HIGH SPEED DIGITAL CONNECTOR TECHNOLOGY

OMNETICS
CONNECTOR CORPORATION

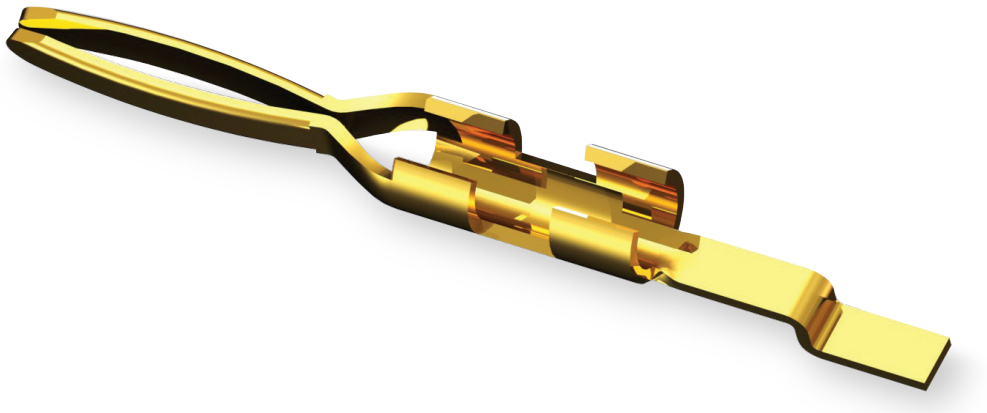
About Omnetics

Omnetics Connector Corporation is a privately held, world class connector design and manufacturing company with over 30 years experience focused on ultra-lightweight micro-miniature and nano-miniature highly reliable electronic connectors and interconnection systems. Our products are designed and assembled at our plant in Minneapolis, Minnesota that includes in-house automatic machining and overmolding equipment.

Omnetics' Flex Pin

Designed for High Shock and Vibration

Omnetics' Flex Pin contact was designed and produced many years before the creation of MIL-DTL-32139. This simple one piece design is stamped from ASTM B194 BeCu. The spring characteristic of BeCu is ideal for withstanding high shock and vibration situations.



About High Speed

Today's design engineers have a strong directive when it comes to military electronics, and much of the emphasis is focused heavily around SWaP (Size, Weight and Power). The main challenge when designing SWaP-optimized electronics is finding the delicate balance between size, weight, and power consumption, without physically compromising the devices' overall performance, durability, and reliability. Many advanced avionics platforms today are processing mountains of data, and in doing so, are consuming more power than ever before. This requires today's engineers to design embedded electronics and interconnect systems differently, so they can handle increased data speeds and bandwidth without adding significant weight. Omnetics Connector Corporation has been able to lend their expertise to this issue by releasing a new set of miniaturized high-speed standards featuring ruggedized USB 3.1 Gen 1, HDMI and Cat6a Ethernet connector offerings. This new family of miniature circulars allows designers the ability to transmit uninterrupted, high-speed digital signals in some of the smallest Mil-spec footprints on the market.

Table of Contents

USB 3.1 Gen 1 Circular

Electrical-Mechanical Specifications

- Performance: Product family tested to and passed or exceeded the performance specifications of Table VIII of MIL-DTL-32139
- Contact Resistance (Nano): 71 Milliohm Max (71mV Drop Max) @ 1.0 Amps per MIL-DTL-32139
- Contact Resistance (Micro): 26 Milliohm Max (65 mV Drop Max) @ 2.5 Amps per MIL-DTL-32139
- Current Rating (Nano): 1 Amp per MIL-DTL-32139
- Current Rating (Micro): 3 Amps per MIL-DTL-83513
- Operating Temperature: -55°C to 85°C
- Durability: >2000 mating cycles min
- Insulation Resistance: 5000 megohms @ 500 VDC
- Shock: 50 g's with no discontinuties > 10 nanosecond
- Vibration: 20 g's with no discontinuties > 10 nanosecond
- Thermal Vacuum Outgassing (Space Class): 1.0% max TML, 0.03% max CVCM
- Mating/Unmating Force: 2.5 oz (71 g) typical per contact

Material Specifications

- Contact: Copper Alloy Per MIL-DTL-32139
- Contact Finish: Gold per ASTM B488, Type II, Class 1.27, Code C Over Nickel Underplate
- Insulator: Thermoplastic per MIL-M-24519
- Overmold: Black Thermoplastic Polyurethane
- O-Ring: BUNA-N
- Cable (Shielded): 30 AWG (7-38) SPC, FEP / 26 AWG (19-38) SPC, FEP color coded, Black Polyurethane Jacket
- Shield: Foil wrap with braid - 38 AWG tin plated copper

Shell Options

- Brass Alloy 360 1/2 Hard: Electroless Nickel per SAE-AMS-2404
Black Nickel per MIL-P-18317
- Stainless Steel, 300 Series: Passivated per SAE-AMS-2700
Black Oxide Finish per MIL-DTL-13924, Class 4*, Passivated per SAE-AMS-2700

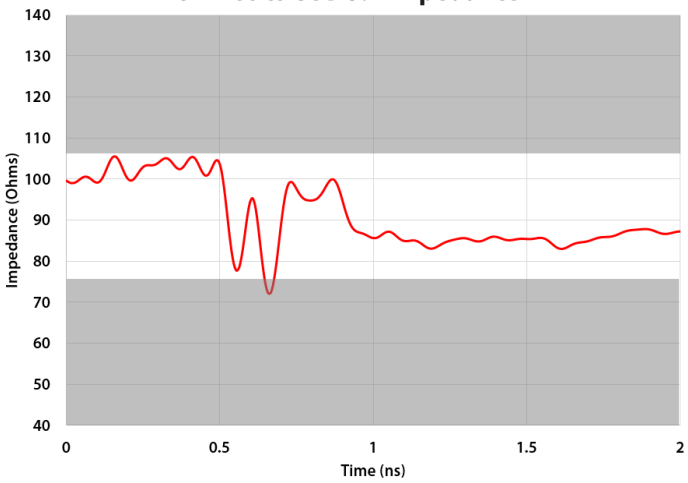
* less resistance to salt spray test.

USB 3.1 Gen 1 Circular

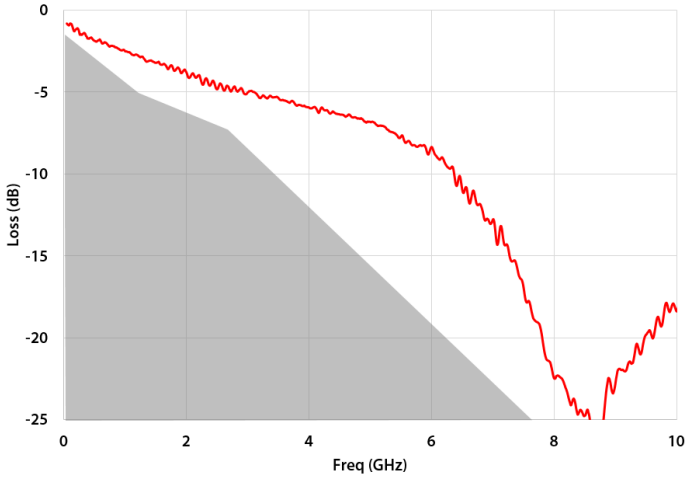
Electrical Specifications

Parameter		Spec	1-Meter
Connector Differential Impedance	Z_{MIN}	75 Ω	72 Ω
	Z_{MAX}	105 Ω	100 Ω
Differential Insertion Loss	Loss @ 7.5 GHz	< 25 dB	16 dB
Differential Far-End Crosstalk	FEXT @ 7.5 GHz	< -23 dB	-28 dB
Diff-to-Common Mode Conversion	DCM @ 7.5 GHz	< -20 dB	-20 dB

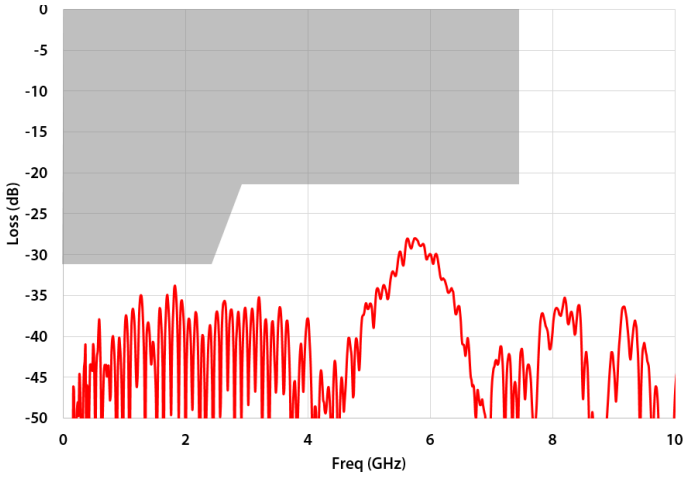
Omnetics USB 3.1 Impedance



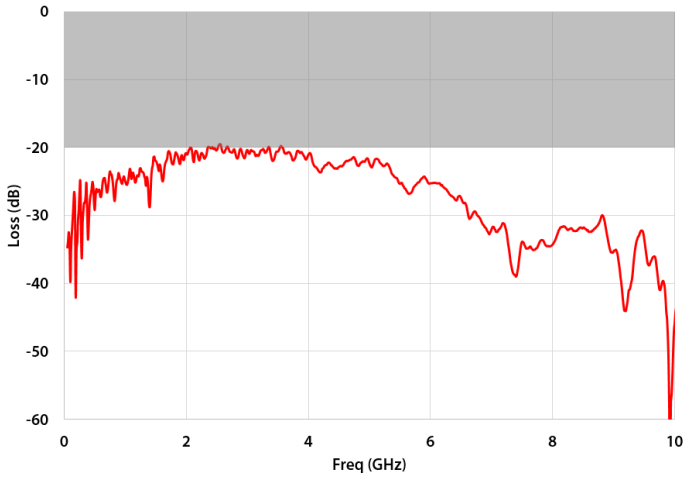
Omnetics USB 3.1 Insertion Loss



Omnetics USB 3.1 NEXT

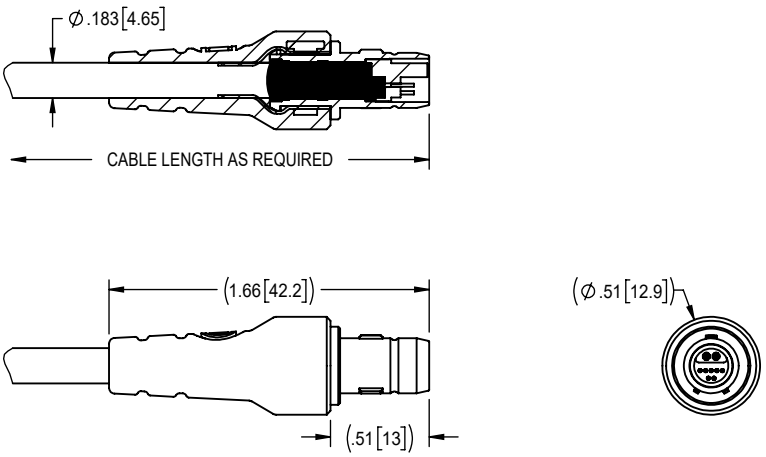


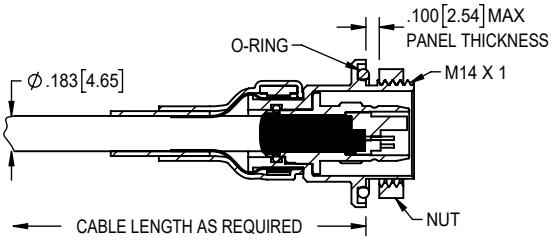
Omnetics USB 3.1 DIFF/COM Conversion

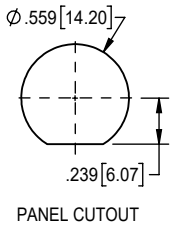


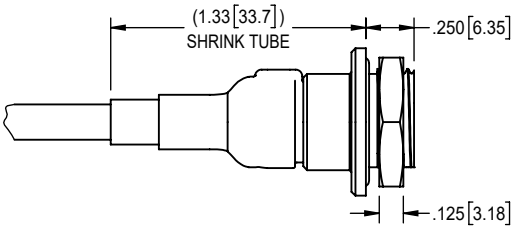
Various cable options are available. Measurements shown above with cables manufactured in Asia.

