Operation Manual

92-1755 Rev. 170929
Model 301.5SP Tube Squaring Machine

TRI TOOL
BUILDING PERFORMANCE

ABOUT TRI TOOL INC.

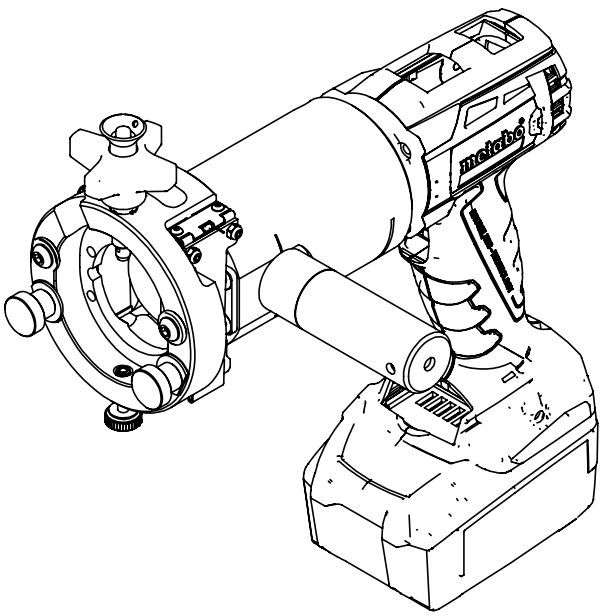
Tri Tool's extensive experience in the design, development and manufacture of portable machine tools and welding equipment has resulted in machinery that is designed to meet the highest standards of quality, safety, and performance. Our products are backed by a company totally committed to service, integrity, and customer satisfaction.

Tri Tool Services has developed a solid reputation as a trusted provider of dependable and cost-effective on-site service solutions including turnkey project management, machining services, and mechanized and manual code welding services using experienced and well-trained machinists and welders.

In addition to developing industry leading machining and welding equipment, Tri Tool's engineering team provides custom equipment design and manufacturing solutions to suit the most rigorous requirements of our customers' special applications.

Please contact us for more information on any of our products or services. Company representatives are available for demonstrations of most of our products at your facility.

Printed in the USA



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TRI TOOL INC. Warranty

All products manufactured by Tri Tool Inc. are warranted to be free from defects in materials and workmanship under normal use. Effective October 12, 2018, the period of this warranty shall be three years from the date of shipment for all products, except for welding and custom equipment which shall be one year from the date of shipment.

The purchaser shall bear all shipping, packing and insurance costs and all other costs to and from a designated repair service center. The product will be returned to the purchaser freight prepaid and billed to the purchaser.

This warranty is not transferable and will not apply to tool bits or other consumables, or to those products that have been misused, abused, or altered without the express permission in writing by Tri Tool Inc.

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 purchasers. This warranty gives the purchaser specific legal rights. Other rights vary from state to state.

Tool Bit Resharpening Policy

Tri Tool Inc. can not resharpen badly gouged, chipped, or broken tool bits. Check the tool bits before you send them and package them well. Within two working days of receipt, the tool bits are evaluated and the customer is contacted for authorization.

The customer will receive a price and a scheduled return shipment date. The price structure is available from your Tri Tool Inc. sales representative.

Tool bits that are not suitable for resharpening are returned with the tool bits that were resharpened, unless Tri Tool Inc. is instructed otherwise.

The customer is responsible for shipping charges to and from Tri Tool Inc.

This policy only covers tool bits manufactured by Tri Tool Inc.

1. ABOUT THE MANUAL

1.1 COPYRIGHT

1.2 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.

2. SAFETY

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

DANGER

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

WARNING

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

CAUTION

2.2 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.
- Secure long hair.

DANGER

DANGER: Do not wear gloves when you use operate the equipment. If you are using the index trip mechanism, a glove may be caught or pulled into the pinch point created by the equipment head. This will result in serious personal injury.

2.3 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.

2.4 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.

2.5 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.

2.6 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.

2.7 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 301.5SP (Short Perch) Tube Squaring Tool is designed specifically to prepare tubes for autogenous welding.

The 301.5SP will face .125” (3.2mm) to 1.500” (38.1mm) outside diameter tubing with a wall thickness up to .125” (3.2mm). The 301.5SP uses a tool-less OD saddle clamping system for holding and rounding the tube.

The 301.5SP accepts its torque through the saddle clamping system.

The Standard saddle clamping system requires a straight length of tube .60” (15.2mm) long.

The Short Perch saddle clamping system requires a straight length of tube .19” (4.8mm) long.

Speed is controlled by a variable speed electric motor. Feed is cam actuated with an auto retract. The feed handle is at a right angle to the cutter head.

DESIGNATIONS FOR THE MODEL 301.5SP

Model No.	P/N	Description
301.5SP-E120	01-2223	120VAC Electric Motor (Metabo)
301.5SP-E220	01-2224	220VAC Electric Motor (Metabo)
301.5SP-B	01-2221	Electric Motor, Battery Powered, 18V (120V Charger)
301.5SP-B	01-2222	Electric Motor, Battery Powered, 18V (220V Charger)
301.5SP-E100	01-2398	Electric Motor (Makita), 100V (Japan only))

4. SPECIFICATIONS

MODEL 301.5SP with Motor

POWER REQUIREMENTS

Model 301.5SP 120	120 VAC +/- 10%, 50 - 60 Hz
Model 301.5SP 220	220 VAC +/- 10%, 50 - 60 Hz

WEIGHTS

Base Machine	5.1 lbs. (2.3 Kg)
Cordless Metabo Motor	4.2 lbs. (1.9 Kg)
Corded Metabo Motor	6.4 lbs. (2.9 Kg)

