

OPERATION MANUAL

92-0547 Rev. 230111
Model 302 Tube Squaring Machine



ABOUT TRI TOOL TECHNOLOGIES

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At Tri Tool, we are committed to your success through relentless innovation and powerful partnership. We insist on developing tools and equipment that exceed your expectations of performance, precision, safety, and durability. As a full-service engineering firm, we are here to support you every step of the way.

For more information on engineered solutions, products, and trainings, visit tritool.com or contact our engineers at +1(916) 288-6100.

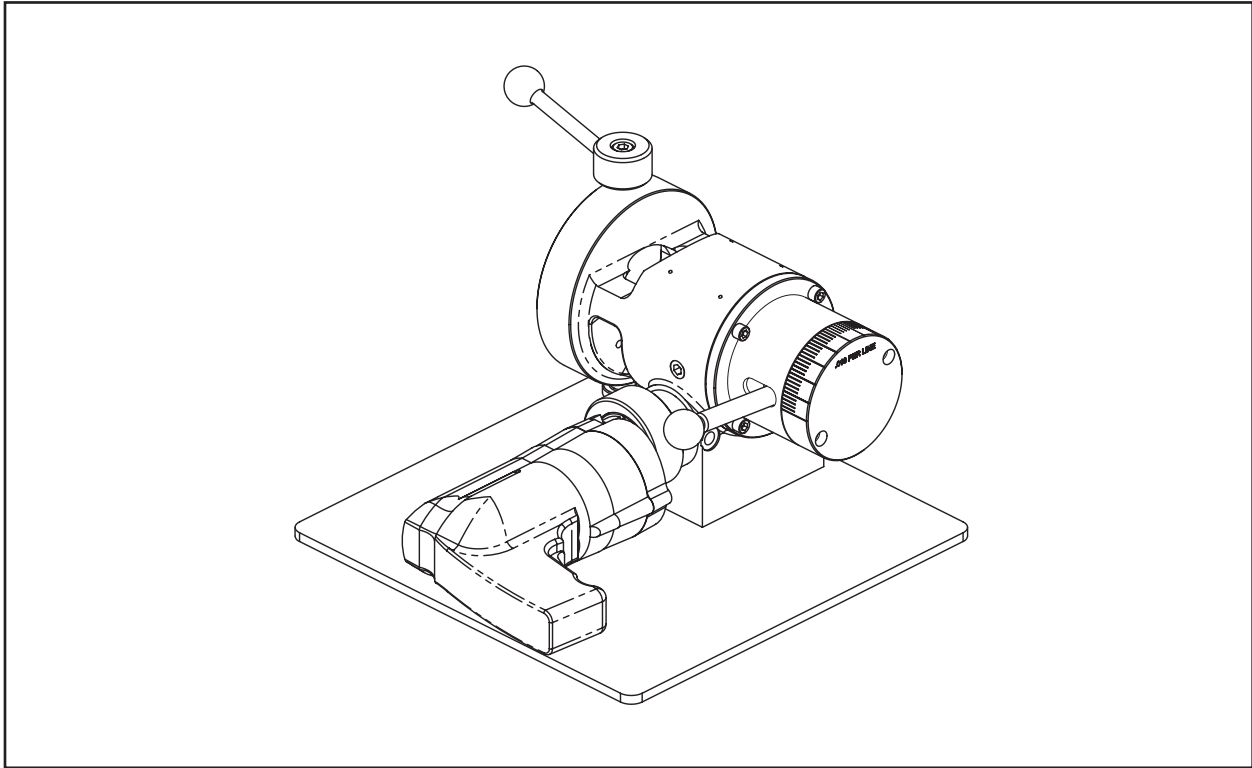


TABLE OF CONTENTS

Tri Tool Inc. Warranty	4
Tool Bit Resharpener Policy	5
About The Manual	6
Safety	8
General Description	10
Specifications	11
Maintenance	13
Operation	15
Cutting Speeds and Feeds	22
Saddle Sets	23
Tool Bits	24
Troubleshooting	26
Illustrated Parts Breakdown	28

TRI TOOL INC. Warranty

LIMITED WARRANTY: All products manufactured by Seller are warranted to be free from defects in materials and workmanship under normal use. The period of this warranty shall be three years from the date of shipment for all products, except for welding and Non-Standard Products which shall be one year from the date of shipment. The Buyer shall bear all shipping, packing and insurance costs and all other costs to and from a designated repair service center. All return goods must be authorized in advance and communicated upon issuance of a Return Material Authorization (RMA) by Seller. The product will be returned to the Seller accompanied by a RMA number and associated paperwork, freight prepaid and billed to the Buyer. This warranty is not transferable and will not apply to tool bits or other consumables, or to any Goods to have been (i) mishandled, misused, abused or damaged by Buyer or any third party; (ii) altered without the express permission in writing by Seller, (iii) repaired by a party other than Seller without Seller's prior written approval; or (iv) improperly stored, installed, operated, or maintained in a manner inconsistent with Seller's instructions. This warranty does not apply to defects attributed to (i) normal wear and tear or (ii) failure to comply with Seller's safety warnings.

No warranty for any parts or other supplies provided to seller by buyer, whether or not they are incorporated into goods. Goods supplied by seller which are designed or manufactured by a third party are subject strictly to the third party's warranty for those goods. Seller makes no warranty and disclaims all statutory or implied warranties for these goods, including the implied warranties of merchantability, freedom from patent infringement and fitness for a particular purpose.

Neither this warranty nor any other warranty, expressed or implied, including implied warranties of mechanical ability, fitness for a particular use, or merchantability, shall extend beyond the warranty period. No responsibility is assumed for any incidental or consequential damages. Some states do not allow limitations on how long an implied warranty lasts and some states do not allow the exclusion or limitations incidental or consequential damages, so the above limitation of exclusion does not apply to all Buyers. This warranty gives the Buyer specific legal rights. Other rights vary from state to state.

Warranty Claims and Remedies

Buyer must promptly notify Seller in writing during the applicable warranty period, of any defective Goods covered by Seller's warranties under the Limited Warranty section herein, and no later than fifteen (15) calendar days after discovery of the defect. Seller has no obligation to honor any warranty claim made after the expiration of the warranty period. However, despite the expiration of the warranty period, Seller, at its reasonable discretion, may accept warranty claims submitted up to fifteen (15) calendar days after the expiration of the warranty period provided that Buyer provides Seller with credible and persuasive documentary evidence that the defect was discovered during the warranty period. No warranty claims submitted after this fifteen (15) day calendar period will be considered by Seller.

Buyer's notice of a defective Goods must identify the specific Goods affected, and the nature of the defect. It is required when returning the defective Goods, that it is suitably packed, fully insured, and transportation and insurance prepaid in accordance with instructions issued by Seller. Seller, at its sole option, will either repair or replace any Goods authorized for return to Seller. Such repair, replacement, or credit shall be Buyer's sole remedy for defective Goods. Buyer must promptly provide Seller with all information requested regarding the identified defect.

If the defect claimed by Buyer cannot be reproduced or otherwise verified by Seller, the Goods will be returned to Buyer unmodified at Buyer's expense.

The warranty period for repaired or replaced Goods shall be (i) ninety (90) days or (ii) the unexpired portion of the original warranty period. Under no circumstances is Seller liable for recall, retrieval, removal, dismantling, re-installation, redeployment, or re-commissioning of any defective Goods or any costs associated therewith.

Tool Bit Resharpener Policy

Buyer is required to check all tool bits prior to returning and ensure they are packaged well for shipment. The price structure is available from the Seller's sales coordinator. Seller cannot sharpen badly gouged, chipped, or broken tool bits. Seller will return tool bits that are not suitable for sharpening with the tool bits that were sharpened upon Buyer's request. Buyer is responsible for all shipping charges to and from Seller.



1. ABOUT THE MANUAL

ORIGINAL INSTRUCTIONS

Copyright

©Copyright Tri Tool Inc. Proprietary property of Tri Tool Inc. No reproduction, use, or duplication of the information shown hereon is permitted without the express written consent of Tri Tool Inc.

Disclaimer

The instructions and descriptions in this manual were accurate when the manual was written. However, the information in the manual is subject to change without notice. Check for updated information before you start any job. The Tri Tool Inc. web site has the most current information.

Do not operate or work on this equipment unless you have read and understood the instructions in this Manual. Failure to follow the instructions or follow the safety instructions could result in serious injury or death. This manual describes conditions and hazards that are common and anticipated during equipment operation. No manual can address all conditions which may occur.

Safety Symbols

The manual may contain one or more safety symbols. These symbols and the associated text warn you of potentially hazardous conditions. Examples of the safety symbols and the associated text follow:



DANGER

DANGER: Indicates a hazardous situation that, if not avoided, will result in serious injury or death.



WARNING

WARNING: Indicates a hazardous situation that, if not avoided, could result in serious injury or death.



CAUTION

CAUTION: Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury, or cause property damage.



GLASSES

SAFETY GLASSES: Indicates a hazardous situation that requires the use of safety glasses.



HOT SURFACE

HOT SURFACE: Indicates a hazardous situation that hot surfaces may be present.



GLOVES

GLOVES: Indicates a hazardous situation that requires glasses.



SHOCK HAZARD

ARC FLASH & SHOCK HAZARD: High voltage. Entry by authorized personnel only. Appropriate PPE and tools required when working on this equipment.



READ MANUAL

READ MANUAL: Read manual before use, refer to manual for Tri Tool machine being used.



DISCONNECT FROM POWER

DISCONNECT FROM POWER: Disconnect main plug from electrical outlet before performing all maintenance.

2. SAFETY PRECAUTIONS

In General

Use standard safety equipment such as: hard hats, safety shoes, safety harnesses, protective clothes, and other safety devices when appropriate.

Operate this tool only in accordance with specific operating instructions.