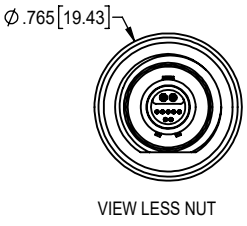
USB 3.1 Gen 1 Circular
Keyed Break Away - KBXP



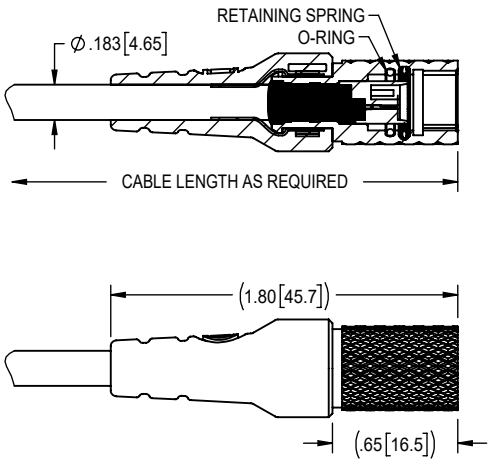


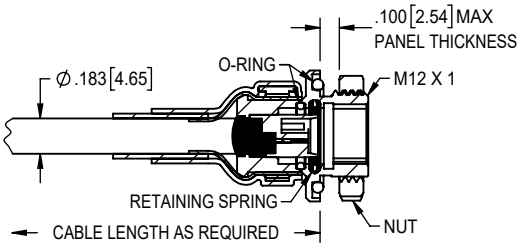


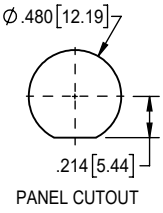


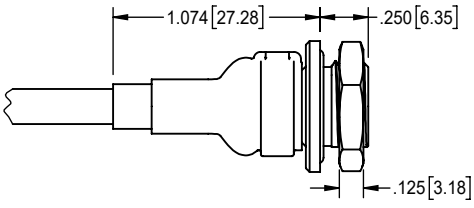


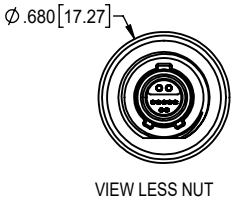
USB 3.1 Gen 1 Circular
Keyed Break Away - KBXS



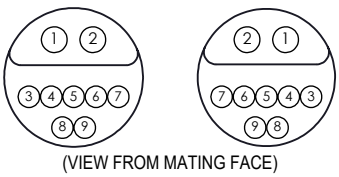






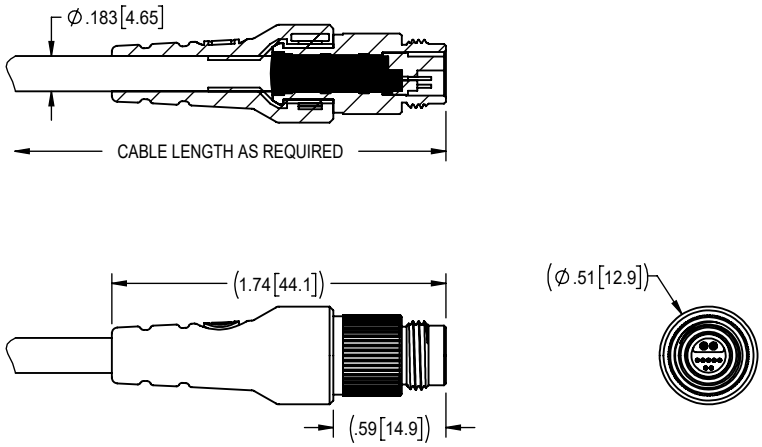


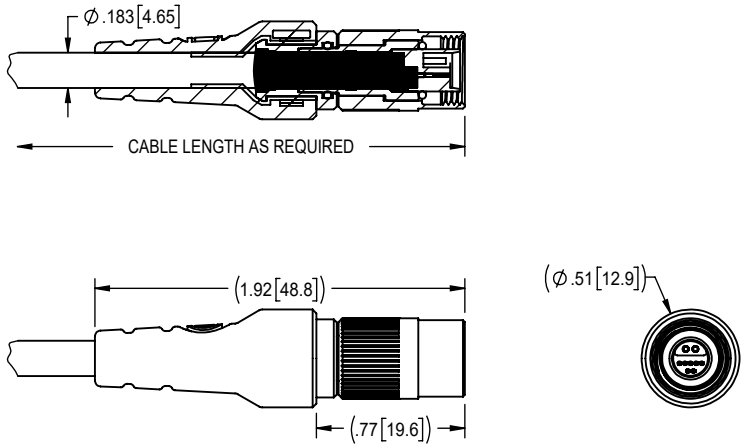
USB PINOUT

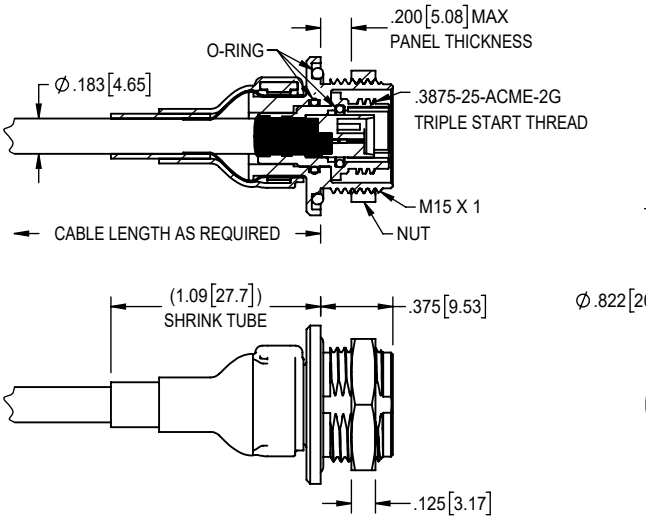


(VIEW FROM MATING FACE)

USB 3.1 Gen 1 Circular
Threaded - MXC







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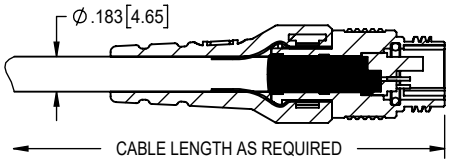
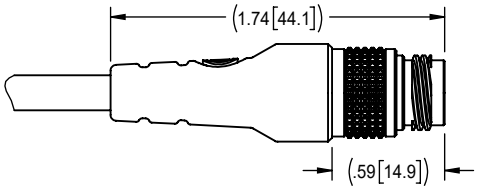
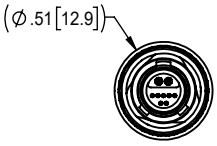
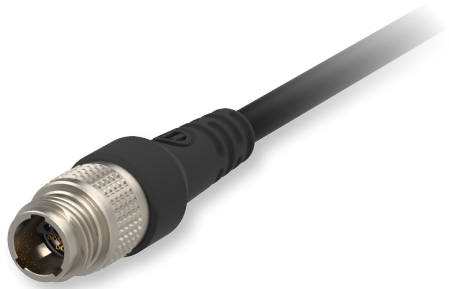
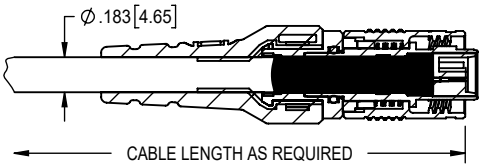
USB 3.1 Gen 1 Circular
Triple Threaded - RXC

