

Whitepaper

WHY M16 CONNECTORS ARE THE RIGHT SOLUTION FOR 5G APPLICATIONS



M16 8-Pin Connectors: The Right Solution for 5G applications

Paul Pulkowski, Marketing Manager; Maciek Czerwinski, Director of Sales and Business Development; and Rick Lopez, Sales Engineer and Project Manager, binder USA



» 4G and 5G wireless communication tower.

The fifth generation of cellular network technology, or 5G, offers many significant improvements over previous generations. Perhaps most impressive is the speed - 5G is expected to deliver data 100 times faster than the average 4G network [1].

Infrastructure to accommodate 5G technology is being built as rapidly as possible, as businesses around the world work to upgrade their systems. In 2020, the global 5G service market size was valued at \$41.48 billion, and global tech analysts expect the market to grow at an estimated compound annual growth rate (CAGR) of 46.2% within the next seven years [2].

Through advanced antenna design, cell tower improvements, and greater frequency rates, 5G provides bigger channels that speed up data, lower latency, reduce energy consumption, and lower maintenance costs. It also increases capacity for the IIoT (Industrial Internet of Things), empowering companies to connect more sensor and smart devices at once. A recent report by Frost & Sullivan predicts that 90% of industrial enterprises will use edge computing by 2022 [3], requiring the connectivity, speeds, and low latency that only 5G can provide. The result is a dramatic impact on a broad range of industries, including manufacturing, energy and utilities, IT, transportation and logistics, aerospace and defense, agriculture, construction, and healthcare. Basically, any application that requires instantaneous communication will benefit from a robust 5G network.

Smaller, more advanced cells power 5G

Compared to other wireless systems, 5G uses higher (and less cluttered) radio frequencies, allowing it to carry more information at a much faster rate. Because higher frequencies are easily blocked by physical objects such as buildings, and may be negatively impacted by weather conditions, 5G uses a higher number of smaller transmitters to boost signals and capacity across the network. 5G cells contain the equipment needed to transmit data between connected devices.,,

The antennas within the small cell are highly directional and use what's called beamforming to direct attention to very specific areas around the tower. These devices can also quickly adjust power usage based on the current load. This means when a radio is not in use, it will drop down into a lower power state in just a few milliseconds, and then re-adjust just as quickly when more power is needed At a minimum, 5G must support one million devices for every square kilometer (0.386 square miles),” wrote Tim Fisher on Lifewire.com [4].

Updated AISG connector standards

Connectors act as the vital link between the cables carrying data and the devices that record and communicate information. For cell tower antennas, the demand for faster and more reliable data transmission has driven the development of products able to support the specific connector requirements set by the Antenna Interface Standards Group (AISG). The AISG defines the communication interface for „remote electrical tilt“ (RET) of the mobile phone antenna. The AISG standard helps to define the AISG connector for RS-485 (AISG C485), which is used for outdoor applications [5].

The AISG standard has been redefined in terms of electrical and mechanical characteristics, environmental conditions, and materials. (See Figure 2.)

Electrical characteristics:

- Rated voltage of 32V
- Current carrying capacity of 5A per contact
- Contact resistance ($\geq 5\text{m}\Omega$)
- Insulation resistance ($\geq 108\ 0$)

Mechanical characteristics:

- IP68 protection degree
- >100 Mating cycles
- Insertion and withdrawal forces of 60N max
- Keying method
- Vibration and shock resistance
- Cable retention force of 80N

Environmental conditions:

- Harsh environment resistance (protection against temperature, salt mist, sunlight, and rain exposure)

Material and other characteristics:

- Housing surface of nickel is recommended
- Contact plating of gold or silver
- Crimp or solder termination
- 8 pins with 4 to 5 pins used
- M16 x 0.75 screw locking system
- EMC shielding



» binder's 423 and 723 series M16 connectors are AISG compliant with an 8-pin DIN variant that supports all wireless networks, including 5G. Rugged metal shells, 360° EMI shielding, and IP68-rated protection fulfill the AISG standard for harsh environment resistance.

M16 connectors and 5G applications

Different M16 connector styles are used within the control infrastructure of antennas and antenna line products, such as RET, tower mounted amplifier (TMA), sensor, and monitoring devices. Gable assemblies fitted with these M16 connectors connect the mobile phone base station to an electric motor mounted on the base of the antenna. Outdoor applications like these need connectors that provide reliable protection against environmental conditions to ensure waterproofness.