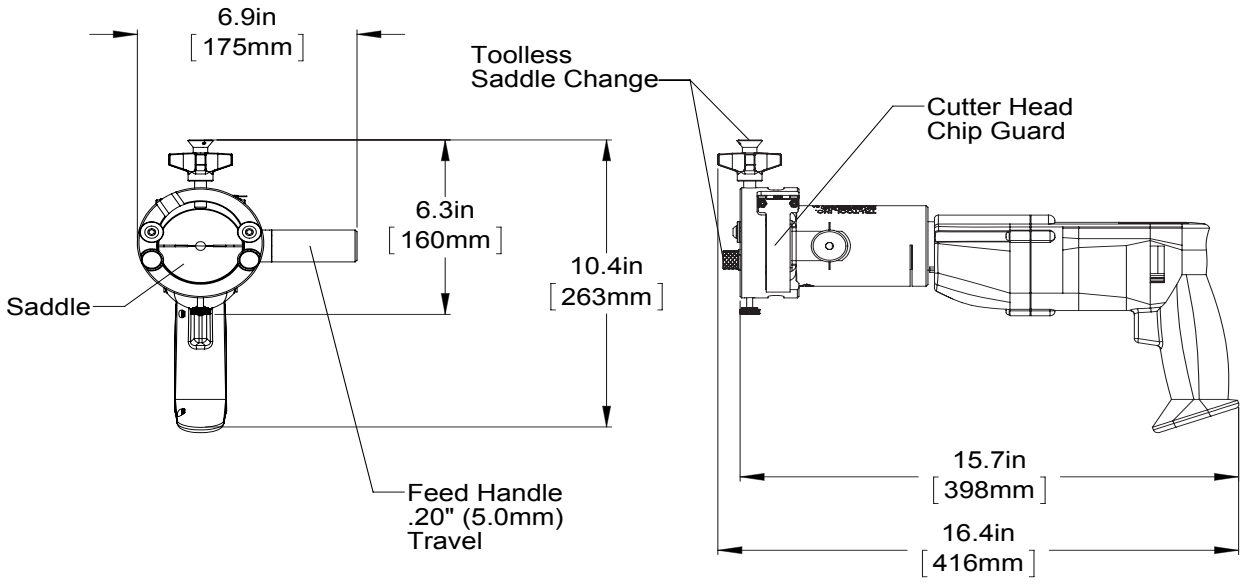


Figure: 1. Envelope Drawing Corded Motor (120V, 220V)

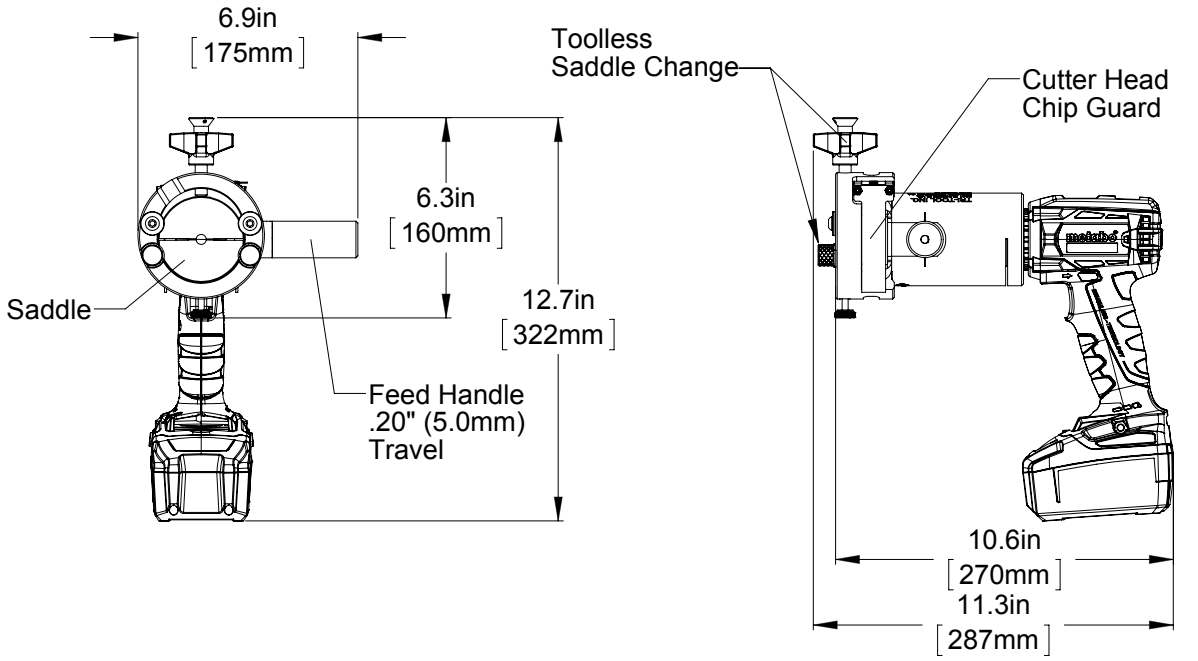


Figure: 2. Envelope Drawing Cordless Motor (18VDC)

5. MAINTENANCE

5.1 MAINTENANCE PROTOCOL

- Clean and Coat components with a light film of oil prior to use. Refer to Fig. 3.
- 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.
- If the Model 301.5SP 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: If the chips are not removed, the tool life may be severely shortened.

- Disassembly of the Model 301.5SP will void the warranty, except when performed by a Tri Tool Inc. designated repair technician.