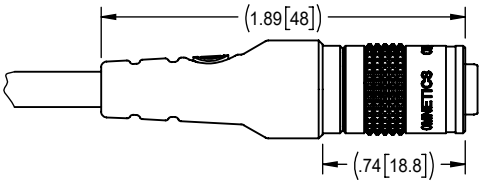


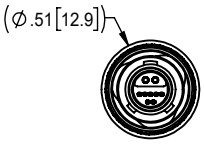


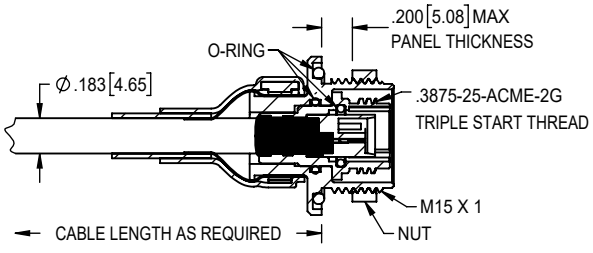


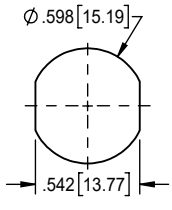


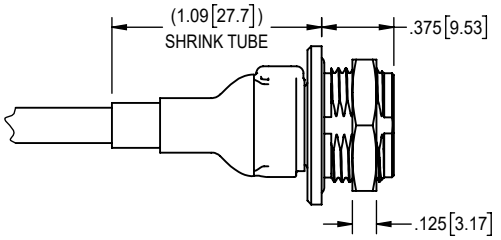


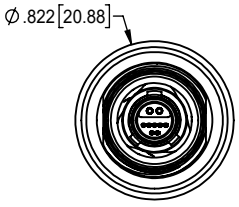




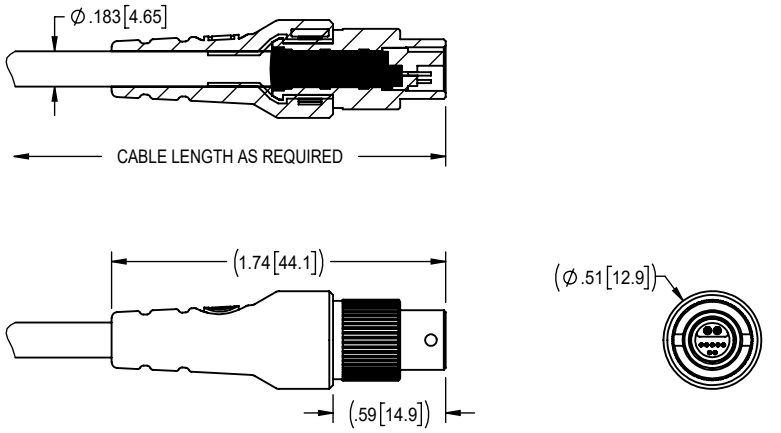


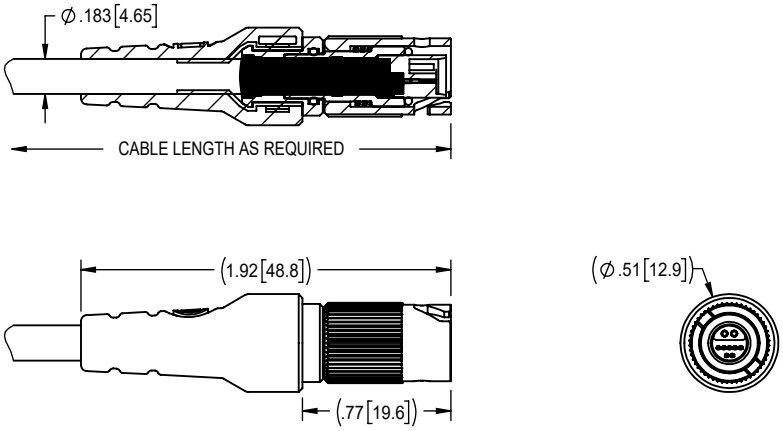


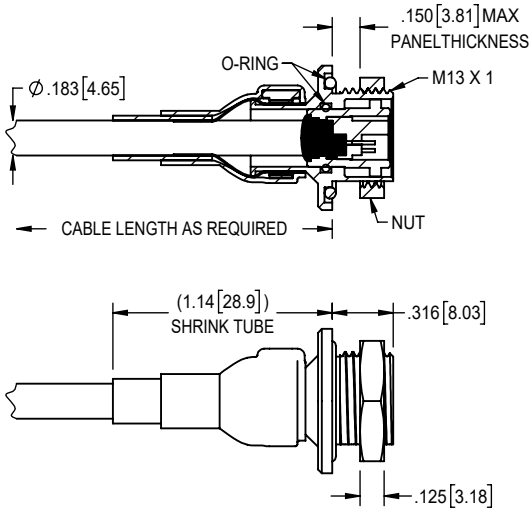




USB 3.1 Gen 1 Circular
Twist Lock - TXC







Cat6a Ethernet Micro

Electrical-Mechanical Specifications

- Operating Temperature: -55ºC to 85ºC
- Dielectric Withstand Voltage: 600 VAC RMS @sea level
- Contact Resistance: 26 milliohms(65 mV) Max @2.5 Amps
- Current Rating: 3 Amps per contact
- Operating Temperature -55°C to 85°C
- Durability: 2000 Mating Cycles min
- Insulation Resistance: 5000 megohms @ 500 VDC
- Shock: 50 g's with no discontinuties > 1 microsecond
- Vibration: 20 g's with no discontinuties > 1 microsecond
- Thermal Vacuum Outgassing (Space Class): 1.0% max TML, 0.03% max CVCM
- Mating/Unmating Force: 3 oz (85 g) per contact

Material Specifications

- Contact: Copper Alloy per MIL-DTL-83513
- Contact Finish: Gold per ASTM B488,Type II, Class 1.27, Code C Over Nickel Underplate
- Insulator: Thermoplastic per MIL-M-24519
- Overmold: Black Thermoplastic Polyurethane
- Cable (Shielded): 26 AWG (7-34) TPC, HDPE color coded, Black Polyurethane Jacket
- Shield: Foamed Polypropylene wrap with braid - 38 AWG tin plated copper

Shell Options

- Stainless Steel, 300 Series: Passivated per SAE-AMS-2700
Black Oxide Finish per MIL-DTL-13924, Class 4*,
Passivated per SAE-AMS-2700
- Brass Alloy 360 1/2 Hard: Electroless Nickel per SAE-AMS-2404
Black Nickel per MIL-P-18317
- Aluminum 6061: Electroless Nickel per SAE-AMS-2404
Black Nickel per MIL-P-18317

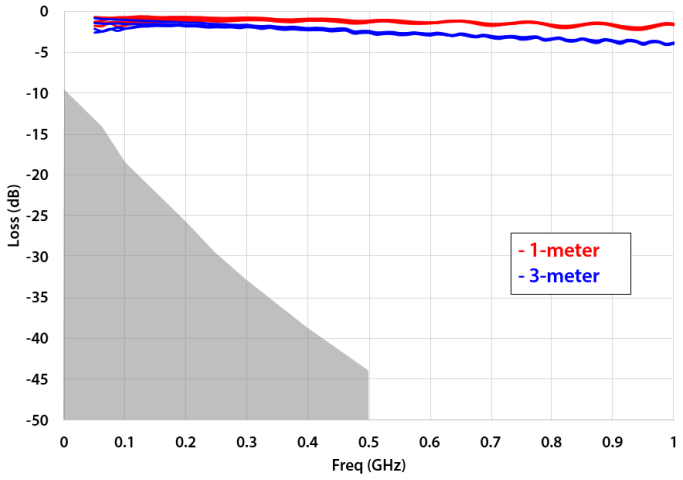
* less resistance to salt spray test.

Cat6a Ethernet Micro

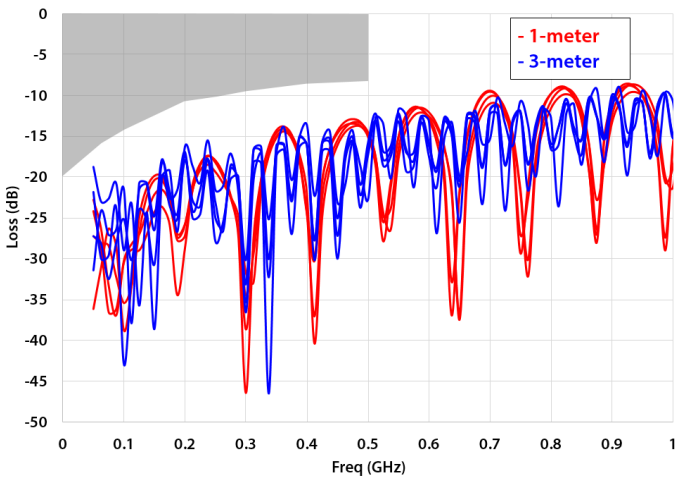
Electrical Specifications

Parameter		Spec	1-Meter	3-Meter
Differential Cable Impedance	Z_{MIN}	90 Ω	97 Ω	
	Z_{MAX}	110 Ω	98 Ω	
Differential Insertion Loss	Loss @ 500 MHz	< 44 dB	1 dB	3 dB
Differential Return Loss	Loss @ 500 MHz	< -8 dB	-13 dB	-14 dB
Differential Far-End Crosstalk	NEXT @ 500 MHz	< -27 dB	-48 dB	-53 dB
Differential Power Sum Far-End Crosstalk	PSNEXT @ 500 MHz	< -24 dB	-45 dB	-50 dB

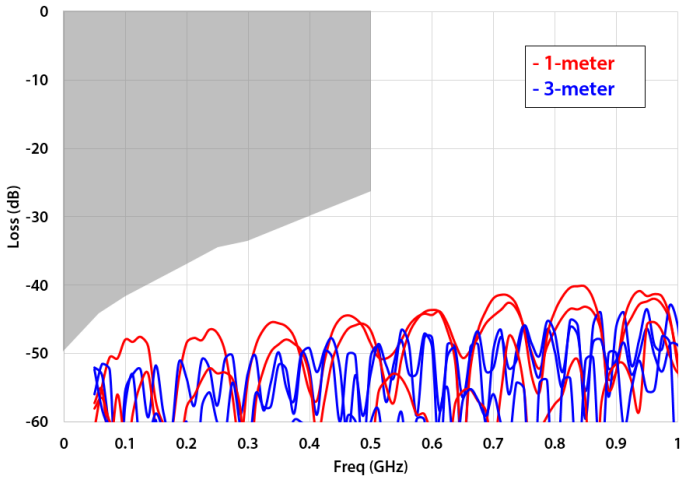
Omnetics Micro 360® Cat6a Insertion Loss



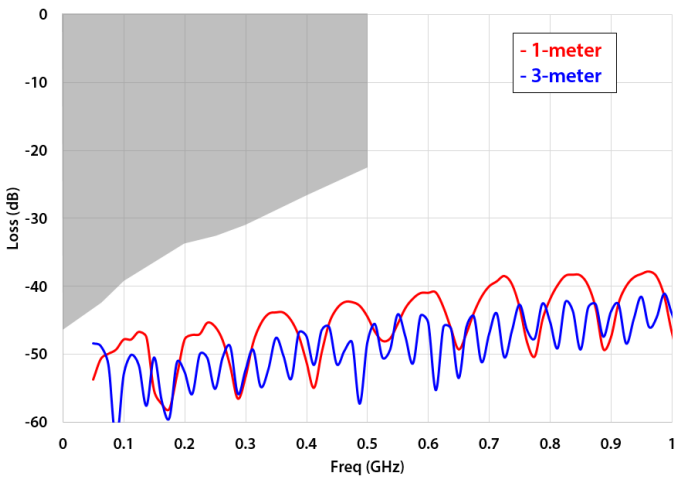
Omnetics Micro 360® Cat6a Return Loss



Omnetics Micro 360® Cat6a NEXT



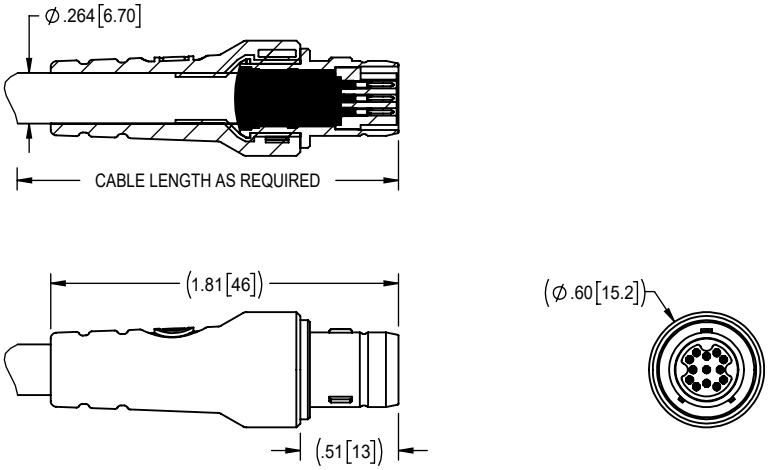
Omnetics Micro 360® Cat6a PSNEXT

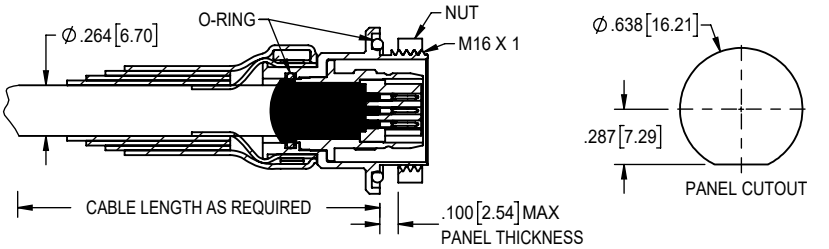


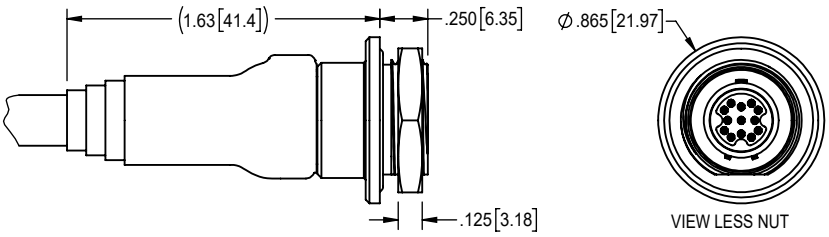
Various cable options are available. Measurements shown above with cables manufactured in Asia.

