M-Line Series Multi-Pin Connectors

FOR PROPER AND SAFE INSTALLATION OF THIS PRODUCT, PLEASE READ THE FOLLOWING INSTRUCTIONS.

Ratings

MEP Series
ATEX Cable Mount/Panel Mount Plugs & Receptacles
• Ex II GD Ex d IIC T6
• Ex II GD Ex td A21
• Tamb -20°C to +40°C
• IP68

IECEX
• Ex d/de IIC T6
• Ex tb IIIC T85°C Db
• Tamb -20°C to +40°C
• IP68

MN Series
• NEC/CEC: IP68

Product Safety

Signal Words Defined

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury. WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury. CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. NOTICE is used to address practices not related to physical injury.

Safety Precautions

⚠️ WARNING:
• Do not disengage devices when energized unless the product is marked “suitable for current rupture”.

⚠️ CAUTION:
• Be certain that all components or connectors are fully assembled before putting the equipment into service.
• MEP Series: Do not attempt to remove inserts that are bonded or locked in place in their shells.
• Before starting actual termination of wires, it is essential that cables and harnesses be laid out in a specific order in accordance with the wiring diagram. Proper layout will eliminate the need for twisting and crossover of conductors. If the wiring layout is not correct, the termination operation will be difficult or even impossible and the chances for making errors will be increased. Cable and harness assemblies with a spiral layout must also be matched carefully to the correct contacts in both the male and female inserts.

⚠️ NOTICE:
• If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions to prevent it from being adversely affected, thus ensuring that the type of protection provided by the equipment is not compromised. Aggressive substances such as acidic liquids or gases may affect polymeric materials. Suitable precautions and routine inspections should be established to detect any corrosion and/or exposure to aggressive substances.
• MEP Series: The equipment may be used with flammable gases and vapors with apparatus group(s) IIA, IIB, & IIC and with temperature class T6.
• MEP Series: Installation, inspection, maintenance, and repair shall be carried out by suitably-trained personnel in accordance with the European standards and local code of practice. It is the end user's responsibility to ensure that the product, as specified and confirmed by the product label, is suitable for its intended application.
Special Conditions for Safe Use

- When installed, there shall be adequate protection from overloading.
- The connectors shall be fully tightened in accordance with the specifications.
- Plug/Receptacle covers are to be fitted when the connectors are not mated.
- If the connector has no external earth/ground, an internal pin is made available for earthing/grounding. Local installation requirements shall be applied. Power through the connector shall not exceed the values specified in Table 1.
- No modifications are allowed to MEP Series components.
- MEP Series: Plugs are not permitted to remain energized when not engaged to the receptacles as per EN 60079-0 Clause 20.25.
- MEP Series: For plugs and receptacles that use certified cable glands, the gland must have a temperature range at their point of mounting between -20°C to 85°C.
- MEP Series: A panel mount variant must be installed in a suitably certified Ex e enclosure when the enclosure allows for such installation. When used in a dust environment, the enclosure must also carry suitable Ex tD certification. After installation, a dielectric strength test must be made per EN 60079-7 Clause 6.1 and must not be subjected to a service temperature greater than 70°C.

Insert Configurations

Electrical Performance

The NEC voltage rating is designated by a service voltage rating letter (listed in the table) and corresponds to the insert configurations provided in the catalog. The voltage to which contact inserts are limited is a function of the dielectric separation between the adjacent contacts and between the contacts and shell.