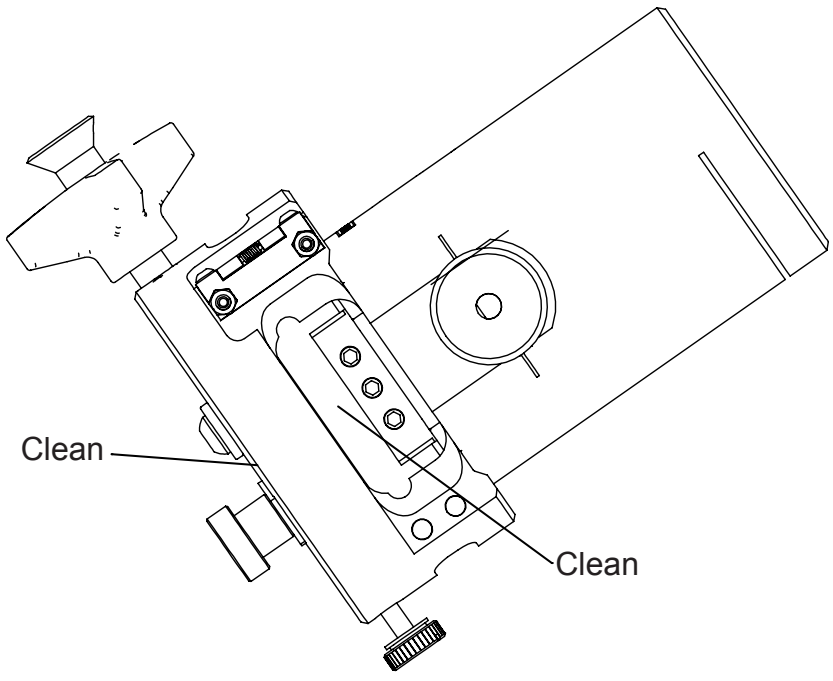


Figure: 3. Sites to Clean

6. OPERATION

6.1 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 a tool bit according to the tubing material, tubing size, and how critical it is to have a near burr free end.
- A standard entrance angle tool bit is recommended for carbon steel. These tool bits also work well with some stainless steel applications where a near burr free end is not a critical requirement.
- A high entrance angle tool bit is recommended for most stainless steels. Generally, this is the most suitable edge geometry for about 90% of all the stainless steel tubing applications.
- An extra hook angle tool bit is recommended for stainless steels that are very soft. These stainless steels include materials like 316L, which have been bright hydrogen annealed, vacuum annealed or annealed and Electro-polished. Electro-polished stainless steel has a micro-thin surface, which is high in Cr and Ni, which makes it very soft, but tough and difficult to cut without a burr.
- The M-42 tool bits are for use with the exotic alloys where the high heat resistance is required to avoid burning the cutting edge of the tool bit. M-42 can improve the life expectancy of the tool bit under some conditions on stainless steel. Since M-42 tool bits are more brittle than the standard M-2 tool bits, there is a much 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 that those tool bits may provide. Some exotic alloys may require tool bits with both the extra hook angle as well as the M-42 tool steel for heat resistance.

6.2 INSTALL THE TOOL BIT

CAUTION: Make sure that the Model 301.5SP is disconnected from the power source before you install a tool bit.

CAUTION

1. Insert the Tool Bit into the slot in the Cutting Head, Refer to Fig. 4. Make sure the cutting edge of the tool bit is on the radical centerline. Do not install the tool bit backwards.
   - This position is used for .100” (25.4 mm) and smaller diameter tubing. This is the designed working position of the tool bit and will leave virtually no burr with standard tubing. When working with Electro-polished stainless steel tubing, use slow cutting speeds to minimize the ID burr. The tool bit may be reversed.
   - Use the reversed position for tubing with an ID greater than .100” (25.4 mm). With the extreme shear cutting action, the burr on the ID will be virtually eliminated.
2. Use the Hex wrench to tighten the set screws.

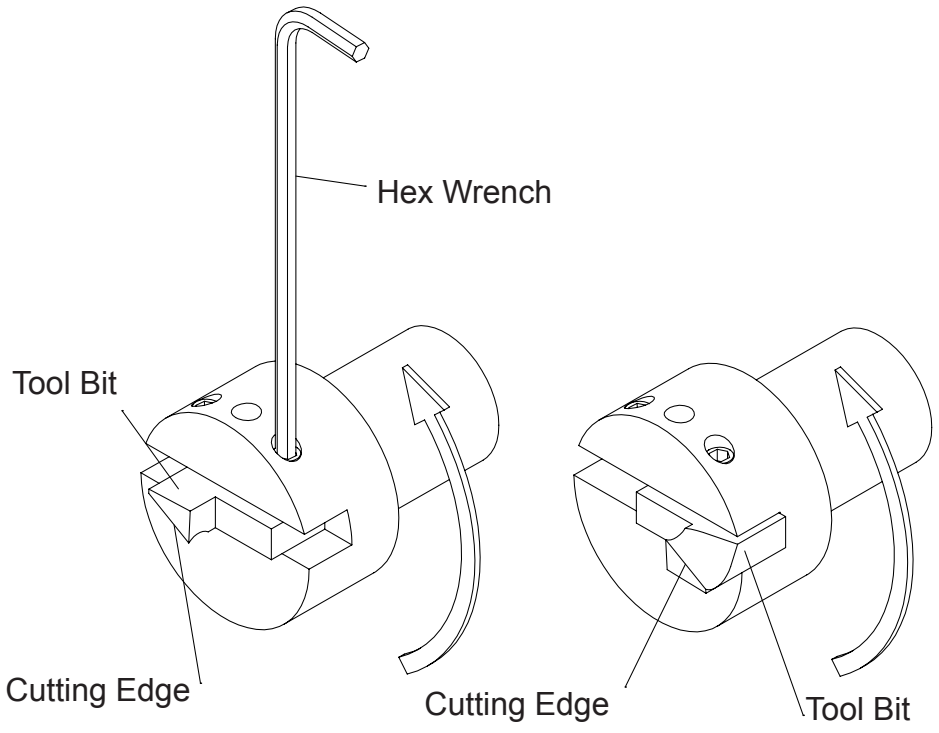


Figure: 4. Tool Bit Installation

6.3 INSTALL A SADDLE IN THE MODEL 301.5SP

1. Select a Saddle for the desired diameter of the tubing to be squared. Refer to section 8, Saddle Sets.
2. Loosen the two thumbscrews and rotate the D-Clip washers.
3. Use the Saddle Quick Release to install the top half of the saddle. Refer to Fig. 5.