Cat6a Ethernet Micro Circular

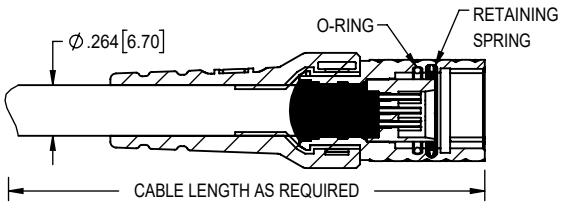
Keyed Break Away - KBMP

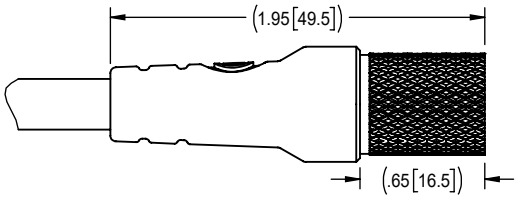


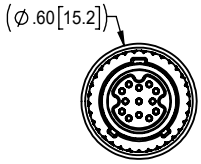


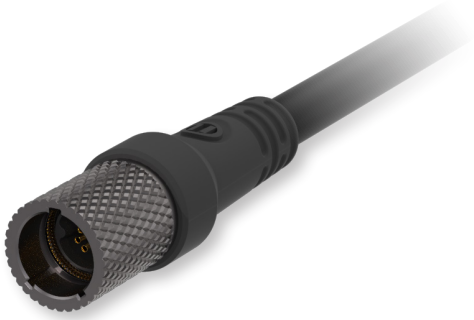


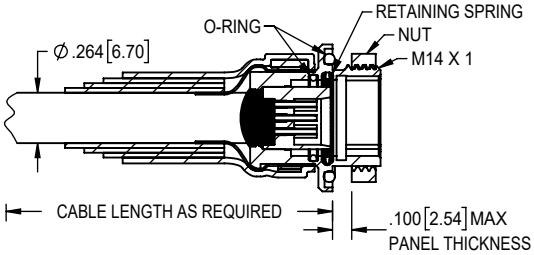
Cat6a Ethernet Micro Circular
Keyed Break Away - KBMS

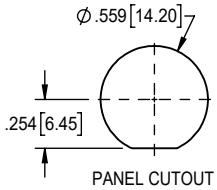


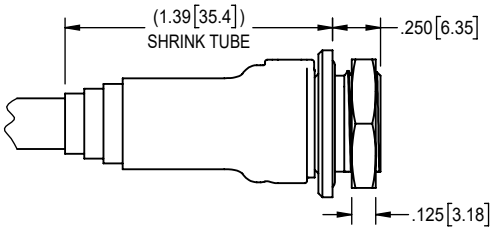


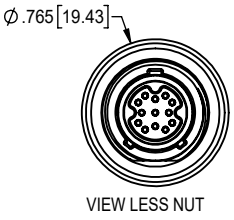




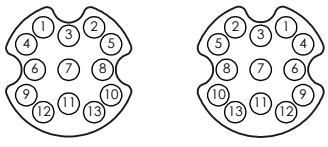








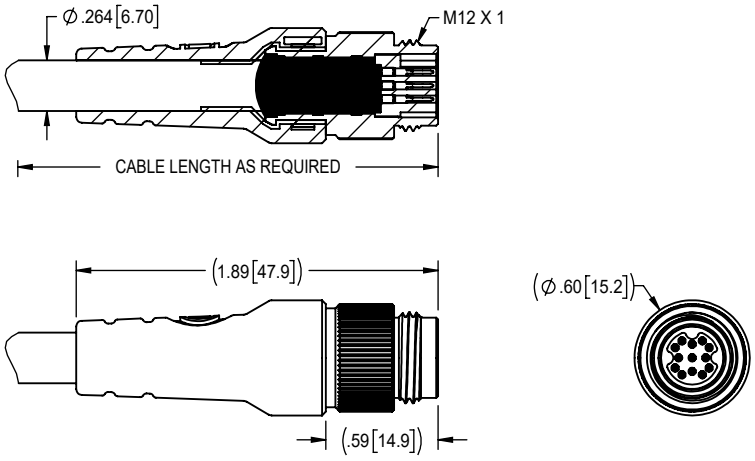
ETHERNET PINOUT

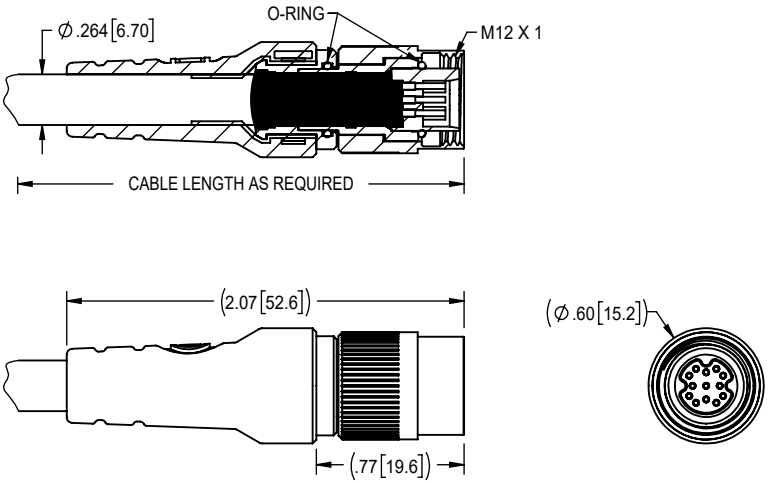


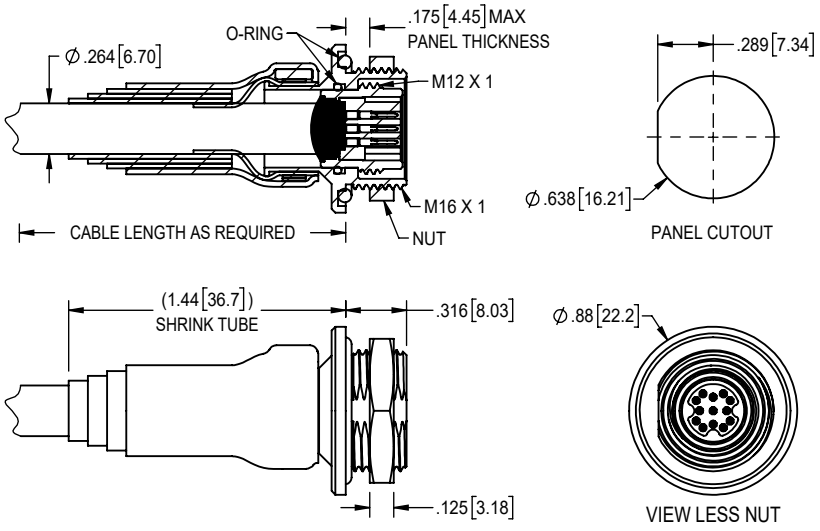
(VIEW FROM MATING FACE)

