Nicomatic DMM Connectors

Engineers are expected to develop connector solutions with minimum size and weight while maintaining outstanding performance, ruggedness, and excellent EMI protection — all while staying within time and budgetary constraints. The Nicomatic's digital multimeter (DMM) connector series addresses the growing need for cost-effective and efficient solutions.

Figure 1. *An example of a Nicomatic DMM connector solution. Source*

This white paper summarizes the key features of Nicomatic DMM connectors, discussing their technical specifications and various applications.

NICOMATIC DMM CONNECTORS

The Nicomatic DMM connectors are rugged, low-profile, space-saving rectangular Micro-D connector solutions tested to meet or exceed MIL-DTL-83513G criteria. They offer a much wider choice of arrangements when compared to similar MIL-SPEC connectors such as Micro-D or Sub-D.

These connectors are lightweight, have a small footprint, and have a high contact density. They can combine power, coax, and/or signal in one connector solution; their metal shell enables resistance to exterior factors such as electromagnetic interference (EMI) and grounding. In addition, DMM connectors' backshells are mountable without modifying the front or rear panel. The various components of a DMM connector are shown in Figure 2.

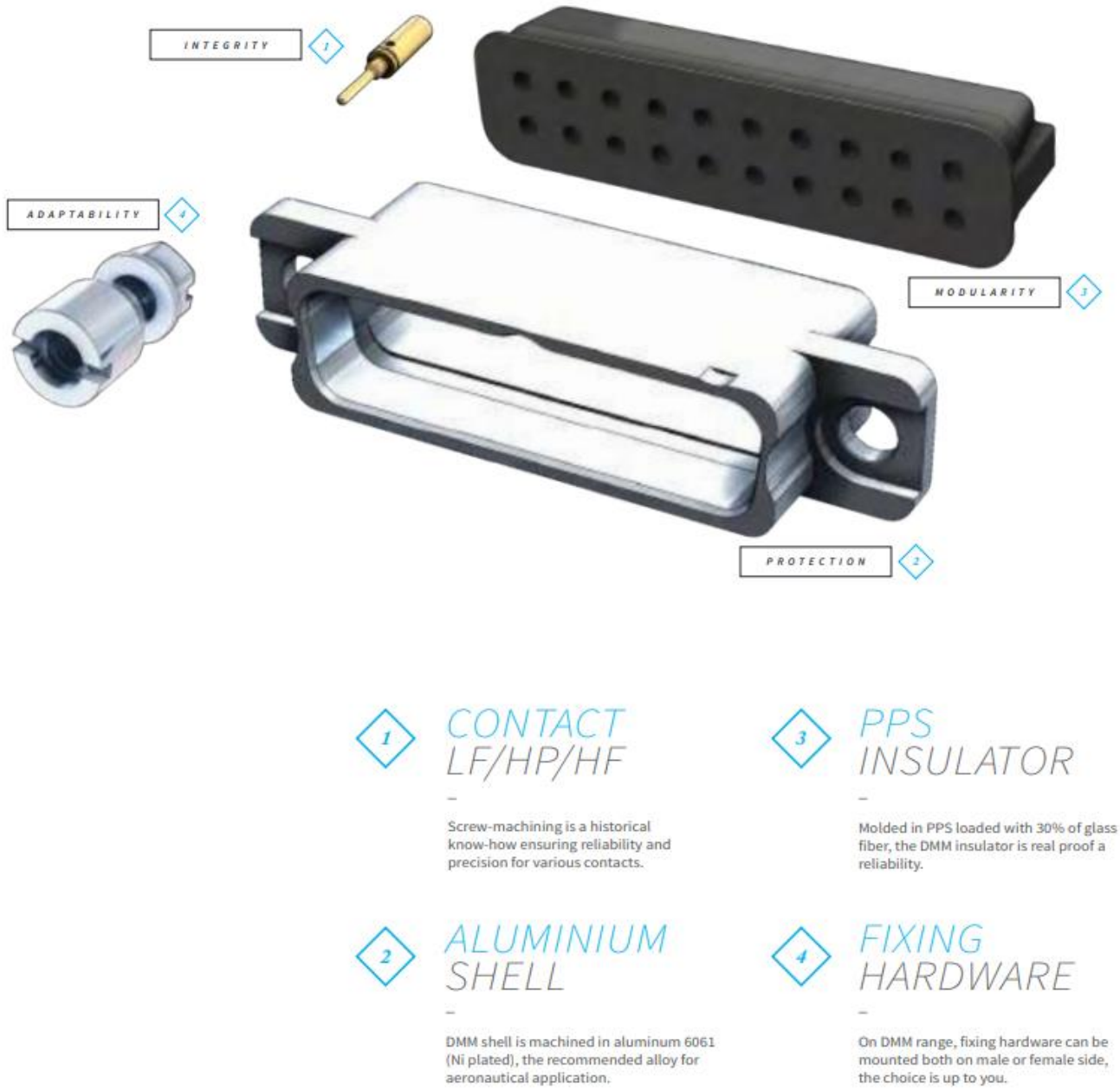

***Figure 2**. Anatomy of a Nicomatic DMM connector. Source*

KEY FEATURES OF NICOMATIC DMM CONNECTORS

Nicomatic DMM connectors have several key features, including space savings, harsh environment performance, EMI protection, mechanical protection, high modularity, and short lead time.

Space Savings

Many defense, aerospace, robotics, and medicine applications face challenges regarding available physical space. Nicomatic designed the DMM connectors to address that problem with a lower profile and high contact density. They have a 2mm pitch and are available in one to four rows of up to 120 contacts. They offer up to 40% space and weight savings compared to similar Micro-D solutions. Their support of hybrid signal, coax, and power combinations further supports miniaturization and an ultra-compact Surface Mount Technology (SMT) 90° option.

Harsh Environment Performance

Nicomatic DMM connectors were engineered with ruggedness in mind. They have an operating temperature range of -55°C to +125°C, and a maximum soldering temperature of 250°C for 5 seconds. Their vibration sensitivity is 10 to 2000Hz / 15g / 3 axis / 12 cycles per axis with no signal interruption > than 1 µs. Their shock severity has been tested at 100g for a 6 ms sawtooth, again with no signal interruption > than 1 µs. They are also resistant to humidity and salt spray for up to 96 hours. Finally, the Nicomatic DMM connectors are available in IP67 or IP68 with an O-ring.