» 5G smart cellular network antenna base station.

The number and variety of applications well suited to the M16 connector have greatly increased over the years thanks to a higher pin count, compact size, and improved levels of protection. The latest 5G applications are the perfect example of the M16's adaptability to new performance and environmental challenges. The M16 connector is an excellent alternative to more expensive connector systems, offering a rugged and reliable design at an affordable price. Contacts with gold plating offer a protective coating to help ensure the connection is free of any corrosion. Nickel plated brass outer housing/shell offers environmental protection, as well as high vibration and shock resistance.

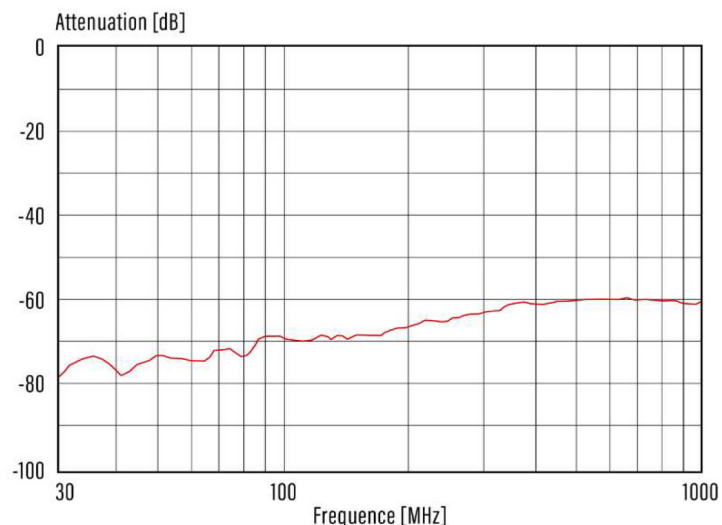
EMC shielding

Millions of cell phones, computers, and smart devices create significant potential for electromagnetic signal interference (EMI) and data disruption.

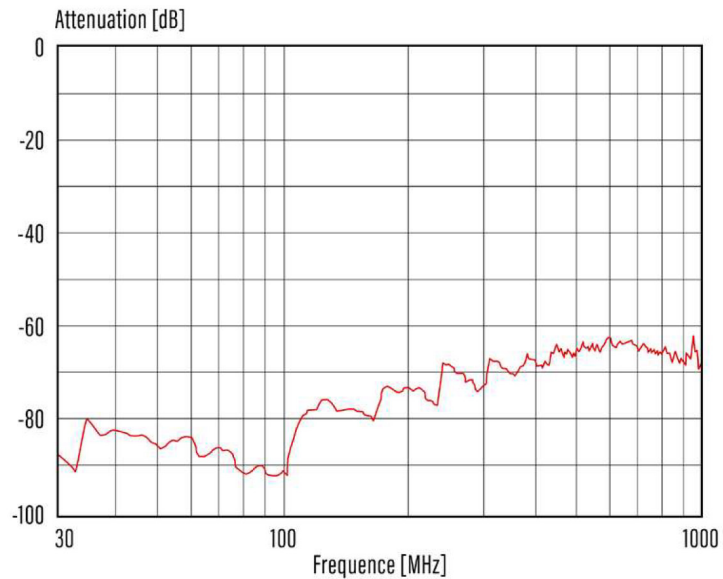
The most effective defense against EMI is filtering at the connector interface [6]. Optimized 360° EMC (electromagnetic compatibility) shielding for M16 connectors provides the highest integrity for sensitive signal and power connections. Shielding is metal and available as a cable clamp or shielding ring.

Effective shielding meets the attenuation requirements of the DIN 47250-6 standard. Attenuation is the loss of signal strength in network cables or connections during transmission. It is typically measured in decibels or voltage. (See Figures 4a and 4b.)

Attenuation curve according to DIN 47250-6 for straight female cable connectors with cable clamp, (cable version IEEE 802.3)



Attenuation curve according to DIN 47250-6 for straight male cable connectors with shielding ring, (cable version IEEE 802.3)



» Attenuation curves per DIN 47250-6 standards for male connectors with shielding ring vs. female connectors with cable clamp. Source: binder USA.