Cat6a Ethernet Micro Circular

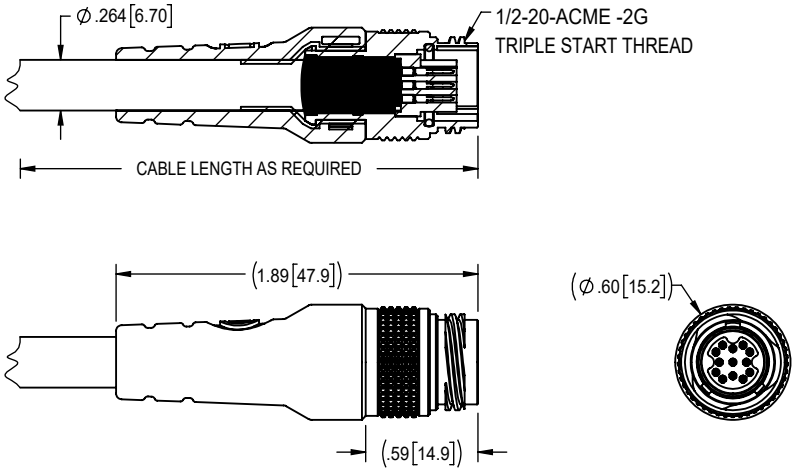
Threaded - MMC

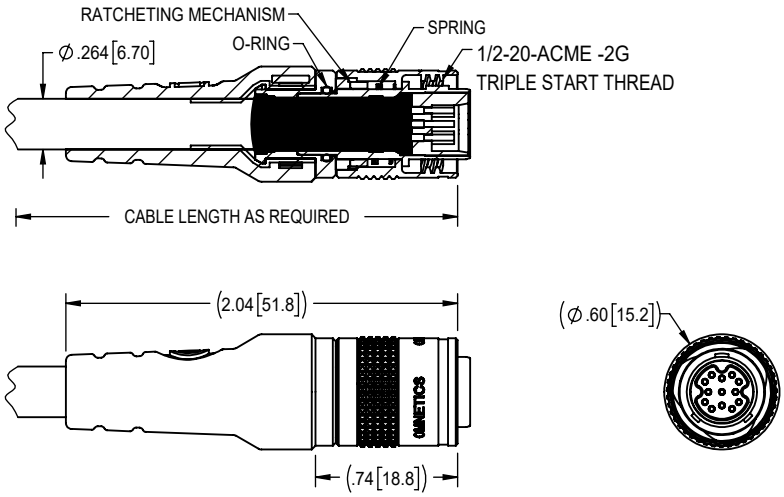


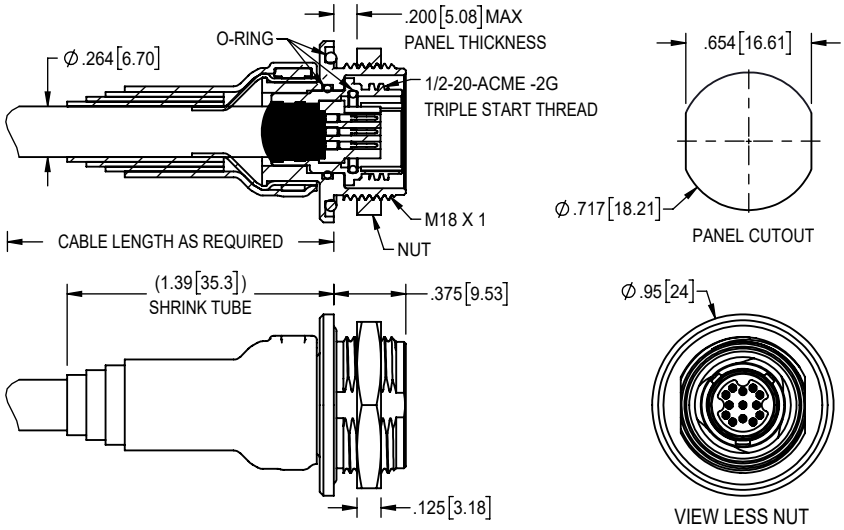


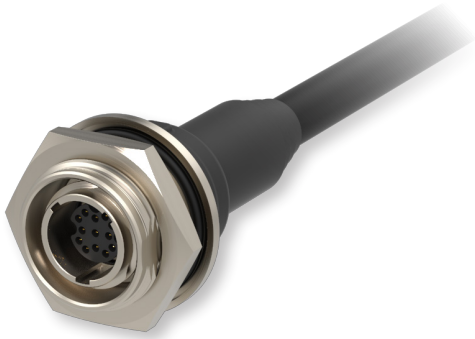


Cat6a Ethernet Micro Circular
Ratcheting - RMC



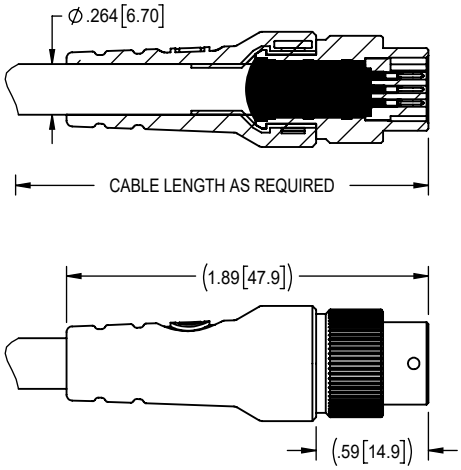


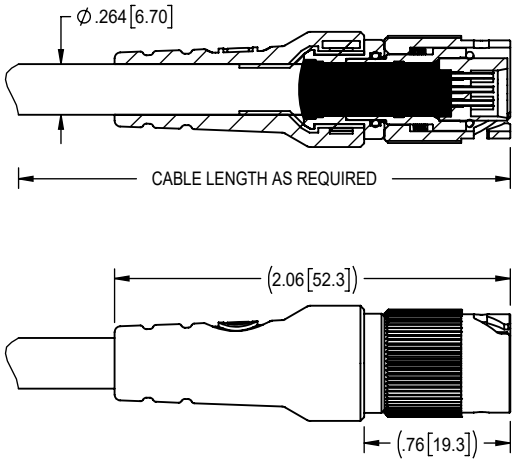


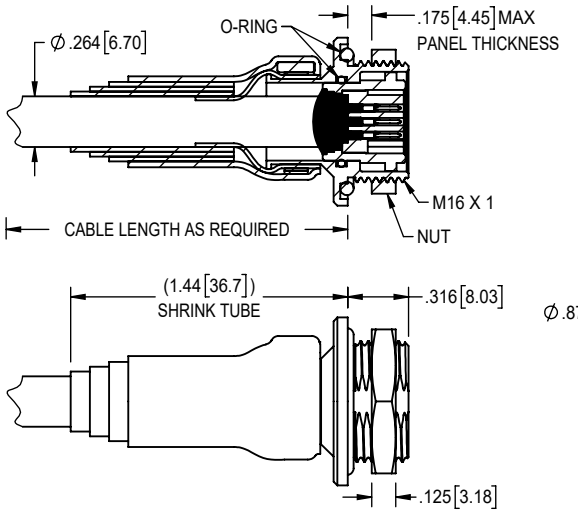


Cat6a Ethernet Micro Circular

Twist Lock - TMC







Cat6a Ethernet Nano

Electrical-Mechanical Specifications

Performance:	Product family tested to and passed or exceeded the performance specifications of Table VIII of MIL-DTL-32139
Contact Resistance:	71 Milliohm Max (71mV Drop Max) @ 1.0 Amps per MIL-DTL-32139
Current Rating:	1 Amp per MIL-DTL-32139
Operating Temperature:	-55°C to 85°C
Durability:	>2000 mating cycles min
Insulation Resistance:	5000 megohms @ 100 VDC
Shock:	100 g's with no discontinuties > 10 nanosecond
Vibration:	20 g's with no discontinuties > 10 nanosecond
Thermal Vacuum Outgassing (Space Class):	1.0% max TML, 0.03% max CVCM
Mating/Unmating Force:	2.5 oz (71 g) typical per contact

Material Specifications

Contact:	Copper Alloy Per MIL-DTL-32139
Contact Finish:	Gold per ASTM B488, Type II, Class 1.27, Code C Over Nickel Underplate
Insulator:	Thermoplastic per MIL-M-24519
Overmold:	Black Thermoplastic Polyurethane
O-Ring:	BUNA-N
Cable (Shielded):	32 AWG (7-40) SPC, FEP color coded, Black Polyurethane Jacket
Shield:	Aluminum/Poly wrap with braid - 40 AWG tin plated copper

Shell Options

Brass Alloy 360 1/2 Hard:	Electroless Nickel per SAE-AMS-2404 Black Nickel per MIL-P-18317
Stainless Steel, 300 Series:	Passivated per SAE-AMS-2700 Black Oxide Finish per MIL-DTL-13924, Class 4*, Passivated per SAE-AMS-2700

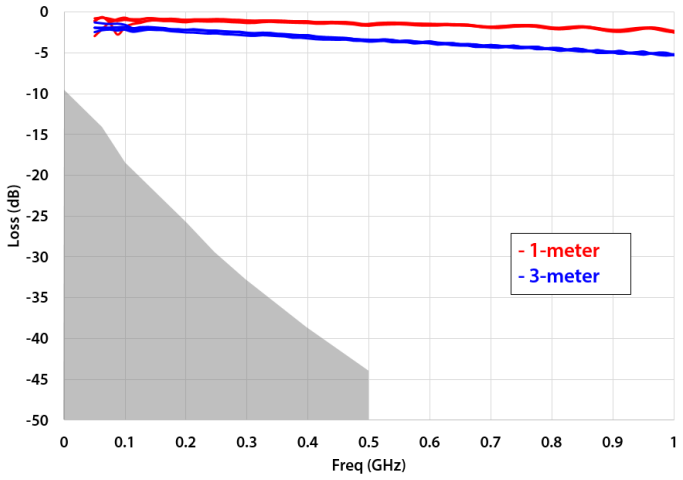
* less resistance to salt spray test.

Cat6a Ethernet Nano

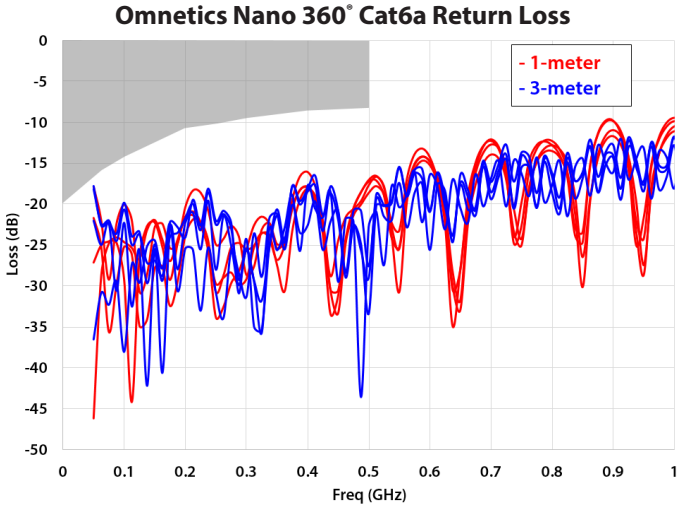
Electrical Specifications

Parameter		Spec	1-Meter	3-Meter
Differential Cable Impedance	Z_{MIN}	90 Ω	96 Ω	
	Z_{MAX}	110 Ω	99 Ω	
Differential Insertion Loss	Loss @ 500 MHz	< 44 dB	1 dB	3 dB
Differential Return Loss	Loss @ 500 MHz	< -8 dB	-16 dB	-17 dB
Differential Far-End Crosstalk	NEXT @ 500 MHz	< -27 dB	-50 dB	-51 dB
Differential Power Sum Far-End Crosstalk	PSNEXT @ 500 MHz	< -24 dB	-48 dB	-49 dB