WARNING: Do not override the dead-man switch on the power unit. Locking down, obstructing, or in any way defeating the dead-man switch on the power drive unit may result in serious injury.

Personal Protective Equipment

Use standard safety equipment such as: hard hats, safety shoes, safety harnesses, protective clothes, and other safety devices when appropriate.

Wear safety glasses.

Do not wear loose clothing or jewelry.

Wear nonskid footwear.

Put long hair in a cap or a net to make sure hair does not get tangled in equipment.

Personnel

Only personnel who are trained or are being trained may operate the equipment.

Keep the operation manual available where the equipment is used.

The operator must read the operation manual before using the equipment.

The equipment must be operated in accordance with the manual information.

The operator must follow the safety precautions in this manual and good engineering practices to reduce the risk of injury.

Before using the equipment, the operator must ensure that all safety messages on the equipment are legible.

Work Area

Keep the work area clean.

Keep the area well lit.

Keep items such as electrical cords, cables, rags, rigging straps, away from rotating equipment.

Do not use power-cutting tools in the presence of flammable liquids and gases.

Do not let visitors or untrained personnel near tools that are in use.

Ensure all observers wear eye protection.

Keep proper footing at all times.

Area Equipment

Secure the pipe with clamps, vises, chains or straps.

Ensure that both sides of the pipe at the cut site is fully supported so that the pipe will not move after the cut is completed. Long lengths of pipe may be under load and the separation of the pipe can release pressure. This pressure can cause both sides of the pipe to move.

Tool Care

Keep tools in good operating condition. Sharp tool bits perform better and are safer than dull tool bits.

Do not use damaged tools. Always check your tools for damage especially if a tool has malfunctioned, been dropped or hit, check it for damage.

Before you start operating the equipment, do no-load tests and feed function checks.

Tool Use

Use the right tool and tool bit for the job. Contact Tri Tool to help with your application.

Keep the tool bits fully engaged in the tool bit holders. Loose bits are sharp and can cause cuts or punctures.

Disconnect power supply during setup and maintenance. Use all 'Stop' or Shut off' features available when changing or adjusting tool bits, maintaining the tool, or when the tool is not in use.

Remove adjusting keys and wrenches before applying power to the equipment. Check the tool before turning it on to make sure that all keys and wrenches have been removed.

Do not force tools. Tools and tool bits function better and safer when used at the recommended speeds.

Do not reach into rotating equipment.

Do not reach into the rotating head stock to remove chips, to make adjustments, or to check the surface finish.

Handle chips with care. Chips have very sharp edges and are hot. Do not try to pull chips apart with bare hands.

Store tools properly. Disconnect tools from the power source, remove the tool bits, and store in a safe place.

3. GENERAL DESCRIPTION

The Model 302 Tube Squaring Tool, a bench mounted machine, prepares tubes for autogenous welding. The 302 will face (square) .188" to 2.375" (4.8 mm to 60.3 mm) outside diameter tubing with a wall thickness up to .200" (5.1 mm).

The 302 uses an OD Saddle Clamping System to holding and to round the tube.

The 302 accepts its torque through the Saddle Clamping System.

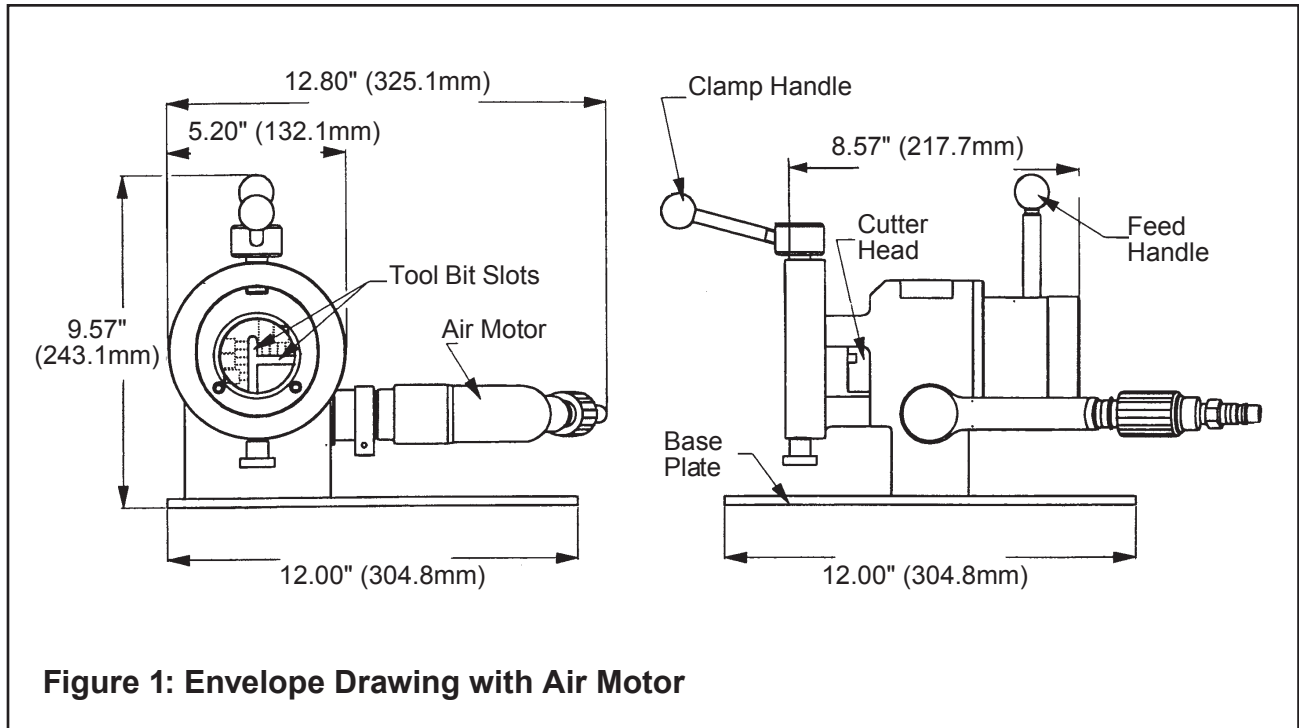
The standard Saddle Clamping System requires a straight length of tube .875" (22.2 mm) long.

An optional pneumatic clamping system can provide automatic clamping.

Speed control is provided with a variable speed electric drive or a pneumatic drive motor. Lever action provides feed control. A microfeed system provides an accurate controlled feed alternative.

4. SPECIFICATIONS

Model 302A with Air Motor (P/N 01-1271)



Weight: 18.5 lbs (8.4 kg) without saddles
Power Requirements: 26 cfm at 90 PSI (12 L/s at 621 kPa)

Model 302A with Electric Motor

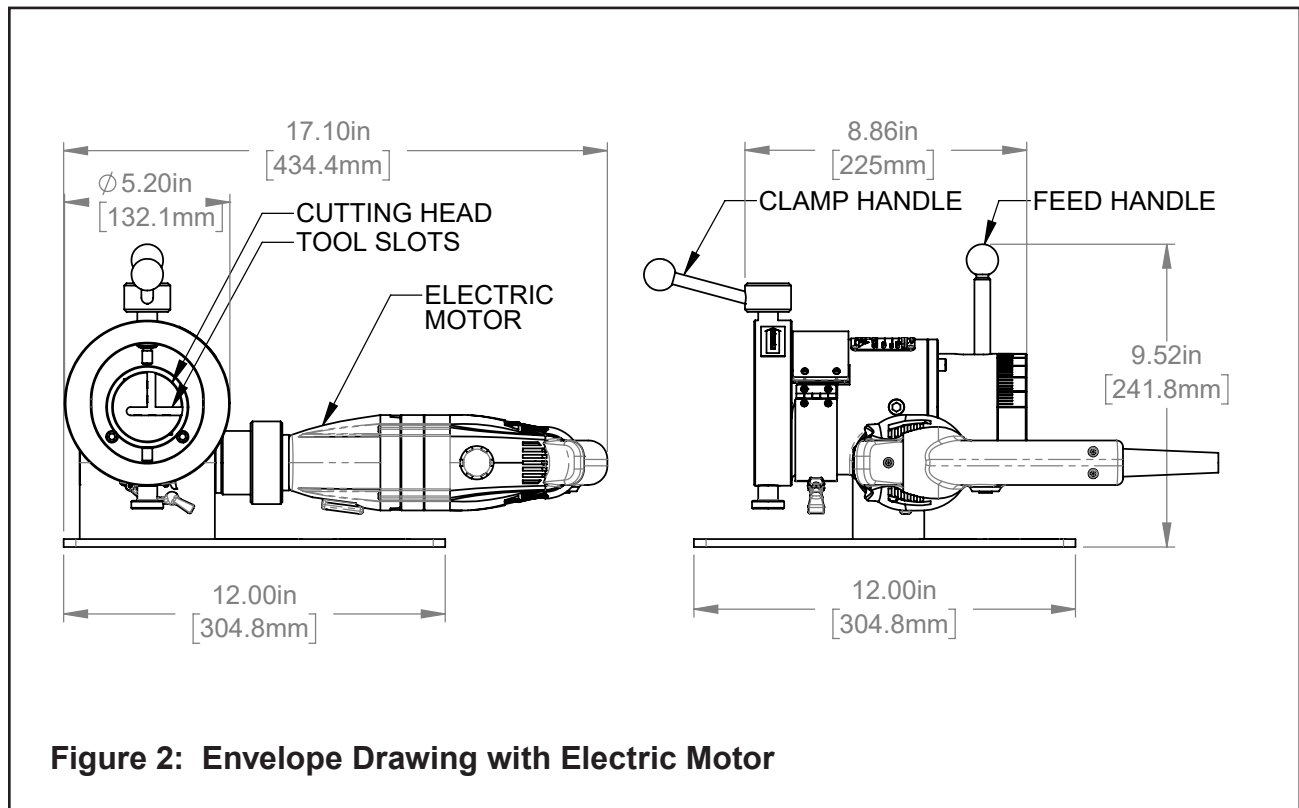


Figure 2: Envelope Drawing with Electric Motor

Model 302E with a 110 VAC, 60 Hz Electric Motor (P/N 01-1769)

