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SAFETY PRECAUTIONS

IN GENERAL:

When using rotating head cutting equipment, basic safety precautions should always be followed to reduce the risk of personal injury.

Operate this tool only in accordance with specific operating instructions.

WARNING:

Do not override the deadman switch on the power unit. Locking down, obstructing, or in any way defeating the deadman switch on the power drive unit may result in serious injury.

DRESS CONSIDERATIONS:

Use standard safety equipment. Hard hats, safety shoes, safety harnesses, protective clothes, and other safety devices should always be used when appropriate.

Use safety glasses. Do not operate cutting tools without eye protection.

Dress properly. Do not wear loose clothing or jewelry. They can get caught in rotating and moving parts. Avoid slippery floors or wear nonskid footwear. If you have long hair, wear protective hair covering to contain it.

WORK AREA:

Keep the work area clean. Cluttered work areas and benches invite injuries.

Consider the work area environment. Keep the area well lit. Keep electrical cords, cables, rags, rigging straps, etc. clear of rotating equipment. Do not use power cutting tools in the presence of flammable liquids and gasses.

Keep visitors away. Do not let visitors or untrained personnel near operating tools.

Enforce eye protection requirements for all observers.

Do not over reach. Keep proper footing at all times.

Stay alert. Watch what you are doing. Use common sense. Do not operate tools when you are tired.

TOOL CARE:

Maintain tools with care. Keep tools in good operating condition. Sharp tool bits perform better and safer than dull tool bits. Well maintained tools function properly when needed.

Check for damaged parts. If a tool has malfunctioned, been dropped or hit, it must be checked for damage. Run no-load tests and feed function checks. Do a complete visual inspection.

Electric motors. Use only with proper AC voltage power sources and observe all normal electric shock hazard procedures.

Do not abuse power and control cords. Pulling or running over cords and cables can result in electrical shock hazards and malfunctions. Keep control and power cords out of all cutting fluids and water.

Hydraulic drives. Observe proper procedures for electrically driven power sources. Avoid damage to hydraulic lines. Keep quick-disconnects clean. Grit contamination causes malfunctions.

Air tools. Check the exhaust muffler. Broken or damaged mufflers can restrict air flow or cause excessive noise. Use air motors only with a filtered, lubricated and regulated air supply. Dirty air, low pressure air or over pressure air will cause malfunctions, including delayed starting.

AREA EQUIPMENT:

Secure work. Whenever possible use clamps, vises, chains and straps to secure pipe.

Make sure the tool is secured, it is safer to have both hands free to operate the tool.

TOOL USE:

Use the right tool and tool bit for the job. Do not use a tool which is incorrect for the job you are doing.

Keep the tool bits fully engaged in the tool bit holders. Loose bits are a safety hazard.

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.

Develop a habit of checking 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 feed and speed rate for which they were designed.

Do not reach into rotating equipment. Do not reach into the rotating headstock to clear chips, to make adjustments, or to check surface finish. A machine designed to cut steel will not stop for a hand or an arm.

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

Avoid unintentional starts. Do not carry or handle tools with your hand on the operating switches or levers. Do not lay the tool down in a manner which will start the drive. Do not allow the tool to flip around or move when adjusting or changing tool bits. Store idle tools properly.

Disconnect tools from the power source and store in a safe place. Remove tool bits for safe handling of the tool.

GENERAL DESCRIPTION

The Model 202TS™ Tube Sheet Cutter is an ID Mount Machine tool for facing and chamfering the ends of tubing and tube sheet bores in preparation for welding and finish squaring.

Design and Operation Features:

1. The lathe accepts it's own torque through the mandrel.
2. The expanding mandrel provides fast, accurate self-centering and alignment.
3. All wrenches needed for operation are provided with the system.
4. The lathe, at less than 17 lbs. (7.7 Kg), is light weight and is easily handled by one operator.
5. Pneumatic Clamping System.
6. Mandrel shaft seal to keep coolants out of the gears.
7. Heat treated mandrel mounting blocks for maximum life and secure mounting.
8. Stops, adjustable, to set mounting and/or cut depth.
9. Hoist ring for attachment to an overhead balancer.

