds.

Key Features

- Sealed against fluids and dusts (IP68)
- Shock, vibration and traction resistant
- No cabling operation in field and no tools required
- Mechanical coding/polarization (4 positions)
- Improved EMI protection
- Tri Start Thread coupling mechanism (MIL-DTL-38999 Series III type) with anti-decoupling device - Shell size 19
- Robust metallic shells
- RJ45 cordset retention in the plug: 100 N in the axis
- Mating cycles: 500 min

Data Transmission

- 10 BaseT, 100 BaseTX and 1000 BaseT networks Cat 5e per TIA/EIA 568B and ClassD per ISO/IEC 11801, Cat6 per TIA/EIA 568B and ClassE per ISO/IEC 11801

Environmental Protection

- Sealing: IP68
- Salt spray: 48h with aluminum shell - nickel, black zinc cobalt plating
- > 500h with aluminum shell - Olive drab cadmium plating
- 500 h with marine bronze shell
- Fire retardant/Low smoke : UL94 V0 and NF F 16 101 & 16 102
- Vibrations : 10 - 500 Hz, 10 g, 3 axes: no discontinuity > 10 nano s.
- Compounded versions tested per NAS 1599 (5-3000 Hz, 20g, 12h)
- Shocks: IK06 > weight of 250 g drop from 40 cm [15.75 in] onto connectors (mated pair)
- Humidity: 21 days, 43°C, 98% humidity
- Temperature range: -40°C / +85°C

Qualified to meet:

MIL-STD-461E
MIL-STD-704A
MIL-STD-810F/GM
MIL-S-901D
MIL-STD-167-1A
MIL-F-18870D



RJ Field Kits

RJFTV connectors ruggedized ethernet connectors for harsh environments. These connectors are designed to provide improved EMI protection and built to standard of quality as seen in Mil-DTL-38999 series connectors. They are designed to IP68 water tight sealing and resistance to shock vibration and traction.



Rugged USB, HDMI

We provide reinforced USB memory keys, available in different capacities. They can only be used with our Amphenol Socapex USBFTV or USB3FTV series receptacles. When mated on the receptacle, the system is IP68 and allows data transmission in harsh environments.



Rugged Ethernet Switches

Designed for harsh environments, our Rugged Ethernet Switches give you the assurance of a continuous and secure data transmission between all your communication equipment.



μCom-10Gb+ Series

μCom-10Gb+ design of 4 twisted data pairs insulated throughout the entire connector results in a performance that exceeds specifications for 10GBASE-T Ethernet and TIA/EIA-568-C.2 Cat6A standards. Designed to be in conformance with MIL-DTL-810F environmental requirements, μCom-10Gb+ 15 mm shell size and 2000 mating cycle coupling provide end users with one of the most rugged and micro-sized interconnect solutions on the market.



Ruggedized CORDSETS

Amphenol offers high reliability Cat5e cable and RJF / USB cable assemblies designed both for harsh or industrial environments. Our exterior cable designs consists of a UV resistant, polyurethane, halogen free flame retardant (HFFR) jacket. Conductors are doubled shielded with a braid and foil (SFTP). Cat5e cables are designed to ISO/IEC11801 requirements. Our extensive offering of Ethernet, USB, FireWire, and ESATA connectors can be sold as cordsets with molded plugs and / or transversal receptacle sealing.

AMAO FIBER OPTIC PRODUCTS OVERVIEW

Amphenol Military and Aerospace Operations (AMAO) designs and manufactures reliable and innovative harsh environment fiber optic interconnect solutions for all military and aerospace applications. AMAO is a global leader in fiber optic interconnect components and systems, including both physical contact and expanded beam connectors, fiber optic cable assemblies, and copper-to-fiber media converters. Our fiber optic interconnect solutions are based on high-performance optical termini, innovative design, and high quality, well-proven connector technology.

AMAO fiber optic interconnect solutions are tailor-made to meet the demanding requirements for customers manufacturing mission critical and safety-related equipment. Accordingly, we develop long-term commitments and customer partnerships to provide maintenance, repair, training and technical support on demand. Rigorous internal quality assurance systems exceed the ISO 9001 and AS9100 requirements and ensure consistent quality products regardless of manufacturing location.

Why Choose Fiber Optics?

Fiber optic interconnect solutions are ideally suited for high speed, high reliability, EMI/RFI immune, digital data transmission in harsh environment applications such as airborne avionics and computers, battlefield communications, and weapon systems.

A large amount of data, voice, and video has to be securely transmitted in these applications, sometimes over long distances. Fiber optic links, with a large bandwidth and a small diameter, provide a fast, reliable, lightweight, and simple method to transmit a huge amount of information between various systems. Fiber optic links only carry light pulses making them immune to electromagnetic or RF interferences, which are a threat to the integrity of the transmitted information.

Fiber optic links suit battlefield communication systems exceedingly well where secrecy and data integrity are paramount. Light pulses from fiber optic links can't be detected or hacked, making the link virtually invisible.

5 Advantages to Choosing Fiber Optics:

- 1. Lower loss:** Optical fiber has lower attenuation than copper conductors, allowing longer cable runs and fewer repeaters.
- 2. Increased bandwidth:** The high signal bandwidth of optical fiber provides significantly greater information-carrying capacity. Typical bandwidths for multi-mode fibers are between 200 and 600 MHz•km, and > 10 GHz•km for single mode fibers. Typical values for electrical conductors are 10 to 25 MHz•km.
- 3. Immunity to interference and detection:** Optical fibers are immune to electromagnetic interference and emit no radiation.
- 4. Electrical isolation:** Fiber optics allows transmission between two points without regard to the electrical potential between them.
- 5. Decreased cost, size and weight:** Compared to copper conductors of equivalent signal-carrying capacity, fiber optic cables are easier to install, require less duct space, weigh 10 to 15 times less, and cost less than copper.

Certifications:

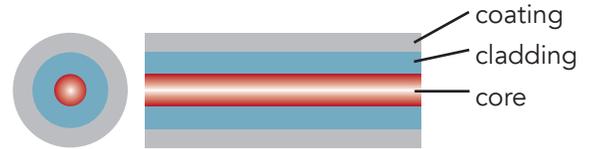
- ISO 9001:2000
- AS9100
- MIL-STD-790
- EN9100:2003
- AQAP 2110
- ISO 14001
- Electronics Technicians Association (ETA) to train and administer the Fiber Optics Installer (FOI) and the Fiber Optics Technician (FOT) certifications.

UNDERSTANDING FIBER OPTICS

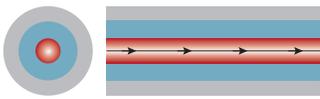
What is an optical fiber?