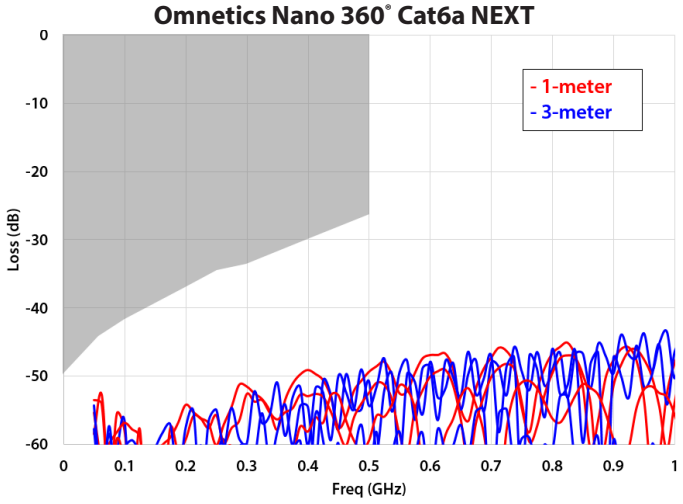
Omnetics Nano 360° Cat6a Insertion Loss



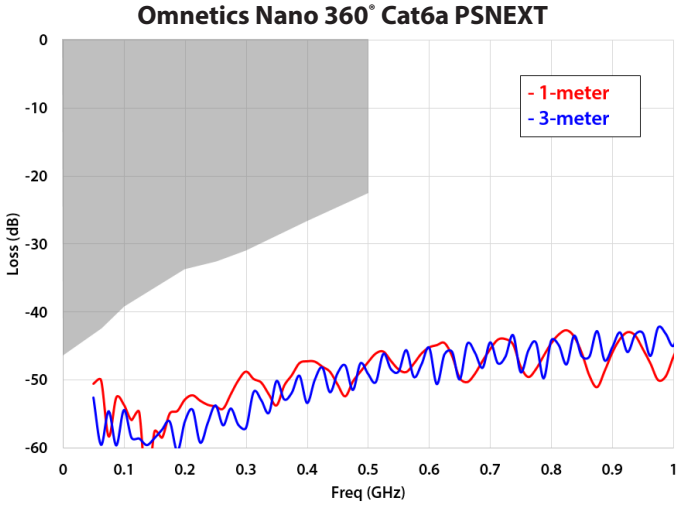
Omnetics Nano 360° Cat6a Return Loss



Omnetics Nano 360° Cat6a NEXT

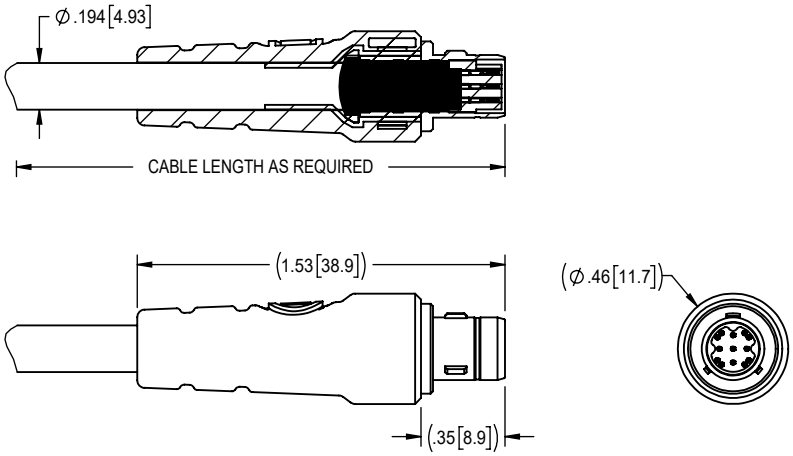


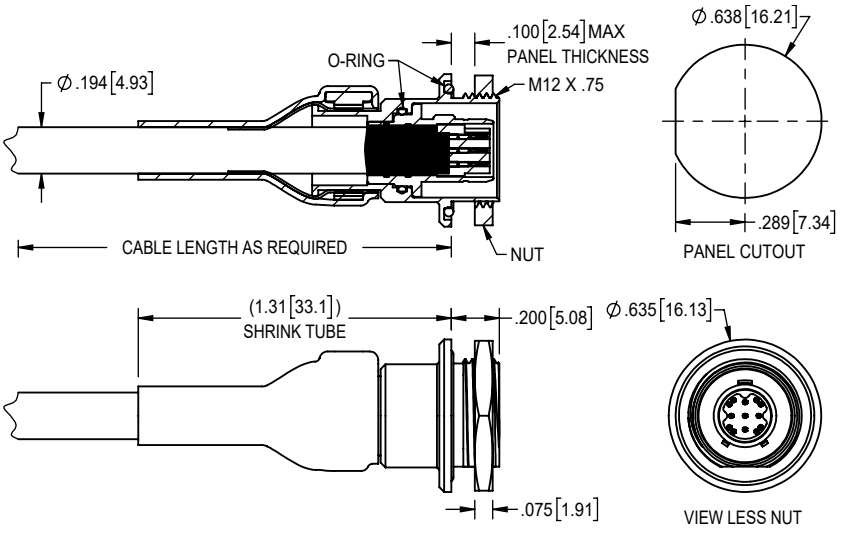
Omnetics Nano 360° Cat6a PSNEXT



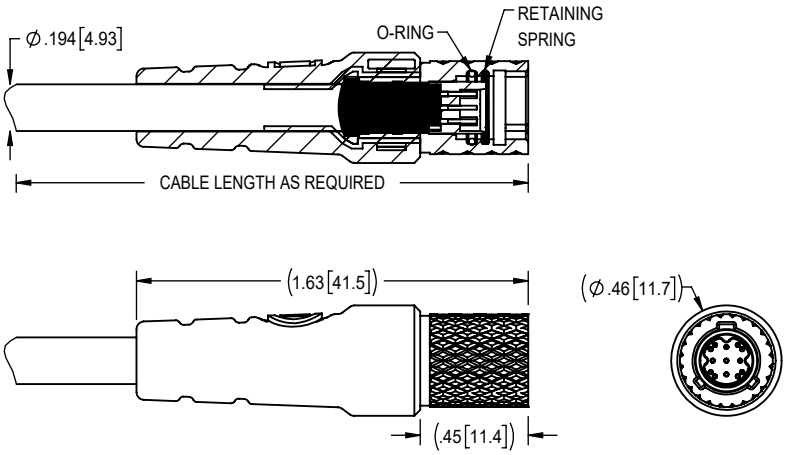
Various cable options are available. Measurements shown above with cables manufactured in Asia.

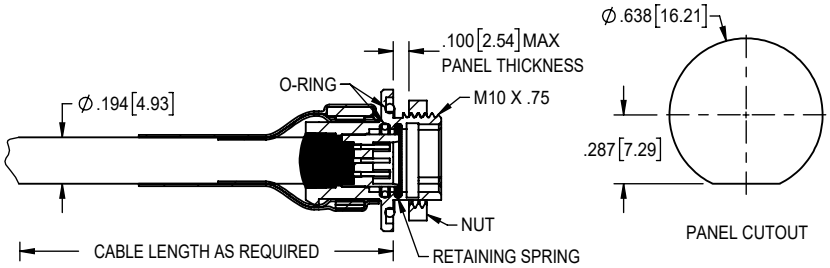
Cat6a Ethernet Nano Circular
Keyed Break Away - KBNP

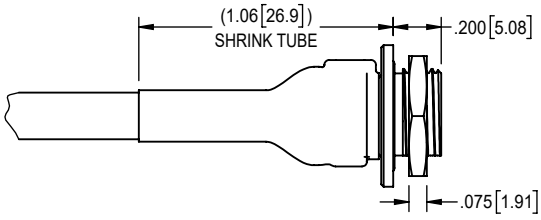


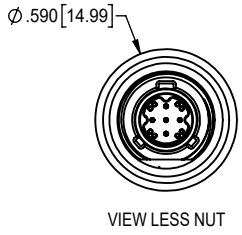


Cat6a Ethernet Nano Circular
Keyed Break Away - KBNS

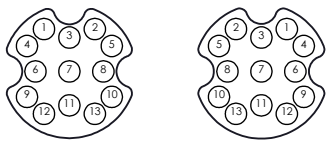






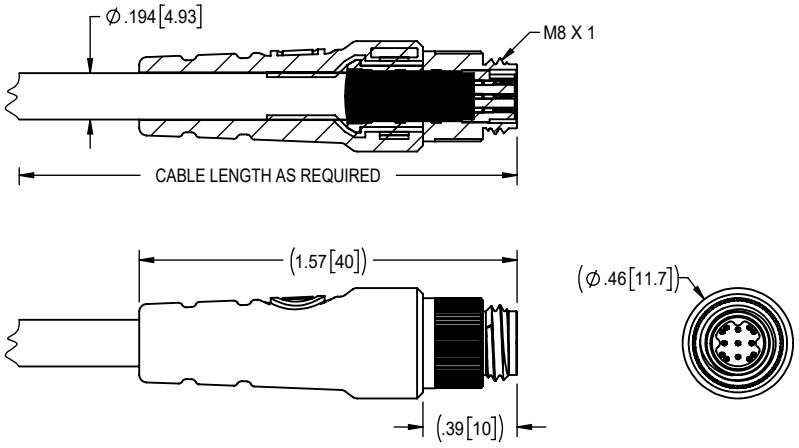


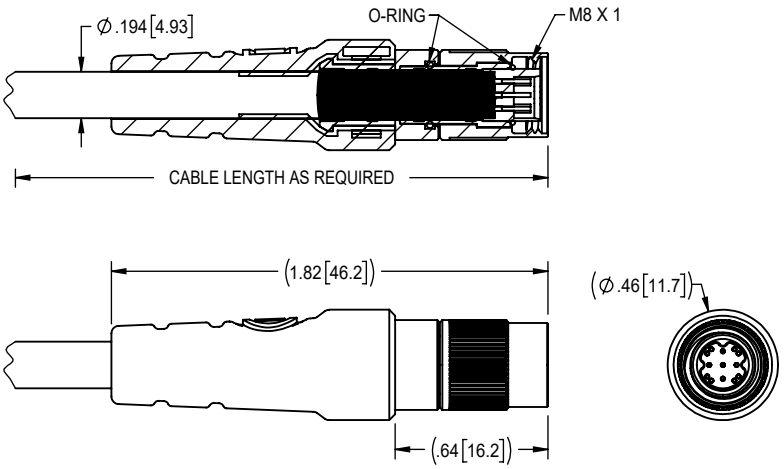
ETHERNET PINOUT

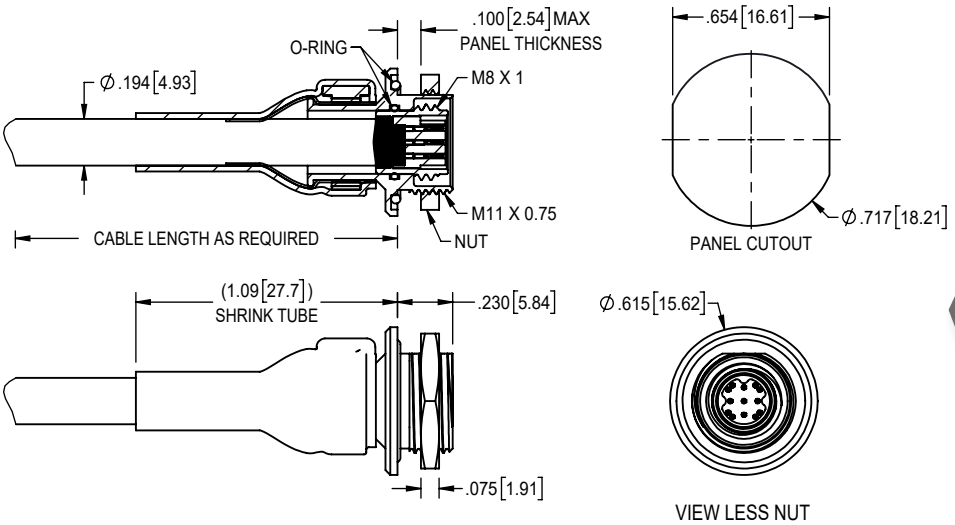


(VIEW FROM MATING FACE)

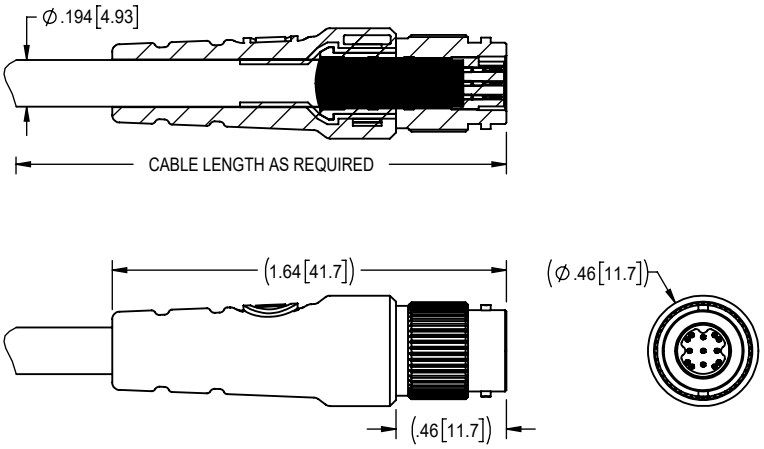
Cat6a Ethernet Nano Circular
Threaded - MNC

