Ultra-Precision Brushless Motor & Spindle “ASTRO-E 500Z”

- 2,000~50,000 min⁻¹ (rpm)
- Maximum Output 270W
- Auto or Manual Control Modes.
- Can be installed on Special-Purpose Machines, NC Lathes, Robots, etc.
- Motor speed is displayed accurately on the front panel.

**Index**

- **Blue characters and blue lines indicate 50,000 min⁻¹ (rpm) combination.
- Do not exceed the maximum motor speed recommendation for the spindles.
- Excess speed will dramatically reduce bearing life.

### Features of ASTRO-E 500Z

- **Maximum Output 270W**
  - The ASTRO-E motor is a brushless DC motor utilizing hall elements, the rotor unit is a rare-earth magnet, motor develops 270W.
- **Brushless Motor**
  - Excellent durability and high reliability were obtained using a high-speed brushless motor, which eliminated the nuisances of brush replacement and maintenance.
- **Motor Speed Control**
  - Motor speed control is a wide range: 2,000~50,000 min⁻¹ (0~2,000 min⁻¹ For centering).

**Overload Protection System**

- The control unit constantly monitors the motor conditions, and will cut power in the event of a motor overload. The system will alert the operator by an error code output.

**Dual Voltage 115V/230V AC Power Source**

- The control unit is equipped with a voltage selector switch that allows the system to operate using either 115V or 230V. It is easily adapted to fit your requirements.

**LED Load Monitor**

- 6 LED load monitor allows the operator to easily assess operating conditions.
- Continuous Duty (3 Green LEDs), Intermittent Duty (2 Yellow LEDs), Ovrange (1 Red LED). If the system is operated in overload for more than 15 seconds, the overload protection system will activate and interrupt power to the motor.

**Front panel can be detached (Option)**

- Front panel can be detached and extended to your control unit with an optional control panel extension cord (Max. 13 ft length).

**Incorporates all the functions of the ASTRO-E 400 and E 500 systems.**

- All of the functions of the ASTRO-E 400 and E 500 systems have been incorporated into the new ASTRO-E 500Z.

- **Motor Endurance**
  - Brushless motor has no carbon brushes or commutator, minimizing wear and resulting in a long service life. Due to the brushless construction, electrical interference and other noises are minimized.

**Smooth Rotation**

- The absence of a commutator and the use of a photo coupler sending a feedback signal of 48 pulses per revolution results in very smooth rotation with little vibration throughout the speed range.

**Excellent Durability by air-cooling system**

- Air-cooled motor uses a small volume of air (1.0CFM) to prevent heat buildup and allow long continuous operation.

- Dry air is required to cool the motor and protect the spindle from contaminants. Use a filter and regulator.

**External housing of stainless steel**

- The external housings of the motor and spindle are made of stainless steel (US440B) and suitable for machine attachments.

**Safety Relay that complies with EN standards**

- A Safety Relay that complies with EN standards is installed as standard equipment.

**Torque Characteristics of ASTRO-E 500Z**

- The control unit constantly monitors the motor conditions, and will cut power in the event of a motor overload. The system will alert the operator by an error code output.

- Motor speed control is a wide range: 2,000~50,000 min⁻¹ (0~2,000 min⁻¹ For centering).

**Overload Protection System**

- The control unit constantly monitors the motor conditions, and will cut power in the event of a motor overload. The system will alert the operator by an error code output.

**Dual Voltage 115V/230V AC Power Source**

- The control unit is equipped with a voltage selector switch that allows the system to operate using either 115V or 230V. It is easily adapted to fit your requirements.

**LED Load Monitor**

- 6 LED load monitor allows the operator to easily assess operating conditions. Continuous Duty (3 Green LEDs), Intermittent Duty (2 Yellow LEDs), Ovrange (1 Red LED). If the system is operated in overload for more than 15 seconds, the overload protection system will activate and interrupt power to the motor.

**Front panel can be detached (Option)**

- Front panel can be detached and extended to your control unit with an optional control panel extension cord (Max. 13 ft length).