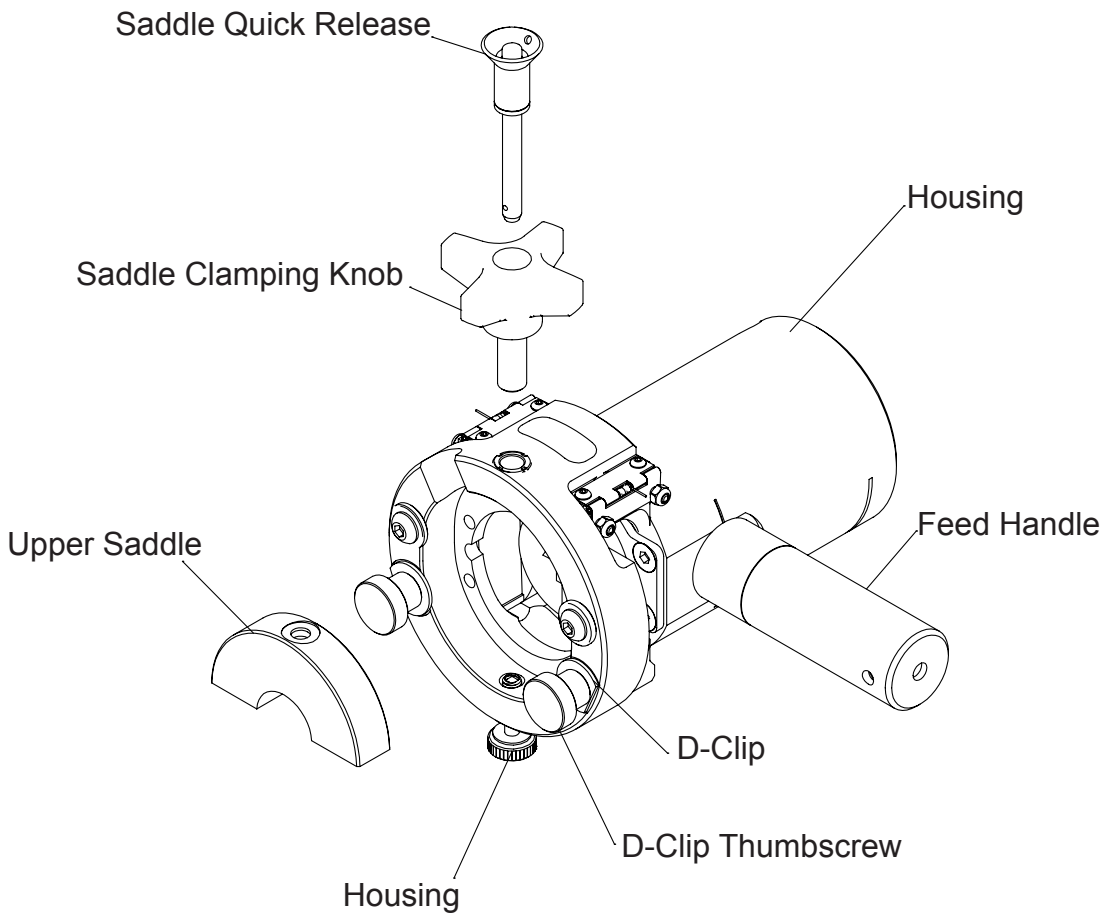


Figure: 5. Install Upper Saddle Half

4. Turn the Saddle Clamping Knob counterclockwise to move the Saddle up.

5. Place the Bottom Saddle half in the Housing. Lightly tighten the Saddle Thumbscrew into the Bottom Saddle half. Refer to Fig. 6.

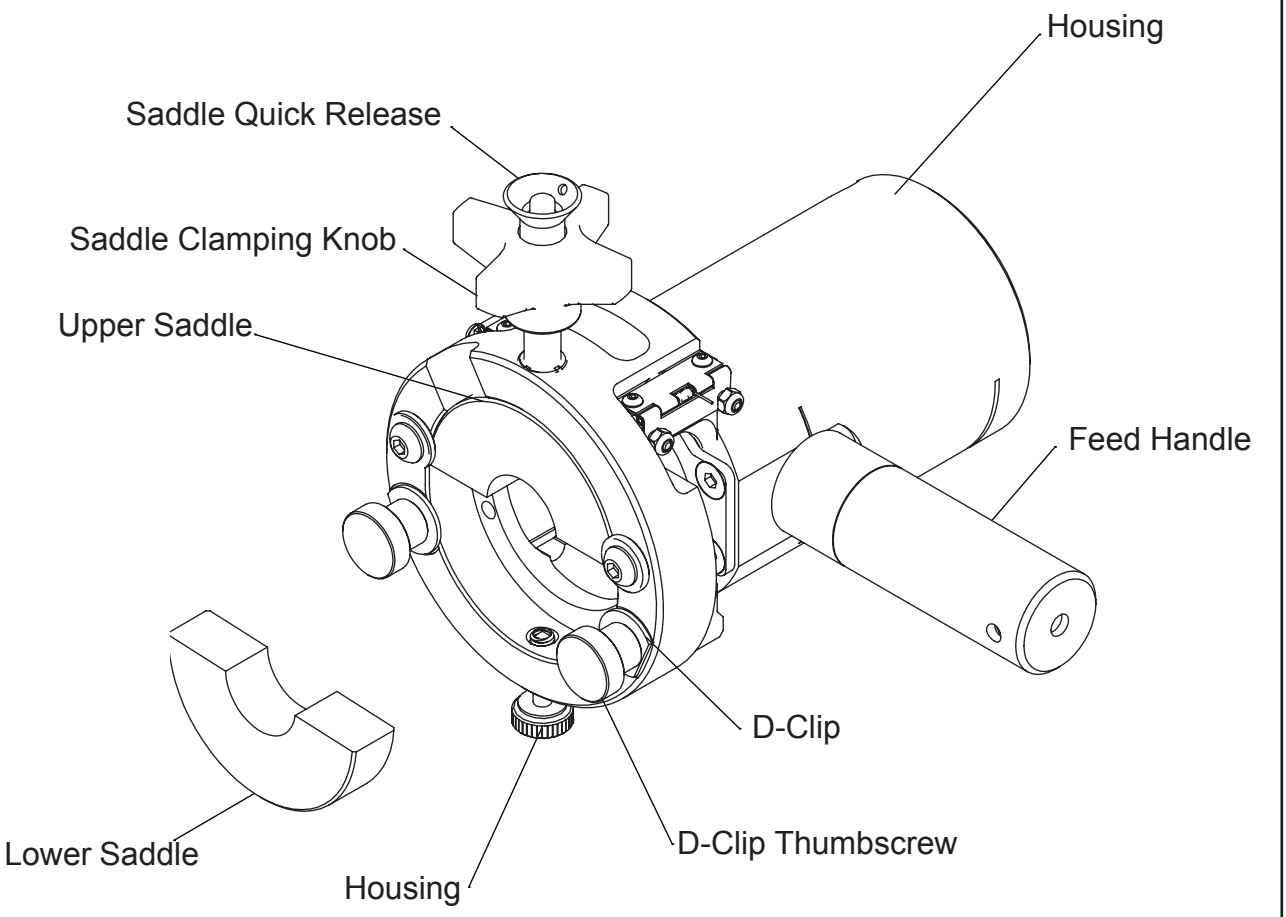


Figure: 6. Install Lower Saddle Half

6. Turn the D-Clip Washers so the washer is touching on the outer diameter of the Bottom Saddle half. Tighten the two D-Clip Thumbscrews.