An optical fiber is made up of 3 concentric layers:

- **Core:** The central section, made of silica, is the light-transmitting region of the fiber.
- **Cladding:** The first layer around the core, also made of silica, that creates an optical waveguide which confines the light in the core by total internal reflection at the core-cladding interface.
- **Coating:** Non-optical layer around the cladding. It typically consists of one or more layers of polymer that protects the silica structure against physical or environmental damage.

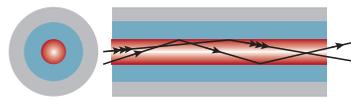


Single Mode Fiber:



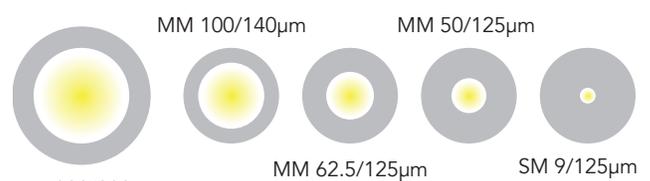
Only one mode is propagated. Light travels "straight" through the fiber. The core diameter is typically 9 microns.

Multi-Mode Fiber:



Light travels through fiber following different paths called "modes".

Fiber Sizes:



MM 200/280µm

First number is Core diameter in microns.

Second number is Cladding diameter in microns.

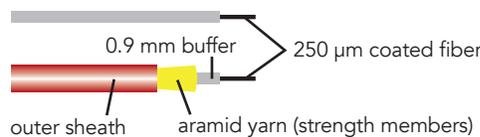
Fiber Optic Cables:

The coated fiber typically has an external diameter of 250 microns and is fragile. It is usually necessary to build cables to reinforce the fibers and make them more durable and easier to handle. There are many different cable constructions.

Single Fiber Cables:

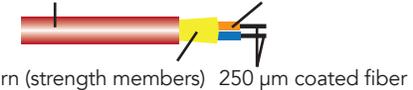
0.9 mm outer diameter

2.0 mm outer diameter



Multi Fiber Cables:

5.8 mm outer diameter

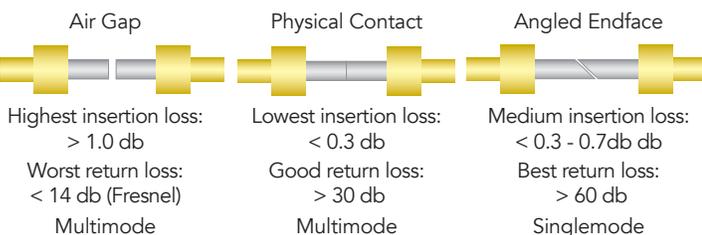


Fiber Optic Connectors:

A connector terminates the optical fiber inside a ceramic ferrule using epoxy to hold the fiber in place. The connectors can be mated and unmated at any time. There are two types of connectors:

Physical Contact:

Direct contact of polished fibers within two ceramic ferrules. The ferrules are aligned using a ceramic alignment sleeve.



Advantages:

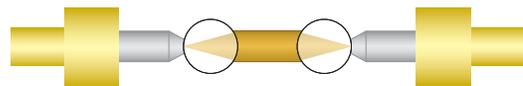
- Most common type of connection: rugged, cost-effective
- Typically low (0.3dB) insertion loss
- Generally less sensitive to liquid contaminants (water, oil)

Limitations:

- Signal loss is a function of alignment accuracy and polish quality

Expanded Beam Technology:

A lens is placed at the exit of each fiber widening and collimating the light, which is then captured and re-focused in the receiving fiber.



Advantages:

- Easy to clean
- Less susceptible to particle contaminants (dust and dirt)

Limitations:

- Performance impacted by liquid/film on lenses
- Mechanical interface between connectors must be precise

FIBER OPTICS



Amphenol is one of the world's leading manufacturers of rugged, reliable, and cost-effective harsh environment fiber optic connectors.

All Amphenol FSI cable assemblies are manufactured by expert technicians in our state-of-the-art, ISO 9001:2000 certified facility. This ensures that our processes and practices are optimized for the unique requirements of fiber optic cable assemblies rather than one-size-fits-all electrical assemblies. Our goal is to exceed customer requirements with every cable assembly. AFSI is able to assist in designing and building custom cable assemblies or building to a customer print. Our technicians are trained to MIL-STD-2042B and a variety of other procedures critical to manufacturing harsh environment fiber optic cable assemblies. An optical test report is included with every cable built. If other tests are required, AFSI is capable of testing either in-house or contracting with one of our test laboratory partners.



F12 Pierside

The 12-channel FS12 Pierside connector design provides flexibility for current and future Navy communication requirements both afloat and ashore. This connector is also ideal for high fiber count tactical broadcast networks.



Optron

Amphenol FSI manufactures a complete line of circular hybrid connectors designed and qualified to MIL-PRF-28876, Rev. E. The QuickLoc backshell also allows easy access to maintain or reconfigure termini without altering the captivated aramid fiber.



M83522 MIL-ST Connectors

For deployable and fixed systems. Designed for the best optical performance available for severe environmental conditions including Naval shock tests.



TFOCA

The TFOCA connector is a hermaphroditic design utilized for tactical deployable communications systems. This genderless characteristic allows for concatenations of cable assemblies without regard for connector interface compatibility.



TFOCA-II

The unique termini design enables TFOCA-II® connectors to seal against high humidity and moisture conditions while allowing full axial and orbital movement of the mated termini, providing low insertion loss and minimal back reflection.



TFOCA-III® Fiber Optic Connectors

The TFOCA-III® utilizes the latest technology in fiber optics. It can be used for broadcast, mining, disaster recovery, oil and gas industries.



Custom Fiber Optic Cable Assemblies

Amphenol has a comprehensive line of single-mode and multi-mode cable assemblies in a variety of cable configurations. From simple jumpers to multi-fiber custom assemblies, we can design & supply all of your cable needs.



M29504 / 14 & / 15 Termini

These termini are qualified to MIL-PRF-29504B and are compatible with M28876 and comparable military-style connectors. They are also precision-engineered, allowing the ferrule to press-fit and bottom out within the terminus bodies.



D38999 w/Fiber

Can house a wide variety of fiber optic termini including MIL-PRF-29504 commercial equivalent, HDF20, ARINC 801, and MT ferrules.

FIBER OPTICS



NGCON Fiber Optic Connector

NGCON Fiber Optic Connector features a rear release, genderless termini, and is manufactured IAW MIL-PRF-64266.