**Incorporates all the functions of the ASTRO-E 400 and E 500 systems.**

- All of the functions of the ASTRO-E 400 and E 500 systems have been incorporated into the new ASTRO-E 500Z.
**ASTRO-E 500Z COMBINATION EXAMPLE**

**Unit Specifications**

<table>
<thead>
<tr>
<th>Model</th>
<th>NE147</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Source</td>
<td>AC 115/230V Switchable type</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>180W</td>
</tr>
<tr>
<td>Dimensions</td>
<td>W12.1 x H14.2 x 25.5&quot;</td>
</tr>
</tbody>
</table>

Motor & Spindle

- Motor: EM-501
- Spindle: NR-452E
- Weight: 2 lb 14.4 oz. (per unit)
- Dimensions: ø1.0" x 9.85"

*Optional:
- Air Line Kit (AL-0201)............................For Control Unit (NE147)

**ASTRO-E 500Z, EM-501, NR-452E Combination Example**

<table>
<thead>
<tr>
<th>CAT. No.</th>
<th>Model</th>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASE8415</td>
<td>NE147</td>
<td>Control Unit</td>
<td>2,268.00</td>
</tr>
<tr>
<td>ASE8415</td>
<td>EM-501</td>
<td>Motor</td>
<td>977.00</td>
</tr>
<tr>
<td>ASE1565</td>
<td>NR-452E</td>
<td>Spindle</td>
<td>930.00</td>
</tr>
</tbody>
</table>

**Total:** 4,175.00

---

**Bracket attachment example —- for rack mount**

- Horizontal Mounting Brackets (Bracket : CAT. No. ASE8411)
- Vertical Mounting Brackets (Bracket : CAT. No. ASE8412)
- Suspended Mounting Brackets (Bracket : CAT. No. ASE8413)

**Dimensions of attachment**

- Horizontal Mounting Brackets
- Vertical Mounting Brackets
- Suspended Mounting Brackets

---

**“ASTRO-E 500Z” CONTROL UNIT**

**High Precision and High-Performance Control Unit**

- High-Performance Electric Circuit
  - "High grade feedback loop to maintain constant spindle speed even if load is varied," and ‘Gentle start/Quick stop functions’ are provided.
- Error Function
  - Motor/Spindle is stopped safely. Error LED is lit, and Error Signal is output to external when there is something wrong with the motor/spindle, or any breakage is detected.
  - (ex.) Overheat/Overload operation, Air shortage
- Overload Protection System ensures safe operation and stops the motor in case of overload.
- A Safety Relay that complies with EN standards is installed as standard equipment.
- LED overload warning. If the system is operated in overload for more than 15 seconds the overload protection system will activate and interrupt power to the motor. (The stop signal can be output outside)
- Front panel can be detached and extended to your control unit with ‘an optional control panel extension cord’ (Max. 13 ft length)

**Product CAT. No. Model Price**

<table>
<thead>
<tr>
<th>CAT. No.</th>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASE8415</td>
<td>NE147</td>
<td>2,268.00</td>
</tr>
</tbody>
</table>

**Specifications**

- Power LED
- Error LED (ERROR)
- Motor Speed Display (SPEED)
- Load Situation LED
- Motor Speed control Select Switch
- Control Switch (AUTO/MANUAL)
- Motor Rotation Direction Control Switch (FWD./REV.)
- START Switch (START)
- Motor Speed Control Knob

**Motor Connector**

**Cooling Air Output Joint**

**Power Switch**

**Power Supply Voltage Changing Switch**

**ASTRO-E 500Z Control Unit**

<table>
<thead>
<tr>
<th>CAT. No.</th>
<th>Model</th>
<th>Standard Equipment</th>
<th>Accessories</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASE8415</td>
<td>NE147</td>
<td></td>
<td></td>
<td>2,268.00</td>
</tr>
</tbody>
</table>

*Power source cord is available according to power source specifications (115V or 220V). Please specify when ordering.

**NE147 is available with a max. motor speed of 40,000 min-1 (rpm). If needed, please specify when ordering.**
**“ASTRO-E 500Z” SELECTOR UNIT**

**INDEX**

- Examples
- Application

**CAT. No.** ASES109  
**MODEL** ASTRO-E SELECTOR UNIT NE62  
**PRICE** for 50,000 - 80,000 min\(^{-1}\) (rpm)

Up to 5 motors can be connected to Selector Unit NE62 providing individual control of each motor. (Multiple motors can not be operated simultaneously.)