Weight: 20.6 lbs (9.3 kg) without saddles

Power Requirements: 110 VAC, 50/60Hz, 9.6 Amp

Model 302E with a 220 VAC, 50 Hz Electric Motor (P/N 01-1770)

Weight: 20.6 lbs (9.3 kg) without saddles

Power Requirements: 220 VAC, 50/60Hz, 5.7 Amp

For Japan

Model 302E with a 100 VAC, 50 Hz Electric Motor (P/N 58-0217)

Weight: 20.6 lbs (9.3 kg) without saddles

Power Requirements: 100 VAC, 50Hz, 6.0 Amp

5. MAINTENANCE

Maintenance Protocol

- Clean and Coat all components with a light film of oil prior to use.
- Lubricate bearing and gears with a high string utility grease (P/N 68-0020).
- Use a clean, non-detergent oil, preferably SAE 10 (90 SSU) or lighter.
- The air supply for the Model 302A with an air motor should include an adequate filter, regulator and lubricator (FRL).
- If the Model 302 is operated in the vertical position (cutting head up), turn it upside down and remove the chips and/other debris after each bevel has been completed.



CAUTION

CAUTION: The Motor Warranty is void if damage occurs from contaminated air or lack of lubrication.

Air Motor Lubrication

- Disassembly of a power unit voids warranty, except when performed by a TRI TOOL designated repair technician. Letter of designation is required.
- No direct maintenance is normally required on the Air Motor.
- The air supply must flow through a filter/regulator/lubricator (FRL) unit or separate units before arriving at the air motor. The FRL unit must be maintained as required (frequency dependent on the basic air supply) to keep the water trap drained, filter cleaned and the lubricator oil reservoir filled so that a drop of oil every two to five seconds is flowing.
- If the Model 302A is to be left idle for 24 hours or more after being run on 'wet' air, squirt oil directly into the air motor inlet and run the motor for two to three seconds. This will prevent rusting and 'freezing' of the rotor vanes.

Lubricant Recommendations

The air motor requires a 'Class 2' lubricant, viscosity of 100 to 200 SSU at 100° F (38° C).

- Tri Tool Inc. – Air Tool Lubricant (P/N 68-0022)
- AMOCO – American Industrial Oil No. 32
- Atlantic Richfield – Duro Oil S-150
- Chevron – A.W. Machine Oil 32
- Exxon – Nuto H32
- Shell – Tellus Oil 32

The bearings in the air motor and in the electric motor are sealed and do not require lubrication.

6. OPERATION

General Comments

Rotate the handle of the motor to another position depending on the situations, by doing the following

1. Loosen the cap screw in the clamp bracket and rotate the motor handle to the desired position.
2. Tighten the cap screw before turning the motor on.

Guidelines for Selecting a Tool Bit



CAUTION

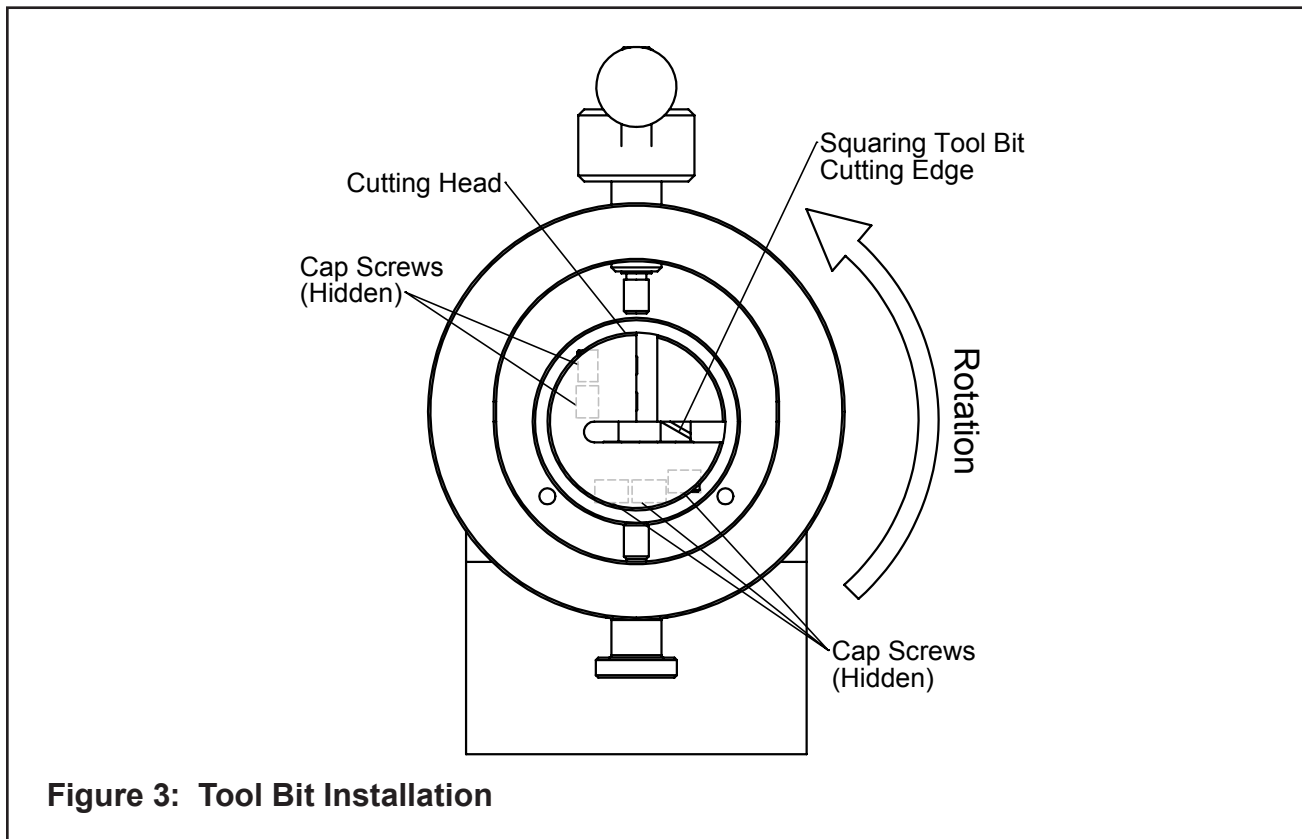
CAUTION: The use of dull or improperly designed Tool Bits or Tool Bits not manufactured by Tri Tool Inc. may result in poor performance and may constitute abuse of this machine and therefore void the Tri Tool Inc. factory warranty.

- Select the Tool Bit based on tubing material, the tubing size, and how critical is it to have a near burr free end.
- The DURABIT 1, DURABIT 2 and DURABIT 3 Tool bits provide near burr free ends (measured burrs less than 0.004" or 0.1mm) on most materials. The DURABIT 1, DURABIT 2 and DURABIT 3 were developed for optimum burr conditions on electro-polished austenitic Stainless Steel tubing such as 316L. They can run at higher speeds than other tube squaring tool bits. Electro-polished stainless steels have a micro-thin surface on the ID, which is high in Cr and Ni. This surface is soft, but tough and difficult to cut without a burr. The Part Number for a DURABIT 1 is "DURBIT1", DURABIT 2 is "DURBIT2" and DURABIT 3 is "DURBIT3".
- Contact your Tri Tool representative for Tool Bit recommendations for carbon steel tubes with a wall thickness greater than 0.083" (2.24mm).
- M-42 Tool Bits are available for use with the exotic alloys where the high heat resistance is required to avoid burning the cutting edge of the Tool Bit. Call your Tri Tool representative for recommendations. M-42 can improve the life expectancy of the Tool Bit under some conditions but M-42 Tool Bits are more brittle than the M-2 Tool Bits. There is a greater risk of damaging the M-42 Tool Bit when installing the tubing in the Tube Squaring Machine. Loss of Tool Bits from damaged edges may not offset the improved cutting life expected from M-42 tool steel. Tool Bits made from M-42 tool steel, with its high heat resistance, may provide longer life on some exotic alloys. Be aware that the cutting speeds to obtain a burr FREE end is slower for all tool bits other than the DURABIT Series Bits. The cost impact of the slower running speeds may not offset the increase in life expectancy.