F-143 Pinnacle Series

Building on the legacy of MIL-PRF-28876, these connectors incorporate the latest technologies in fiber optic interconnect design; ideally suited for ground vehicle applications.



ARINC 801 Connectors

AFSI produces the ARINC 801 cylindrical fiber optic connector for commercial airframe, military radar and more.



THDM

THDM is a MIL-PRF-28876 derived mechanical transfer (MT) rugged fiber optic connector for high-density military and aerospace applications.



M28876 Fiber Optic Connectors

AFSI is a market leader in the manufacture and sale of QPL listed M28876 connectors, primarily used for Naval applications.



LowPro Low Profile Fiber Optic Connectors

The LowPro fiber optic connector is ideal for edge-card connections and other applications that require minimal connector profiles.



MFM

The MFM Fiber Optic Connector is lightweight, with an anti-vibration coupling mechanism, and uses ceramic PC ferrule technology w/ a ceramic alignment sleeve.



AquaLink® FS140

The AquaLink® FS140 is a cost-effective series of dry-mate submersible fiber optic connectors for underwater applications.



FSBDC Series Bayonet Duplex Connector

Offers the Pattern 105, Size 10, series connector construction, with the tri-mating bayonet locking mechanism for quick mate/de-mate.



TVOP

Fiber optic connector design with 38999 Series III shell. Optimised insert for butt joint termini dia. 2.5mm. Design for Multimode and Singlemode PC or APC version for high return loss.



FTTA (Fiber-to-Antenna)

FTTA is highly configurable to support industrial applications where both fiber and copper connectivity are required in a single connector.



EN4165 / SIM Elio for EN4531-101 Contacts

The module SIM Elio can be used with the whole range of EN4165 / SIM connectors.



EN4165 / SIM for MPO Connectors

MTP/MPO connector directly plugs and locks itself into the module. It can be easily removed for repair.



EN4165 / SIM Luxcis for Arinc 801 Contacts

The module SIM Luxcis can be used with the whole range of EN4165 / SIM connectors.

RECTANGULAR



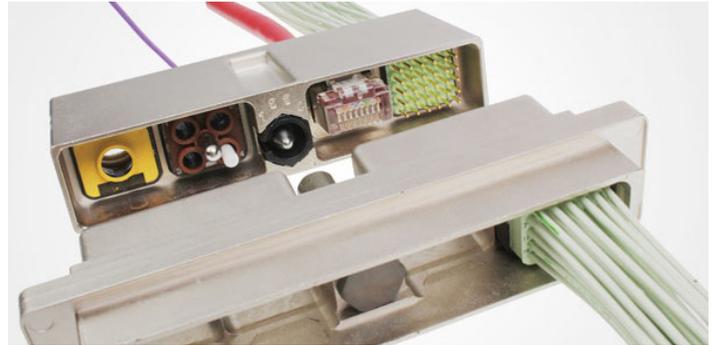
Why Rectangular vs a circular connector?

The advantages come in the high contact density and efficiency of mating and de-mating with rectangular connectors. The rectangular shape of the connectors allows the connectors to fit in a row which optimizes the spacing resulting in less wasted space compared to circulars. Rectangular connectors typically mate with minimal hardware, if any, which leads to a lower profile design than circular connectors. This allows more rectangular connectors in a given space. With floating mounts and guide pins rectangular form factor makes it ideal connector for blind mate and rack and panel applications.



ARINC

Amphenol Canada's NextGen ARINC 600 addresses the Aircraft industries issues of weight and cost. By incorporating Stamped and Formed overmoulded wafer technology and selective plating the result is a significantly reduced cost and weight product that is qualified to meet all the requirements of ARINC 600.



SIM

Designed and qualified to EN4165 European military aerospace standards, Amphenol's SIM Connector is a modular, multi-functional rectangular connector geared at the US Com-Air and Military markets. While similar to MIL-DTL-38999 in performance, the SIM Connector provides additional benefits with its small footprint and versatility. The SIM Connector is comprised of shells and modules, which together create an integrated solution for advanced signal and power requirements – all at a fraction of the space typically required for the same results.



Micro-D

Amphenol Micro-D connectors provide small interconnect solutions, which will exceed the requirements of the US military standard M83513. What differentiates Amphenol from the competition is our overall connector design. Custom solutions can easily be engineered to ensure exact performance in any application. Amphenol is not limited to the traditional M83513 rectangular connectors but has also developed and produced circular connectors, strip line connectors, PC board connectors, and hybrid connectors utilizing power, signal, coaxial and fiber optics contacts.



D-Subs

Qualified to MIL-DTL-24308, Amphenol's D-Sub Connectors are subminiature rack & panel type connectors with polarized shells. They use pin & socket machined contacts that provide high reliability & density for the connectors. With its versatile designs including non-magnetic and low outgass, these high-performance connectors are used in a variety of applications including space where weight & dimensions are critical factors.

PRINTED CIRCUITS



Amphenol Printed Circuit is a world leader in the printed circuit industry for Military and Commercial markets, building PCB's, Backplanes, Flex and Rigid-Flex products to meet our customers' demanding needs.

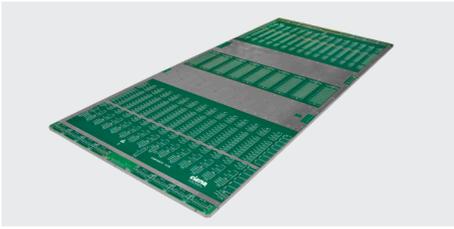
Amphenol Printed Circuits (APC) capabilities are among the world's broadest and most advanced, delivering consistent quality and reliability for demanding high-bandwidth systems and mission-critical applications for more than 30 years. Proven engineering and manufacturing expertise eliminates design obstacles. The 214,000 square foot New Hampshire facility features state-of-the-art PCB manufacturing equipment and optimized material handling to ensure the highest quality and consistency. Our Advanced Assembly and Test Operations are located in Nashua NH and Nogales Mexico. Connector expertise and assembly integration that exceeds any other printed circuit board/assembly manufacturer. Printed circuit and assembly expertise that exceeds any other connector manufacturer.