### Specifications
- Model: NE62
- Power Source: AC115V/230V (switchable type), 50-60Hz
- Power Consumption: 7W
- Weight: 8 Lb
- Dimensions: W11.85" x D10.31" x H3.82"

### Motor Speed

- 2,000~50,000 min\(^{-1}\) (rpm)
- Spindle Accuracy: Within 1 μm
- Max. Output Power: 250W
- Cord: Length 13 ft
- Air Coolant Hose (Endurable for a long use): Length 13 ft
- Standard Size Collet Chuck (CHK-3.175): Length 18/8

### Accessories
- Motor Speed Control Terminal
- Motor Connector (to the Control Unit)
- Speed Control Knob
- Power Lamp

**CAT. No.** ASES219  
**MODEL** ASTRO-E SELECTOR UNIT 2 NE135  
**PRICE** for 50,000 - 80,000 min\(^{-1}\) (rpm)

By connecting Selector Unit 2 NE135 to the control unit, 2 motors are able to control individually. (Two motors can not be operated simultaneously.)

### Specifications
- Model: NE135
- Power Source: DC24V
- Power Consumption: 7W
- Weight: 8.4 oz. / Dimensions: W2.95" x D4.37" x H1.18"

### Motor Speed

- 2,000~50,000 min\(^{-1}\) (rpm)
- Spindle Accuracy: Within 1 μm
- Max. Output Power: 250W
- Cord: Length 13 ft
- Air Coolant Hose (Endurable for a long use): Length 13 ft
- Standard Size Collet Chuck (CHK-3.175): Length 18/8

### Accessories
- Motor Speed Control Terminal
- Motor Connector (to the Control Unit)
- Speed Control Knob
- Power Lamp

**“ASTRO-E 500Z” MOTOR SPINDLE & BRUSHLESS MOTOR**

**“ASTRO-E 500Z” MOTOR SPINDLE & BRUSHLESS MOTOR**

**INDEX**

- Examples
- Application

**CAT. No.** ASES1509  
**MODEL** ASTRO-E Selector Unit 2 NE135  
**PRICE** for 50,000 - 80,000 min\(^{-1}\) (rpm)

ASTRO-E Selector Unit 2 NE135 can use cooling water and oil during processing work.

**CAT. No.** ASES1570  
**MODEL** EMS-3045  
**PRICE** 4,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1571  
**MODEL** EMS-3045  
**PRICE** 4,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1509  
**MODEL** EMS-3052  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1570  
**MODEL** EMS-3056  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1569  
**MODEL** EMS-3056  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1509  
**MODEL** EMS-3052  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1569  
**MODEL** EMS-3056  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1509  
**MODEL** EMS-3052  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1569  
**MODEL** EMS-3056  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1509  
**MODEL** EMS-3052  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1569  
**MODEL** EMS-3056  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1509  
**MODEL** EMS-3052  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1569  
**MODEL** EMS-3056  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1509  
**MODEL** EMS-3052  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1569  
**MODEL** EMS-3056  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1509  
**MODEL** EMS-3052  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1569  
**MODEL** EMS-3056  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1509  
**MODEL** EMS-3052  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1569  
**MODEL** EMS-3056  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1509  
**MODEL** EMS-3052  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1569  
**MODEL** EMS-3056  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1509  
**MODEL** EMS-3052  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1569  
**MODEL** EMS-3056  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1509  
**MODEL** EMS-3052  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1569  
**MODEL** EMS-3056  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1509  
**MODEL** EMS-3052  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)

**CAT. No.** ASES1569  
**MODEL** EMS-3056  
**PRICE** 6,000 yen (excl. tax)

- Motor Cord
- Air Coolant Hose
- Reducer
- Collet Chuck
- Air Coolant Hose (Endurable for a long use)
**“ASTRO-E 500Z” SPINDLE**