EMI Protection

The metal backshell provides EMI/RFI 360° protection with a transfer impedance (Zt) under 200mΩ from 10 KHz to 400 Mhz, according to MIL-STD-1377. The metal backshell is Aluminum 6061 with a 10µm chemical Nickel plating. In addition, the DMM with flange options offers better shielding continuity when mounting on a panel. As it fills the space between the panel cut and the connector, it significantly improves signal attenuation (up to 15dB).

Mechanical Protection

The backshell is the rear portion of a connector, normally separate from the connector head, and is used to secure the cable to the end of the connector for strain relief on solder and crimp joints. It also helps mitigate physical damage due to environmental conditions. The metal backshell has been engineered with better retention cables and contacts to ensure reliability. It also helps eliminate tension directly on the connector pins, transferring it to the housing instead, to prevent tension exerted on a cable assembly from damaging the contact solder or crimping the connections. Furthermore, the connectors exhibit excellent vibration and shock performance as discussed under Harsh Environment Performance.

High Modularity

The Nicomatic DMM is so flexible, with options Signal (LF), power (HP), and coax (HF) mixed layouts, that 10+ million configurations are possible. They are also available in board-to-board, board-to-wire, wire-to-wire, and panel-mount options, as well as on-cable, straight, and right-angle PCB.

Short Lead Time

The current lead time is four weeks, and the minimum order quantity is one. Online CAD models can be downloaded instantly. In addition, the new series can be produced in less than 2 hours, which contributes to Nicomatic's 97% on-time delivery.

SPECIFICATIONS

The Nicomatic DMM connectors have been tested to meet or exceed MIL-DTL-83513G criteria and comply with AS/EN9100 aerospace quality standards and EN4893 standards.

The power contacts (HP) support high current and high power up to 30A and require a 4mm pitch. The coax (HF) contacts transmit high-frequency signals and are suitable for a bandwidth from 400MHz to 11GHz, and up to 20GHz. The signal (LF) contacts support high-speed data up to 5 Gbit/s.

The backshell is machined Aluminum 6061, a lightweight yet rugged material with an excellent thermal coefficient to further guarantee reliability even in the presence of intense thermal cycling. It is also nickel-plated at 10µm and provides EMI/RF protection. There are two different backshell designs available: split and mono, shown in Fig. 3.

