SEW Brakes

Service and Maintenance
Objectives

Upon completion of this session, you will be able to do the following:

- Identify the components of an SEW brakemotor
- Explain the operation of the SEW brakemotor
- Apply basic troubleshooting procedures
Brake Purpose

- **To Stop Motion**
  - The brake engages when power is removed from the motor
  - The brake applies force to an object in motion until friction either slows or stops the motion.
  - Motor slows and finally stops

- **To Prevent Motion**
  - Brake engages after motor has come to complete stop
  - Brake merely holds motor to prevent rotation.
Brake Features

- SEW features:
  - Fail-safe operation
  - Rectifier for conversion of AC into DC current
  - DC controlled brake coil

Without a fail-safe brake, what would happen to machinery in the event of a power loss?

What about the product?
Brake Operation

- Coil functions like an electromagnet when energized
Brake Operation

De-energized

When the coil is de-energized, the springs apply force to the stationary plate.
This force presses against the brake disc to create friction.
Friction stops the motor and/or prevents it from rotating.

Energized

When the coil is energized, its magnetic field pulls the plate towards the coil.
The magnetic force compresses the springs.
The motor can now rotate freely.
Brake Operation

- **Coil:**
  - The brake coil actually consists of two separate parts: an Accelerator coil (BS) and a Fractional holding coil (TS).
  - An SEW brake rectifier controls both coils.

![Brake Coil Diagram]
Brake Operation

- **Step 1**
  - Initially, the rectifier energizes the Accelerator (BS) coil very quickly, due to its low resistance.

Low resistance = High Current
High Current = Strong Electromagnetism
Strong Electromagnetism = Fast Reaction
Brake Operation

- **Step 2**
  - After 120 ms, the rectifier energizes both coils. Combined coils have a higher resistance, allowing the coils to de-energize faster when power is removed.

High resistance = Low Current
Low Current = Weak Electromagnetism
Weak Electromagnetism = Quick Coil Collapse
Brake Operation

- **Step 1**

- **Step 2 – 120ms**
Brake Operation

- **Starting**
  1. The rectifier energizes the brake coil.
  2. The brake coil attracts the stationary disc, removing pressure between stationary disc and brake disc.

- **Stopping**
  1. Rectifier de-energizes the coil.
  2. Brake springs create pressure between stationary disc and brake disc.
  3. Friction stops motor and prevents it from rotating.
Brake Components

- Brake Disc (rotates)
- Brake End Shield
- Brake Carrier (rotates)
- Air Gap
- Spring
- Brake Coil
- Coil Body
- Brake Rotor Shaft (rotates)
- Stationary Disc (moves)
- Dampening Plate (BMG only)
Brake Components

Disc
Coil
Spring

Disc
Coil
Spring
Brake Components

- Rectifiers and relays that mount in Motor Conduit Box
Brake Components

- Rectifiers that mount in Control Panel
Brake Components

- Typical wiring diagram
Troubleshooting

- Troubleshooting an SEW brake
Troubleshooting

- Always follow the proper lockout/tagout procedures.

- Use the proper safety equipment at all times.
Troubleshooting

- **Resources needed**
  - Nameplate data from motor
  - Brakemotor operating instructions
  - Motor/Brakemotor parts list
  - Digital multi-meter
Troubleshooting

- Possible Faults

- Rectifier is damaged.
- Rectifier is wired incorrectly.
- AC brake voltage is incorrect or not applied.
- Brake coil is damaged or malfunctioning.
- Brake is mechanically locked.
- Air gap is outside of tolerance.
- Brake disc is worn or damaged.  
  FAULT...
Troubleshooting

- Brake rectifier is damaged
  - Incorrect voltage or wiring of the rectifier causes internal or external damage

Rectifier received incorrect voltage

Components are damaged
Troubleshooting

- Rectifier is wired incorrectly.
  - Refer to nameplate for correct type of connection (Conn Dia)
  - Refer to the operating instructions for wiring diagrams
Troubleshooting

- AC brake voltage is incorrect or not applied
  - Refer to nameplate for correct brake voltage

AC Voltage that should be applied to the brake rectifier
Troubleshooting

- **Check voltage at brake contactor**
  - If rectifier power does not come from motor terminals, measure the voltage at the brake contactor

- **Check the activation of the brake contactor**
  - Verify that the brake contactor functions properly and changes position when energized
Troubleshooting

- Brake coil is damaged or malfunctioning
  - Wrong voltage applied to brake coil causes internal and external damage
Troubleshooting

- Obtain normal coil resistances
  
  Look up the correct values in the SEW Brakemotor Operating Instructions.