Certifications

- ISO 9001:2008, AS9100 & 14001
- UL
- NADCAP
- AS9100
- MIL-PRF-31032
- MIL-PRF-55110
- MIL-PRF-50884
- ITAR Registered
- IPC-A-600 & 610 – Class I, II, III
- IPC-A-6012 & 6013 – Class I, II, III
- J-STD-001

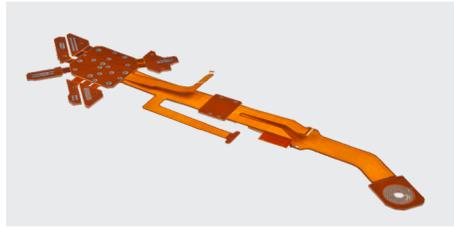
Design services: Rigid, Flex, Rigid-Flex and Assemblies

- APC has a highly skilled applications and design support team available to collaborate with you on new designs, product updates, wire harness conversions and reverse engineering of legacy products.
- APC designs to IPC-2221/2223 as a baseline unless otherwise directed and can accommodate customers unique design rules and requirements.
- APC can support all typical design platforms and uses advanced modeling techniques and rules based algorithms to ensure accurate, effective and application relevant solutions:
 - o Cadence Allegro
 - o Mentor Graphics available
 - o Polar impedance modeling and signal integrity analysis
 - o Siemens NX, Solidworks and KeyCreator 3D modeling capability
 - o Advanced rules based DFM analysis system
 - o "Control Center" custom configuration management, scheduling and rules based design process system



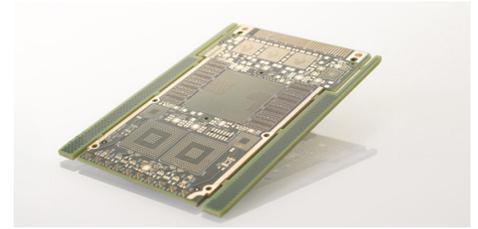
Commercial Backplanes

- 28 GHz Signals with line lengths in excess of 24 inches, Low Loss, Low Dk, Smooth Copper
- 5% Tolerance Possible (Impedance)
- Precision+ Backdrill
- Small Drill Diameter/Thick Boards (>25:1 Aspect Ratio)



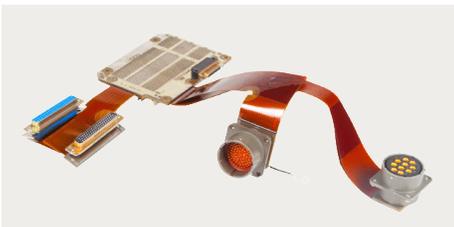
Mil/Aero Flex Assemblies

- High reliability, performance targeted applications utilizing leading-edge technology and processes. Polyimide, Epoxy, LCP, BT, PPO, Teflon and Hybrid Constructions
- High Aspect Ratio Plating (> 25:1)
- 5% Tolerance Possible (Impedance)
- 60 Layers +



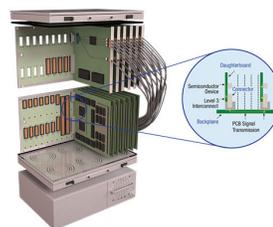
HDI

- High-density designs incorporating blind vias, buried vias, sequential lamination, via-in-pad, high aspect ratio plating Thin dielectric materials ($\leq 0.002''$)
- HASL, ENIG, Immersion Tin, Immersion Silver
- Up to 5X Lamination (material dependent)
- Blind, buried and micro vias control stub length enhancing overall signal integrity



Rigid Flex & Flex Alternatives

Flex and rigid-flex circuitry offers many advantages when considering the most effective means to transmit signals or power within your system. Amphenol Printed Circuits supports all types of flex and rigid-flex circuitry and assemblies, from simple single sided flex to the most advanced rigid-flex assemblies and everything in between. Whether your system requires highspeed, high temperature, large formfactor or HDI, Amphenol provides world class flex and rigid-flex capability supported by the most knowledgeable staff in the industry.



UltraSpeed

Users can achieve data rates of 56 Gb/s by maximizing: the design of the PCB and connectors and the manufacturing of the complete backplane assembly. This is achieved within the confines of a system's current architecture, thereby eliminating any costly changes from a complete re-design. UltraSpeed® has been tested and verified to mitigate transmission loss in printed wiring boards. Available on many of the most common and popular laminate systems, we continue testing and evaluating to offer the best performance with significant value to our customers.

BOARD LEVEL CONNECTORS



Amphenol is the leader in board level and rectangular interconnection products through its long history of engineering expertise for product solution solving.

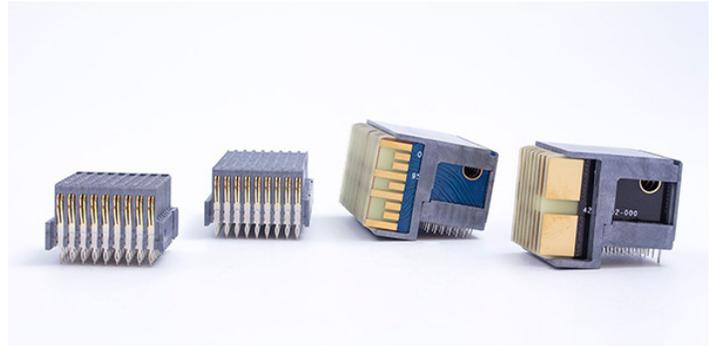
New and innovative solutions are under development every day within our highly skilled engineering departments who are teamed with marketing product managers and production specialists. They are always striving to meet new customer requirements in ever changing markets.

- Ruggedized Options
- Hi-Speed Options
- Fiber Optic & Power Options
- Termination Options: PCB Tail Crimp, Compliant Pin, Flex Termination, Surface Mount, Cable



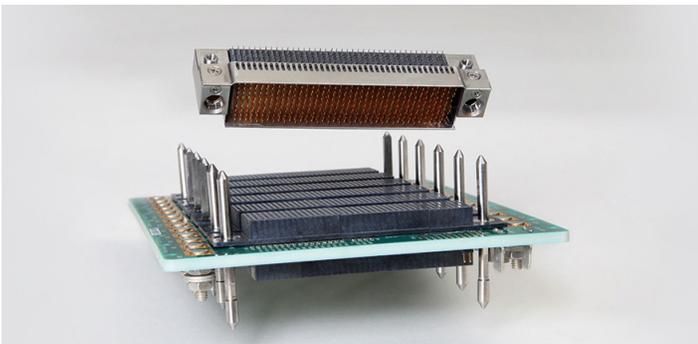
LRM

Amphenol's LRM Surface Mount Connectors meet the high density needs of today's integrated electronic modules. Amphenol goes beyond the usual board level product offering. That's what you expect from a worldwide interconnect product leader. With its flexibility in design, Amphenol LRM interconnects are capable of meeting the wide variety of user requirements for a board mount connector.



R-VPX Ruggedized VITA 46

Amphenol's R-VPX is a ruggedized, high-speed, board-to-board interconnect system capable of data rates in excess of 10 Gbps, meeting and exceeding VITA 46 standards. This connector system gives users modularity and flexibility by utilizing PCB wafer construction with customized wafer-loading patterns.



