AC Gearless Machines
Imperial Alternating Current, Permanent Magnet, Gearless Machines are available in three frame sizes to suit a wide range of elevator installations in both machine room and machine roomless applications:

- **470 Frame Models:**
  1375 to 2500 pound lifting capacity
  Car speed to 500 FPM
- **520 Frame Models:**
  2000 to 5500 pound lifting capacity
  Car speed to 600 FPM
- **800 Frame Models:**
  2000 to 6500 pound lifting capacity
  Car speed to 1400 FPM

All machines include:
- AC, synchronous, permanent magnet, self-cooling motor.
- Traction sheave, brake, and encoder.
- Heavy duty construction.
- Electrically released, double action brake.
- Very low maintenance, brushless design.
- U or V grooving (as ordered)

All machines feature quiet operation, reduced cogging/smooth start design, precise/vibration free low speed operation, sub-base with secondary sheave options, and harsh operating environment suitability.

Receipt
- Upon delivery, report any significant damage to shipper and to manufacturer.
- Check that machine nameplate data matches your order. Sample nameplate data matches

### AC MOTOR DATA

<table>
<thead>
<tr>
<th>HP</th>
<th>Volts</th>
<th>FR.</th>
<th>AMB.</th>
<th>Hz.</th>
<th>STARTS/HR</th>
</tr>
</thead>
<tbody>
<tr>
<td>26.7</td>
<td>380</td>
<td>475A</td>
<td>40</td>
<td>47.7</td>
<td>30</td>
</tr>
<tr>
<td>239</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 MIN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEWM NORM EFF.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DUTY</td>
<td>NEMA CAT.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>UPPER END BRG.</td>
</tr>
<tr>
<td>DEM</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>ENCL.</td>
<td>TENV</td>
<td>F</td>
<td>PHASE</td>
<td>3</td>
<td>475EA027P701</td>
</tr>
<tr>
<td>INSUL.</td>
<td>CLASS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Handling
- If possible, lift machine as a single unit.
- Anchor lifting sling at each eyebolt.
- Use spreader bars to prevent damage.

Storage
- Store in warm, dry, clean location.
- Protect from dust and dirt – particularly concrete dust which can penetrate bearing fits.

Extended Storage
Brake pins, brake drum, sheave, and solenoid parts are coated with a rust-preventative oil before shipment. (Shields are placed between the brake shoes and the braking surface to protect the brake linings.)
If the machine is stored beyond thirty days:
• Store in sealed, waterproof enclosure with appropriate dehydrating sachet.
• Periodically check and re-lubricate protected parts if needed. If necessary, remove any rust with a fine abrasive paper before relubricating.
• Do not allow oil or solvent on brake linings.

Commissioning
Commissioning the machine includes pre-installation inspection, installation, and start up.

Inspection
Especially if the machine has been stored beyond thirty days and before connecting any wiring:
• Check that there is no condensation. If there is condensation, contact manufacturer for drying instructions before proceeding.
• Use a megohm meter to check insulation between motor phases and ground terminal. Minimum 100M ohms @ 500VDC for 60 seconds.

Installation
• Provide structural support consistent with loading on gearless motor feet or base pads.
• Provide a level foundation with bolts well anchored and matched to machine foot or base holes.
• Remove rust preventative oil from brake drum before allowing linings to contact drum.
• Remove rust preventative oil from other parts.
• Carefully check brake settings and solenoid. Refer to brake adjustment instructions for guidance.
• Manually release brake and turn rotating unit over by hand to check for mechanical interference.
• Make all electrical connections according to local code, observing all safety precautions.

Caution
It is the responsibility of the installer to follow local legislation, code, and pertinent regulations. Especially in regard to cable size, proper mechanical connections, and earth or ground connections.

Encoder
470 frames use a Heidenhain™ ECN1313 encoder. Pinout and general specifications follow.