**CAT. No.**

<table>
<thead>
<tr>
<th>CAT. No.</th>
<th>Model</th>
<th>Standard Equipment</th>
<th>Accessories</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASE2540</td>
<td>SPINDLE NRL-300E</td>
<td><strong>Spindle Accuracy</strong> Within 1 µm</td>
<td><strong>Standard Size Collet Chuck (CHK-3.175)</strong> ø1/8”</td>
<td><strong>40,000 min’ (rpm)</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Weight</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Spindle Accuracy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Weight</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Allowable Motor Speed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Spindle Accuracy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Weight</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Allowable Motor Speed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Spindle Accuracy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Weight</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Allowable Motor Speed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Spindle Accuracy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Weight</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Allowable Motor Speed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Spindle Accuracy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Weight</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Allowable Motor Speed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Spindle Accuracy</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Spindle**

- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 30,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 30,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 30,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 30,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 30,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 30,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 30,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 30,000 min’ (rpm)

**For light duty Grinding**

- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 30,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 30,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 30,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 30,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 30,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 30,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 30,000 min’ (rpm)

**“ASTRO-E 500Z” SPINDLE**

**CAT. No.**

<table>
<thead>
<tr>
<th>CAT. No.</th>
<th>Model</th>
<th>Standard Equipment</th>
<th>Accessories</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASE9056</td>
<td>AUTOMATIC TOOL REPLACEMENT SPINDLE NR-5040E ATC</td>
<td><strong>Spindle Accuracy</strong> Within 1 µm</td>
<td><strong>Standard Size Collet Chuck (CHK-3.175)</strong> ø1/8”</td>
<td><strong>40,000 min’ (rpm)</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Weight</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Spindle Accuracy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Weight</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Allowable Motor Speed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Spindle Accuracy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Weight</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Allowable Motor Speed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Spindle Accuracy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Weight</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Allowable Motor Speed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Spindle Accuracy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Weight</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Allowable Motor Speed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Spindle Accuracy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Weight</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Allowable Motor Speed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Spindle Accuracy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Weight</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Allowable Motor Speed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Spindle Accuracy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Weight</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Spindle**

- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 40,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 40,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 40,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 40,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 40,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 40,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 40,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 40,000 min’ (rpm)

**For light duty Grinding**

- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 40,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 40,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 40,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 40,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 40,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 40,000 min’ (rpm)
- **Spindle Accuracy**: Within 1 µm
- **Weight**: 1.97” (Max. Tool Mounting Depth)
- **Allowable Motor Speed**: 40,000 min’ (rpm)

**American Rotary Tools Co.**

Toll Free US & CA +1 (800) 645-3824
**"ASTRO-E 500Z" SPINDLE**

**"ASTRO-E 500Z" SPINDLE**

---

### 90° Angle Spindle RAX-271E (Speed Reduction Ratio 1/1.5)

- **Maximum allowable motor speed for the spindle**: 20,000 min\(^{-1}\) (rpm)
- **Maximum rotating speed at the cutting tool**: 7,490 min\(^{-1}\) (rpm)
- **Spindle Accuracy**: Within 3 µm
- **Weight**: 1.0 Lb (0.45 kg)
- **Chuck Nut (K-265)**: For Collet Chuck (CHS)
- **Metal Saw Arbor (ECH-20)**: For ø24 (0.95) x ø1.18 (3.00)
- **Dill Chuck Arbor (ECH-20)**: For Jacobs’ Taper No. 0
- **Grindstone Arbor (AGM-03)**: For grinding wheel with I.D. of ø5 mm

---

### 90° Angle Spindle RAX-71E (Speed Reduction Ratio 1/6)

- **Maximum allowable motor speed for the spindle**: 20,000 min\(^{-1}\) (rpm)
- **Maximum rotating speed at the cutting tool**: 5,000 min\(^{-1}\) (rpm)
- **Spindle Accuracy**: Within 3 µm
- **Weight**: 1.0 Lb (0.45 kg)
- **Chuck Nut (K-265)**: For Collet Chuck (CHS)
- **Metal Saw Arbor (ECH-20)**: For ø24 (0.95) x ø1.18 (3.00)
- **Dill Chuck Arbor (ECH-20)**: For Jacobs’ Taper No. 0
- **Grindstone Arbor (AGM-03)**: For grinding wheel with I.D. of ø5 mm

---

**2-p10**

---

**2-p11**
**“ASTRO-E 500Z” SPINDLE**

**Caution:** Use the motor at motor speed less than maximum allowable speed or use the speed reducer. DO NOT exceed the allowable motor speed for the spindle and the reducer.