6.4 INSERT THE TUBE

1. Insert the tube to be machined in the front of the Model 301.5SP. Move the tube or pipe approximately 1/16” (1.6 mm) from the tool bit.

CAUTION

CAUTION: Do not let the tool bit touch the tube or pipe. This will damage the tool bit or the Tube Squaring Machine when power is applied.

2. Tighten the Saddle Clamping Knob to tighten the tube in the Saddle.

6.5 OPERATION SEQUENCE

1. Connect the Model 301.5SP to the power source.

1. Pull the Trigger to start rotation of the Cutting Head, Refer to section 7, Cutting Speeds and Feeds.

2. Use the Feed Handle to feed the Shaft with the tool bit into the work.

3. The Metabo Motor Speed Control is in the Trigger Guard. Use it to adjust the cutting speed.

CAUTION

CAUTION: The Two Speed Gearbox Knob should be in the 1st gear position. If the Knob does not snap into the desired position, turn the chuck by hand slightly until the knob snaps into place. Put the speed control in the drill position.

- To obtain a minimum burr tube end, avoid heat build up. When the tube or the tool bit gets hot, the tube material starts to flow or push away from the tool bit edge in the form of a burr, instead of being cut cleanly with a minimum burr. Keep the RPMs low to avoid generating excessive heat. An excessive cutting speed will generate unwanted heat.

- Keep the chip curl loose by avoiding very deep cuts. A dull tool bit will not do the job right, so be sure that there is a sharp tool bit mounted in the Machine.

4. Rotate the Feed Handle clockwise to bring the Cutting Head and tube closer together. The machining operation begins when the tool bit contacts the tube or pipe.

5. If the tube end is not square to the tube axis, the tool bit will contact only a small segment of the tube during each revolution. To avoid tool bit damage, use a very slow feed rate until the tool bit contacts the tube continually for at least one revolution.

6. Adjust the cutting RPM with the Speed Control Trigger until it is just above the required cutting speed as the tool bit enters the cut. The tool will slow down slightly as the cutting load increases. Apply additional power to hold the cutting speed.

7. Observe the chip as the Machine is cutting. The ideal chip will come off in a loose pig tail spiral. A chip that is coming off in a tight straight spiral indicates that the feed is too heavy. A straight or slightly curled chip normally indicates that the feed is too light. Back off the feed as required to break the chips and let them fall away.

8. If a significant amount of stock must be removed, occasionally back out of the cut and let the tool bit spin free in the air to cool. Remove any chips, they may harm the electro-polished tube.

9. Rotate the Feed Handle clockwise until the end of the pipe is completely machined.

CAUTION

CAUTION: Be careful not to let the tool bit cut into the Saddle or the Saddle Adapter.

10. Discontinue the feed and allow the Cutting Head to rotate one time for stainless steel and up to three times for other materials. This will improve the finish of the prep surface. Never let a tool bit 'rub' the surface of a stainless steel tube without cutting. This will work harden the material and make it difficult for the tool bit to get under the material to finish the cut. This will also cause excessive tool bit wear.

11. For precise cuts, engage the tool bit into the end of the tube and use the indicator sleeve located on the Feed Handle to check the depth of the cut. The graduations are in .005" (.13mm) increments.

12. Rotate the Feed Handle counterclockwise to separate the Cutting Head and the tube.

13. Release the Trigger to stop the Cutting Head rotation.

14. Continue to rotate the Feed Handle counterclockwise until the Cutting Head clears the tube or pipe by at least 1/8" (3.2 mm) or more.

15. Loosen the Clamp Knob Assy to release the tube or pipe.

16. Remove all chips before starting the next end prep.

7. CUTTING SPEEDS AND FEEDS

7.1 CUTTING SPEEDS

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. Reducing the RPM will significantly increase tool bit life and reduce the formation of burrs.

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.

7.2 FEED RECOMMENDATIONS

Use very light feed for initial facing or until a continuous cut is established. This is very important for longer tool bit life when cutting through flame cut or out-of-round pipe ends.

Use adequate feed, .003” to .006” (.08 mm to .15 mm) per revolution thereafter, to establish a continuous chip cut.

- If the feed is too light, only light stringer chips will be removed.
- If the feed is too heavy, the drive will start to overload and the chip will start to have a rough or torn appearance.

Stainless steel, which work hardens, must be worked with a heavy enough feed to prevent work hardness (.003” to .006” or .08 mm to .15 mm feed)

Do not let the tool bit burnish the surface.

Reduced feeds and speeds will normally minimize chatter problems.

8. SADDLE SETS

8.1 STANDARD SADDLES

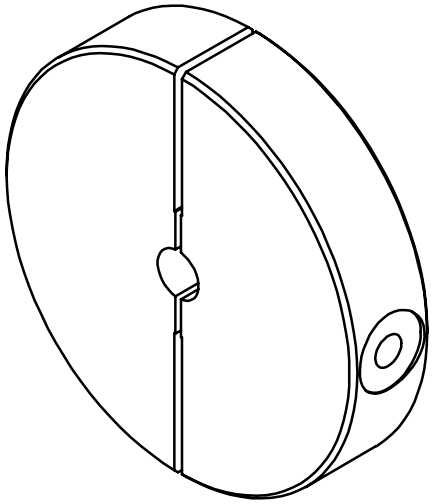


Figure: 7. Standard Saddle Sets

SADDLE SET PART NUMBERS				
Pipe Size	**Fraction**	**Decimal**	**Metric**	**Saddle P/N**
	1/8"	.125"	3.18 mm	67-4774
	5/32"	.156"	3.96 mm	67-4775
		.158"	4.00 mm	67-4776
	3/16"	.188"	4.78 mm	67-4777
		.197"	5.00 mm	67-4778
		.218"	5.54 mm	67-4779
		.236"	6.00 mm	67-4780
	1/4"	.250"	6.35 mm	67-4781
		.276"	7.00 mm	67-4782
	9/32"	.281"	7.14 mm	67-4783
		.283"	7.20 mm	67-4784
	5/16"	.313"	7.95 mm	67-4785
		.315"	8.00 mm	67-4786
	11/32"	.344"	8.74 mm	67-4787
		.354"	9.00 mm	67-4788
		.359"	9.13 mm	67-4789
		.365"	9.27 mm	67-4790