Table 1: ECN1313 Encoder Information

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data interface</td>
<td>EnDat</td>
</tr>
<tr>
<td>Positions per rev</td>
<td>8192 (13 bit)</td>
</tr>
<tr>
<td>Incremental signals</td>
<td>1Vpp</td>
</tr>
<tr>
<td>Line count</td>
<td>2048</td>
</tr>
<tr>
<td>Power supply</td>
<td>5V +/- 5%</td>
</tr>
<tr>
<td>Max current consumption w/o load</td>
<td>150 mA</td>
</tr>
<tr>
<td>Max cable length</td>
<td>150m/492ft</td>
</tr>
</tbody>
</table>
Motor Connections
Verify that intended connections comply with motor characteristics as indicated on the motor nameplate.

Brake Connections
470 frame machines are provided with dual circuit, electrically released brakes. The switching requirements of the brake are specified when the machine is ordered. Connect the brake as shown in the elevator controller document/drawings package.

- Pick Voltage: 198 VDC for 1 second
- Hold Voltage: 52 VDC

Startup
- Verify that motor related settings on elevator controller comply with motor nameplate data.
- Briefly run the machine to verify connections and brake operation.
- After coupling to load, adjust cable guides and check cable tension. Cable tension must be uniform to ensure satisfactory performance and uniform wear of sheave grooves.
- Recheck cable tension six weeks after initial installation, six months after initial installation, and at least yearly thereafter.

Caution
Once the machine is coupled to the load, always be certain that the car is immobilized before performing any work on the motor or on the brakes.
Observe all safety precautions to avoid risk of injury or death from contact with rotating equipment or high electrical voltages.

Table 2: Phase Connections

<table>
<thead>
<tr>
<th>Phase Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>U</td>
</tr>
<tr>
<td>V</td>
</tr>
<tr>
<td>W</td>
</tr>
<tr>
<td>Ground</td>
</tr>
</tbody>
</table>

Model 472 machine shown. 475 spring arrangement is different but adjustment is similar.
**Brake Adjustment**

Brake adjustment and proper clearances are critical to elevator and machine performance. Damage due to improper brake adjustment is not covered under warranty.

**Note**

National Elevator Code requires that the brake hold stationary 125% of rated load. If local requirements are greater, please consult manufacturer.

1. With the brake set, check that there is a gap of 1.5mm between the solenoid plunger and the stroke adjustment bolt on each end of the solenoid. (Brake is fully set.)

2. Check that the uniform gap adjustment is allowing the shoes to set flush against the braking surface.

### Table 3: Brake Torque

<table>
<thead>
<tr>
<th>Brake Torque / Per Side</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>472</td>
<td>682 Ft lbs.</td>
</tr>
<tr>
<td>475</td>
<td>738 Ft lbs.</td>
</tr>
</tbody>
</table>

3. Check that the brake will hold stationary the required percentage of rated load. If necessary adjust spring bolt torque equally for each brake to hold load.

4. Check that the gap between the solenoid plunger and the stroke adjustment bolt on each end of the solenoid remains 1.5mm. Adjust and lock if required.

5. Run the car on inspection mode. Check that the brake releases and operates properly. Brake running clearance should be between 0.3 and 0.5mm and must be uniform around the circumference of the shoe. If needed, adjust gap uniformity using the uniform gap adjustment.

**Machine Lubrication**

The sheave-end bearing requires lubrication.
- SKF LGEP2 recommended (ZL3 acceptable)
- Remove motor from service.
- Remove grease “drain” plug.
- Add grease through fitting.
- Clean drain hole area, restore plug.
- Sheave end volume: 50g

**Maintenance**

Periodic maintenance is critical to machine operation.

**Monthly**

- Inspect visually. Check for wear, debris, lubricant leakage, and any evidence of heating or abnormal operation.
- Clean using a dry cloth. If compressed air is used, it must be dry and not over 30 PSI.
- Check for proper brake operation.