<table>
<thead>
<tr>
<th>CAT. No.</th>
<th>Model</th>
<th>Standard Equipment</th>
<th>Accessories</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASE1505</td>
<td>RA-150E</td>
<td>90° Angle Spindle</td>
<td></td>
<td>608.00</td>
</tr>
</tbody>
</table>

90° Angle Spindle

- Maximum allowable motor speed for the spindle: 20,000 min⁻¹ (rpm)
- Maximum rotating speed at the cutting tool: 7,490 min⁻¹ (rpm)

- Standard Size Collet Chuck (CH8-3.175)
- Weight: 13.69 oz.
- Optional Collet Chuck (CH6-3.175)
- Metal Saw Arbor (CH10-3.175)

- Speed Reducing Mechanism: By planetary gear system
- Weight: 8.6 oz.

**“ASTRO-E 500Z” SPEED REDUCER & AIR LINE KIT**

**Caution:** Use the motor at motor speed less than maximum allowable speed or use the speed reducer. DO NOT exceed the allowable motor speed for the spindle and the reducer.

<table>
<thead>
<tr>
<th>CAT. No.</th>
<th>Model</th>
<th>Speed Reduction Ratio</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASE1507</td>
<td>ARG-01E</td>
<td>1/4</td>
<td>228.00</td>
</tr>
</tbody>
</table>

SPEED REDUCER 1/4 ARG-01E

- Maximum allowable motor speed for the spindle: 30,000 min⁻¹ (rpm)
- Maximum rotating speed at the cutting tool: 7,500 min⁻¹ (rpm)

- Speed Reducing Mechanism: By planetary gear system
- Weight: 8.8 oz.

<table>
<thead>
<tr>
<th>CAT. No.</th>
<th>Model</th>
<th>Speed Reduction Ratio</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASE1508</td>
<td>ARG-02E</td>
<td>1/16</td>
<td>305.00</td>
</tr>
</tbody>
</table>

SPEED REDUCER 1/16 ARG-02E

- Maximum allowable motor speed for the spindle: 30,000 min⁻¹ (rpm)
- Maximum rotating speed at the cutting tool: 7,490 min⁻¹ (rpm)

- Speed Reducing Mechanism: By planetary gear system
- Weight: 11.8 oz.

**Air Line Kit AL-0201**

- Air Line Kit AL-0201 is a Clean air supply unit for ASTRO-E 500Z Control Unit. The dust and moisture in the compressed air are eliminated by the filter in the first stage and the regulator provides accurate and stable air to the control unit.

<table>
<thead>
<tr>
<th>CAT. No.</th>
<th>Model</th>
<th>Specifications</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL0201</td>
<td>AL-0201</td>
<td>Air Filter - Air Regulator - Air Pressure Gauge - Air ON-OFF Valve - Hose for Piping (Φ30) : 6 ft</td>
<td>350.00</td>
</tr>
</tbody>
</table>

**Reducer (ø6 - ø4 mm Adaptor)**

<table>
<thead>
<tr>
<th>CAT. No.</th>
<th>Model</th>
<th>Specifications</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>U235406</td>
<td>Reducer</td>
<td>ø6 - ø4 mm Adaptor</td>
<td>8.91</td>
</tr>
</tbody>
</table>
### "ASTRO-E 500Z" PARTS