SADDLE SET PART NUMBERS				
Pipe Size	**Fraction**	**Decimal**	**Metric**	**Saddle P/N**
1/8"	3/8"	.375"	9.53 mm	67-4791
		.391"	9.92 mm	67-4792
		.394"	10.00 mm	67-4793
		.400"	10.16 mm	67-4794
	13/32"	.406"	10.31 mm	67-4795
		.413"	10.50 mm	67-4796
		.422"	10.72 mm	67-4797
		.430"	10.92 mm	67-4798
		.433"	11.00 mm	67-4799
	7/16"	.438"	11.13 mm	67-4800
		.440"	11.18 mm	67-4801
	15/32"	.469"	11.91 mm	67-4802
		.472"	12.00 mm	67-4803
		.483"	12.27 mm	67-4804
		.489"	12.42 mm	67-4805
	1/2"	.500"	12.70 mm	67-4806
		.512"	13.00 mm	67-4807
		.528"	13.40 mm	67-4808
	17/32"	.531"	13.50 mm	67-4809
1/4"	9/16"	.540"	13.72 mm	67-4810
		.543"	13.80 mm	67-4811
		.547"	13.89 mm	67-4812
		.551"	14.00 mm	67-4813
		.563"	14.30 mm	67-4814
		.579"	14.70 mm	67-4815
		.591"	15.00 mm	67-4816
	19/32"	.594"	15.08 mm	67-4817
		.602"	15.29 mm	67-4818
	5/8"	.625"	15.88 mm	67-4819
		.630"	16.00 mm	67-4820
		.641"	16.27 mm	67-4821
	21/32"	.656"	16.66 mm	67-4822
		.669"	17.00 mm	67-4823

SADDLE SET PART NUMBERS				
Pipe Size	**Fraction**	**Decimal**	**Metric**	**Saddle P/N**
3/8"		.675"	17.15 mm	67-4824
		.677"	17.20 mm	67-4825
		.681"	17.30 mm	67-4826
	11/16"	.688"	17.48 mm	67-4827
		.709"	18.00 mm	67-4828
	23/32"	.718"	18.24 mm	67-4829
	3/4"	.750"	19.05 mm	67-4830
	25/32"	.781"	19.84 mm	67-4831
		.787"	20.00 mm	67-4832
		.790"	20.07 mm	67-4833
	13/16"	.813"	20.65 mm	67-4834
		.825"	20.96 mm	67-4835
1/2"		.840"	21.34 mm	67-4836
	27/32"	.844"	21.44 mm	67-4837
		.848"	21.55 mm	67-4838
		.854"	21.70 mm	67-4839
		.859"	21.83 mm	67-4840
		.866"	22.00 mm	67-4841
		.875"	22.23 mm	67-4842
		.896"	22.75 mm	67-4843
	29/32"	.906"	23.00 mm	67-4844
	15/16"	.938"	23.83 mm	67-4845
	31/32"	.969"	24.61 mm	67-4846
		.984"	25.00 mm	67-4847
	1"	1.000"	25.40 mm	67-4848
3/4"		1.050"	26.67 mm	67-4849
		1.059"	26.90 mm	67-4850
	1-1/16"	1.063"	27.00 mm	67-4851
		1.071"	27.20 mm	67-4852
		1.102"	27.99 mm	67-4853
	1-1/8"	1.125"	28.58 mm	67-4854
	1-5/32"	1.156"	29.36 mm	67-4855
		1.181"	30.00 mm	67-4856
	1-3/16"	1.188"	30.18 mm	67-4857
		1.218"	30.94 mm	67-4858

SADDLE SET PART NUMBERS				
Pipe Size	**Fraction**	**Decimal**	**Metric**	**Saddle P/N**
1"	1-1/4"	1.250"	31.75 mm	67-4859
		1.260"	32.00 mm	67-4860
	1-9/32"	1.281"	32.54 mm	67-4861
		1.283"	32.59 mm	67-4862
	1-5/16"	1.313"	33.35 mm	67-4863
		1.315"	33.40 mm	67-4864
		1.338"	34.00 mm	67-4865
	1-11/32"	1.344"	34.14 mm	67-4866
		1.354"	34.39 mm	67-4867
		1.359"	34.52 mm	67-4868
		1.365"	34.67 mm	67-4869
	1-3/8"	1.375"	34.93 mm	67-4870
		1.378"	35.00 mm	67-4871
		1.391"	35.33 mm	67-4872
		1.394"	35.41 mm	67-4873
		1.400"	35.56 mm	67-4874
	1-13/32"	1.406"	35.71 mm	67-4875
		1.413"	35.89 mm	67-4876
		1.417"	36.00 mm	67-4877
		1.422"	36.12 mm	67-4878
		1.430"	36.32 mm	67-4879
		1.433"	36.40 mm	67-4880
	1-7/16"	1.438"	36.53 mm	67-4881
		1.440"	36.58 mm	67-4882
		1.456	37.00 mm	67-4883
	1-15/32"	1.469"	37.31 mm	67-4884
		1.472"	37.39 mm	67-4885
		1.483"	37.67 mm	67-4886
		1.489"	37.82 mm	67-4887
		1.496"	38.00 mm	67-4888
	1-1/2"	1.500"	38.10 mm	67-4889

8.2 SHORT PERCH SADDLES

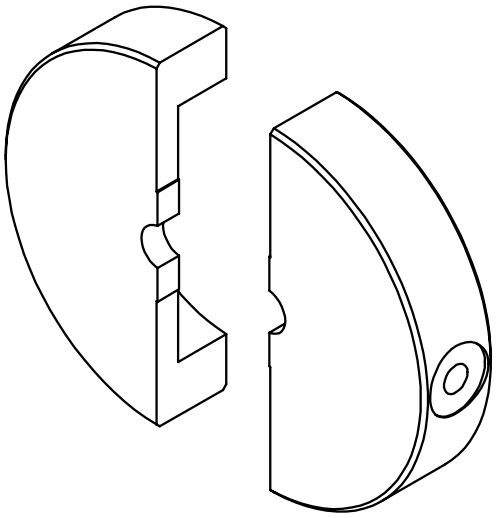


Figure: 8. Short Perch Saddle Sets

SHORT PERCH SADDLE SET PART NUMBERS

Pipe Size	Fraction	Decimal	Metric	Saddle P/N
	1/8"	.125"	3.18 mm	67-4891
	5/32"	.156"	3.96 mm	67-4892
		.158"	4.00 mm	67-4893
	3/16"	.188"	4.78 mm	67-4894
		.197"	5.00 mm	67-4895
		.218"	5.54 mm	67-4896
		.236"	6.00 mm	67-4897
	1/4"	.250"	6.35 mm	67-4898
		.276"	7.00 mm	67-4899
	9/32"	.281"	7.14 mm	67-4900
		.283"	7.20 mm	67-4901
	5/16"	.313"	7.95 mm	67-4902
		.315"	8.00 mm	67-4903
	11/32"	.344"	8.74 mm	67-4904
		.354"	9.00 mm	67-4905
		.359"	9.13 mm	67-4906
		.365"	9.27 mm	67-4907