<table>
<thead>
<tr>
<th>Service Voltage</th>
<th>Over Service Distance Inches Nominal</th>
<th>Thru-Air Spacing Inches Nominal</th>
<th>Mil-C-5015 Rating Non-Circuit Breaking Dc Volts RMS</th>
<th>Non-Circuit Breaking Ac Volts RMS</th>
<th>NEC Rating* Non-Circuit Breaking Dc Volts RMS</th>
<th>Circuit Breaking Ac Volts RMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instrument</td>
<td>1/16</td>
<td>---</td>
<td>250</td>
<td>200</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>A</td>
<td>1/8</td>
<td>1/16</td>
<td>700</td>
<td>500</td>
<td>250</td>
<td>240</td>
</tr>
<tr>
<td>D</td>
<td>3/16</td>
<td>1/8</td>
<td>1250</td>
<td>900</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>E</td>
<td>1/4</td>
<td>3/16</td>
<td>1750</td>
<td>1250</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>B</td>
<td>5/16</td>
<td>1/4</td>
<td>2450</td>
<td>1750</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
<td>5/16</td>
<td>4200</td>
<td>3000</td>
<td>600</td>
<td>600</td>
</tr>
</tbody>
</table>

Service Voltage Rating: A = 240 V; B–E = 600 V. *Consult Appleton for non “d” protection method voltages.
General Assembly Instructions

Connector Components

Major Connector Components
Connector Assembly

Before assembly, lay out all the components, materials, and tools.

NOTE: The assembly process is identical for panel mount receptacles; only the physical connection method is different.

Prep the Wire
1. Cut the cable to length.
2. Strip the outer jacket of the cable to length:
   a. Measure the length of the cable adapter from the end to the start of hex area. See Figure 1.
   b. Cut and remove the cable’s outer jacket to match the cable adaptor's length.

3. Bundle and tape the conductors together.
4. Slide the basket weave or mechanical clamp and retaining nut over the cable.
   NOTE: If using the Ex d gland, refer to the gland installation instructions before proceeding.

   CAUTION: When handling cables, use adequate support to prevent damage to the internal wires. Ex d glands are intended for sealing purposes and should not be used as a cable grip.

   NOTICE: Use only correctly sized and provided Ex d glands and correctly sized sealing grommets to ensure resistance to moisture and other contaminates. Ensure that the cable jacket is smooth where the grommet is to seal. Remove any grooves or ridges (if present) by sanding or scarfing.

5. Lubricate the grommet and outer cable jacket with 70% isopropyl alcohol.
6. Slide the grommet onto the cable, then slide the cable adapter over the cable.
7. Slide the coupling nut and environmental cover retaining ring onto the cable.
8. Remove the tape from the bundled conductors.
9. Strip the outer jacket of each conductor to the depth of the terminal, so that the wire strands are visible through the terminal inspection port (when inserted). Make sure the conductor insulation is flush with the terminal. Rotate the terminal to ensure that all strands are contained. See Figure 2.

FIGURE 1: MEASURING THE CABLE ADAPTER

FIGURE 2: TERMINAL INSPECTION PORT
10. Crimp each terminal using the proper crimping tool, which is set to match the wire gage.

⚠️ **CAUTION:** Use only the proper crimping tools that have been set or calibrated with precision gages. Ensure that all contacts are the correct size before attempting to assemble in the insert cavities. This is particularly important when both power and control types of contacts are used in the same connector. Please refer to Table 2 for Contact Ratings & Dimensions.

⚠️ **CAUTION:** Do not tin or dip solder the stranded conductors.

⚠️ **CAUTION:** Soldering conductors to contacts must be done carefully and a non-conductive flux should be used to avoid corrosion or hygroscopic action. Do not use solder salts or acids; they may affect the dielectric properties of the insulation materials.

⚠️ **CAUTION:** When contacts are to be soldered, avoid direct contact of soldering tools to inserts. An open flame or hot soldering tip can carbonize insulating materials, making them useless.