#### ASTRO-E 500Z Parts

<table>
<thead>
<tr>
<th>Bracket</th>
<th>Product</th>
<th>Model</th>
<th>Description / Specifications</th>
<th>Fit to</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ASE 8410</td>
<td>BRB-4</td>
<td>Horizontal Mounting Brackets (2 pcs. / set)</td>
<td>NE147 - NE147-800</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASE 8412</td>
<td>BRB-2</td>
<td>Vertical Mounting Brackets (2 pcs. / set)</td>
<td>NE147 - NE147-800</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASE 8413</td>
<td>BRC-4</td>
<td>Suspended Mounting Brackets (4 pcs. / set)</td>
<td>NE147 - NE147-800</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control Panel Extension Cord</th>
<th>Product</th>
<th>Model</th>
<th>Description / Specifications</th>
<th>Fit to</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ASE 8411</td>
<td>PEX-4</td>
<td>Control Panel Extension Cord Assembly (1 set)</td>
<td>NE147 - NE147-800</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AC Power Socket</th>
<th>Product</th>
<th>Model</th>
<th>Description / Specifications</th>
<th>Fit to</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ASE 8414</td>
<td>AC-SO3</td>
<td>AC Power Socket. No cord (connector set for 115V and 230V) Socket for 3 cores cable</td>
<td>NE147 - NE147-800</td>
<td></td>
</tr>
</tbody>
</table>

**Dub Connector** (Purchase specified connectors from outside source.)

- **Outside input-output connector C11**
  - Available plug product No.: XM2A-1501 (Dub connector Plug, 15 poles type, male) / made in OMRON CORP. (or equivalent product)
  - Available hood product No.: XM2S-1511 (Dub connector Hood, 15 poles type) / made in OMRON CORP. (or equivalent product)
  - Available product No.: NEDJ-P-A-15-2.0 (Dub connector standard harness, 15 pins, male) / made in MISUMI CORP. (or equivalent product) [Connector with 6 ft (2 m) cable]

- **Outside input-output connector C12**
  - Available plug product No.: XM2A-2501 (Dub connector Plug, 25 poles type, male) / made in OMRON CORP. (or equivalent product)
  - Available hood product No.: XMA2S-2511 (Dub connector Hood, 25 poles type) / made in OMRON CORP. (or equivalent product)
  - Available product No.: XMA2P-A-25-2.0 (Dub connector standard harness, 25 pins, male) / made in MISUMI CORP. (or equivalent product) [Connector with 6 ft (2 m) cable]

---

AMERICAN ROTARY TOOLS CO. (ARTCO TOOLS)
250 WEST DUARTE ROAD, #E
MONROVIA, CA USA 91016-7464

Tel: (626) 358-8466 Fax: (626) 358-0076
Toll Free USA Tel: (800) 624-2212 Fax: (800) 624-2210
Email: info@artcotools.com

Order by catalog number.
Features of ASTRO-800Z

- Maximum Output 300W
- Brushless Motor
- Motor Endurance
- Smooth Rotation
- Excellent Durability by air-cooling system
- External housing is made of stainless steel
- Torque Characteristics of ASTRO-800Z

Index

Mounting Brackets are available as optional accessories. (Refer to 2-p22)

ASTRO-800Z System Chart

ASTRO-800Z Combination Example

<table>
<thead>
<tr>
<th>Unit Specifications</th>
<th>NE147-400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>NE147-400</td>
</tr>
<tr>
<td>Power Source</td>
<td>AC 115V/230V Switchable type</td>
</tr>
<tr>
<td>Motor Speed</td>
<td>50~60Hz</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>150W</td>
</tr>
<tr>
<td>Weight</td>
<td>12 Lb 14.2 oz</td>
</tr>
<tr>
<td>Dimensions</td>
<td>ø2 Lb 10.7 oz, h=7.60&quot;</td>
</tr>
</tbody>
</table>

Motor & Spindle

Motor: EM-801
Anchor: EM-805
Speed: 20,000~80,000 min⁻¹ (rpm)
Weight: 12 Lb 14.2 oz
Dimensions: ø2 Lb 10.7 oz, h=7.60"

ASTRO-800Z, EM-801, NR-3080 Combination Example

<table>
<thead>
<tr>
<th>Product ID</th>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>NE147-800</td>
<td>Control Unit</td>
<td>2,268.00</td>
</tr>
<tr>
<td>EM-801</td>
<td>Motor</td>
<td>1,036.00</td>
</tr>
<tr>
<td>NR-3080</td>
<td>Spindle</td>
<td>500.00</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>4,508.00</td>
</tr>
</tbody>
</table>

Brackets

- Horizontal Mounting Brackets
- Vertical Mounting Brackets
- Suspended Mounting Brackets

Order by catalog number. 2-p17
**“ASTRO-E 800Z” CONTROL UNIT**

### High Precision and High-Performance Control Unit

- **High-Performance Electric Circuit**
  - “High grade feedback loop to maintain constant spindle speed even if load is varied”, and “Gentle start/Quick stop functions” are provided.