MACHINE SPECIFICATIONS

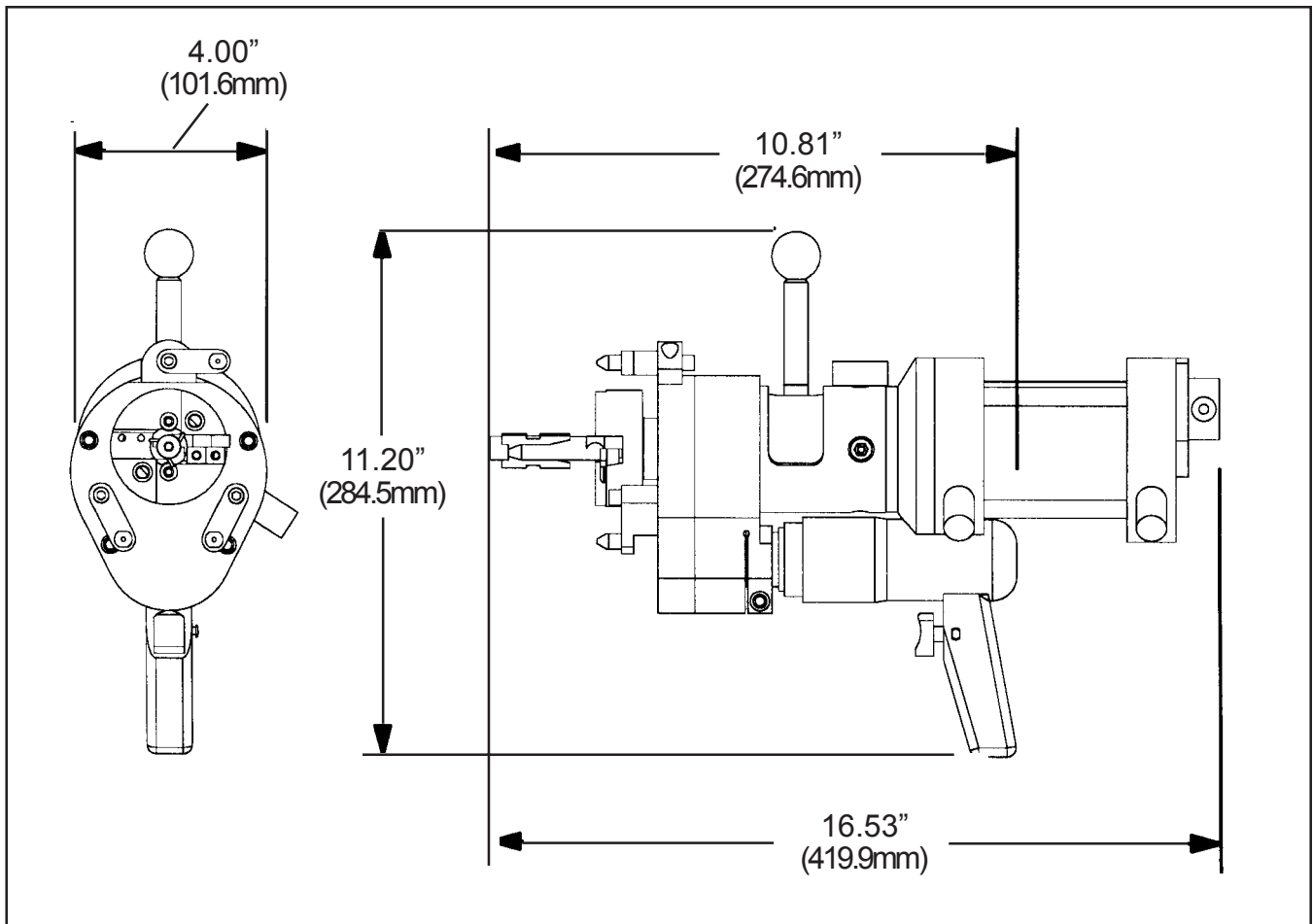
IN GENERAL:

The Tube Sheet Cutter has been designed for quick and easy repetition cutting of a tube sheet.

IN SPECIFIC:

Feed Travel: .56" (14.2 mm)
Weight: 16.5 lbs (7.5 kg)
Power requirement: 55 cfm at 90 psi 26 L/s at 621 kPa
Pipe range: Maximum O.D. of 2.00" (50.8mm) and
Minimum I.D. of .77" (19.6mm)

Optional Small Mandrel: Minimum ID of .50" (12.7mm)
Maximum ID of .78" (19.8mm)



MAINTENANCE

IN GENERAL:

All components should be cleaned and coated with a light film of oil prior to use. Use a clean, non detergent oil, preferably SAE 10 (90 SSU) or lighter.

The air supply for the Tube Sheet Cutter should include all adequate filter, regulator and lubricator (FRL).

NOTE:

The motor warranty is void if damage occurs from contaminated air or lack of lubrication.

If the Tube Sheet Cutter is operated in the vertical position (cutting head up), it should be turned upside down and the chips and/or other debris removed after each bevel has been completed.

NOTE:

Tool life may be severely shortened, unless chips and/or debris, that have been deposited on the cutting head during the machining operation, are removed.

Bearings and gears are to be lubricated using "Chevron Ultra-Duty NLGI 2 Grease" or equivalent.

Air Motor lubrication:

NOTE:

Disassembly of a power unit voids warranty, except when performed by TRI TOOL Inc. designated repair technician. (Letter of designation is required).

No direct maintenance is normally required on the air motor.

However, 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 upon the basic air supply) to keep the water trap drained, filter cleaned and the lubricator oil reservoir filled so that a drop of oil is flowing every 2 to 5 seconds..

If the Tube Sheet Cutter is to be left idle for 24 hours or more after being run on 'wet' air, it is advisable to squirt oil directly into the air motor inlet and run the motor for 2 to 3 seconds.

This will prevent rusting and 'freezing' of the rotor vanes.

Lubricant recommendations:

The air motor requires Class 2 lubricant, viscosity of 100 to 200 SSU at 100° F (38°C) minimum aniline point of 200° F (93°C).

TRI TOOL Inc. - Air Tool Lubricant (P/N 68-0022)

AMACO - American Industrial Oil No. 32
Atlantic Richfield - Duro Oil S - 150
Exxon - Nuto H32
Shell - Tellus Oil 32

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

OPERATION

Standard Mandrel Installation and Removal Procedure (P/N 12-0127)

INSTALLATION:

1. Select the ramp block set for the size of the tube to be machined.
2. Slide the mandrel into the tool until it bottoms out.
3. Attach the butt plate on the draw rod. Tighten the set screw on the draw rod at the flat.
4. With the draw rod in the extended position, install (1) ramp block in to each of the (3) slots on the mandrel shaft and into the matching slots in the butt plate on the draw rod.
5. Install the spring to retain the ramp blocks.

NOTE:

Depending on the ramp block set, the spring can be fed through the ramp blocks or wrapped around the ramp blocks.

6. Thread the draw rod and the mandrel together into the tool.
7. Align the holes in the mandrel with the set screw holes in the feed housing.
8. Install the cone point set screws on both sides.
9. Install the cup point set screws after the cone point set screws.
10. Back the butt plate away from the mandrel shaft to a maximum of .03" in the retracted position.

REMOVAL:

1. Remove the cup point set screws.
2. Remove the cone point set screws.
3. Unthread the draw rod from the tool.

NOTE:

The feed handle will rotate when the draw rod is being removed. The feed handle can be rotated back and forth to help in threading of the mandrel from the tool. If the ramp blocks are attached to the mandrel, unthread the mandrel and the draw rod at the same time.