VIPER

The VIPER® Connector is a shielded, high-density, hi-speed modular interconnect with press-fit termination. Amphenol Backplane Systems* developed the VIPER interconnect platform to meet or exceed future avionic high-level requirements such as:

- High-level vibration and mechanical shock protection
- Condensing moisture resistance
- Ruggedization in packaging that can scale to higher bandwidths without costly and timeconsuming chassis redesigns. The VIPER connector platform offers the ability to scale from 80 Mbps to over 10 Gb/s while retaining the same Vita 46 platform slot pitch.



MICRO AMM

Amphenol's Modular Micro AMM Series is a low-profile, high-density rugged connector that fills the gap between the Micro-D (MIL-DTL-83513) and D-Sub (MIL-DTL-24308) product lines. Designed to meet the harsh environments of the Aerospace, Defense and Industrial markets, the unique modular insert design allows for a wide variety of insert arrangements combining signal, power and RF contacts. Custom designs featuring Sealing, Filtering, and High Speed contacts are also available.

HIGH PERFORMANCE RF CONNECTORS & CABLE ASSEMBLIES



Amphenol SV Microwave offers a complete line of high performance RF connectors, cable assemblies, and components ideal for harsh environment Naval applications.

Our designs meet the standard military specifications (MIL-STD-202) for corrosion, vibration and thermal shock necessary for lasting performance in salt spray conditions. We offer sealed hermetic and water resistant designs using glass seals and o-ring for even the most extreme conditions. Our pedigree in the mil-aero marketplace and full in-house environmental testing capabilities make us an ideal partner for all your shipboard RF cable and connector needs.



High Performance RF Cable Assemblies

Our products range from small diameter flexible cables to custom semi-rigid cable assemblies. We offer custom cables & connectors for high-density requirements with right angle connectors & cable bends as tight as .125" past the back of the ferrule on select cable types.



VITA 67.1 / 67.2

Our high density, high performance VITA 67.1 and 67.2 backplane interconnect systems are a recent addition to the Open VPX platform. This unique connector system enables quick engage/disengage with high density, performance and reliability.



VITA 67.3

VITA 67.3 allows for customizable RF contact locations within the module for embedded systems applications. This new addition includes an edge launch option to eliminate cable assemblies on plug-in cards.



Hermetic/Waterproof Connectors and Adapters

SV offers a wide range of IP 67 and IP 68 water-protected interconnect products designed to withstand rigorous environments and harsh elements.



High Speed Edge Launch PCB Connectors

SV has a diverse product offering of extreme frequency (DC - 100 GHz) RF edge launch PCB connectors come in standard and customizable configurations to meet difficult packaging requirements



SMP, SMPM & SMPS Connectors

SV's SMP, SMPM and SMPS push-on connectors and cable assemblies offer excellent shielding and electrical performance with simplified mating and increased density.



Extreme Frequency Surface Mount PCB Connectors

SV's RF board mount connectors meet the industry need for high-performing, compact designs. As processing speeds grow faster, frequencies levels must increase to ensure the best performance and SV has your high speed solution.



Pre-tinned PCB Connectors

Our pre-tinned PCB connectors eliminate cost and lead-time associated with sending parts out to a 3rd party pre-tinning operation. Pre-tinned products not only prevent rust, corrosion and oxidization, but also increase durability of solder joints.



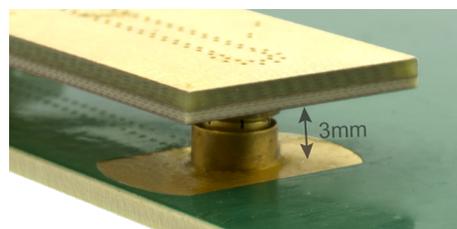
Secure Locking QuarterBack® SMP/SMPM Series

This connector line utilizes a quarter turn bayonet style coupling nut with a locking feature for standard SMP/SMPM interfaces. These connectors are ideal for high vibration and test applications that require a large number of mating cycles.



Mini-D RF Connection System

SV's new Mini-D RF Connection System has industry leading .110" port-to-port spacing and uses removable SMPS bullets for high mating cycle applications without damage to the cable assembly.



3mm Board-to-Board Interconnects

Our 3 mm B2B product line offers the lowest stacked height (3mm) of any board-to-board high frequency coaxial connection system making these connectors ideal for high-density applications.



RF Contacts for Multiport Connectors

SV offers an extensive line of RF contacts and cables for multiport circular (D38999) and many other housing varieties. These contacts utilize our standard high-performance interfaces in standard Size 8, 12 and 16 arrangements.

FILTERED PRODUCTS



Filter connectors have been used for over thirty years to provide cost and space effective solutions to EMI problems in a wide range of military and commercial applications including avionics systems, satellites, missiles, communications, and control systems.

A low pass filter connector incorporates capacitors and ferrite inductors into the connector body. The two capacitor types commonly used in filter connectors for military or avionics applications are planar arrays and tubular capacitors. Each of these capacitor types is an efficient filter at high frequencies (> 1 GHz) and has been proven to be extremely reliable when suitably assembled into a connector. Both planar and tubular designs feature Amphenol's unique solderless construction which reduces stress on the ceramic elements and results in superior physical and thermal shock capabilities.



Filtered D38999

Amphenol's EMI/EMP Protection Connectors offer the versatility of standard connectors with EMI/EMP protection for sensitive circuits. Internal housing of the EMI/EMP devices eliminates costly and bulky exterior discrete protection devices. Virtually all major MIL-Spec circulars can be incorporated with filter devices.



Filtered ARINC

The Amphenol 485 Series is a range of filtered ARINC 404 and 600 rack and panel connectors designed to provide space and cost-effective solutions to EMC compliance issues in avionics products.



Filtered D-SUB

Amphenol's FD308 connectors are available in the full range of standard and high-density arrangements, either pin or socket. These connectors are supplied with fixed screw machine contacts and are available in Solder Cup, Straight or Right Angle PCB terminations.



Custom Filtered Solutions

Filter connectors have been to provide cost and space effective solutions to EMI problems in a wide range of military and commercial applications including avionics systems, satellites, missiles, communications, control systems and tempest equipment. A low pass filter connector incorporates capacitors and ferrite inductors into the connector body. The two capacitor types commonly used in filter connectors for military or avionics applications are planar arrays and tubular capacitors. Each of these capacitor types is an efficient filter at high frequencies (> 1 GHz) and has been proven to be extremely reliable when suitably assembled into a connector.