- **Error Function**
  - Motor/Spindle is stopped safely. Error LED is lit, and Error Signal is output to external when there is something wrong with the motor/spindle, or any breakage is detected. (e.g. Overheat/Overload operation, Air shortage)

- **External Input-Output Connector**
  - Motor/Spindle can be controlled and monitored by external input-output connector: Control : Start/Stop, Motor Speed Control, FWD./REV. Rotation and etc. Monitor : While Rotating, Rotation Pulse, Unit Power Source Detection, AUTO Mode, Motor Speed Voltage and etc.

- **Motor Speed Display**
  - Motor speed is displayed precisely and digitally.

- **LOAD Monitor LED**
  - Motor load is displayed by 6 LED’s to mean load level.

### Specifications

### Table: “ASTRO-E 800Z” CONTROL UNIT NE147-800

<table>
<thead>
<tr>
<th>CAT. No.</th>
<th>Model</th>
<th>Standard Equipment</th>
<th>Accessories</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASE8417</td>
<td>NE147-800</td>
<td>Power Cord</td>
<td>Air Hose with Filter (K-251) : 16 ft.</td>
<td>2,268.00</td>
</tr>
</tbody>
</table>

- Power source cord is available according to power source specifications (115V or 230V). Please specify when ordering.

---

**“ASTRO-E 800Z” SELECTOR UNIT**

### Specifications - Model: NE147 / Power Source: AC 115V/230V (switchable type) / 50-60Hz / Power Consumption: 7W / Weight: 1 lbs. / Dimensions: W: 11.31” x D: 11.21” x H: 11.21”

### Table: “ASTRO-E SELECTOR UNIT” NE62

<table>
<thead>
<tr>
<th>CAT. No.</th>
<th>Model</th>
<th>Standard Equipment</th>
<th>Accessories</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASE1509</td>
<td>NE62</td>
<td>Power Cord</td>
<td>Air Coolant Hose</td>
<td>1,311.00</td>
</tr>
</tbody>
</table>

- By connecting Selector Unit 2 NE135 to the control unit, 2 motors are able to control individually. (Two motors can not be operated simultaneously.)

### Table: “ASTRO-E SELECTOR UNIT” NE135

<table>
<thead>
<tr>
<th>CAT. No.</th>
<th>Model</th>
<th>Standard Equipment</th>
<th>Accessories</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASE8219</td>
<td>NE135</td>
<td>Cord with 8 pin plug</td>
<td>Air ‘Y’ Adaptor</td>
<td>476.00</td>
</tr>
</tbody>
</table>

- Order by catalog number. 2-p19
**“ASTRO-E 800Z” BRUSHLESS MOTOR & SPINDLE**

ASTRO-E 800Z can use cooling water and oil during processing work.

<table>
<thead>
<tr>
<th>CAT. No.</th>
<th>BRUSHLESS MOTOR EM-801</th>
<th>Model</th>
<th>Standard Equipment</th>
<th>Accessories</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS9059</td>
<td></td>
<td></td>
<td>Motor with Cool</td>
<td>Air Coolant Hose</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Motor with Quick Disconnect</td>
<td>Air Coolant Hose</td>
<td></td>
</tr>
</tbody>
</table>

**“ASTRO-E 800Z” AIR LINE KIT & REDUCER**

<table>
<thead>
<tr>
<th>CAT. No.</th>
<th>Model</th>
<th>Standard Equipment</th>
<th>Accessories</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL0203</td>
<td>AL-0203</td>
<td>AIR LINE KIT</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Air Line Kit AL-0203 is the air supply unit provided as the standard set for ASTRO-E 800Z. Control Unit NE147-800 supplies clean air and atomized oil to the Spindle NR-3080 at the same time.*