SHORT PERCH SADDLE SET PART NUMBERS				
Pipe Size	**Fraction**	**Decimal**	**Metric**	**Saddle P/N**
1/8"	3/8"	.375"	9.53 mm	67-4908
		.391"	9.92 mm	67-4909
		.394"	10.00 mm	67-4910
		.400"	10.16 mm	67-4911
	13/32"	.406"	10.31 mm	67-4912
		.413"	10.50 mm	67-4913
		.422"	10.72 mm	67-4914
		.430"	10.92 mm	67-4915
		.433"	11.00 mm	67-4916
	7/16"	.438"	11.13 mm	67-4917
		.440"	11.18 mm	67-4918
	15/32"	.469"	11.91 mm	67-4919
		.472"	12.00 mm	67-4920
		.483"	12.27 mm	67-4921
		.489"	12.42 mm	67-4922
	1/2"	.500"	12.70 mm	67-4923
		.512"	13.00 mm	67-4924
		.528"	13.40 mm	67-4925
	17/32"	.531"	13.50 mm	67-4926
1/4"		.540"	13.72 mm	67-4927
		.543"	13.80 mm	67-4928
		.547"	13.89 mm	67-4929
		.551"	14.00 mm	67-4930
	9/16"	.563"	14.30 mm	67-4931
		.579"	14.70 mm	67-4932
		.591"	15.00 mm	67-4933
	19/32"	.594"	15.08 mm	67-4934
		.602"	15.29 mm	67-4935
	5/8"	.625"	15.88 mm	67-4936
		.630"	16.00 mm	67-4937
		.641"	16.27 mm	67-4938
	21/32"	.656"	16.66 mm	67-4939
		.669"	17.00 mm	67-4940

SHORT PERCH SADDLE SET PART NUMBERS				
Pipe Size	**Fraction**	**Decimal**	**Metric**	**Saddle P/N**
3/8"		.675"	17.15 mm	67-4941
		.677"	17.20 mm	67-4942
		.681"	17.30 mm	67-4943
	11/16"	.688"	17.48 mm	67-4944
		.709"	18.00 mm	67-4945
	23/32"	.718"	18.24 mm	67-4946
	3/4"	.750"	19.05 mm	67-4947
	25/32"	.781"	19.84 mm	67-4948
		.787"	20.00 mm	67-4949
		.790"	20.07 mm	67-4950
	13/16"	.813"	20.65 mm	67-4951
		.825"	20.96 mm	67-4952
1/2"		.840"	21.34 mm	67-4953
	27/32"	.844"	21.44 mm	67-4954
		.848"	21.55 mm	67-4955
		.854"	21.70 mm	67-4956
		.859"	21.83 mm	67-4957
		.866"	22.00 mm	67-4958
		.875"	22.23 mm	67-4959
		.896"	22.75 mm	67-4960
	29/32"	.906"	23.00 mm	67-4961
	15/16"	.938"	23.83 mm	67-4962
	31/32"	.969"	24.61 mm	67-4963
		.984"	25.00 mm	67-4964
	1"	1.000"	25.40 mm	67-4965
3/4"		1.050"	26.67 mm	67-4966
		1.059"	26.90 mm	67-4967
	1-1/16"	1.063"	27.00 mm	67-4968
		1.071"	27.20 mm	67-4969
		1.102"	27.99 mm	67-4970
	1-1/8"	1.125"	28.58 mm	67-4971
	1-5/32"	1.156"	29.36 mm	67-4972
		1.181"	30.00 mm	67-4973
	1-3/16"	1.188"	30.18 mm	67-4974
		1.218"	30.94 mm	67-4975

SHORT PERCH SADDLE SET PART NUMBERS				
Pipe Size	**Fraction**	**Decimal**	**Metric**	**Saddle P/N**
1"	1-1/4"	1.250"	31.75 mm	67-4976
		1.260"	32.00 mm	67-4977
	1-9/32"	1.281"	32.54 mm	67-4978
		1.283"	32.59 mm	67-4979
	1-5/16"	1.313"	33.35 mm	67-4980
		1.315"	33.40 mm	67-4981
		1.338"	34.00 mm	67-4982
	1-11/32"	1.344"	34.14 mm	67-4983
		1.354"	34.39 mm	67-4984
		1.359"	34.52 mm	67-4985
		1.365"	34.67 mm	67-4986
	1-3/8"	1.375"	34.93 mm	67-4987
		1.378"	35.00 mm	67-4988
		1.391"	35.33 mm	67-4989
		1.394"	35.41 mm	67-4990
		1.400"	35.56 mm	67-4991
	1-13/32"	1.406"	35.71 mm	67-5006
		1.413"	35.89 mm	67-4992
		1.417"	36.00 mm	67-4993
		1.422"	36.12 mm	67-4994
		1.430"	36.32 mm	67-4995
		1.433"	36.40 mm	67-4996
	1-7/16"	1.438"	36.53 mm	67-4997
		1.440"	36.58 mm	67-4998
		1.456	37.00 mm	67-4999
	1-15/32"	1.469"	37.31 mm	67-5000
		1.472"	37.39 mm	67-5001
		1.483"	37.67 mm	67-5002
		1.489"	37.82 mm	67-5003
		1.496"	38.00 mm	67-5004
	1-1/2"	1.500"	38.10 mm	67-5005