4. After the draw rod is loose and no longer threaded into the tool, pull the mandrel out of the tool.

Optional Small Mandrel Installation and Removal Procedure (P/N 06-0450)

INSTALLATION:

1. Slide the mandrel into the tool unit until it bottoms out.
2. Thread the draw rod into the tool.
3. The draw rod will thread up to the mandrel.
4. Rotate the feed handle to its full range and back. This will pull the mandrel into the tool.
5. Repeat steps 3 and 4 until the mandrel and draw rod are fully installed.
6. Back the draw rod away to a maximum of .03" between the butt plate on the draw rod and the mandrel.
7. Align the holes in the mandrel with the set screws holes in the feed housing.
8. Install the cone point set screws on both sides.
9. Install the cup point set screws after the cone point set screws.
10. Slide the seal block up to the head.
11. Install (2) 10-24 x 1/4" button head screws into head, to secure the seal block.
12. Actuate the air cylinder for the draw rod to be in extended position.
13. Select the ramp block set for the size of the tube to be machined.
14. Install (1) ramp block into each of the (3) slots on the mandrel shaft and into the matching slots in the butt plate on the draw rod.
15. Install the spring to retain the ramp blocks.

REMOVAL:

1. Remove the cup point set screws.
2. Remove the cone point set screws.

3. Remove the spring and the (3) three ramp blocks.
4. Remove (2) 10-24 x 1/4" button head screws that secure the seal block to the head.
5. Unthread the draw rod from the tool.

NOTE:

The feed handle will rotate when the draw rod is being removed. For ease of removal, the feed handle can rotate back and forth to help the unthreading of the draw rod.

6. After the draw rod is loose and no longer threaded into the tool, pull the mandrel out of the tool.

Install the Tool Bits:

Select the tool bit(s) to do the required machining.

NOTE:

The use of dull 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 voids the TRI TOOL Inc. factory warranty

Insert the tool bit(s) into the slot with the cutting edge located on the radial centerline.

Tighten the (2) two wedges to secure each tool bit in it's slot.

SETUP:

Adjust the stop pins so that the tool bit will rest about .05" (1.3mm) back from the maximum height tube to be machined.

If a pre-determined stop point is desired, loosen the locking screw and rotate the outer sleeve to the desired position.

Tighten the locking screw.

Position the three set screws so they rest at the same height and location between the tubes on the tube sheet.

INSTALLATION:

Reduce the diameter of the mandrel ramp blocks by actuating the 4-way air valve.

NOTE:

Check that all (3) three stop pins are resting on the tube sheet and that the tool bit(s) is not in contact with the tube.

Actuate the air valve to expand the mandrel ramp blocks out to contact the inside diameter of the tube.

CAUTION: Make sure the lever on the air valve is thrown all of the way when the mandrel is expanded to prevent the air valve from releasing during the machining sequence.

MACHINING SEQUENCE:

Turn the air motor on by pulling the trigger on the air motor.

Feed the tool bit in by rotating the feed knob.

When the tube has been machined, retract the feed knob.

Turn the air motor off by releasing the trigger.

CUTTING SPEEDS:

Outside Dia		RPM for 200 in / min (508 cm / min)	RPM for 250 in / min (635 cm / min)	RPM for 300 in / min (762 cm / min)
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 Speed (Approximately)				

Use 200 surface inches per minute (508 surface centimeters per minute) for: Stainless steels in general when no coolant is allowed, all heavy-wall tube and some of the chrome/molybdenum steels.

Use 250 surface inches per minute (635 surface centimeters per minute) for: Mild steels and some thin wall stainless steels when coolants are permitted and applied.

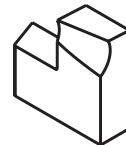
Use 300 surface inches per minute (762 surface centimeters per minute) for: Aluminum and thin-wall mild steel and tube with coolants.

RAMP SETS

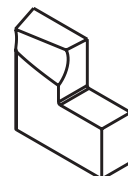
Mandrel Assembly	Ramp Set P/N	ID Range
12-0127	08-0439	.77" to 1.00" (19.6mm to 25.4mm)
12-0127	08-0440	1.00" to 1.23" (25.4mm to 31.2mm)
12-0127	08-0441	1.22" to 1.48" (31.0mm to 37.6mm)
12-0127	08-0442	1.45" to 1.72" (36.8mm to 43.7mm)
12-0127	08-0443	1.70" to 1.95" (43.2mm to 49.5mm)

TOOL BITS

99-5533 Tool Bit, Facing, Outside
1.50" ID (38.1mm) up to 2.00" OD (50.8mm)



99-5534 Tool Bit, Facing, Inside
.50" ID (12.7mm) up to 1.50" OD (38.1mm)



TROUBLE SHOOTING

Problem: The Tool Bit Chatters.

- The tool bit is loose.
- The tool bit is damaged.
- The cutting speed is too fast.
- The mandrel ramp blocks are loose in the pipe or tube.
- Cutting fluid is required.

Problem: There is 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: The surface finish is rough.

- 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: There is a 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: The air motor will 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.