» binder M16 IP67 shielded 8-pin connector for 5G applications.

5G networks represent a genuine revolution in mobile connectivity: lightning fast connection speeds, lower latency, and greater device capacity that empower consumers and businesses alike. The IIoT may approach its true potential with significant advances in automation, efficiency, and productivity. Industries as diverse as manufacturing, healthcare, transportation, oil and gas, aerospace, and defense will be impacted.

Of course, 5G is only as reliable as the components and systems that power it. Reliable connections require state-of-the-art shielding and protection levels. Connectors - and their ability to ensure signal integrity, performance, and EMI shielding in the face of harsh outdoor conditions - are critical to the success of 5G. Forward-thinking companies have already designed their products to ensure they can handle 5G (and future) requirements at a competitive cost that allows the world to connect.

To sum it up, these are the 5 reasons of why M16 connectors are the right fit for 5g Applications:

1. High number of poles
2. Compact in diameter and length
3. Optimized 360° shielding
4. Protection rating to IP68
5. Cost effective

About binder USA

Binder USA, LP, is a subsidiary of binder group, a leading global manufacturer of circular connectors, custom cordsets, and LED lights. Defined by technical innovation and traditional values, the binder name is synonymous with the highest standards of quality and reliability. The company's quality management system is DIN ISO 9001 and ISO 9001 & 14001 certificated, but it is a solution-focused approach to customer applications and commitment to superior service that truly differentiates binder from the competition.

We primarily serve the following sectors:

- Agriculture
- Automation
- Commercial
- Communication
- Food and Beverage
- Industrial
- Medical applications
- Robotics
- Transportation

Manufacturing capabilities

Our manufacturing capabilities allow binder USA to offer German-engineered products made in the US. We produce M8, M12 and Mini 7/8ths cordsets, which significantly shortens lead times for customers. Industrial Ethernet cordsets in the M8 and M12 family are just one of the highlights in our product range.

Stocking capabilities

Our warehouse offers plenty of space to stock binder products manufactured in the US as well as ones imported from Germany. Our finely-tuned logistics help to deliver orders to customers in no time at all. We offer same day shipping for products in stock.

For more information, visit www.binder-usa.com, or email sales@binder-usa.com.

References

[1]

C. Eastman, „The Road to the Future? What to Expect from 5G,“ Tech Native. April 7, 2020.

[Online], Available:

<https://technative.io/the-road-to-the-future-what-to-expect-from-5g/>

[2]

Grand View Research, „5G Services Market Size, Share & Trends Analysis Report By Communication Type (FWA, eMBB, uRLLC, mMTC), By Vertical (Manufacturing, IT & Telecom, BFSI), By Region, And Segment Forecasts, 2021 - 2028,“ March 2021.

[Online], Available:

<https://www.grandviewresearch.com/industry-analysis/5g-servicesmarket>

[3]

A. Gulli, „The Critical Role of 5G In the Future of Work,“ Forbes. Jan. 27, 2021.

[Online], Available:

<https://www.forbes.com/sites/googlecloud/2021/01/27/the-critical-role-of-5g-in-the-future-of-work/?sh=6b9736c16619>

[4]

T. Fisher, „5G Cell Towers: Why You See Them and How They Work,“ Lifewire. March 24, 2021.

[Online], Available:

<https://www.lifewire.com/5g-cell-towers-4584192>

[5]

AISSG Standard No. AISSG C485 V1 .1. June 17, 2016.

[Online], Available:

<https://aisg.org.uk/files/AISSG-Connectorspecification-C485-v1.1.pdf>

[6]

L. Smith, „Three Key Considerations When Selecting EMI/RFI Shielding Solutions for Aerospace and Defense Applications,“ April 6, 2020. ConnectorSupplier.com.

[Online], Available:

<https://www.connectorsupplier.com/threekey-considerations-when-selecting-emi-rfi-shielding-solutions-for-aerospace-and-defense-applications/>

Binder USA, LP

3903 Calle Tecate
Camarillo CA 93012
USA

Tel. 805.437.9925
Fax 805.504.9656
sales@binder-usa.com
www.binder-usa.com

