**Delta Connected, 9-Lead Motor Insulation Testing**

This type of motor is probably the most commonly used in factories, lumber-mills, and other commercial plants. They are dual-voltage and can be wired for either 240VAC or 480VAC. Each motor will have 9 numbered leads coming out of the motor. The leads are numbered to aid the electrician when connecting the motor. If you look at the manufacturer’s nameplate it will have a table similar to Table 1 that describes how the leads should be connected.

<table>
<thead>
<tr>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>Join</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Voltage</td>
<td>1, 6, 7</td>
<td>2, 4, 8</td>
<td>3, 5, 9</td>
</tr>
<tr>
<td>High Voltage</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

*Table 1. Manufacturer’s nameplate for Delta connected 9-lead motor*

According to the table above, for a high-voltage connection, the electrician would connect L1 to lead #1, L2 to lead #2, L3 to lead #3, wire-nut 4 & 7 together, wire-nut 5 & 8 together, and wire-nut 6 & 9 together. Refer to Figure 1 for a detailed internal wiring diagram.

In Figure 1 the leads are numbered and the individual coils are referenced with roman numerals.

From Figure 1 it can be seen that some coils are permanently and internally connected. These coils are I & II, III & IV and V & VI. They can not be separated. This fact is important when considering insulation resistance testing.

Since the coils do not separate it will not be possible to test coil-to-coil insulation resistance for all 6 coils and the combinations that they represent.

In order to effectively test the motor we must disconnect the field coils from one another where possible. The wire-nuts from 4 & 7, 5 & 8 and 6 & 9 need to be removed.

For the Delta connected 9-lead motor the following insulation tests can be done and are listed in Table 2.

<table>
<thead>
<tr>
<th>Megohmmeter + Connection</th>
<th>Megohmmeter – Connection</th>
<th>Insulation Resistance Tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead 1</td>
<td>Motor Frame</td>
<td>Coils I &amp; II to Frame</td>
</tr>
<tr>
<td>Lead 2</td>
<td>Motor Frame</td>
<td>Coils III &amp; IV to Frame</td>
</tr>
<tr>
<td>Lead 3</td>
<td>Motor Frame</td>
<td>Coils V to VI to Frame</td>
</tr>
<tr>
<td>Lead 1</td>
<td>Lead 2</td>
<td>Coils I &amp; II to III to IV</td>
</tr>
<tr>
<td>Lead 2</td>
<td>Lead 3</td>
<td>Coils III &amp; IV to V &amp; VI</td>
</tr>
<tr>
<td>Lead 3</td>
<td>Lead 1</td>
<td>Coils V &amp; VI to I &amp; II</td>
</tr>
</tbody>
</table>

*Table 2. Testing guide for a Delta connected 9-lead motor.*

Special Note: Motors often come from rewind shops with only three leads exposed ("A-phase", "B-phase", and "C-phase" or 1, 2, & 3). In order to make reconnection easier for the plant electricians the motor rewind shops internally connect 4 & 7, 5 & 8, and 6 & 9. This causes a problem for proper insulation resistance testing. Essentially it is impossible to properly test a motor’s insulation resistance once this is done.
Contact Us

**United States & Canada:**

Chauvin Arnoux®, Inc.
d.b.a. AEMC® Instruments
200 Foxborough Blvd.
Foxborough, MA 02035 USA
(508) 698-2115 • Fax (508) 698-2118
www.aemc.com

Customer Support – for placing an order, obtaining price & delivery:
customerservice@aemc.com

Sales Department – for general sales information:
sales@aemc.com

Repair and Calibration Service – for information on repair & calibration, obtaining a user manual:
repair@aemc.com

Technical and Product Application Support – for technical and application support:
technfo@aemc.com

Webmaster – for information regarding www.aemc.com:
webmaster@aemc.com

**South America, Australia & New Zealand:**

Chauvin Arnoux®, Inc.
d.b.a. AEMC® Instruments
15 Faraday Drive
Dover, NH 03820 USA
(978) 526-7667 • Fax (978) 526-7605
export@aemc.com

**All other countries:**

Chauvin Arnoux
190, rue Championnet
75876 Paris Cedex 18, France
33 1 44 85 45 28 • Fax 33 1 46 27 73 89
info@chauvin-arnoux.com