ACCESSORIES

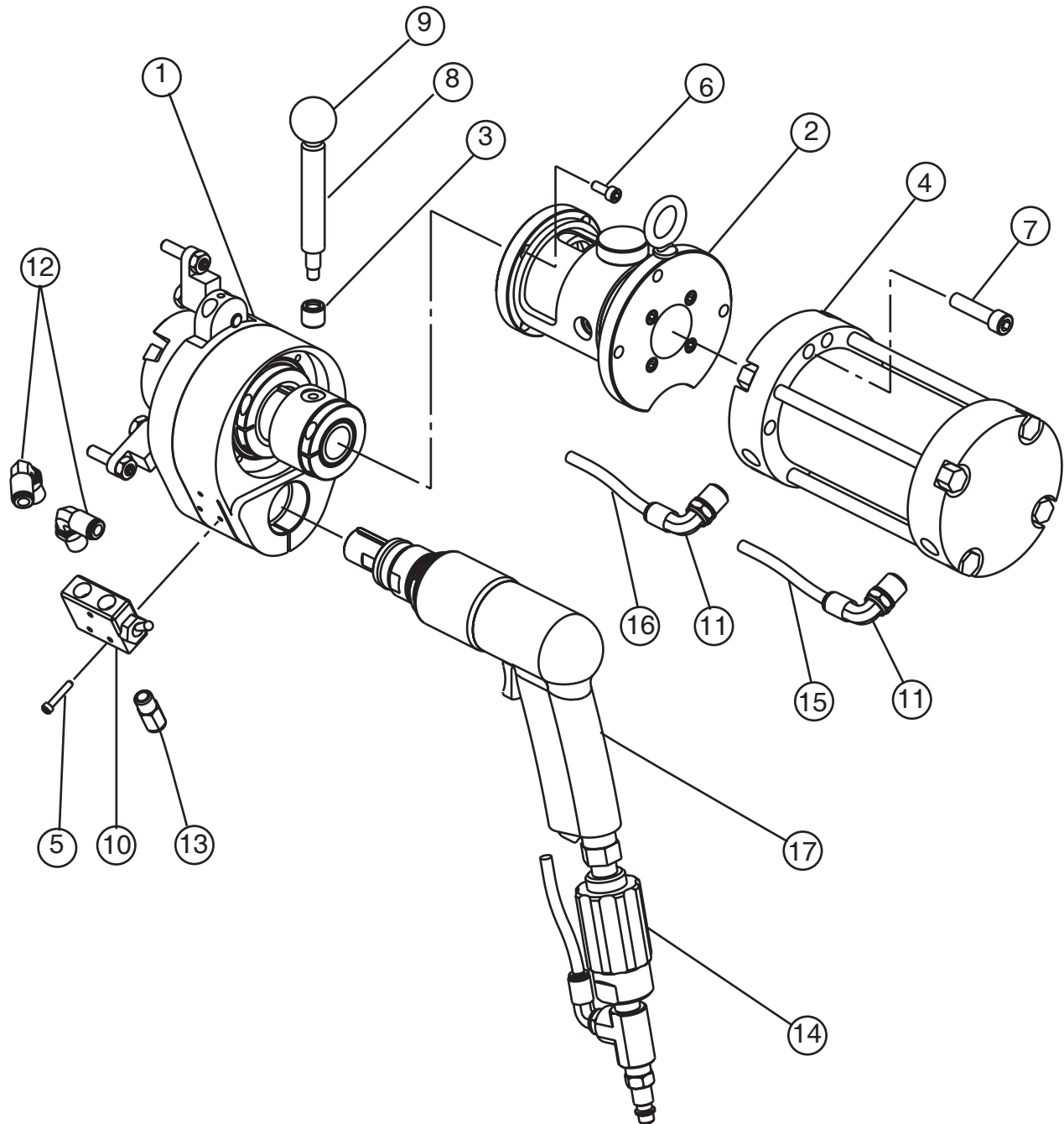
Mandrel Assembly, Small (P/N 06-0450)
.500" ID to .780" ID (12.7mm to 19.8mm)

Portable Air Filter Caddy (P/N 75-0100)

NOTE: A FRL is required to protect the warranty on all TRI TOOL Inc. Air Driven Tools.

ILLUSTRATED PARTS BREAKDOWN

202TS Sub Assembly (P/N 02-2298)