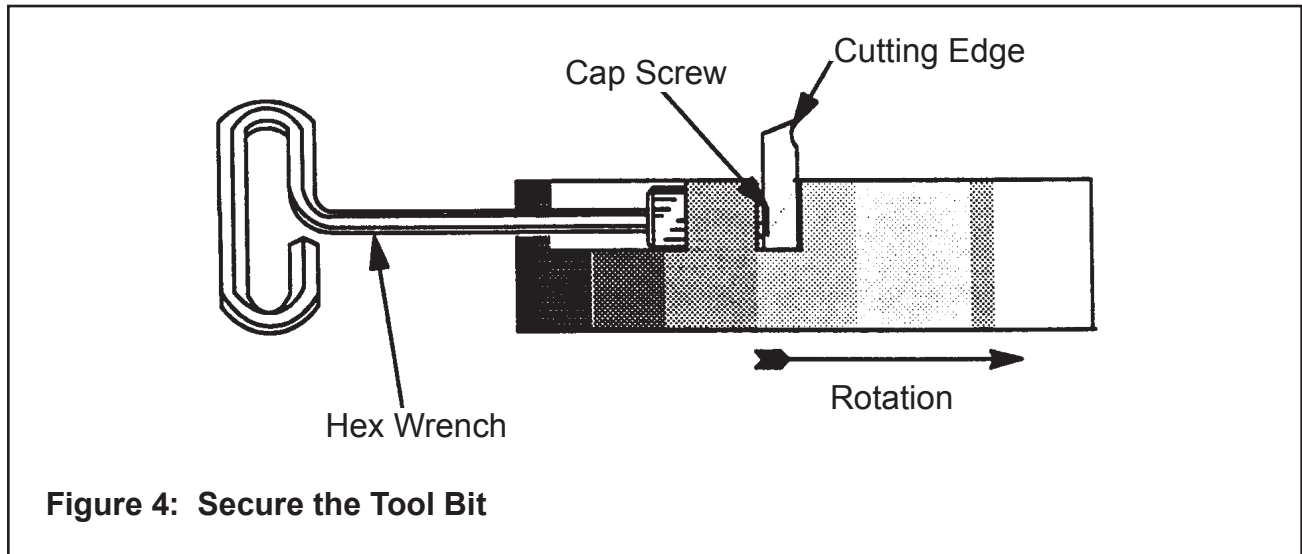
- Select the tool bit(s) required to machine the end configuration desired.
- Select the Tool Bit required to machine the tube ends square and flat as needed for an autogenous weld joint.
- When performing a tube squaring operation the tool bit may be placed in any slot.
- When performing separate machining operations such as facing or beveling, the tool bit(s) may be installed in any one of the two cutting head slots.
- When performing two machining operations such as facing and beveling, install the tool bits with one type in each slot.

Installing a Tool Bit

1. Make sure that the Model 302 Tube Squaring Machine is disconnected from the power source before installing a Tool Bit.
2. Insert the Tool Bit into the slot in the Cutting Head. The cutting edge of the Tool Bit must be located on the radial centerline. Make sure the cutting edge is positioned correctly.
3. Position the tip of the tool bit just inside the inner side of the tube wall. The tip must be inside the tube bore to achieve a flat end. The tip location is critical on .50" to 1.00" tube because if the tip is too close to the center of the tube, the chip may roll into the tube and scratch the ID. Refer to Fig. 3.



4. Tighten the cap screws to secure the tool bit(s) to the cutting head. Refer to Fig. 4.



Select the Tool Bit

Durabit 1 Tool Bit

- DURABIT 1 is designed to run at the maximum available RPM from the tool this makes the cutting procedure different in relation to the other Tube Facing Bits with 99-xxxx part numbers.
- Make sure the tool bit clears the end of the tube with the feed fully retracted (normal return position). A tube end that is cut at an angle (not square) can be set so the tool bit clears the end, but when the tool bit is rotated, it engages the tube will a very heavy cut.



CAUTION

CAUTION: Do not do an excess cut to reduce the risk of damage to the tool bit from an excessive cut.

- Use the maximum speed to turn the machine on and advance the tool bit into the end.
- On interrupted or out of square ends, advances the bit slowly with light feed pressure (torque applied to the feed handle) until a continuous cut is achieved (the tool bit is cutting all the way around the end).
- After a full cut is achieved, use moderate feed pressure to finish the cut (either to a just achieve a quality end or to cut to a scribe line).

- When the desired length is achieved, let the machine make one or two revolutions without feeding the machine (holding the feed handle in a fixed position). If the feed is backed out before the making the finish revolutions the end will not be square. This effect will be most noticeable on larger diameter tubes.
- Back the tool bit away from the end with the machine running.



CAUTION: Do not do stop the machine with the tool bit in the cut. The tool bit may chip.

99-xxxx Series Tube Squaring Tool Bits

- The 99-xxxx series tool bit works at slow speeds. This is especially true with electro-polished tubes. Electro-polished austenitic stainless steel tube alloys are very soft and tend to “mush” away from the cutting edge. If the tube or the tool bit get warm, this tendency is increased. The cutting speed must be kept very slow to avoid creating heat at the tool bit. The material will flow away from the bit and form large burrs.
- Make sure that the tube bit clears the end of the tube with the feed fully retracted (normal return position). A tube end that is cut at an angle (not square) can be set such that the tool bit clears the end, but when the tool bit is rotated, it engages the tube with a very heavy cut.
- Turn the machine on and set the RPM between 30 and 50.
- Advance the tool bit into the end. Use the low end of the speed range (30 RPM) for 0.50 and larger tubes and the high end (50 RPM) of the range for smaller tubes.



CAUTION: Do not do an excess cut to reduce the risk of damage to the tool bit from an excessive cut.

- On interrupted or out of square ends, advances the bit slowly with light feed pressure (torque applied to the feed handle) until a continuous cut is achieved (the tool bit is cutting all the way around the end). The operator must increase the speed control position to maintain the cutting speed as the load increases.
- After a full cut is achieved use moderate feed pressure to finish the cut (either to a just achieve a quality end or to cut to a scribe line). The operator should strive to achieve a loose but continuous chip. The chip should be a loose curl, not a tight spiral.

- After the desired length is reached, let the machine make one or two revolutions without feeding the machine (i.e. while holding the feed handle in a fixed position). If the feed is backed out before making the finishing revolutions the end will not be square. This effect will be most noticeable on larger diameter tubes.
- Back the tool bit away from the end with the machine running. Never stop the machine with the tool bit in the cut as this can chip the tool bit.
- Adjust the bevel tool bit radially to control the land width to the bevel relationship.

Saddle Installation

1. Select the saddle size for the pipe or tube to be worked on.
2. Insert the lower saddle half into the lower front of the main housing. Refer to Fig. 5.

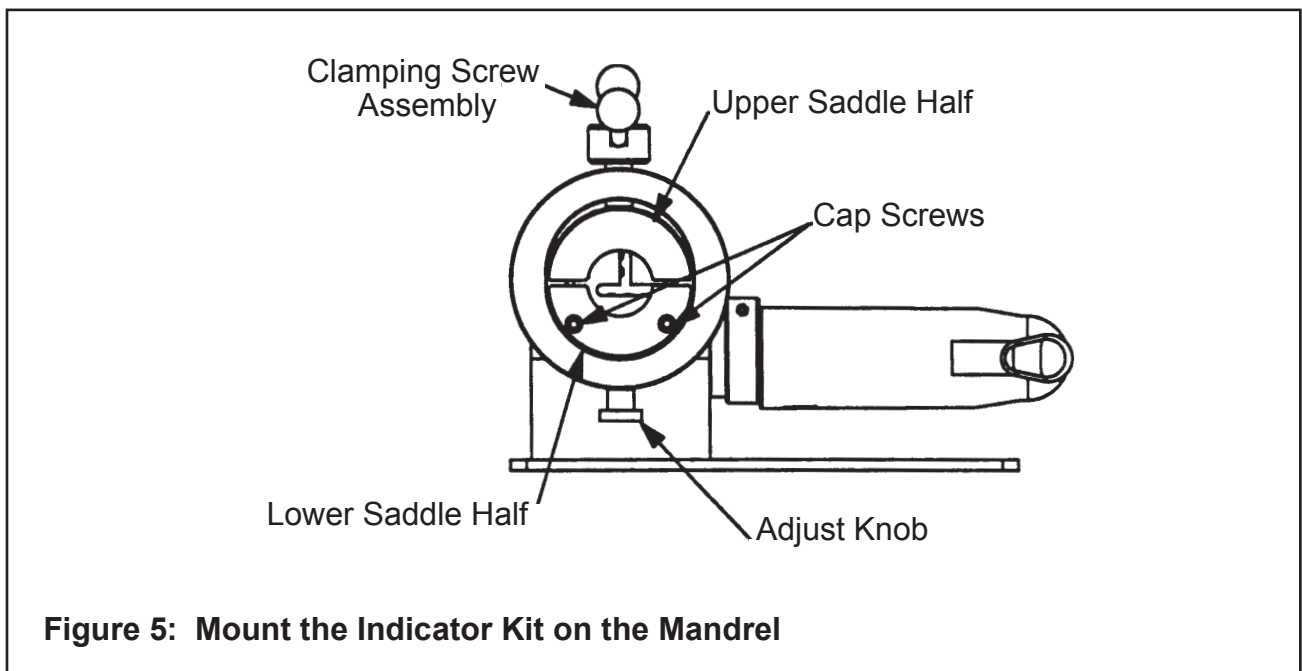


Figure 5: Mount the Indicator Kit on the Mandrel

3. Thread the adjust knob in through the bottom of the main housing and into the lower saddle half.
4. Slide the two cap screws through the front of the lower saddle half and into front of the main housing and tighten.
5. Place the upper saddle half into the front of the main housing.
6. Thread the shoulder screw into the top of the upper saddle half.
7. Back the clamping screw assembly out until the upper half of the saddle comes in contact with the main housing.

Machining Sequence

1. Place the pipe or tube into the saddles, Refer to Fig. 5.
2. Make sure there is a clearance of 1/8" (3 mm) between the tool bit(s) and the pipe or tube face as held by the saddles.
3. Tighten the upper saddle by turning the clamping screw assembly to secure the pipe or tube once the proper clearance has been verified.