<table>
<thead>
<tr>
<th>Contact Size</th>
<th>NEC Ampere Rating*</th>
<th>Crimp** Diameter, in. [mm]</th>
<th>Crimp Pullout Depth, in. [mm]</th>
<th>Solder Diameter, in. [mm]</th>
<th>Solder Depth, in. [mm]</th>
<th>Pressure Contact Torque in.-lb. [N-m]</th>
</tr>
</thead>
<tbody>
<tr>
<td>#18 [0.75]</td>
<td>9</td>
<td>0.059 [1.49]</td>
<td>0.375 [9.52]</td>
<td>0.060 [1.52]</td>
<td>0.203 [5.15]</td>
<td>---</td>
</tr>
<tr>
<td>#16 [1.50]</td>
<td>16</td>
<td>0.078 [2.00]</td>
<td>0.500 [12.70]</td>
<td>0.078 [2.00]</td>
<td>0.203 [5.15]</td>
<td>---</td>
</tr>
<tr>
<td>#12 [4.0]</td>
<td>30</td>
<td>0.110 [2.80]</td>
<td>0.500 [12.70]</td>
<td>0.110 [2.80]</td>
<td>0.250 [6.45]</td>
<td>---</td>
</tr>
<tr>
<td>#10 [6.0]</td>
<td>40</td>
<td>0.142 [3.60]</td>
<td>0.591 [15.00]</td>
<td>0.142 [3.60]</td>
<td>0.394 [10.00]</td>
<td>15 [1.7]</td>
</tr>
<tr>
<td>#8 [10.0]</td>
<td>50</td>
<td>0.189 [4.80]</td>
<td>0.748 [19.00]</td>
<td>0.209 [5.30]</td>
<td>0.516 [12.80]</td>
<td>25 [1.8]</td>
</tr>
<tr>
<td>#4 [25.0]</td>
<td>90</td>
<td>0.285 [7.24]</td>
<td>0.875 [22.20]</td>
<td>0.329 [8.35]</td>
<td>0.580 [14.70]</td>
<td>20 [2.3]</td>
</tr>
<tr>
<td>#1/0 [50.0]</td>
<td>155</td>
<td>0.450 [11.40]</td>
<td>0.775 [19.70]</td>
<td>0.470 [12.00]</td>
<td>0.641 [16.30]</td>
<td>50 [5.7]</td>
</tr>
<tr>
<td>#4/0 [120.0]</td>
<td>225</td>
<td>0.620 [15.70]</td>
<td>1.00 [25.40]</td>
<td>0.650 [16.50]</td>
<td>0.885 [22.50]</td>
<td>100 [11.3]</td>
</tr>
<tr>
<td>350 MCM</td>
<td>325</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>500 MCM</td>
<td>750</td>
<td>---</td>
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<td>---</td>
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<tr>
<td>535 MCM</td>
<td>839</td>
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<tr>
<td>646 MCM</td>
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<td>---</td>
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</tbody>
</table>

*Maximum conductor ampacities must be calculated according to the specific insert selected and NEC Paragraph 310.15 and Table 310.16 so not to exceed the T6, 85°C connector shell rating. **Includes wire inspection holes.

11. With the terminal numbers facing away from you, slide the black outer insert into the plug or receptacle shell by aligning the polarization rib and slot. See Figure 3.

**FIGURE 3: ALIGNING THE POLARIZATION RIB AND SLOT**

12. Lubricate the red or green inner insert with 70% isopropyl alcohol.

13. With the terminal numbers facing you, press the inner insert into the plug or receptacle shell by aligning the polarization rib and slot.
Inserting the Terminals

**NOTICE:** All conductors should be numbered according to your project’s wiring diagram.

1. Working outward from the center, insert the terminals with the insertion tool. Make sure the insertion tool’s concave side is fitted against the terminal to prevent the tool from sliding and to ensure proper terminal seating. Verify that each terminal goes into the insert opening with the correct corresponding number.

![Figure 4: Inserting the terminals](image)

Complete the Receptacle

1. Once all terminals are properly seated, slide the coupling nut up and over the plug or receptacle shell.
2. Hand-tighten the cable adapter counter-clockwise.
3. Lubricate the cable using 70% isopropyl alcohol and slide the grommet into the adapter.
4. Slide the basket weave or mechanical clamp up to the cable adapter.
5. Attach the connector to a mating assembly while secured in a bench vice. (A bench vice will hold the interior terminals together tightly in the adapter.)
6. Using a strap wrench, shoulder the cable adapter against the plug or receptacle shell and turn it counter-clockwise.
7. Assemble the basket weave or mechanical clamp to the cable adapter.
8. For MEP Plug Assemblies, make sure the grub screws are fully retracted, then slide the coupling nut up onto the plug shell until it seats against the mating shoulder.