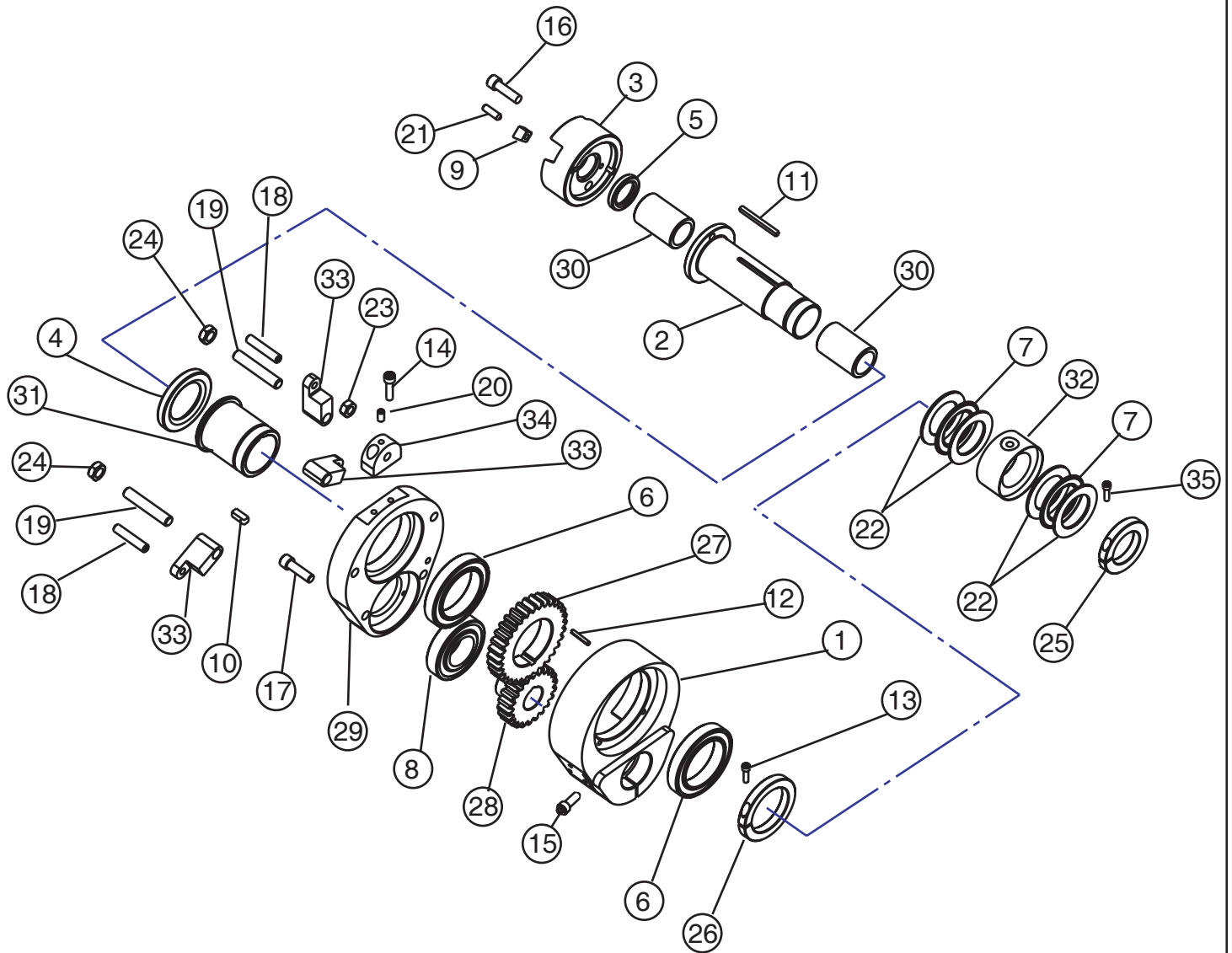


Parts List, 202TS Sub Assembly (P/N 02-2298)

Item No.	Part No.	Description	Qty.
1.	04-0112	DRIVE ASSEMBLY	1
2.	16-0038	FEED ASSEMBLY	1
3.	29-0311	BEARING, NEEDLE	1
4.	30-2632	CYLINDER, PNEUMATIC	1
5.	33-0016	SCREW, CAP (#6-32 X7/8")	3
6.	33-0028	SCREW, CAP (#10-24 X 1/2")	4
7.	33-0225	SCREW, CAP (5/16-24 X 1 1/4")	3
8.	41-0147	HANDLE, FEED	1
9.	42-0076	KNOB, BALL	1
10.	53-0076	VALVE, PNEUMATIC 4-WAY	1
11.	54-0353	FITTING, ELBOW , (1/4"P-1/4" TUBE)	2
12.	54-0396	FITTING, ELBOW, (1/8" P-1/4" TUBE	2
13.	54-0397	FITTING, STRAIGHT, (1/8"P-1/4" TUBE)	1
14.	55-0185	TUBING, (1/4 OD)	11"
15.	55-0185	TUBING, (1/4 OD)	10.5"
16.	55-0185	TUBING, (1/4 OD)	4"
17.	57-0239	MOTOR ASSEMBLY, PNEUMATIC	1
NOT SHOWN:			
	36-0003	WRENCH, L (3/32 HEX)	1
	36-0004	WRENCH, L (7/64 HEX)	1
	36-0005	WRENCH, L (1/8 HEX)	1
	36-0007	WRENCH, L (5/32 HEX)	1
	36-0008	WRENCH, L (3/16 HEX)	1
	36-0010	WRENCH, L (1/4 HEX)	1
	36-0237	WRENCH, OPEN END, (7/16 X 1/2")	1
	86-0221	CARRYING CASE	1

Model 202TS Tube Sheet Cutter

Drive Assembly (P/N 04-0112)



Parts List, Drive Assembly (P/N 04-0112)

Item No.	Part No.	Description	Qty.
1.	19-0848	HOUSING, MAIN	1
2.	20-0725	SHAFT, MAIN	1
3.	21-0529	HEAD, (2 3/8")	1
4.	28-0265	SEAL	1
5.	28-0287	SEAL	1
6.	29-0005	BEARING, BALL	2
7.	29-0130	BEARING, THRUST	2

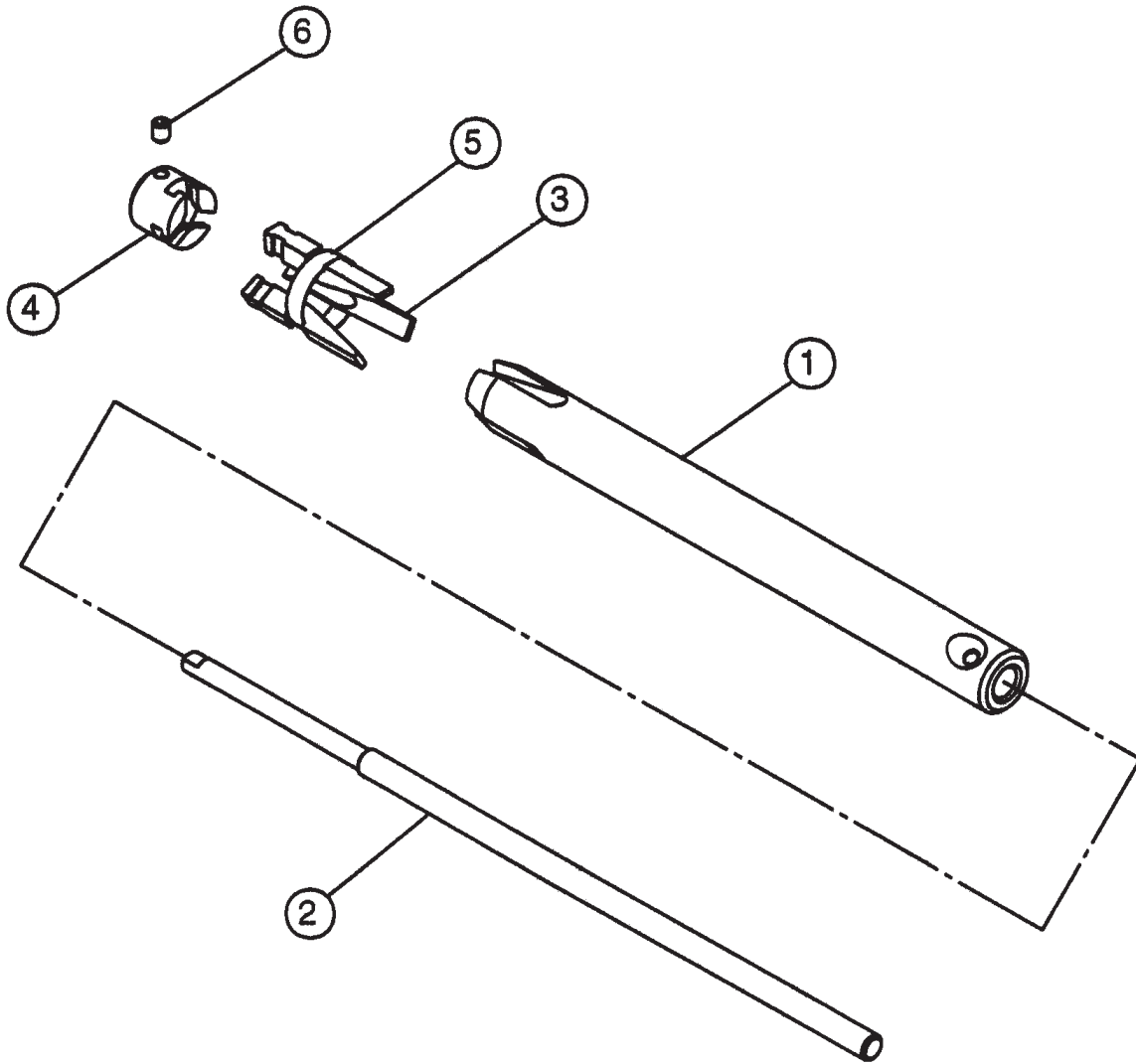
Parts List, Drive Assembly (P/N 04-0112)