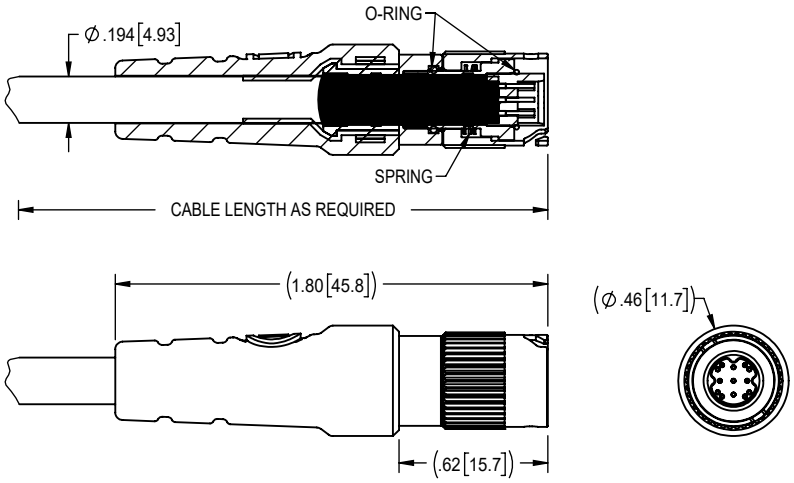


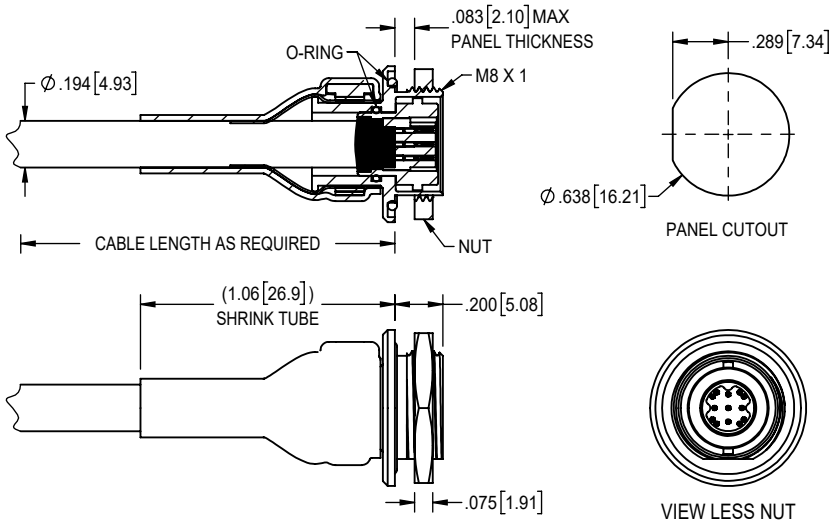




Cat6a Ethernet Nano Circular
Twist Lock - TNC







HDMI Nano

Electrical-Mechanical Specifications

- Performance: Product family tested to and passed or exceeded the performance specifications of Table VIII of MIL-DTL-32139
- Contact Resistance: 71 Milliohm Max (71mV Drop Max) @ 1.0 Amps per MIL-DTL-32139
- Current Rating: 1 Amp per MIL-DTL-32139
- Operating Temperature: -55°C to 85°C
- Durability: >2000 mating cycles min
- Insulation Resistance: 5000 megohms @ 100 VDC
- Shock: 100 g's with no discontinuties > 10 nanosecond
- Vibration: 20 g's with no discontinuties > 10 nanosecond
- Thermal Vacuum Outgassing (Space Class): 1.0% max TML, 0.03% max CVCM
- Mating/Unmating Force: 2.5 oz (71 g) typical per contact

Material Specifications

- Contact: Copper Alloy Per MIL-DTL-32139
- Contact Finish: Gold per ASTM B488, Type II, Class 1.27, Code C Over Nickel Underplate
- Insulator: Thermoplastic per MIL-M-24519
- Overmold: Black Thermoplastic Polyurethane
- O-Ring: BUNA-N
- Cable (Shielded): 32 AWG (7-40) SPA, EPTFE/PFA, color coded, Black Polyurethane Jacket
- Shield: Mylar foil wrap, 38 AWG tin plate copper braiding

Shell Options

- Brass Alloy 360 1/2 Hard: Electroless Nickel per SAE-AMS-2404
Black Nickel per MIL-P-18317
- Stainless Steel, 300 Series: Passivated per SAE-AMS-2700
Black Oxide Finish per MIL-DTL-13924, Class 4*, Passivated per SAE-AMS-2700

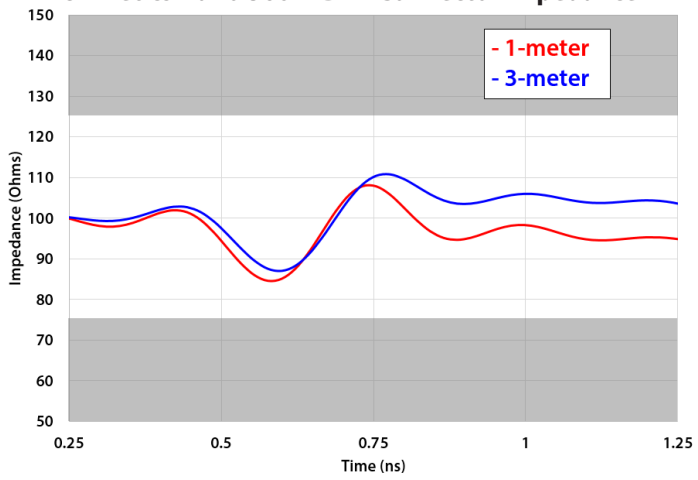
* less resistance to salt spray test.

HDMI Nano

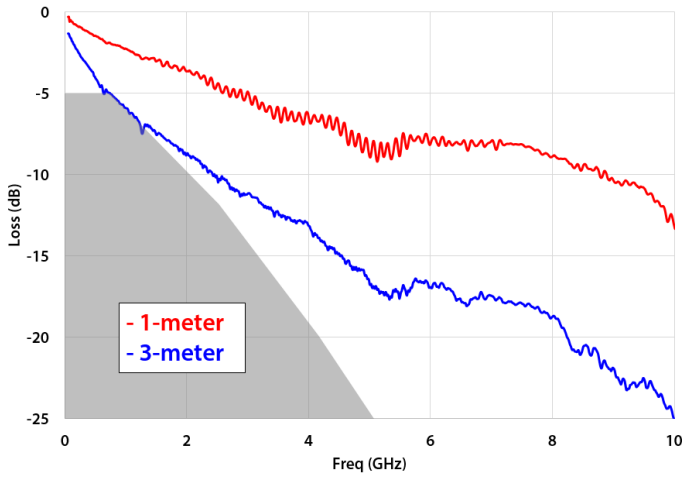
Electrical Specifications

Parameter		Spec	1-Meter	3-Meter
Connector Differential Impedance	Z_{MIN}	75 Ω	85 Ω	87 Ω
	Z_{MAX}	125 Ω	108 Ω	110 Ω
Cable Differential Impedance	Z_{MIN}	90 Ω	95 Ω	95 Ω
	Z_{MAX}	100 Ω	104 Ω	103 Ω
Differential Insertion Loss	0.825 GHz	5 dB	2 dB	5 dB
	2.475 GHz	12 dB	5 dB	9 dB
	4.125 GHz	20 dB	7 dB	12 dB
	5.100 GHz	25 dB	9 dB	15 dB
Differential Far-End Crosstalk	FEXT MAX	< -20 dB	-32 dB	-38 dB
Intra-Pair Skew	Skew MAX	112 ps	34 ps	79 ps

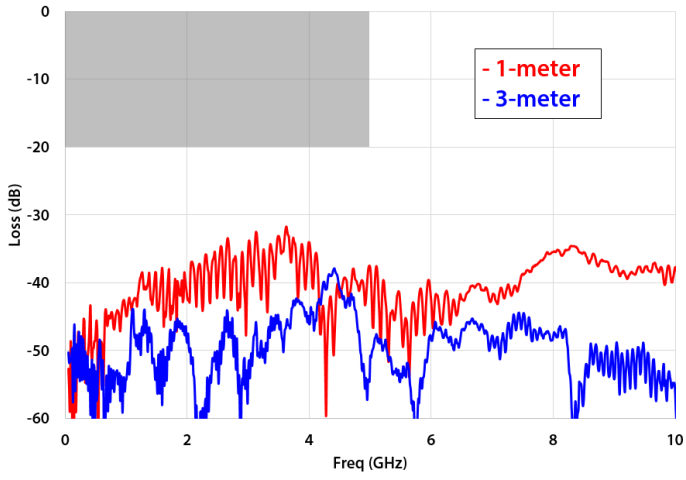
Omnetics Nano 360° HDMI Connector Impedance