**“ASTRO-E 800Z” AIR LINE KIT & REDUCER**

<table>
<thead>
<tr>
<th>CAT. No.</th>
<th>Model</th>
<th>Standard Equipment</th>
<th>Accessories</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL982</td>
<td>AL-982</td>
<td>AIR LINE KIT</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*AL-982 is an air supply unit for air bearing spindles “NRA-5080” and control unit “NE147-800”. Supply air to “NRA-5080” first, and rotate motor after spindle is floated. When stepping the motor, you must supply air to the spindle until the motor stops completely.*

**Air Line Kit (For ø6 mm Hose · Filter Mesh 5 µm)**

<table>
<thead>
<tr>
<th>CAT. No.</th>
<th>Model</th>
<th>Standard Equipment</th>
<th>Accessories</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL982</td>
<td>AL-982</td>
<td>AIR LINE KIT</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Reducers (ø6 - ø4 mm Adaptor)**

<table>
<thead>
<tr>
<th>CAT. No.</th>
<th>Model</th>
<th>Specifications</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>U235406</td>
<td>Reducer</td>
<td>ø6 - ø4 mm Adaptor</td>
<td>8.91</td>
</tr>
</tbody>
</table>

*Order by catalog number.*
“ASTRO-E 800Z" PARTS

ASTRO-E 800Z Parts

### Bracket

<table>
<thead>
<tr>
<th>Product</th>
<th>GC No.</th>
<th>Model</th>
<th>Description / Specifications</th>
<th>Fit to</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASE 8410</td>
<td>BRB-4</td>
<td>Horizontal Mounting Brackets (4 pcs. / set)</td>
<td>NE147 · NE147-800</td>
<td></td>
</tr>
<tr>
<td>ASE 8412</td>
<td>BRB-2</td>
<td>Vertical Mounting Brackets (4 pcs. / set)</td>
<td>NE147 · NE147-800</td>
<td></td>
</tr>
<tr>
<td>ASE 8413</td>
<td>BRC-4</td>
<td>Suspended Mounting Brackets (4 pcs. / set)</td>
<td>NE147 · NE147-800</td>
<td></td>
</tr>
</tbody>
</table>

### Control Panel Extension Cord

<table>
<thead>
<tr>
<th>Product</th>
<th>GC No.</th>
<th>Model</th>
<th>Description / Specifications</th>
<th>Fit to</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASE 8411</td>
<td>PEX-4</td>
<td>Control Panel Extension Cord Assembly (13 ft)</td>
<td>NE147 · NE147-800</td>
<td></td>
</tr>
</tbody>
</table>

### AC Power Socket

<table>
<thead>
<tr>
<th>Product</th>
<th>GC No.</th>
<th>Model</th>
<th>Description / Specifications</th>
<th>Fit to</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASE 8414</td>
<td>AC-SO3</td>
<td>AC Power Socket</td>
<td>NE147 · NE147-800</td>
<td></td>
</tr>
</tbody>
</table>

### Dsub Connector (Purchase specified connectors from outside source.)

- **Outside input-output connector CN1**
  - Available plug product No.: XM2A-1501 (Dsub Connector Plug, 15 poles type, male) / made in OMRON CORP. (or equivalent product)
  - Available product No.: NEJ2-P-A-15-2.0 (Dsub connector standard harness, 15 pins, male / made in MISUMI CORP. (or equivalent product)

- **Outside input-output connector CN2**
  - Available plug product No.: XM2A-2501 (Dsub Connector Plug, 25 poles type, male) / made in OMRON CORP. (or equivalent product)
  - Available product No.: NEJ2-P-A-25-2.0 (Dsub connector standard harness, 25 pins, male / made in MISUMI CORP. (or equivalent product)

---

AMERICAN ROTARY TOOLS CO. (ARTCO TOOLS)
250 WEST DUARTE ROAD, #E
MONROVIA, CA USA 91016-7464
Tel: (626) 358-8466 Fax: (626) 358-0076
Toll Free USA Tel: (800) 624-2212 Fax: (800) 624-2210
Email: info@artcotools.com