Item No.	Part No.	Description	Qty.
8.	29-0376	BEARING, BALL	1
9.	30-0578	WEDGE, TOOL BIT	4
10.	31-0186	KEY	1
11.	31-0172	KEY	1
12.	33-0272	PIN, DOWEL (3/16 DIA X 1 1/4")	1
13.	33-0013	SCREW, CAP (#6 - 32 X 1/2")	1
14.	33-0028	SCREW, CAP (#10 - 24 X 1/2")	2
15.	33-0040	SCREW, CAP (1/4 - 20 X 3/4")	1
16.	33-0041	SCREW, CAP (1/4 - 20 X 7/8")	2
17.	33-0042	SCREW, CAP (1/4 - 20 X 1")	4
18.	33-0508	SCREW, SET, CUP PT (1/4 - 20 X 1 1/4")	3
19.	33-0523	SCREW, SET, CUP PT (5/16 - 18 X 1 3/4")	3
20.	33-0619	SCREW, SET, CUP PT (#10 - 32 X 1/4")	1
21.	33-1294	SCREW, INSERT WEDGE, LH - RH	4
22.	34-0182	WASHER, THRUST	4
23.	35-0006	NUT, HEX (1/4 - 20)	3
24.	35-0191	NUT, JAM (5/16 - 18)	3
25.	35-0525	NUT, FEED LOCK	1
26.	35-0526	NUT, BEARING	1
27.	39-0826	GEAR, MAIN, 32T	1
28.	39-0868	GEAR, DRIVE, 22T	1
29.	43-0537	COVER, HOUSING	1
30.	45-0274	BUSHING, MAIN	2
31.	46-0460	SLEEVE, SHAFT	1
32.	46-0461	SLEEVE, FEED	1
33.	48-1103	BLOCK, STOP PIN	3
34.	48-1104	BLOCK, ROD	1
35.	33-0331	SCREW, FLAT HEAD (#4-40 X 1/4")	1

Model 202TS Tube Sheet Cutter

Standard Mandrel Assembly (P/N 12-0127)

Ramp Sets (P/N 08-0439 through 08-0443)



Parts List, Mandrel Assembly, Standard (P/N 12-0127)

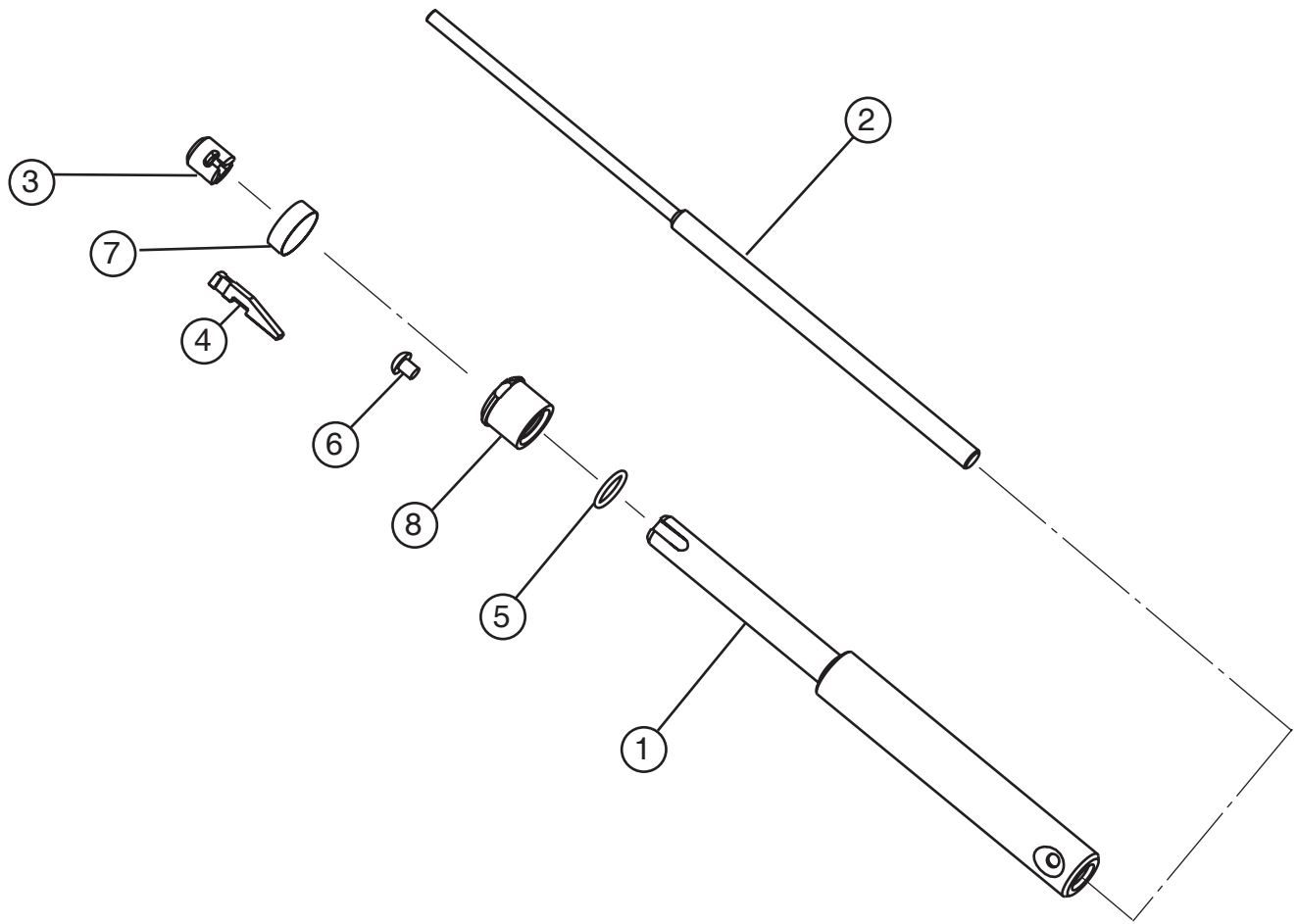
Ramp Sets (P/N 08-0439 through 08-0443)