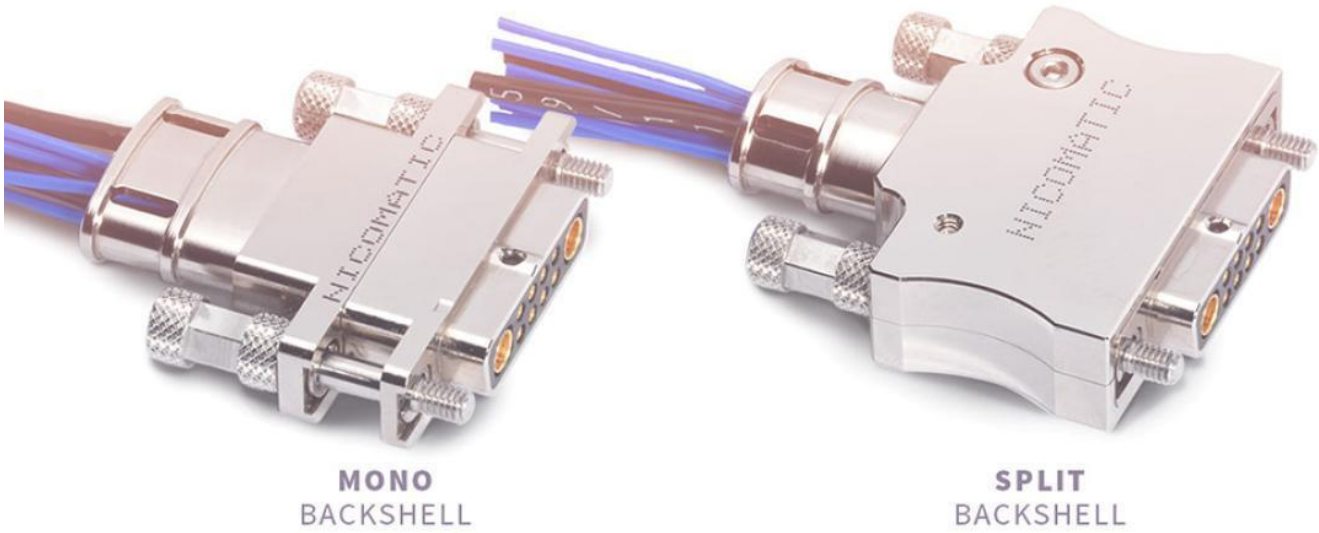

Figure 3. *Mono and split backshell options. Source*

The split backshells do not require fixing hardware, making them quick and easy to assemble, and the shell cable entry can be either circular or elliptical in shape. Mono backshells have elliptical cable entries and do carry the fixing hardware.

The insulator for both types is made from molded PPS (Polyphenylene Sulfide) reinforced with 30% glass fiber. This composite material exhibits no humidity absorption and excellent outgassing characteristics, making it ideal for space applications.

The contacts are made from a Copper alloy and plated in Nickel and Gold (Ni and Au), and the clips are made from Nickel-plated Beryllium Copper. The contact engagement force is a maximum of 2 N. The fixing hardware is 316L passivated stainless steel, manufactured in-house. It can be mounted onto either the female or male side and is available as a racking or screw-locking type. Note that custom fixing hardware is also available.

At sea level, the withstand voltages are as follows:

- Signal (LF) contacts have a withstanding voltage of 600 VRMS and a rated voltage of 200 VRMS
- Power (HP) & Coax (HF) contacts have a withstanding voltage of 800 VRMS and a rated voltage of 267 VRM

At high altitudes, Signal (LF), Power (HP), & Coax (HF) contacts all have a withstanding voltage of 150 VRMS and a rated voltage of 50 VRMS.

DMM connectors with only signal (LF) contacts have a maximum temperature elevation at 3A @ 25°C of 67°C and a maximum temperature elevation at 2.5A @ 85° is 28°C. For the DMM connectors with only High Power (HP) contacts, the maximum temperature elevation at 20A @ 25°C is 61°C and for 20A @ 85°C it is 29°C.

As for reliability, DMM connectors with only signal (LF) contacts have tested at 500 cycles per minute - up to 2500 cycles, while connectors with signal (LF) and High Power (HP) contacts also achieved 500 cycles per minute.

Figure 4 illustrates the high-speed data capabilities of the signal (LF) contacts.