RF CABLES AND CONNECTIONS



Times Microwave Systems is the leader in coaxial transmission line technology and production.

We provide the broadest range of transmission line solutions for military, aerospace, wireless communications and industrial applications. Our engineering expertise and range of manufacturing capabilities are unmatched in the industry. We lead the way in innovative cabling products for advanced interconnects for demanding naval market such as electronic warfare systems that require high quality RF cables and connectors with precision.

No two applications are the same, and complete development specifications are not always necessary - it depends on your needs. The following are suggestions to help you make sure that all of the basic requirements are defined by your inquiry:

Choose a product family the easy way - by working with a Times Applications Specialist. This will ensure you have the right product for your application.

Mechanical Requirements

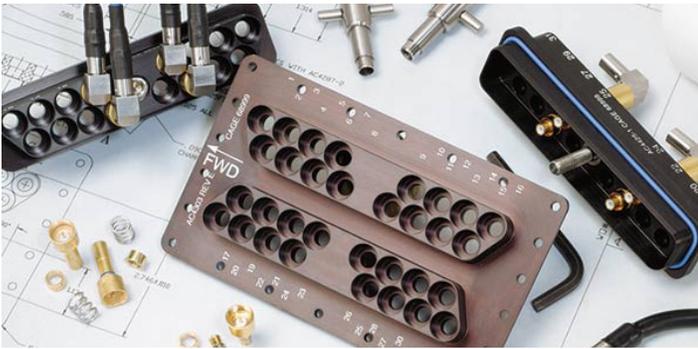
Overall length of a cable assembly is the most basic mechanical specification. Length can be specified in inches, feet and inches, millimeters, centimeters, or meters. Standard measurement datum are to the end of straight connectors, and to the tip of the center pin of angle connectors.

Times standard length tolerances are: +0.5" / -0" if less than 5 feet long; +1" / -0" if 5 feet up to 10 feet long; +1% / -0% of length if longer than 10 feet. Phase (Electrical Length) matched assemblies are built with +4% / -0% length tolerance as standard.

Electrical Requirements

Frequency Range, maximum Insertion Loss and maximum VSWR values are the typical electrical Acceptance Test Requirements used by Times for our assembly products. As a minimum, be sure to indicate your actual operating frequency range.

If typical or standard electrical characteristics are not sufficient for your acceptance testing, define the electrical performance requirements based on the system requirements, whenever possible. This provides the most flexibility in allowing consideration of alternate products that may provide a better solution to your connection needs. If hard-copy test results are required for each assembly, be sure to indicate this.



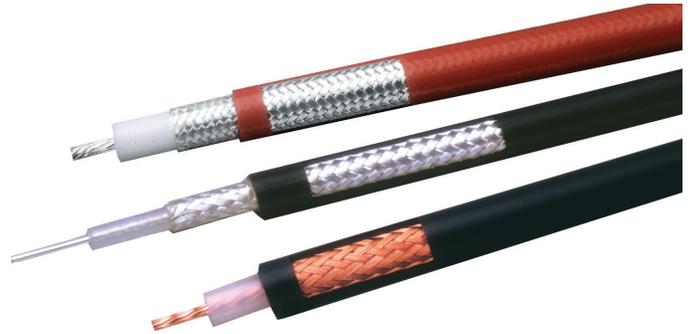
Multi Port RF Connector

Times Microwave High Density Interface families provide quick mate/de-mate of multiple cable assemblies to give you unprecedented microwave connectivity and maintainability. The M8 Multi-Port, Mini-Multi-Port (MMP) and 38999 (BMB) series contacts provide broadband performance extending up to 40 GHz. All of our High Density Interconnect products have been developed to provide extended life and full performance in harsh environments. Sealing features are built into the contact interfaces and connector shells, providing redundant assurance of long-term performance in fielded systems.



Phase Track®

PhaseTrack® cable assemblies are designed for applications demanding minimal phase change over temperature. All PhaseTrack cables use proprietary TF4™ dielectric that does not have the abrupt shift in the phase that occurs with solid or tape wrapped PTFE based products under normal room ambient temperature conditions. PhaseTrack cable has the same triple shield construction used in Times popular SF, SFT, SilverLine and MT cables. The features of our Phase Track offer superior stability, nonexistent PTFE “knee” at room temperature, and TF4 dielectric technology.



M17 / Cables

Times Microwave Systems has been instrumental in the development of commercial and military specifications, including MIL-C-17 for coaxial cables. We are the leading source of MIL-C-17 qualified products, holding more Qualified Product Listings (QPL's) than any other cable manufacturer. Times is dedicated to the improvement of coaxial cable technology and the development of new and innovative cable products to address your rigorous requirements within your system. Our MIL-C-17 cable offers good shielding effectiveness, Low Passive Intermodulation (PIM) and the ease of use with standard connectors.



SI-02

Times Microwave Systems SiO2 cable assemblies are a major advancement in Silicon Dioxide coaxial cable technology. Improvements have been made in the areas of cable design, cable manufacturing technology, glass seal technology and the range of connector types available. The use of advanced equipment and materials results in the production of a low loss, high velocity dielectric with consistent properties. This results in excellent phase versus temperature and loss versus temperature performance and excellent repeatability of these characteristics from lot to lot.

THE LIGHT SIDE OF NAVAL



In below deck areas of a ship sheltered from the harsh environments, lightweight, cost-effective connectors that are highly reliable and simple to use are best for the applications.

With proven durability and quality in the aerospace markets the Luminus, Pegagus, and Solaris connectors multiple configurations and arrangements available, a solution can be tailored to suite your application's exact requirements. Ideal where space is limited, these innovative, "scoop-proof" connectors feature a locking mechanism that ensures stability, are suitable for blind-mating, and are RoHS compliant.