<table>
<thead>
<tr>
<th>Motor Frame</th>
<th>Brake Size</th>
<th>Brake Torque (lb-ft)</th>
<th>DT71-80 BM(G)05</th>
<th>DT80 BM(G)1</th>
<th>DT90-100 BM(G)2</th>
<th>DT100 BM(G)4</th>
<th>DV112-132S BM(C)9</th>
<th>DV132M-160M BM15</th>
<th>DV160L-225 BM30/31/32/62</th>
<th>DV250-280 BM61/122</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Rₗ(Ω)</td>
<td>Rₗ(Ω)</td>
<td>Rₗ(Ω)</td>
<td>Rₗ(Ω)</td>
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<td>Rₗ(Ω)</td>
<td>Rₗ(Ω)</td>
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<td>208 - 233</td>
<td>96</td>
<td></td>
<td>70.0</td>
<td>213</td>
<td>62.3</td>
<td>192</td>
<td>54.0</td>
<td>161</td>
<td>43.4</td>
<td>130</td>
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<tr>
<td>218 - 243</td>
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<td></td>
<td>70.0</td>
<td>213</td>
<td>62.3</td>
<td>192</td>
<td>54.0</td>
<td>161</td>
<td>43.4</td>
<td>130</td>
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<tr>
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<td>344 - 379</td>
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<td></td>
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<td>481</td>
<td>136</td>
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<td>370 - 414</td>
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<td>510</td>
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<td>606</td>
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<td>510</td>
<td>137</td>
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<td>415 - 464</td>
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<td>846</td>
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<td>762</td>
<td>215</td>
<td>643</td>
<td>171</td>
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<tr>
<td>432 - 484</td>
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<td>643</td>
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<td>518</td>
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<td>809</td>
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<td>485 - 542</td>
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<td>312</td>
<td>960</td>
<td>271</td>
<td>809</td>
<td>218</td>
<td>652</td>
</tr>
</tbody>
</table>

Voltage

AC - The voltage shown is the nameplate AC brake voltage supplied to the brake rectifier.
DC - The voltage shown is the effective DC voltage required by the brake coil. The measured voltage from the rectifier will be 10-20% lower than that shown.

Brake Coil Resistance - values must be measured with the brake coil disconnected from the rectifier.
Rₗ - Accelerator coil resistance in Ω, measured from the red to the white brake coil wire at 20°C.
Rₗ - Fractional coil resistance in Ω, measured from the white to the blue brake coil wire at 20°C.
Troubleshooting

- Measure the actual resistances of accelerator coil and fractional coil

14-white w/ blue stripe
15-blue
13-red

13-14 (accelerator coil)
14-15 (fractional coil)
13-15 (total coil)

Accelerator coil winding resistance = \( \frac{1}{4} \) of winding resistance
Fractional coil winding resistance = \( \frac{3}{4} \) of winding resistance
Total coil winding resistance = sum of accelerator and holding coil resistance
Troubleshooting

- Brake is mechanically locked

  - Verify the free play on the release arm. Loosen the locking nuts as needed to achieve 1.5 – 2.0 mm gap. (S Dimension)

Caution!

There must always be clearance on the lever.

Note: The brake release mechanism is not used to change the brake’s torque setting.
Troubleshooting

- Air gap is outside of tolerance
  - Insufficient air gap between the dampening plate (BMG brakes) and the brake coil. (For BM brakes, there is no dampening plate, so air gap lies between stationary disc and brake coil).
# Troubleshooting

- Obtain correct value for air gap.

Look up the correct values in the SEW Brakemotor Operating Instructions.