**Semi-Annually**

- Complete all monthly checks.
- Check brake shoe lining and clearance. Adjust if necessary.
- Check all brake pivot bearings.
- Lubricate brake shoe pins.
- Check groove wear and cable tension.
- Lubricate machine per instructions.
## Data Tables

### Table 4: Mechanical Data

<table>
<thead>
<tr>
<th>Frame</th>
<th>472</th>
<th>475</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheave shaft load (lbs)</td>
<td>6600</td>
<td>11000</td>
</tr>
<tr>
<td>Maximum brake torque (ft lbs per shoe)</td>
<td>682</td>
<td>738</td>
</tr>
<tr>
<td>Motor Poles</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td>Heidenhain encoder ppr and model</td>
<td>2048 / ECN 1313</td>
<td>2048 / ECN 1313</td>
</tr>
<tr>
<td>Sheave end bearing</td>
<td>23024EAS</td>
<td>23024-CC/W33</td>
</tr>
<tr>
<td>Front end bearing</td>
<td>6211-2RS</td>
<td>BS2-2216-2CS</td>
</tr>
</tbody>
</table>

### Table 5: 470 2:1 Duty Table (50% counterweight)

<table>
<thead>
<tr>
<th>Live Load Kg</th>
<th>Meters/second</th>
<th>Feet Per Minute</th>
<th>Sheave Diameter (mm)</th>
<th>Sheave Diameter (inches)</th>
<th>Rated Torque</th>
<th>Rated Torque</th>
<th>Motor Frame</th>
<th>Horsepower</th>
<th>KW</th>
<th>RPM</th>
<th>Motor Volts</th>
<th>Rated Amps</th>
<th>Car Wght Pounds</th>
<th>T1 Pounds</th>
<th>T2 Pounds</th>
<th>Number of Cables</th>
<th>Cable Size</th>
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</thead>
<tbody>
<tr>
<td>800 (1764 lbs)</td>
<td>0.63</td>
<td>124</td>
<td>400</td>
<td>15.75</td>
<td>461</td>
<td>340</td>
<td>472</td>
<td>3.9</td>
<td>2.9</td>
<td>60</td>
<td>380</td>
<td>6.9</td>
<td>5950</td>
<td>7714</td>
<td>6656</td>
<td>5</td>
<td>10mm</td>
</tr>
<tr>
<td>1000 (2200 lbs)</td>
<td>0.63</td>
<td>124</td>
<td>400</td>
<td>15.75</td>
<td>577</td>
<td>425</td>
<td>472</td>
<td>4.9</td>
<td>3.6</td>
<td>60</td>
<td>380</td>
<td>9.1</td>
<td>5975</td>
<td>8175</td>
<td>6855</td>
<td>5</td>
<td>10mm</td>
</tr>
<tr>
<td>1150 (2530 lbs)</td>
<td>0.63</td>
<td>124</td>
<td>400</td>
<td>15.75</td>
<td>663</td>
<td>489</td>
<td>475</td>
<td>5.6</td>
<td>4.2</td>
<td>60</td>
<td>380</td>
<td>9.4</td>
<td>6000</td>
<td>8530</td>
<td>7012</td>
<td>5</td>
<td>10mm</td>
</tr>
<tr>
<td>1250 (2756 lbs)</td>
<td>0.63</td>
<td>124</td>
<td>400</td>
<td>15.75</td>
<td>721</td>
<td>532</td>
<td>475</td>
<td>6.1</td>
<td>4.5</td>
<td>60</td>
<td>380</td>
<td>10.3</td>
<td>6150</td>
<td>8906</td>
<td>7252</td>
<td>5</td>
<td>10mm</td>
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<tr>
<td>1360 (3000 lbs)</td>
<td>0.63</td>
<td>124</td>
<td>400</td>
<td>15.75</td>
<td>784</td>
<td>579</td>
<td>475</td>
<td>6.6</td>
<td>4.9</td>
<td>60</td>
<td>380</td>
<td>11.2</td>
<td>6300</td>
<td>9056</td>
<td>7402</td>
<td>5</td>
<td>10mm</td>
</tr>
</tbody>
</table>
Dimensions

Frame 472

Frame 475
Contact Information
For technical assistance, or to order replacement parts, please contact:

Imperial Electric
330 734 3600

1503 Exeter Road
 Akron, OH 44306
www.imperialelectric.com

Imperial Warranty
The Imperial Electric Company, in connection with equipment sold, agrees to correct any defect or defects in workmanship or material which may develop under proper care, supervision, and normal use during the period of one year from the date of shipment, by repair or by replacement of the defective part or parts, and such correction shall constitute a fulfillment of the company’s liabilities with respect to noted equipment.