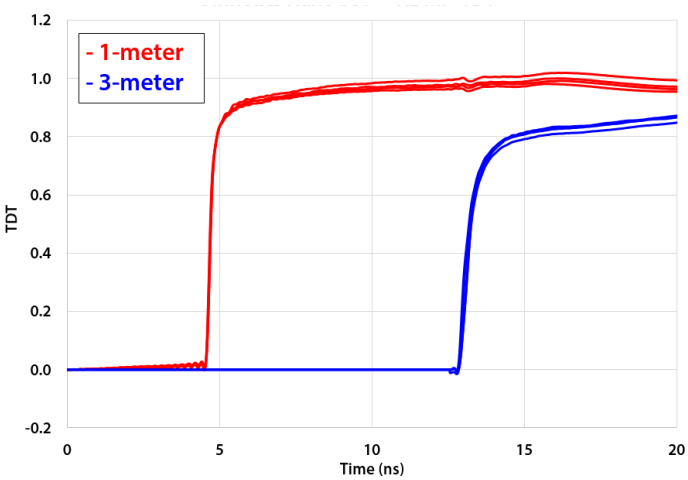
Omnetics Nano 360° HDMI Insertion Loss



Omnetics Nano 360° HDMI FEXT

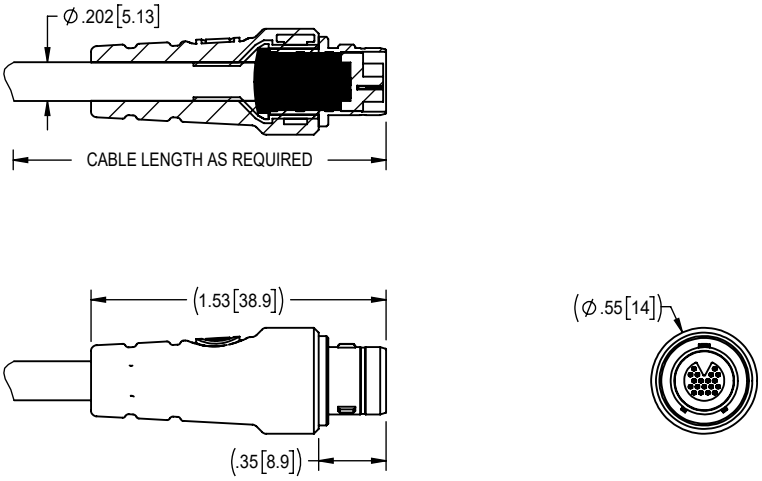


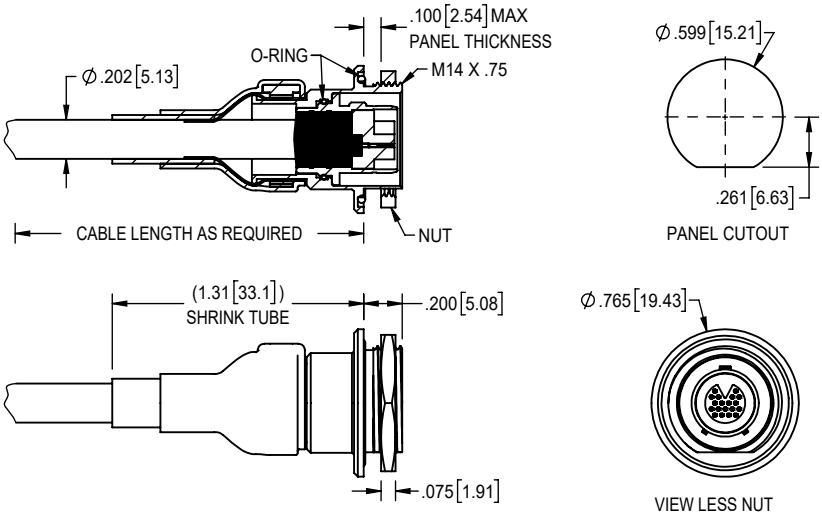
Omnetics Nano 360° HDMI TDT



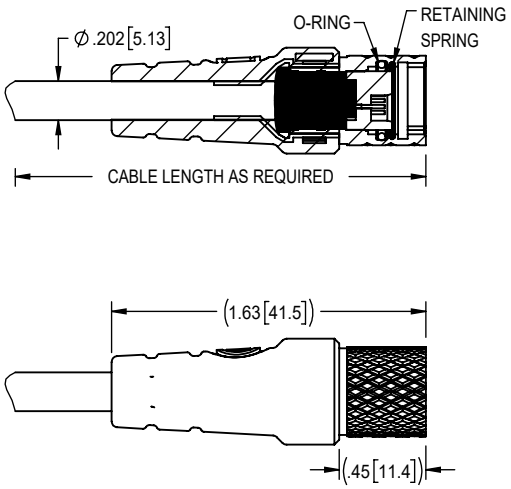
Various cable options are available. Measurements shown above with cables manufactured in Asia.

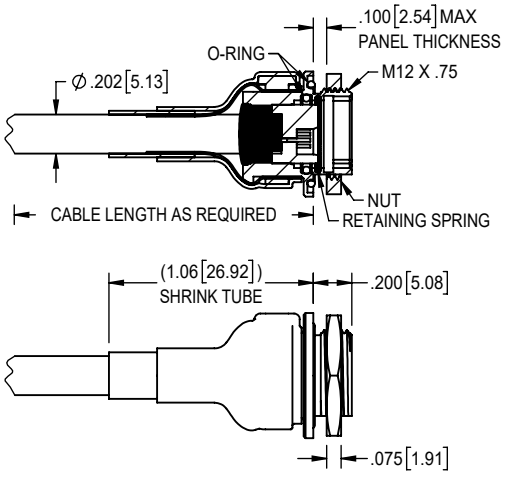
HDMI Nano Circular
Keyed Break Away - KBNP

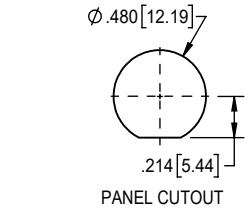


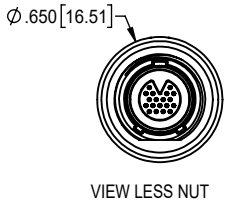


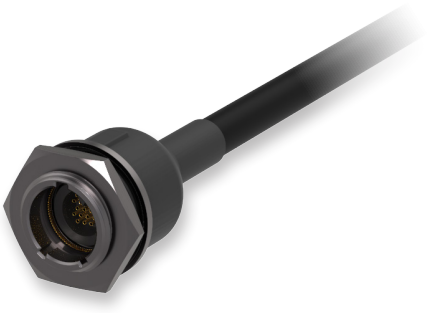
HDMI Nano Circular
Keyed Break Away - KBNS

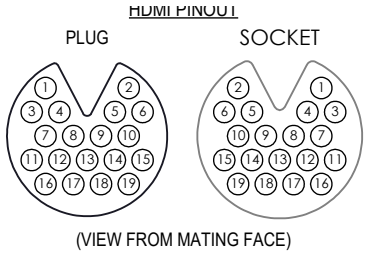




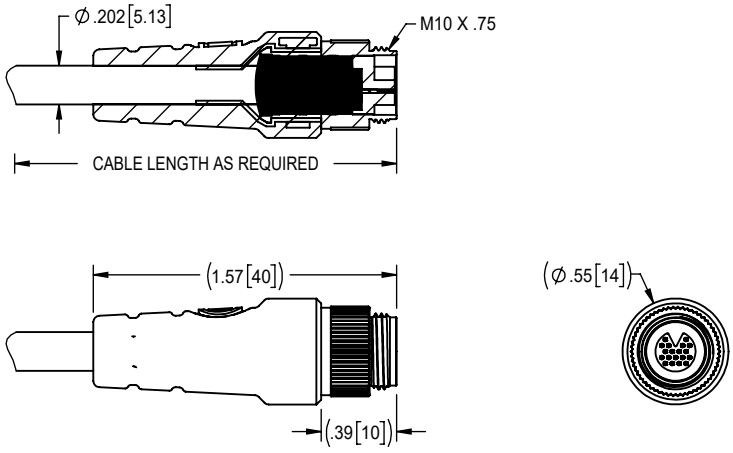


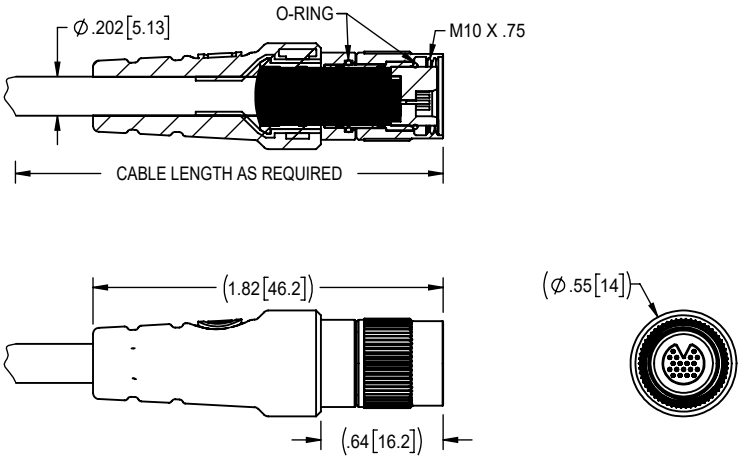


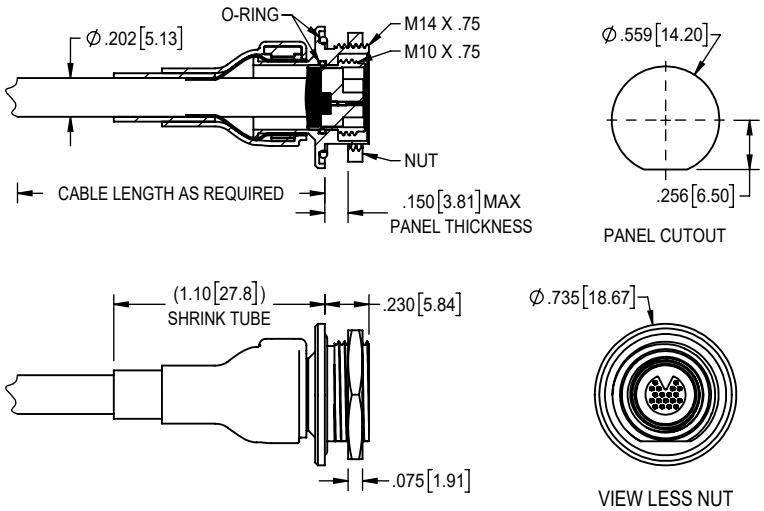




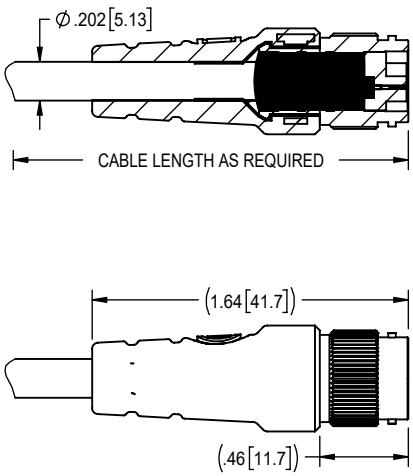
HDMI Nano Circular
Threaded - MNC

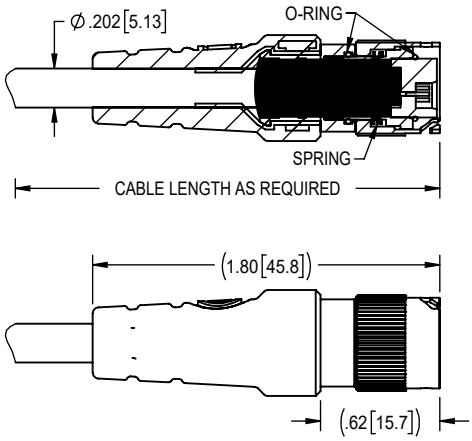


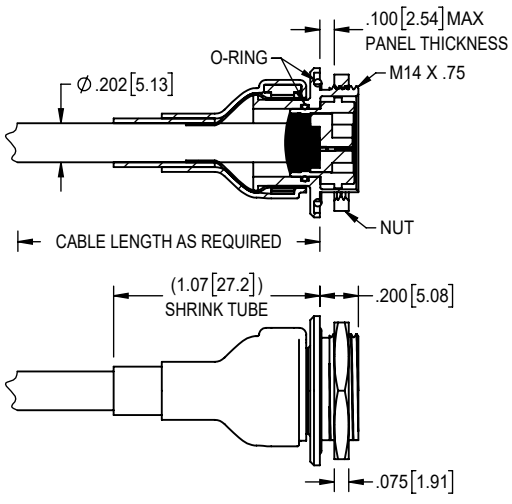




HDMI Nano Circular
Twist Lock - TNC







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