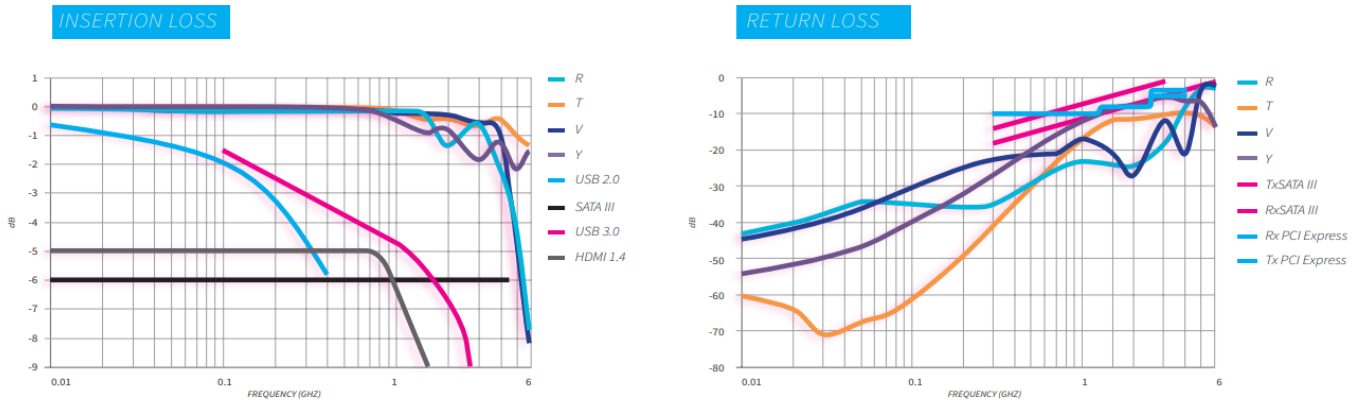

Figure 4. Performance of signal (LF) contacts in the Nicomatic DMM connectors. Source

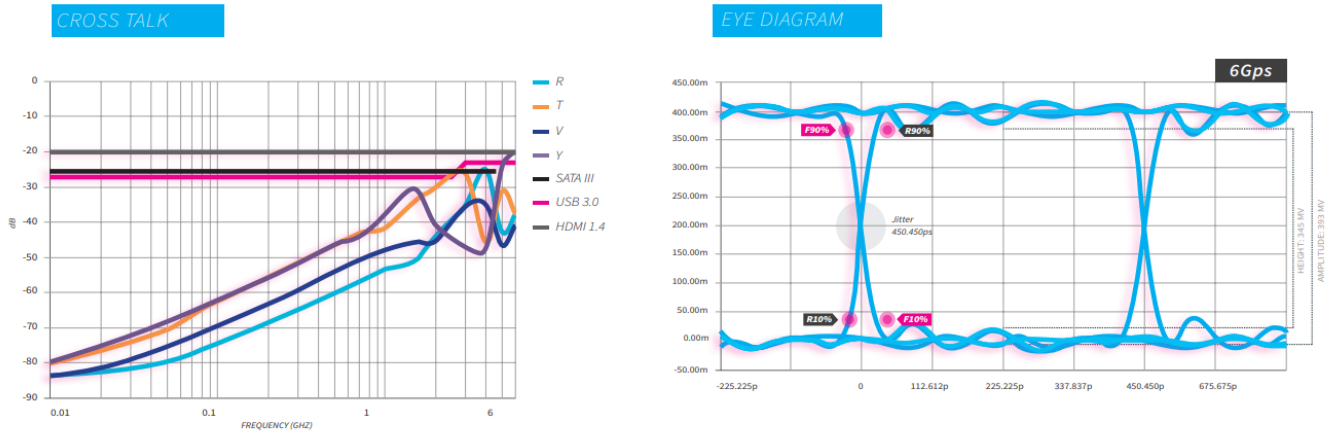

Figure 4. **Continued** Performance of signal (LF) contacts in the Nicomatic DMM connectors. Source

For the power contacts (HP), current rating performance is shown in Figure 5.