Operation Sequence

1. Connect the proper power supply.
2. Depress the motor trigger. Refer to Fig. 6.

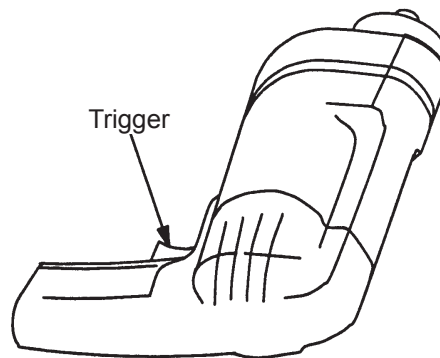
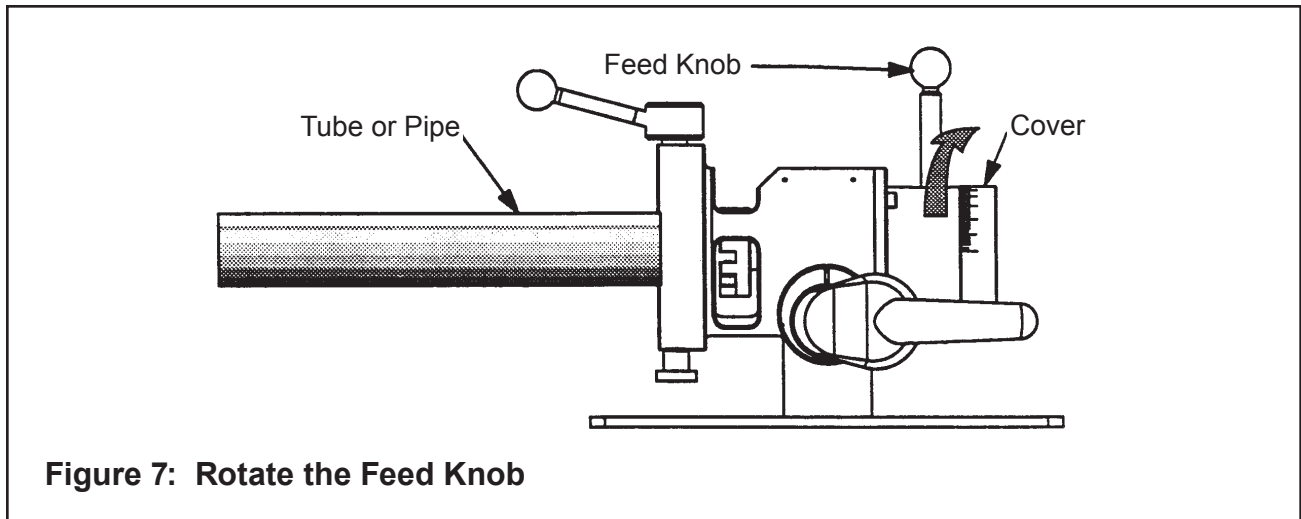


Figure 6: Trigger Location

3. Control and maintain constant cutting speed. Refer to section 7, Cutting Speeds and Feeds.
4. Rotate the feed knob clockwise to bring the cutting head and end of the tube or pipe closer together. Refer to Fig. 7. Each line on the cover represents .001" (.025 mm) of feed travel. The machining operation begins when the tool bit contacts the tube or pipe.



- If the tube or pipe end is not square to the tube or pipe axis, the tool bit will contact only a small segment of the tube or pipe during each revolution.
 - To avoid tool bit damage, use a very slow feed rate until the tool bit contacts the tube or pipe continually during at least one revolution.
5. Continue rotating the feed knob clockwise until the end of the tube or pipe is completely machined. Do not let the tool bit(s) cut into the saddle.
 6. Discontinue the feed and allow the cutting head to rotate one to three more revolutions to improve the finish of the prep surface.
 7. Rotate the feed knob counterclockwise to separate the cutting head and the tube or pipe.
 8. Stop the tool rotation.
 9. Release the trigger on the motor.
 10. Rotate the feed knob counterclockwise until the cutting head clears the tube or pipe by at least 1/8" (3 mm) or more.
 11. Loosen the upper saddle to release the tube or pipe.

7. CUTTING SPEEDS AND FEEDS

True DIA	RPM for 200 in/min (5080 mm/min)	RPM for 250 in/min (6350 mm/min)	RPM for 300 in/min (7620 mm/min)
.250" (6.4 mm)	255	318	382
.375" (9.5 mm)	170	212	255
.500" (12.7 mm)	127	159	191
.750" (19.1 mm)	85	106	127
1.00" (25.4 mm)	64	80	95
1.25" (31.8 mm)	51	64	76
1.50" (38.1 mm)	42	53	64
2.00" (50.8 mm)	32	40	48

*Cutting Speeds are approximate.

Use 200 surface inches per minute (5080 surface millimeters per minute) for:

- Stainless steels in general when no coolant is allowed, all heavy-wall tube and some chrome/molybdenum steels.

Use 250 surface inches per minute (6350 surface millimeters per minute) for:

- Mild steels and some thin wall stainless steels when coolants are permitted and applied.

Use 300 surface inches per minute (7620 surface millimeters per minute) for:

- Aluminum and thin-wall mild steel and tube with coolants.

8. SADDLE SETS

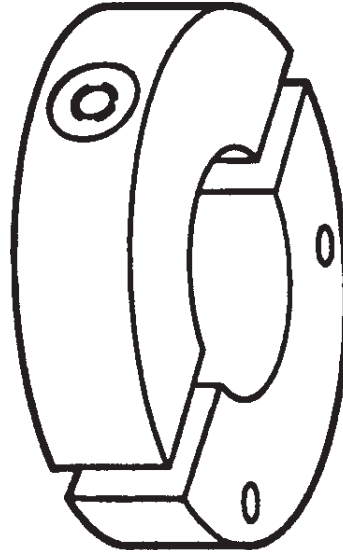
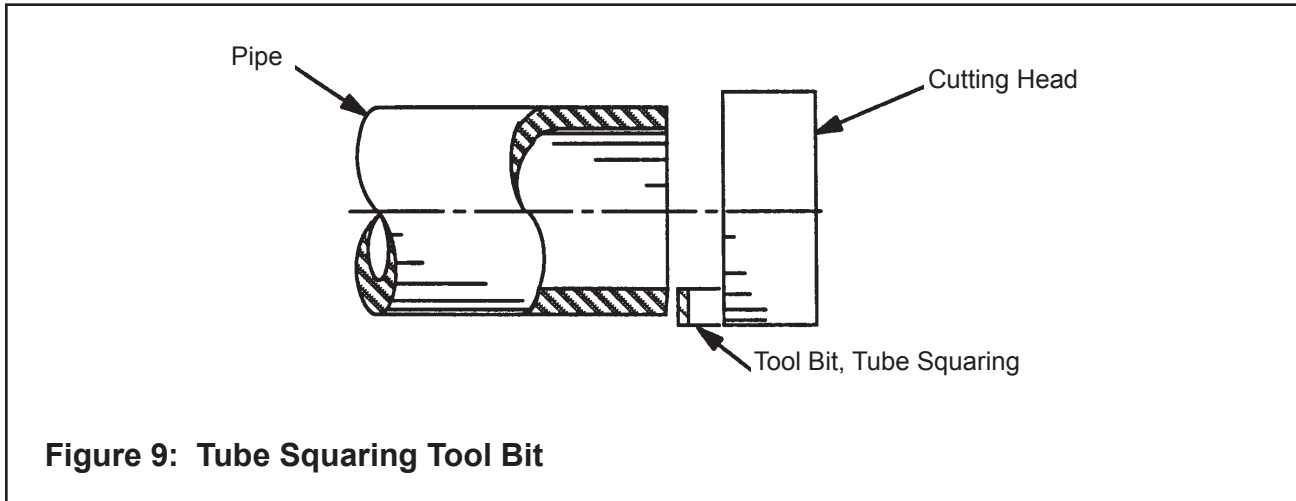


Figure 8: Saddle Sets

SADDLE SET PART NUMBERS			
Fraction	Decimal	Metric	Saddle P/N
1/4"	.250"	6.4 mm	67-3523
3/8"	.375"	9.5 mm	67-3532
1/2"	.500"	12.7 mm	67-3545
3/4"	.750"	19.1 mm	67-3567
1"	1.000"	25.4 mm	67-3582
1 1/4"	1.250"	31.8 mm	67-3589
1 1/2"	1.500"	38.1 mm	67-3598
2"	2.000"	50.8 mm	67-3612
2 3/8"	2.375"	60.3 mm	67-3619

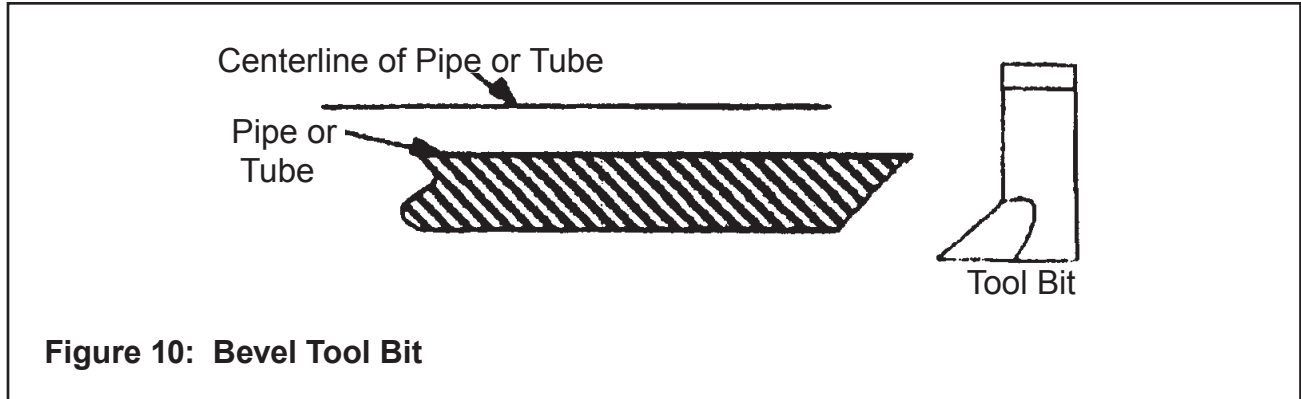
The Saddles are made of Stainless Steel
 If you need a size that is not listed, please contact Tri Tool, Inc.