Item No.	Part No.	Description	Qty.
1.	13-0447	MANDREL, STANDARD	1
2.	23-0325	DRAWROD, STANDARD	1

Item No.	Part No.	Description	Qty.
	08-0439	RAMP BLOCK SET , #1	
3.	48-1123	BLOCK, RAMP	3
4.	24-1544	PLATE, BUTT	1
5.	40-0130	SPRING, (1/4 X 1/2')	1
6.	33-0488	SCREW, SET, CUP PT (#10-24 X 1/4")	1
	08-0440	RAMP BLOCK SET, #2	
3.	48-1124	BLOCK, RAMP	3
4.	24-1545	PLATE, BUTT	1
5.	40-0108	SPRING, (1/8 X 1 3/4")	1
6.	33-0490	SCREW, SET, CUP PT (#10-24 X 3/8")	1
	08-0441	RAMP BLOCK SET, #3	
3.	48-1125	BLOCK, RAMP	3
4.	24-1564	PLATE, BUTT	1
5.	40-0036	SPRING, (1/8 X 2")	1
6.	33-0490	SCREW, SET, CUP PT, (#10-24 X 3/8")	1
	08-0442	RAMP BLOCK SET, #4	
3.	48-1159	BLOCK, RAMP	3
4.	24-1584	PLATE, BUTT	1
5.	40-0263	SPRING, EXT. , (1/8 X 2 1/4")	1
6.	33-0492	SCREW, SET, CUP PT, (#10-24 X 1/2")	1
	08-0443	RAMP BLOCK SET, #5	
3.	48-1160	BLOCK, RAMP	3
4.	24-1585	PLATE, BUTT	1
5.	40-0264	SPRING, EXT., (1/8 X 2 1/2")	1
6.	33-0492	SCREW, SET, CUP PT, (#10-24 X 1/2")	1

Model 202TS Tube Sheet Cutter

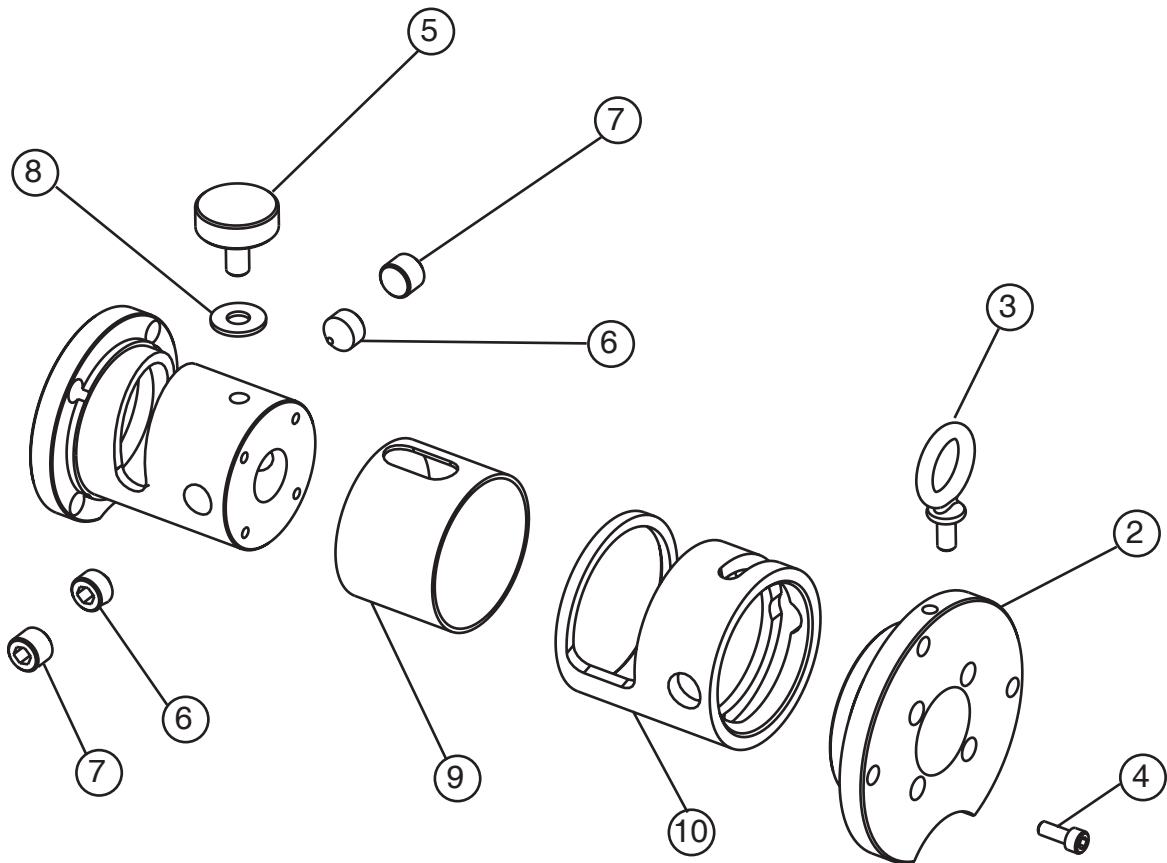
Small Mandrel Assembly (P/N 06-0450)