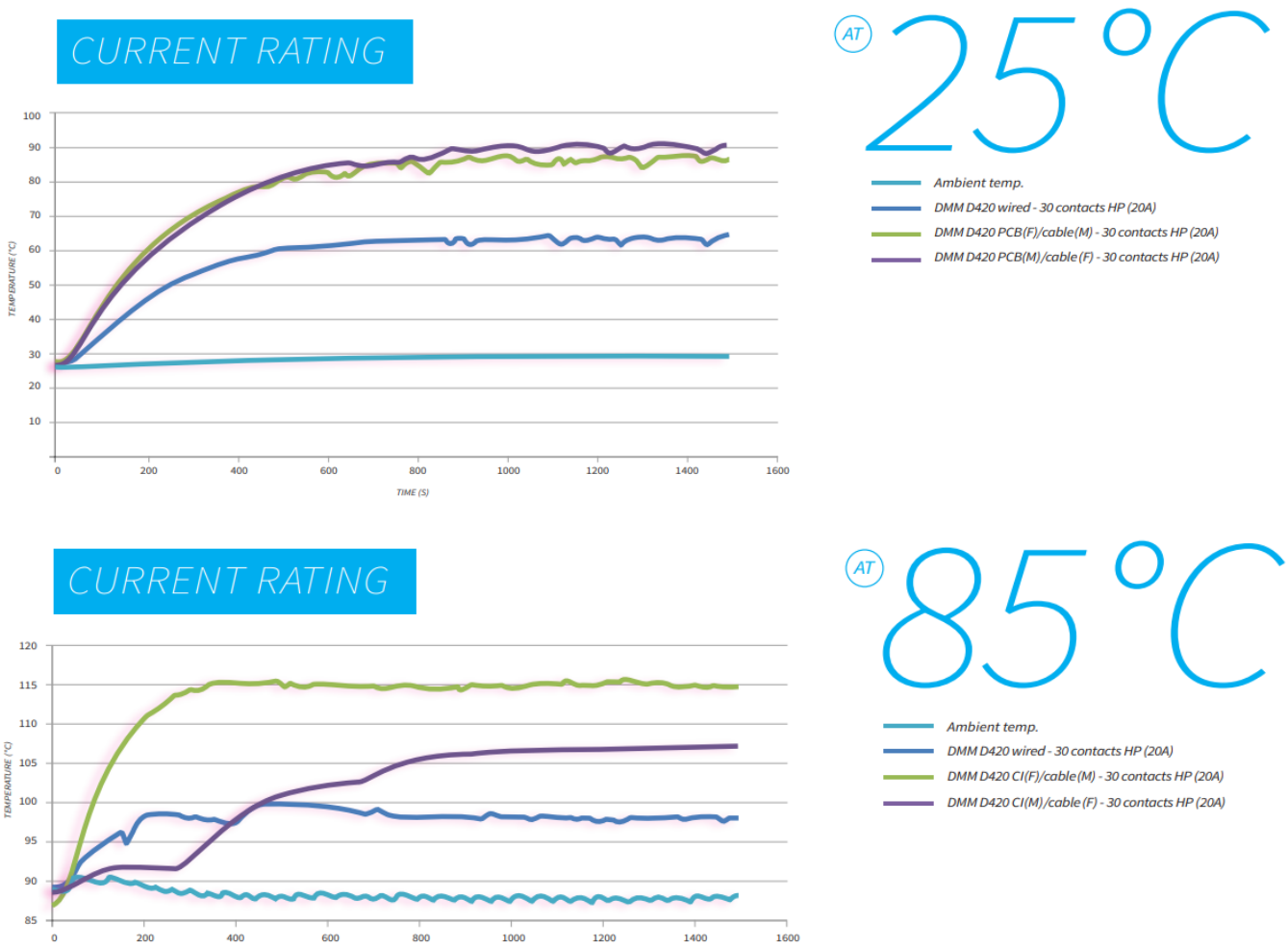

***Figure 5**. Derating charts for Nicomatic DMM power contacts. Source*

APPLICATIONS

Nicomatic DMM connectors are Ideal for miniature and portable devices or equipment used in the field. Some applications include:

- Civil Avionics
- UAV (Unmanned Aerial Vehicle)
- Space
- Defense
- Robotics
- Medical

LEARNING MORE

For engineers searching for rugged, high-performance, compact connector solutions that have been tested to meet or exceed MIL-DTL-83513G criteria and/or comply with AS/EN9100 aerospace quality standards, Nicomatic DMM connectors are the answer.

To learn more about Nicomatic DMM connectors, or explore other solutions, contact a Powell representative today at nicomaticinfo@powell.com or go to www.powell.com.