9. TOOL BITS

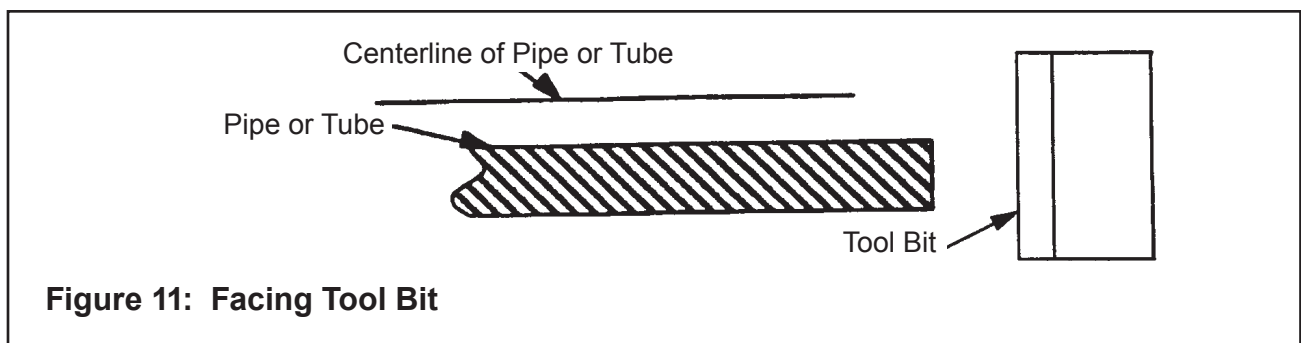


TOO BIT PART NUMBERS				
Range	Max Wall Thickness	Pipe or Tube Material	Tool Bit Height	Squaring Tool Bit P/N
.187" OD thru 2.00" OD (4.8 mm OD thru 50.8 mm OD)	.200" (5.1 mm)	CS	.750" (19.1 mm)	99-1480
.187" OD thru 2.00" OD (4.8 mm OD thru 50.8 mm OD)	.200" (5.1 mm)	SS	.750" (19.1 mm)	DURABIT 1
.187" OD thru 2.00" OD (4.8 mm OD thru 50.8 mm OD)	.200" (5.1 mm)	SS	.750" (19.1 mm)	DURABIT 1
.187" OD thru 2.00" OD (4.8 mm OD thru 50.8 mm OD)	.200" (5.1 mm)	Inconel	.750" (19.1 mm)	99-3650*

*M42



Bevel Range	Max Wall Thickness	Pipe or Tube Material	Bevel Angle	Bevel Tool Bit P/N
.187" OD thru 1.00" OD (4.8 mm OD thru 25.4 mm OD)	.200" (5.1 mm)	SS	37.50°	99-0210
.100" OD thru 2.38" OD (25.4 mm OD thru 60.5 mm OD)	.200" (5.1 mm)	SS	37.50°	99-0276
.187" OD thru 1.00" OD (4.8 mm OD thru 25.4 mm OD)	.200" (5.1 mm)	CS	45°	99-5085
.100" OD thru 2.38" OD (25.4 mm OD thru 60.5 mm OD)	.200" (5.1 mm)	SS	45°	99-5994



Facing Range	Max Wall Thickness	Pipe or Tube Material	Tool Bit Height	Facing Tool Bit P/N
.187" OD thru 2.00" OD (4.8 mm OD thru 50.8 mm OD)	.200" (5.1 mm)	CS	.625" (15.9 mm)	99-1406
.187" OD thru 2.00" OD (4.8 mm OD thru 50.8 mm OD)	.200" (5.1 mm)	SS	.625" (15.9 mm)	99-1406

10. TROUBLESHOOTING

Problem: Tool Bit Chatters

- The tool bit is loose or overextended.
 - The tool bit is damaged.
 - The tool holder is too loose in the slides.
 - The cutting speed is too fast.
 - The clamping pads are loose on the pipe or tube.
 - Cutting fluid is required.
 - The main bearing pre-load is loose.
-

Problem: Excessive Tool Bit Wear

- The pipe or tube material is too hard or abrasive.
 - The cutting speed is too fast.
 - Cutting fluid is required.
 - A dull Tool Bit is causing surface hardening conditions (Stainless pipe or tubing).
 - There is scale or other foreign matter on the pipe or tube, which is dulling the tool bit at the start of the cut.
 - The tool bit is incorrect for the material being cut.
-

Problem: Rough Surface Finish

- The tool bit is dull, chipped, etc.
 - Metal build-up on the cutting edge of the tool bit is creating a false cutting edge.
 - Cutting fluid is required.
 - The cutting speed is incorrect.
-

Problem: Tool Holder is not Feeding

- The feed pin is broken or out of position.
 - The feed sprocket shear pin is broken.
 - The feed screw is stripped.
 - The feed nut is stripped.
 - The slide rails are too tight.
-

Problem: Loss of Air Power

The air supply pressure is too low.

The air filter is plugged.

The air line size is insufficient.

The air line is too long.

Problem: Tool Bit does not Reach the Work

Incorrect tool blocks are installed for the size of the pipe or tube being worked on.

Incorrect tool bit is installed.

Problem: Air Motor does not Start

The air power supply is shut off.

The air motor is damaged and will not run free.

The air motor needs lubrication.

Add lubrication and do not run the air motor for a few minutes, then try running the motor.

Tap on the side of the air motor casing lightly with a piece of wood or with a soft rubber mallet just in case the vanes may be sticking.

Sand or other foreign material may be in the vanes of the air motor.

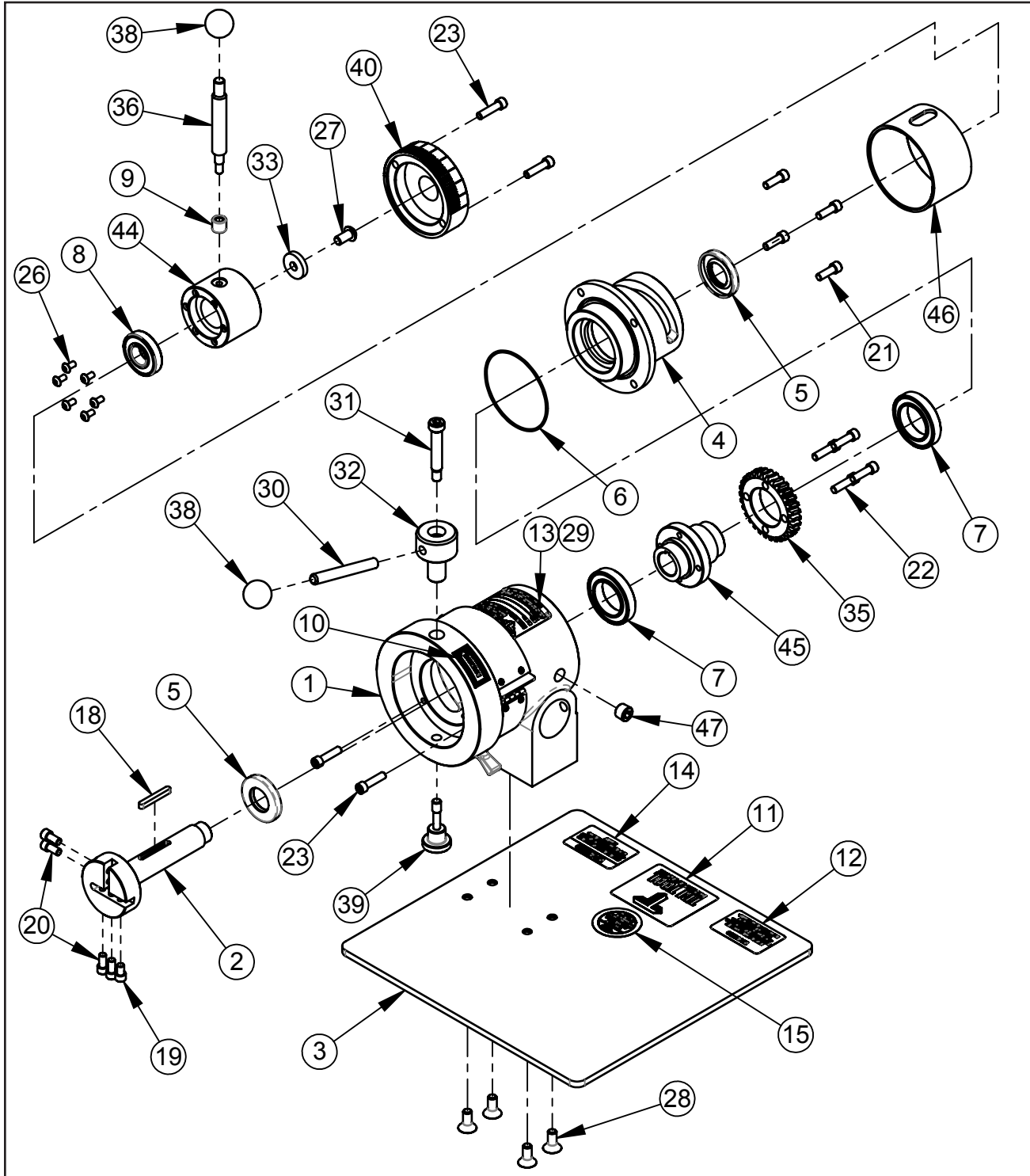
Problem: Electric Motor does not Start

The air power supply is shut off.