Interfacial and Triple-Barrier Seal

Enables environmental sealing (IP 67 rating)

Multiple Keying Positions

Ensures proper connectivity

Multiple Configurations and Accessories

Tailored solutions to meet application needs

Contacts

AS39029 MIL Spec contacts for broad application compatibility. Stamped & Formed available as lower cost option

Visual markings

Visual aid for easy assembly

Rugged Polyamide Housings; 500 mating cycles

Durability

Blind-Mate Connection

Enables simple, blind mating; easy assembly

D160, M81714, FAR25 Compliance

Meets demanding military-aerospace environmental conditions

Applications:

Aerospace lighting, IFE, Instrumentation, Power & Signal Distribution, Actuation & Sensors, Soldier Communications, Military Aerospace - Rotorcraft, UAV's, Interior/Exterior LED



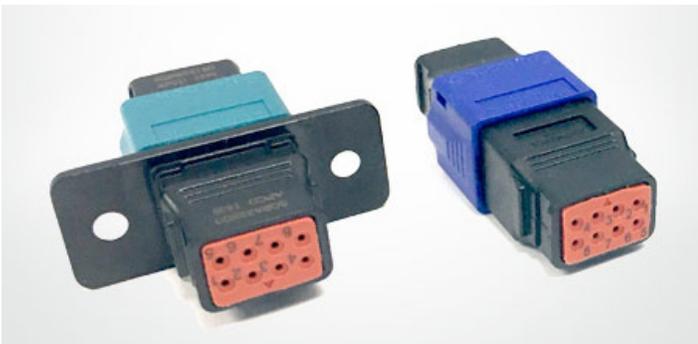
Luminus

The Luminus Series are lightweight, cost-effective connectors that are highly reliable and simple to use. With multiple configurations and arrangements available, a solution can be tailored to suite your application's exact requirements. Proven solutions can be found in single engine general aviation, multiple-engine business and passenger jets, and high performance rotary aircraft. Ideal where space is limited, these innovative, "scoop-proof" connectors feature a locking mechanism that ensures stability, are suitable for blind-mating, and are RoHS compliant.



Pegasus

The Pegasus Series is Amphenol Pcd's latest innovation in small, lightweight, rugged connectors. Designed for use in harsh environments, Pegasus builds on the successful Luminus Aerospace connector with the addition of EMI shielding. EMI shielding is provided by electroless copper and nickel plate, with a copper alloy spring finger gasket to ensure shell to shell conductivity. Tests show between 60db and 40db of attenuation, depending on frequency. This combination of light weight, small size, and EMI shielding makes Pegasus the ideal choice where protection against ambient noise transients, or suppression of emitted noise is required, and space and weight are at a premium.



Solaris

SOLARIS is a small, plastic, easy-to-use rectangular connector designed specifically for low and medium power applications. Solaris' spring-loaded slide lock mechanism is a snap to use - simply push to lock, and slide to unlock. The slide lock provides convenient single handed & tool-less mating, eliminating the Foreign Object Debris (FOD), found in typical screw mount D-Subs. Each housing has raised finger ridges for a sure grip, and built-in cable tie access hole provides a "zero footprint" method to secure the connector to a bulkhead or cable bundle. High grade polyetherimide plastic makes SOLARIS suitable for man/machine interfaces with high mating cycles, and provides a wide operating temperature range.

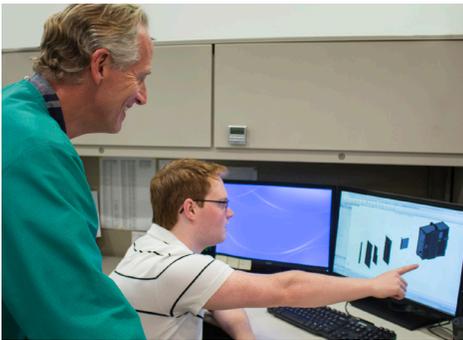


System Attachments

Designed to secure, guide and manage cable harnesses through aircraft and vehicles, Amphenol's System Attachments were engineered with strength, stability and weight reduction in mind. Designed for lean manufacturing, our cable and pipe supports are rugged - able to withstand high vibration and shock, and non-conductive/non-corrosive - able to withstand many harsh environments. Based on the requirement, there are many styles and materials to choose from.

TOTAL ELECTRONIC SOLUTIONS PROVIDER

Amphenol Military & Aerospace Operations is your **total electronic solutions provider.**



We offer a unique complement of vertically integrated manufacturing, engineering and test expertise, and dedicated program management support. Our engineering team supports design-to-spec programs ranging from connectors and accessories to cable harness designs and complex electro-mechanical assemblies. With manufacturing in the U.S., Mexico, and Canada, our customers can confidently expect product delivered on time and with the highest quality. Amphenol's interconnect product breadth, robust processes, state-of-the-art manufacturing capabilities, globally integrated supply chain, and assembly expertise is unmatched in the industry.



Amphenol Borisch Technologies

Amphenol Borisch Technologies is a vertically integrated Electronics design and manufacturing firm that specializes in superior service. Our experience and expertise in electronics design, Design-for-manufacturer, assembly and test leads the industry. ABT is your complete supply chain solution provider. Amphenol Borisch has a large span of capabilities ranging from CNC machining, Cable and wire harness, to electronic circuit card assemblies, all the way to electro-mechanical integration.

High Speed RF Cable Assemblies

SV Microwave offers a complete line of high frequency cable assemblies utilizing 2.92mm (SVK)/2.4mm and SMP/ SMPM/SMPS connectors on Ø.047 and Ø.085 cable. SV's cable assemblies feature low solder wicking and our high flexibility allows for tight bends behind the cable ferrule. Our low loss is your gain.



Fiber Cable Assemblies

Fiber Optic Cable Assemblies Amphenol's cable assembly expertise dates back to the first industry standard fiber optic connector, over 25 years ago. Our depth of understanding of connector and termini design, and the complete control of connector materials, make Amphenol Fiber Optic cable assemblies one of the best in the industry. Amphenol offers a comprehensive line of single-mode and multi-mode cable assemblies in a variety of cable configurations. From simplex jumpers to multi-fiber custom assemblies, Amphenol can design and supply all of your cable needs.

Complete Embedded Systems

Amphenol can provide the entire solution for the customer and manufacture solutions from cradle to grade. Our core business of connectors is complimented with supporting technologies such as printed circuit board manufacturing, circuit card assembly, CNC machining which enables Amphenol to be vertically integrated. Coupled with our industry knowledge of military and defense harsh environment Amphenol offers to our customer service and support to design and complete system level integrated assemblies.

THE AMPHENOL ADVANTAGE



Amphenol Military & Aerospace Operations (AMAO) offers unique advantages that no other interconnect manufacturer can. The unique combination of interconnect expertise and harness manufacturing capabilities enables us to offer the optimum solution at the design phase by leveraging our connectors and wire management and harness solutions, with the goal of reducing weight, installation and maintenance times, as well as optimizing cost.

Global footprint, local support:

With 21 divisions in North America, Europe, and Asia, we can provide a local, regional presence to design and build any interconnect solution.

Cost-effective partnerships:

AMAO utilizes a vertically integrated supply chain to flow down the most competitive costs to our customers, even on the most complex solutions.