<table>
<thead>
<tr>
<th>Motor Size</th>
<th>Brake Size</th>
<th>Air Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>DT71 - DT100</td>
<td>BM(G)05 - BM(G)4</td>
<td>0.010&quot;-0.024&quot; (0.25-0.6 mm)</td>
</tr>
<tr>
<td>DV112 - DV225</td>
<td>BM(G)8 - BM31</td>
<td>0.012&quot;-0.047&quot; (0.3-1.2 mm)</td>
</tr>
<tr>
<td>DV180 - DV225</td>
<td>BM32-BM62 Double Disc</td>
<td>0.016&quot;-0.047&quot; (0.4-1.2 mm)</td>
</tr>
<tr>
<td>DV250 - DV280</td>
<td>BMG61</td>
<td>0.012&quot;-0.047&quot; (0.3mm - 1.2mm)</td>
</tr>
<tr>
<td></td>
<td>BMG122 Double Disk</td>
<td>0.016&quot;-0.047&quot; (0.4mm-1.2mm)</td>
</tr>
</tbody>
</table>
**Troubleshooting**

**Adjust the Brake Air Gap (Method 1)**

1. Insert feeler gauge between dampening plate and coil (BMG) or between stationary plate and coil (BM).

2. Tighten (3) hex nuts until there is minimal air gap (clearance) equally around the disc.

**Attention:**

When using a feeler gauge on a BMG brake, measure from a dimple on the dampening plate!
Troubleshooting

- **Adjust the Brake Air Gap (Alternate Method 2)**

1. Tighten the three adjustment nuts equally to establish zero air gap.
2. Loosen the adjustment nuts according to the figures below.

<table>
<thead>
<tr>
<th>Brake Size</th>
<th>Degree of Rotation</th>
<th>Approximate Rotation Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM(G)05, BM(G)1</td>
<td>160°</td>
<td>7/16 Turn</td>
</tr>
<tr>
<td>BM(G)2, BM4</td>
<td>135°</td>
<td>3/8 Turn</td>
</tr>
<tr>
<td>BM(G)8</td>
<td>180°</td>
<td>1/2 Turn</td>
</tr>
<tr>
<td>BM15, BM30, BM31</td>
<td>145°</td>
<td>2/5 Turn</td>
</tr>
<tr>
<td>BM32, BM62</td>
<td>135°</td>
<td>3/8 Turn</td>
</tr>
<tr>
<td>BMG61, BMG122</td>
<td>145°</td>
<td>2/5 Turn</td>
</tr>
</tbody>
</table>

**Note:** Chart is based on the middle air gap tolerance. However, all SEW brakes fall within the air gap tolerance range if the degree of rotation is ½ turn.
Troubleshooting

- Brake disc is worn or damaged
  - Sliding friction causes carbon-based brake disc to wear
  - High cycle rates require more frequent disc replacement
  - Overheating can cause stationary disc to warp
Troubleshooting

- Check thickness of brake disc

<table>
<thead>
<tr>
<th>Motor Size</th>
<th>Brake Size</th>
<th>Min. Disc (26) Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>DT71 - DT100</td>
<td>BM05 - BM4</td>
<td>0.354&quot; (9mm)</td>
</tr>
<tr>
<td>DV112 - DV225</td>
<td>BM8 - BM62</td>
<td>0.394&quot; (10mm)</td>
</tr>
<tr>
<td>DV250 - DV280</td>
<td>BMG61 - BMG122</td>
<td>0.472&quot; (12mm)</td>
</tr>
</tbody>
</table>

1. Measure the brake disc with calipers to determine the actual disc thickness.
2. If the disc is below tolerance, replace it.
3. If the disc is acceptable, reinstall it according to the parts list and operating instructions.
Review

- What are the components of an SEW brake?
  
  SHOW ME

- How does an SEW brake function?
  
  SHOW ME

- What possible faults could occur when an SEW brake does not operate properly?
  
  SHOW ME
Brake Operation

- **Starting**
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Brake Components

- Brake Disc (rotates)
- Brake End Shield
- Brake Carrier (rotates)
- Stationary Disc (moves)
- Air Gap
- Spring
- Brake Coil
- Coil Body
- Brake Rotor Shaft (rotates)
- Dampening Plate (BMG only)
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