**NOTICES:**
- Use only the proper insertion tools and make sure they are aligned axially when pushing contacts into their fully seated position.
- Seat all contacts properly so that they will not be damaged or become disengaged during connector mating operation.
- Ensure that ground contacts are correctly located.
- When inserts have more cavities than conductors, plug unused cavities with furnished contacts.
- Never try to straighten bent contacts. Straightening cannot be done properly and the plating on contacts very likely will be marred. This will result in a high resistance connection and will expose the base material to possible corrosion.
- If for any reason terminated conductors have to be removed from an insert because of any assembly error or change in circuitry, be sure to remove the cable clamp or insert clamp nut first before extracting the contact and reinserting it. This step is important because any attempt to remove the contacts when the resilient insulator components are compressed will result in damage.
Potting Instructions for Hazardous Locations Only

Cable or potting adapters (except for Ex gland versions) must be filled with encapsulate (potting material). The materials certified for use are 3M Scotchcast™ Resin 4 or Tough Seal TS-22 Epoxy Elastomer. The user or installer shall consider the performance of these materials with regards to an attack by aggressive substances that may be present in the environment.

When potting, be sure to apply potting only in the mated condition to ensure that the contacts will align properly.

When potting, the receptacle flange should be rigidly fixtured in a horizontal position. This fixture must be capable of holding the mated connector pair in that position for a minimum of 2 hours at room temperature. The exiting conductor/cable should be fixtured in-line above the connector pair during the entire curing process.

After curing, the assembly is permanently cemented, non-separable and non-repairable, and can be mounted to the adapter.

A careful review should be made of the mixing instructions that follow. When required, potting of the connector is the very last step prior to fastening down the grommet and nut on the cable adapter. “Ringing” of the contacts with their mate should be done prior to potting.

Mixing/Potting for 3M Scotchcast™ Resin 4—Sizes #6 to #10

The material is a two-component casting system with a 1:1 volumetric mix ratio. Typical cure times at 70°F (21ºC) are 1–2 hours and at 50°F (10ºC) 4–8 hours. The product is available in pre-measured “mix & dispense” packaging. The potting material should be warmed to at least 60°F (16ºC). Please follow the instructions on the package for mixing and pouring.

The potting compound is pre-measured in “burst bag” packaging. This packaging consists of a single plastic bag that is compartmentalized into two chambers, each containing one part of the two part compound. The segregating feature is called a burst seal.

⚠️ CAUTION: Wear goggles or other eye protection during all operations. Do not use potting material that is 2 years beyond the manufacturing date marked on the packaging.

1. Lay the bag on a flat surface. Choosing either end of the bag (parallel to the burst seal), start coiling/rolling the bag so that the compound is pushed up against the burst seal.

2. Squeeze and apply pressure to the rolled side of the bag, so that the compound bursts through the burst seal and joins the compound on the other side of the bag. Unroll the bag.

3. Mix the entire contents of the bag by alternately squeezing the bag and working the bag across the edge of a table (to fully move the entire contents back-and-forth between chambers). Constantly work the material in this manner for a minimum of 4 minutes.

4. Once mixed, squeeze all the contents away from one corner of the bag, fully clearing that corner of the bag of all compound.

5. Make a 3/16” pouring spout by snipping off the bag’s cleared corner.

6. Stand the potting adapter vertically with the conductors pointing up.

7. To minimize air entrapment, slowly pour the compound into the back end of the potting adapter. Potting adapters should be filled to a maximum of 1/16” below the inspection port. See Figure 5.

⚠️ CAUTION: Care must be exercised so that the potting compound does not contaminate the adapter threads or spill onto the outer surfaces of the receptacle flange.