Manufacturing versatility:

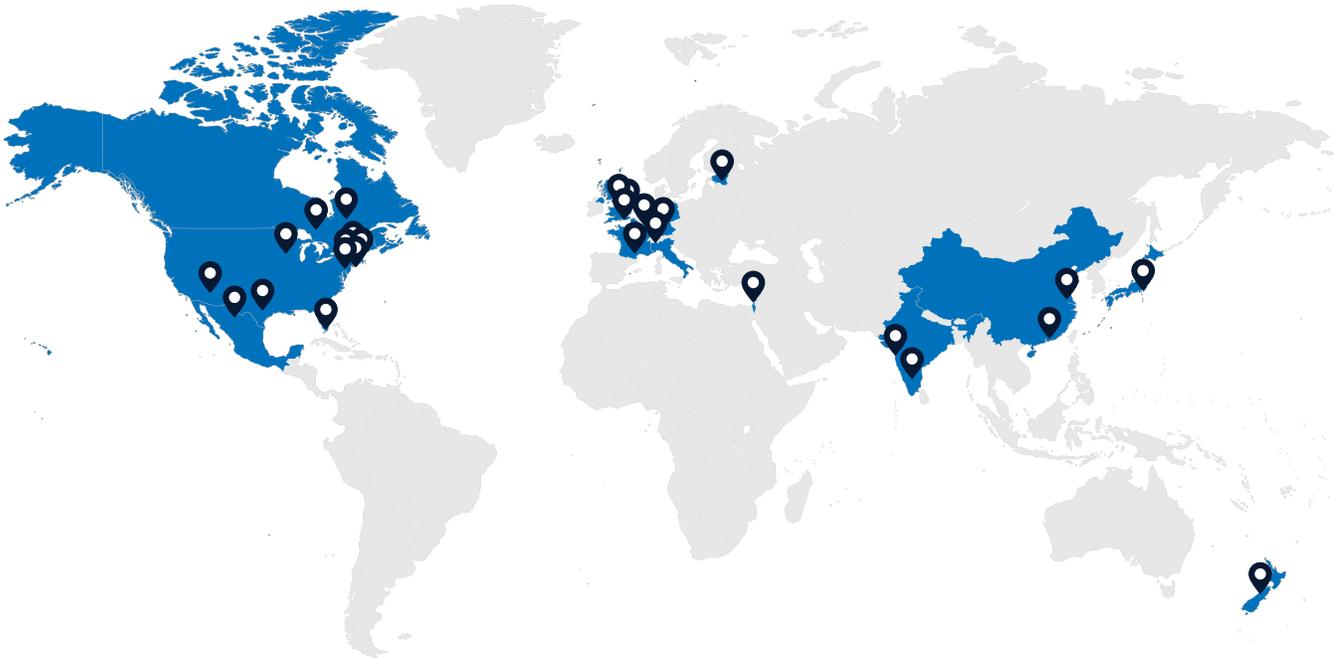
Many AMAO interconnect solutions have dual-production locations and off-set options (Mexico, Estonia, India, and China) which means our customers benefit from low-cost options without the fear of a single-source position.

Technology proliferation from other Amphenol divisions:

As the 2nd largest interconnect company in the world, we're highly diversified and can provide our proven COTS technology from the antennas, sensors, industrial, and automotive markets to the military and aerospace world.

Amphenol Military & Aerospace Operations is perfectly aligned to provide the latest technologies, cost-effective manufacturing and supply chain management, and local support to solve any military and aerospace interconnect need.

GLOBAL LOCATIONS



Amphenol Aerospace Operations

40-60 Delaware Avenue
Sidney, NY 13838
800-678-0141

Amphenol Commercial Air Division

40-60 Delaware Avenue
Sidney, NY 13838
1-800-687-0141

Amphenol Nexus Technologies

50 Sunnyside Avenue
Stamford, CT 06902
203-327-7300

Amphenol PCD

72 Cherry Hill Drive
Beverly, MA 01915
978-624-3400

Amphenol SV Microwave

2400 Centrepark West Drive
West Palm Beach, FL
561-840-1800

Amphenol Times Microwave, Inc.

358 Hall Avenue
Wallingford, CT 06492
800-867-2629

Amphenol Fiber Systems International

1300 Central Expressway North, Suite 100
Allen, TX 75013
214-547-2400

Amphenol Borisch Technologies

4511 East Paris AVE
Grand Rapids, MI 49512
616-554-9820

Amphenol Printed Circuit Board Technology

91 Northeastern Boulevard
Nashua, NH 03062
603-324-4500

Amphenol Canada

605 Milner Avenue
Toronto, ON Canada M1B 5X6
416-291-0647

Amphenol Invotec

Unit 1-3, Hedging Lane Industrial Estate
Dosthill, Tamworth, B77 5HH United Kingdom
+44 (0) 1827 263250

Amphenol Ionix Systems

Prospect House, Taylor Business Park
Risley, Warrington, WA3 6HP United Kingdom
+44 (0) 1942 685200

Amphenol Limited

Thanet Way
Whitstable, Kent, CT5 3JF United Kingdom
+44 (0) 1227 773200

Amphenol Socapex

948 Promenade De L'Arve – BP 29
74311 Theyez France
+33 (0) 4 50 89 28 00

Amphenol Air LB SAS

2 Rue Clément Ader, Zac de Wé
08110 Carignan France
+33 (0) 03 24 22 78 49

Amphenol AirLB GmbH

Am Kleinbahnhof 4
D-66740 Saarlouis Germany
+49 (0) 68 31/98 10 0

Amphenol SEFEE

Z.I. des Cazes – BP243
12402 Saint-Affrique Cedex France
+33 (0) 5 65 98 11 00

Amphenol Interconnect India

105, Bhosari Industrial Area
Pune – 411 026 India
+91 20 27120363

Amphenol Japan, Ltd.

471-1, Deba, Ritto-City
Shiga, 520 3041 Japan
+81 77 553 8501

Amphenol Martec Limited

St. Augustines Business Park
Swalecliffe, Whitstable, Kent
CT5 2QJ United Kingdom
+44 (0) 1227 793 733

Amphenol Optimize

Carretera Internacional Km 6.5
Col. Parque Industrial
Nogales, Sonora, México. C.P. 84094
+52 (631) 311-160

Amphenol Ionix Systems OÜ

Pikk Street 59b
Kuressaare 93815 Estonia
+372 4521 780

AMAO – European Sales Operations

Via Barbaiana 5
20020 Lainate Milano, Italy
+39 02 932 541

Amphenol Bar-Tec Ltd.

3 Hagavish st
POB 2479 Kfar-Saba 44641
Israel
+972-9-7644100

Phitek

Level 4, 2 Kingdon Street
Newmarket, Auckland 1023
New Zealand
+64 9 524 2984

Amphenol
MILITARY & AEROSPACE

www.amphenolmao.com