Parts List, Mandrel Assembly, Small (P/N 06-0450)

Item No.	Part No.	Description	Qty.
1.	13-0457	MANDREL, SMALL	1
2.	23-0351	DRAWROD, SMALL	1
3.	24-1741	BUTT PLATE, SMALL	1
4.	48-1269	BLOCK, RAMP #1 .50" TO .65" (12.7MM TO 16.5MM)	3
	48-1270	BLOCK, RAMP #2 .65" TO .78" (16.5MM TO 19.8MM)	3
5.	28-0269	O-RING	1
6.	33-0277	SCREW, BUTTON (#10-24 X 1/4")	2
7.	40-0129	SPRING, FLAT	1
8.	48-1268	BLOCK, SEAL	1

Feed Assembly (P/N 16-0038)

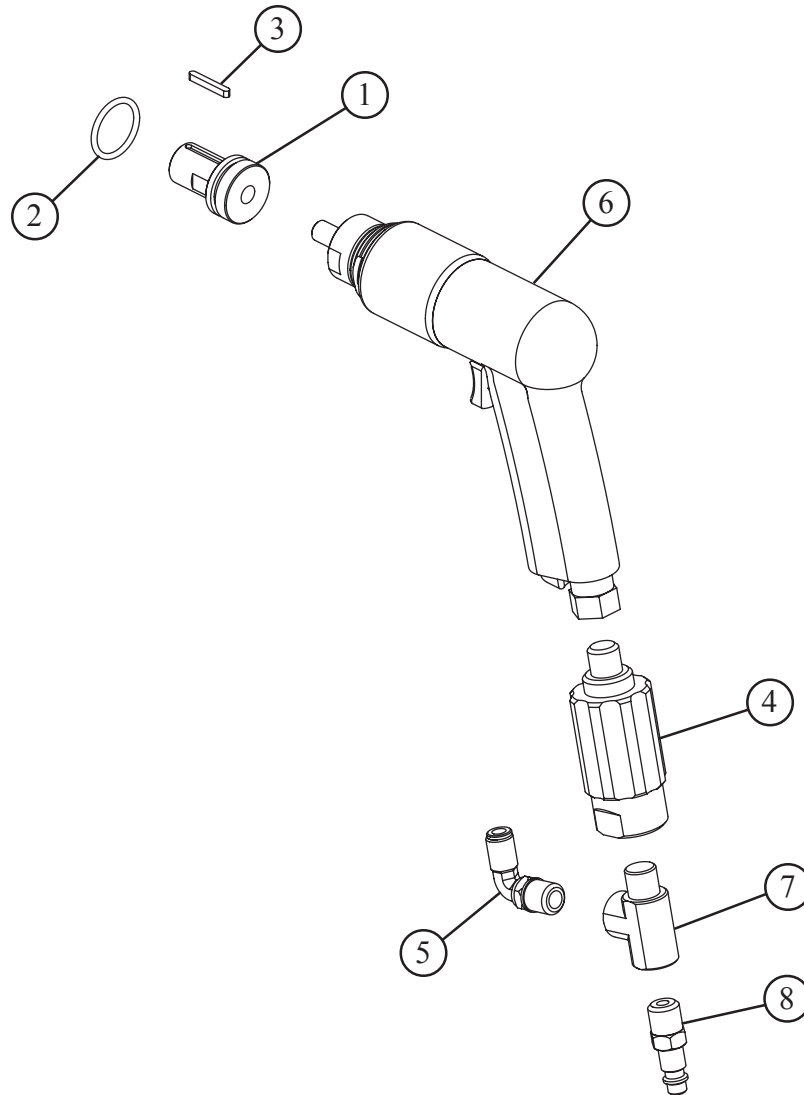


Parts List, Feed Assembly (P/N 16-0038)

Item No.	Part No.	Description	Qty.
1.	19-0852	HOUSING, FEED	1
2.	27-0592	ADAPTOR, CYLINDER	1
3.	30-2708	EYE, BOLT	1
4.	33-0033	SCREW, CAP (#10 - 24 X 1 1/4)	4
5.	33-2045	SCREW, LOCKING	1
6.	33-2136	SETSCREW, LOCK, CONE PT (1/2 - 20)	2
7.	33-2137	SETSCREW, SS, CUP PT (1/2 - 20 X 3/8)	2
8.	34-0353	WASHER, NYLON (5/16" ID)	1
9.	43-0505	COVER, INNER	1
10.	43-0506	COVER, OUTER STOP	1

Model 202TS Tube Sheet Cutter

Pneumatic Motor Assembly (P/N 57-0239)



Parts List, Motor Assembly, Pneumatic (P/N 57-0239)

Item No.	Part No.	Description	Qty.
1.	20-0726	SHAFT, DRIVE	1
2.	28-0274	O-RING	1
3.	31-0115	KEY	1
4.	53-0045	VALVE, FLOW CONTROL	1
5.	54-0149	COUPLING, MALE Q.D.	1
6.	57-0227	MOTOR, AIR	1
7.	54-0394	FITTING, STREET TEE	1
8.	54-0353	FITTING, ELBOW	1