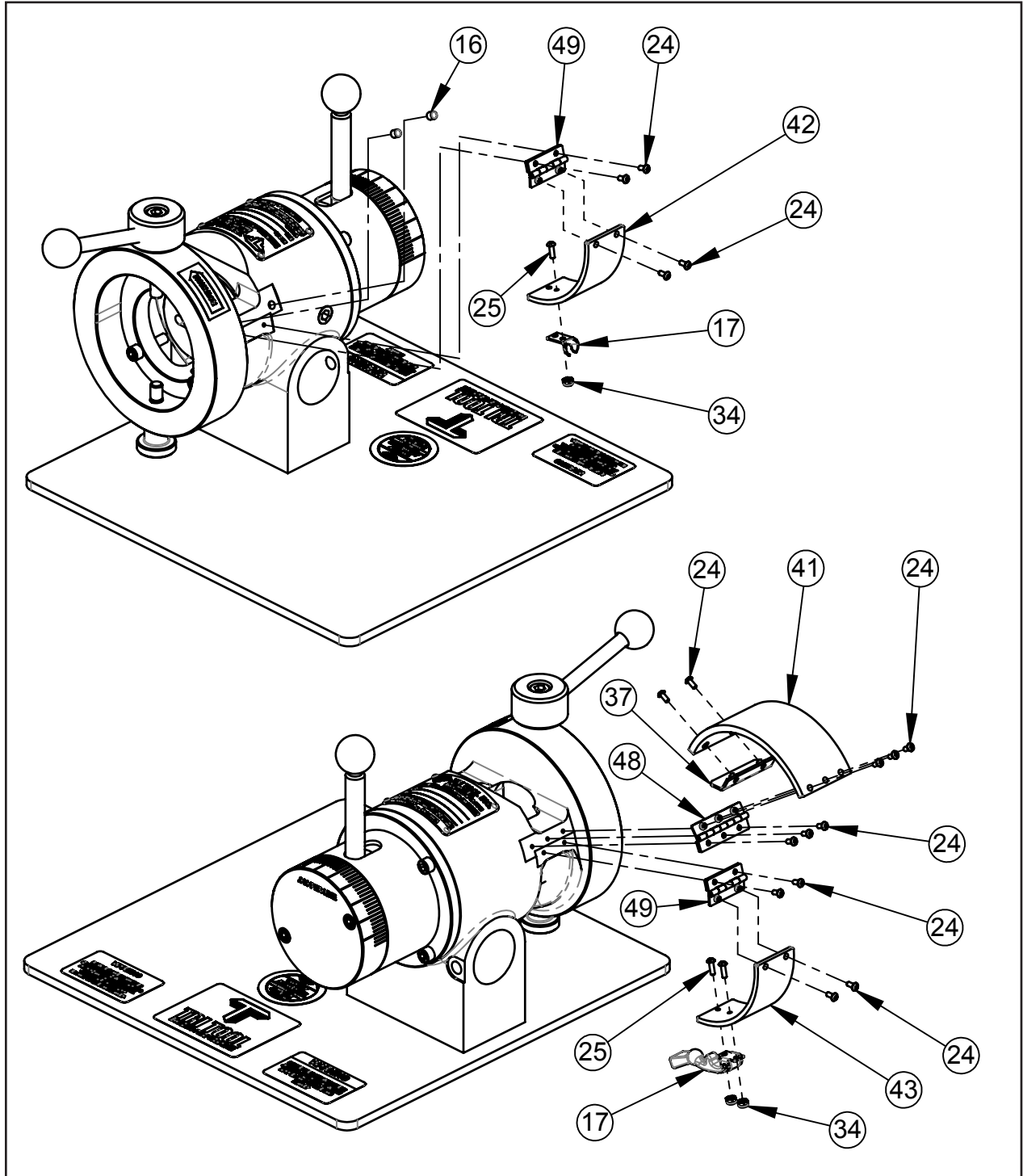
The air motor is damaged and will not run free.

11. ILLUSTRATED PARTS BREAKDOWN

MODEL 302, TUBE SQUARING MACHINE SUB-ASSY (P/N 02-2174) (1 OF 2)



MODEL 302, TUBE SQUARING MACHINE SUB-ASSY (P/N 02-2174) (2 OF 2)



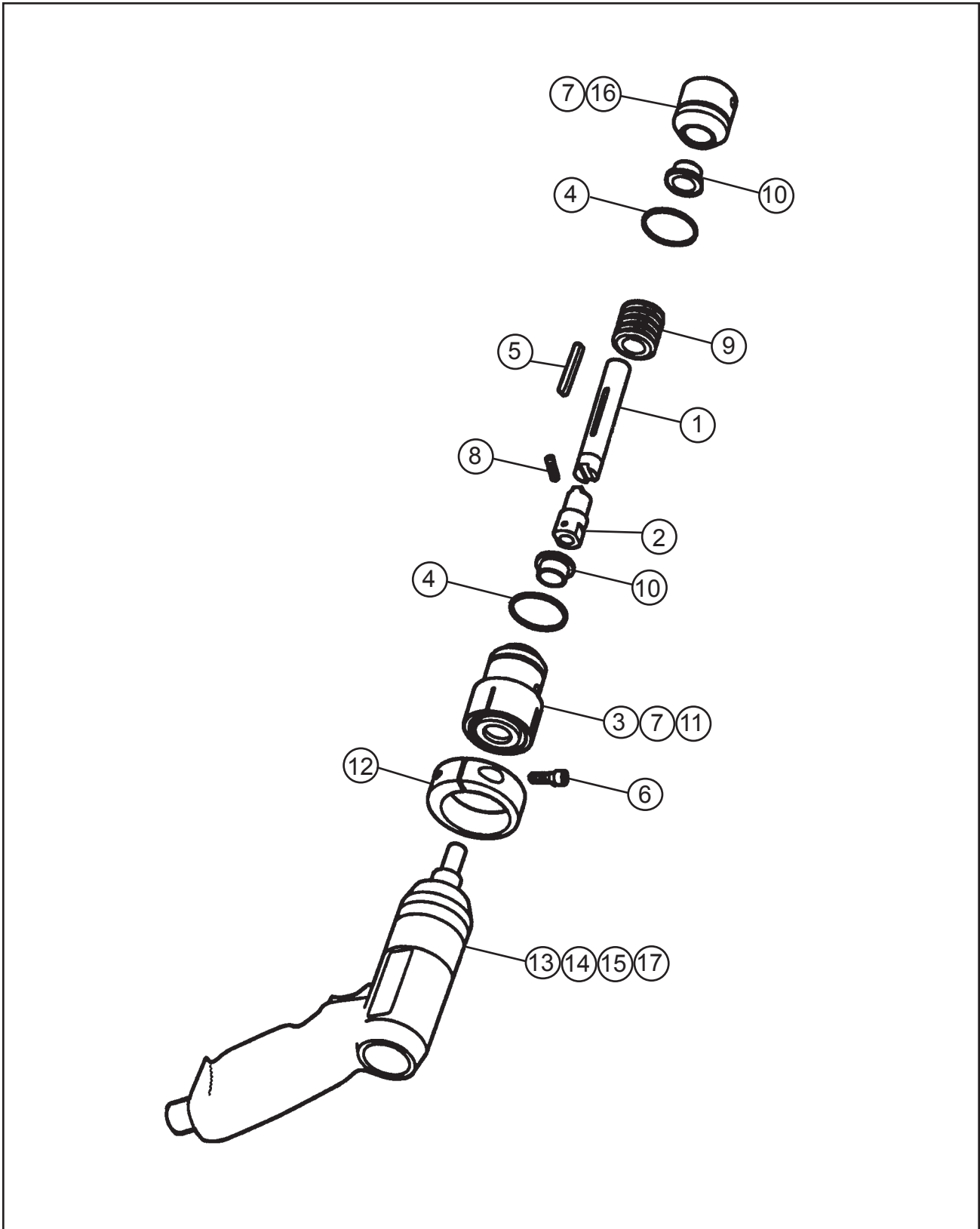
Parts List, Model 302 Tube Squaring Machine Sub-Assy (P/N 02-2174)

Item No	Part No.	Description	Qty
1.	19-0660	HOUSING, MAIN	1
2.	20-0561	SHAFT, FEED	1
3.	24-1256	PLATE, MOUNTING	1
4.	27-0455	ADAPTER, FEED	1
5.	28-0231	SEAL, 7/8" I.D. X 1 3/4" O.D. X 1/4"	2
6.	28-0234	O-RING, 2.989" D. X .070" W.	1
7.	29-0011	BEARING, BALL, 1 5/16" X 2 1/16" X 7/16"	2
8.	29-0020	BEARING, BALL, 3/4" X 1 5/8" X 7/16"	1
9.	29-0311	BEARING, ROLLER, 5/16", X 1/2", X 7/16" LONG	1
10.	30-0105	LABEL, "ROTATION"	1
11.	30-0483	LABEL, LOGO, SMALL	1
12.	30-0508	LABEL, "WARNING DISCONNECT"	1
13.	30-0924	PLATE, DATA	1
14.	30-0961	LABEL, WARNING, SAFETY SWITCH	1
15.	30-2061	LABEL, TRI TOOL	1
16.	30-6120	MAGNET, 5 MM DIA. X 5 MM	2
17.	30-6530	LATCH, DRAW, RUBBER PULL HANDLE	1
18.	31-0142	KEY, 3/16" SQ. X 1 1/2"	1
19.	33-0037	SCREW, CAP, 1/4 - 20 X 3/8"	1
20.	33-0038	SCREW, CAP, 1/4 - 20 X 1/2"	4
21.	33-0040	SCREW, CAP, 1/4 - 20 X 3/4"	4
22.	33-0041	SCREW, CAP, 1/4 - 20 X 7/8"	4
23.	33-0042	SCREW, CAP, 1/4 - 20 X 1"	4
24.	33-0265	SCREW, BUTTON, #4 - 40 X 1/4"	16
25.	33-0266	SCREW, BUTTON, #4 - 40 X 3/8"	3
26.	33-0278	SCREW, BUTTON, #10 - 24 X 3/8"	6
27.	33-0292	SCREW, BUTTON, 5/16 - 18 X 5/8"	1
28.	33-0369	SCREW, FLAT, 5/16 - 18 X 3/4"	4
29.	33-0995	SCREW, DRIVE, #2 X 3/16"	4
30.	33-1424	STUD, HANDLE	1