8. Set the bag with the remaining compound aside so that it may cure. After cure, the bag may be disposed of safely, along with common consumer refuse.

⚠️ CAUTION: As the remaining compound cures, the bag will become warm.
Mixing/Potting for ToughSeal TS-22 Epoxy Elastomer—Sizes #6 to #14

This material is a two-component casting system with a 1:2 volumetric mix ratio. Typical cure times at complete cure is attained within 3–5 days at room temperature and cast parts are typically demoldable overnight after the first 12–16 hours. The product is available in pre-measured cartridges and needs a dispenser and mixing tube to “mix & dispense”. The potting material should be kept at a room temperature of 60°F (16ºC) to 77°F (25ºC). Please follow the instructions on the package for mixing and pouring.

The potting compound is pre-measured in a cartridge. These cartridges are available in a 50cc or 200cc plastic body that is compartmentalized into two chambers, each containing one part of the two-part compound.

⚠️ CAUTION: Wear goggles or other eye protection during all operations. Do not use potting material that is expired. Please read the “use by” date label on the packaging.

1. Select the appropriate cartridge and mount in the dispenser with tube. See Figure 6.

2. Stand the potting adapter vertically with the conductors pointing up.

3. To minimize air entrapment, slowly pour the compound into the back end of the potting adapter. Potting adapters should be filled to a maximum of 1/16” below the inspection port. See Figure 5.

4. Allow the remaining compound in the tube to cure. After cure, the mixer tube may be disposed of safely, along with common consumer refuse.

5. Thread the receptacle assembly into the adapter until the seal touches down, then tighten it by the smallest fraction of a revolution to the first instance. Ensure that the mounting holes line up with the threaded enclosure holes.

6. Position the protective covers’ lanyard tab over one of the mounting holes and screw a fastener through it. Apply the remaining fasteners to the other three holes with a torque suitable for the screw size used.

7. Install the protective cover and tighten fully.

8. Secure both grub screws to prevent unauthorized removal.

⚠️ NOTICE: It is best to fit the connector to the adapter at a time when the free end of the cable is not terminated to the electrical system. If this is not possible, then it is necessary to rotate the connector assembly counter-clockwise to wind the cable/conductors so when the assembly is threaded into the adapter, the cable/conductors regain their most natural position (once the connector is mounted to the adapter). The rotations are determined by the end-user.
Mating the Connector

⚠️ WARNING: Make sure power has been turned off from the connectors before mating and unmating.

⚠️ WARNING: If one of the connector poles is a ground wire, make sure that it is grounded properly before the connector is actually engaged.

⚠️ CAUTION: When connectors using the same configuration are mounted close together, different or alternate key arrangements should be used to prevent mismatching and possible damage to the electrical system.

⚠️ CAUTION: Always inspect all aspects of a connector before actual operation. It is recommended that normal DWV and IR tests be performed on assemblies before using.

Mating

1. Turn the power off and remove the environmental covers from their respective connectors. Retract the locking grub screws to prevent thread damage.
2. Insert the plug into the receptacle by hand, then draw up the coupling nut by hand.
3. Using a strap wrench, fully tighten the coupling nut to ensure environmental seals. Tighten the locking grub screws.
4. Inspect your work before turning the power back on.

Unmating

1. Turn the power off and loosen the locking grub screws.
2. Using a strap wrench, fully loosen the coupling nut and remove the plug from the receptacle by hand.
3. Install the respective environmental covers and tighten with a strap wrench. Lock in place by using the grub screws.
4. Inspect your work before turning the power back on.
Dimensional Data

- Please refer to the catalog for product dimensions.

Technical Support

- For General Assembly video instructions, please visit [http://www.youtube.com/watch?v=bncejLgFWcw&feature=youtu.be](http://www.youtube.com/watch?v=bncejLgFWcw&feature=youtu.be)
- For Technical Support, please call 1.800.621.1506 or send us an e-mail at [appleton.technicalservices@emerson.com](mailto:appleton.technicalservices@emerson.com)