Parts List, Model 302 Tube Squaring Machine Sub-Assy (P/N 02-2174)

Item No	Part No.	Description	Qty
31.	33-1440	SCREW, SHOULDER, 3/8" X 1 3/4"	1
32.	33-1839	SCREW ASSY., ADJUST	1
33.	34-0278	WASHER, CAPTURE	1
34.	35-0253	NUT, LOCK, #4 - 40	3
35.	39-0725	GEAR, WORM	1
36.	41-0106	HANDLE, FEED	1
37.	41-1133	HANDLE ASSY., LATCH	1
38.	42-0076	KNOB, BALL	1
39.	42-0143	KNOB, ADJUST	1
40.	43-0426	COVER	1
41.	43-1248	COVER, GUARD WINDOW	1
42.	43-1249	COVER # 1, GUARD	1
43.	43-1250	COVER # 2, GUARD	1
44.	44-0417	SPACER, FEED	1
45.	46-0384	SLEEVE, DRIVE	1
46.	46-0385	SLEEVE, FEED	1
47.	54-0374	PLUG, PRESSURE, 1/4" NPT	1
48.	71-0626	WELDMENT, HINGE, GUARD WINDOW	1
49.	71-0627	WELDMENT, HINGE, GUARD COVER	2
	NOT SHOWN		
	36-0021	WRENCH, T, 3/16" HEX	1
	86-0199	CASE, CARRYING	1

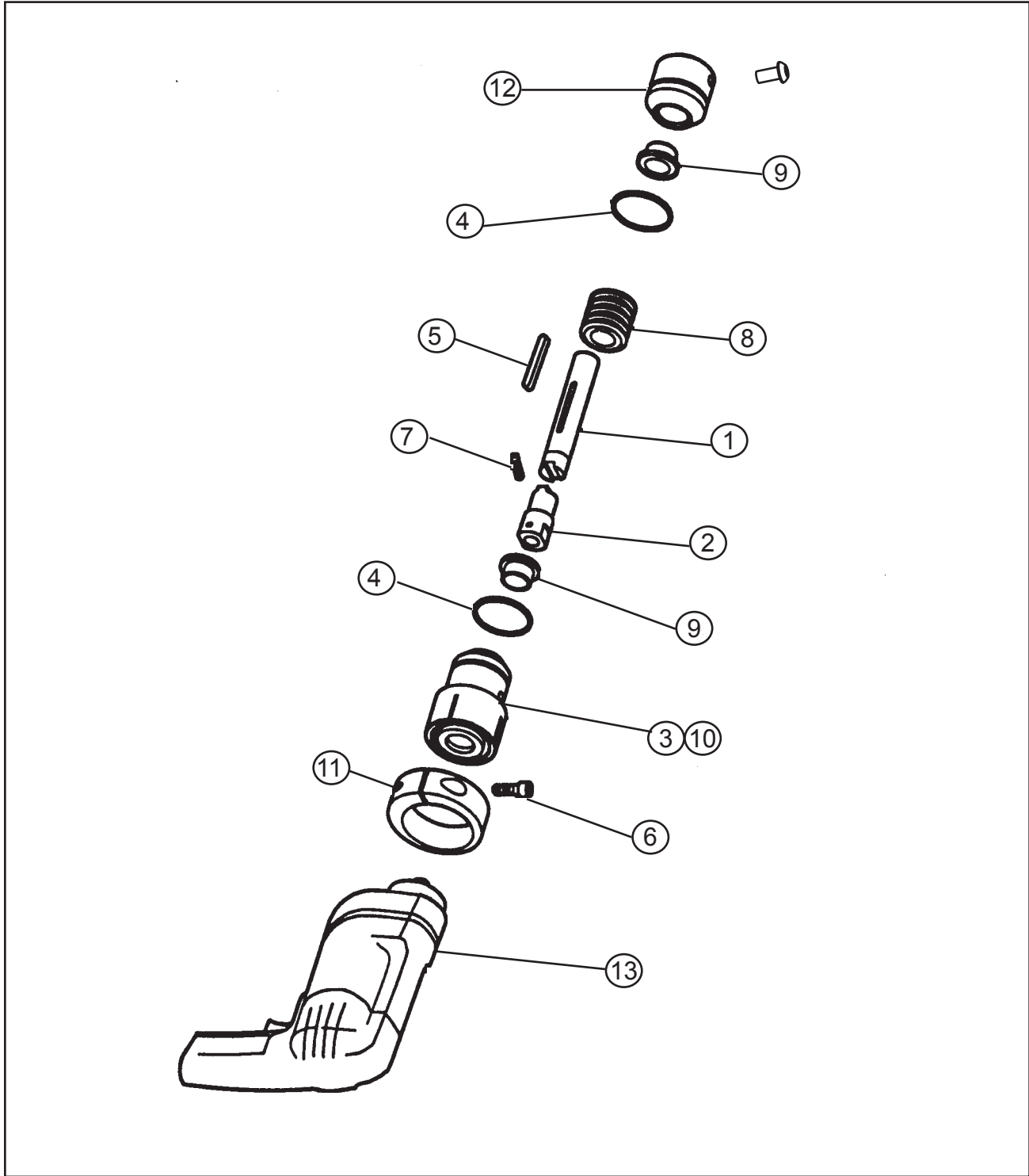
MOTOR ASSEMBLY, AIR, 302A (P/N 57-0213)



Parts List, Motor Assembly, Air, 302A (P/N 57-0213)

Item No	Part No.	Description	Qty
1.	20-0617	SHAFT, DRIVE	1
2.	20-0618	SHAFT, DRIVE, 3/8-24 UNF	1
3.	28-0218	SEAL, GREASE	1
4.	28-0233	O-RING	2
5.	31-0115	KEY, ROUND ENDS	1
6.	33-0041	SCREW, CAP, 1/4-20 X 7/8"	1
7.	33-0292	SCREW, BUTTON, 5/16-18 X 5/8"	2
8.	33-0619	SCREW, SET, #10-32 X 1/4", CUP PT	1
9.	39-0005	WORM	1
10.	45-0221	BUSHING, FLANGE, 5/8" ID	2
11.	46-0390	SLEEVE, MOTOR, AIR	1
12.	47-0919	BRACKET, CLAMP	1
13.	53-0045	VALVE, FLOW CONTROL, 1/4" NPT	1
14.	54-0149	COUPLING, MALE, QD, HOSE TO PIPE	1
15.	54-0201	CAP, YELLOW	1
16.	54-0347	PLUG	1
17.	57-0212	MOTOR, AIR, PISTOL GRIP	1

**MOTOR ASSEMBLY, ELECTRIC 110V (P/N 58-0184)
AND 220V (P/N 58-0080)**



Parts List, Motor Assembly, Metabo, 110 VAC (P/N 58-0301)

Item No	Part No.	Description	Qty
1.	20-0617	SHAFT, DRIVE	1
2.	20-0619	SHAFT, DRIVE	1
3.	28-0245	SEAL, GREASE	1
4.	28-0233	O-RING	2
5.	31-0115	KEY, ROUND ENDS	1
6.	33-0041	SCREW, CAP, 1/4-20 X 7/8"	1
7.	33-0619	SCREW, SET, #10-32 X 1/4", CUP PT	2
8.	39-0005	WORM	1
9.	45-0258	BUSHING, FLANGE, 5/8" ID	2
10.	46-0411	SLEEVE, MOTOR	1
11.	47-1111	BRACKET CLAMP	1
12.	54-0347	PLUG	1
13.	58-0277	MOTOR, C.W.ELEC., METABO, 110V	1
	NOT SHOWN		
	33-0292	SCREW, BUTTON, 5/16-18 X 5/8"	REF

Parts List, Motor Assembly, Electric, 220 VAC (P/N 58-0412)

Item No	Part No.	Description	Qty
1.	20-0617	SHAFT,DRIVE	1
2.	20-1468	SHAFT,DRIVE	1
3.	28-0245	SEAL,GREASE,.875"ID	1
4.	28-0233	O-RING,1.364"ID X .070"W	2
5.	31-0115	KEY,1/8"SQ X 15/16, BOTH ENDS ROUND	1
6.	33-0041	SCREW,CAP,1/4-20 X 7/8	1
7.	33-0619	SCREW,SET,10-32 X 1/4 CUP PT	2
8.	39-0005	WORM,RH,12DP 4T,1.00PD	1
9.	45-0258	BUSHING.FLG,5/8"ID"	2
10.	46-0411	SLEEVE,MOTOR	1
11.	47-1111	BRACKET,CLAMP	1
12.	54-0347	PLUG	1
13.	58-0321	MOTOR,C.W.ELEC,METABO,220V	1
	NOT SHOWN		
	33-0292	SCREW, BUTTON, 5/16-18 X 5/8"	2



WARNING



Read the manual and be familiar with all safety precautions before operating equipment. The following are general warnings for industrial equipment with moving parts. Refer to the manual for specific warnings applicable to your equipment.



EYE HAZARD - Always wear appropriate eye protection while operating the equipment.



PINCH HAZARD - Keep your hands and clothing away from moving parts.



CRUSH HAZARD - The machinery, pipe, or work piece can shift, separate, lurch, or fall.



CHIP HAZARD - Metal chips may be hot and sharp. Be careful when you clear the tooling path or clean up chips.



TIE DOWN HAZARD - Deliberate overriding of safety triggers can result in serious injury. Never lock or tie down any safety triggers.



SHOCK HAZARD - Ensure that the equipment is properly installed and grounded. Ensure that the equipment is not damaged and that the power cord is intact.

OTHER HAZARDS

- Tool bits are sharp and can cause serious injury.
- Do not defeat or modify safety features.
- Disconnect power sources before servicing or moving the equipment.
- Remove all loose articles of clothing and jewelry before operating the equipment.

Be Safety Conscious!



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