9. TOOL BITS

9.1 TOOL BITS FOR STANDARD SADDLES

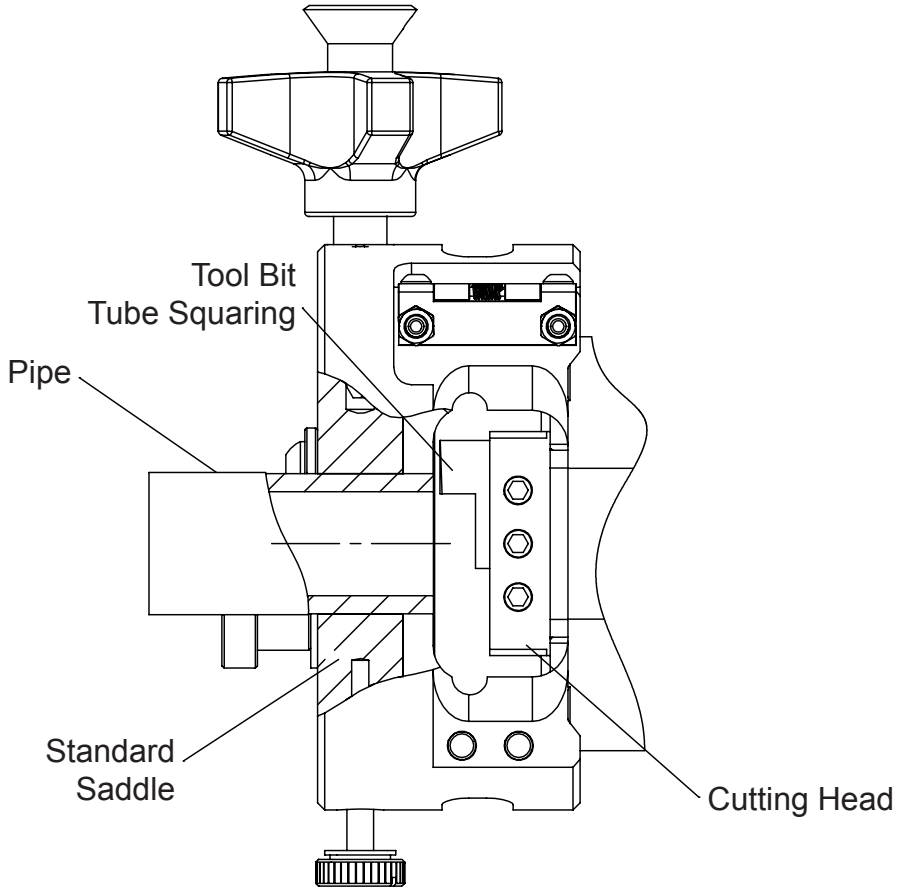


Figure: 9. Tube Squaring Tool Bits for Standard Saddles

TUBE SQUARING TOOL BITS FOR STANDARD SADDLES

Range	Max Wall Thickness	Pipe or Tube Material	Tool Bit Height	Squaring Tool Bit P/N
.125" OD thru 1.50" (3.2 mm OD thru 38.1 mm OD)	.125" (3.2mm)	CS SS 316L SS	.750" (16.1 mm)	Durabit 1

9.2 TOOL BITS FOR SHORT PERCH SADDLES

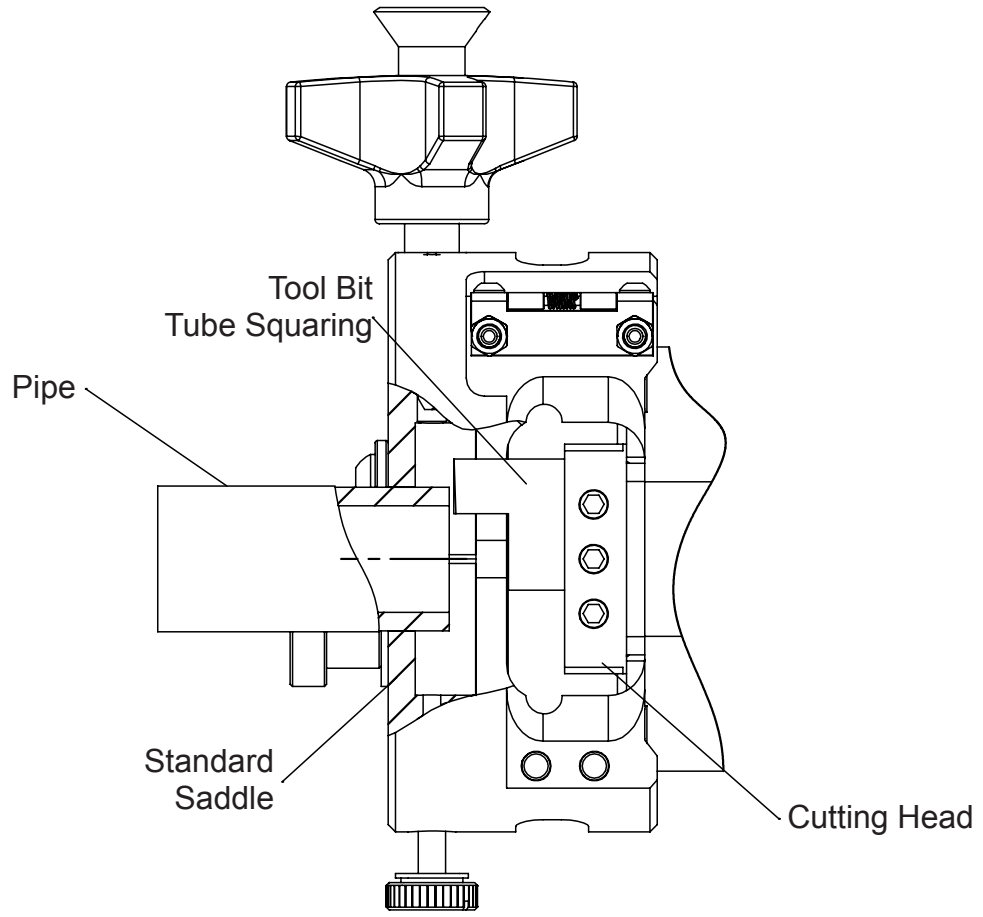


Figure: 10. Tube Squaring Tool Bits for Short Perch Saddles

TUBE SQUARING TOOL BITS FOR SHORT PERCH SADDLES

Range	Max Wall Thickness	Pipe or Tube Material	Tool Bit Height	Tool Bit Material	Squaring Tool Bit P/N
.125" OD thru 1.50" (3.2 mm OD thru 38.1 mm OD)	.125" (3.2mm)	CS SS 316L	.750" (16.1 mm)	M2	Durabit 3

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:	**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.

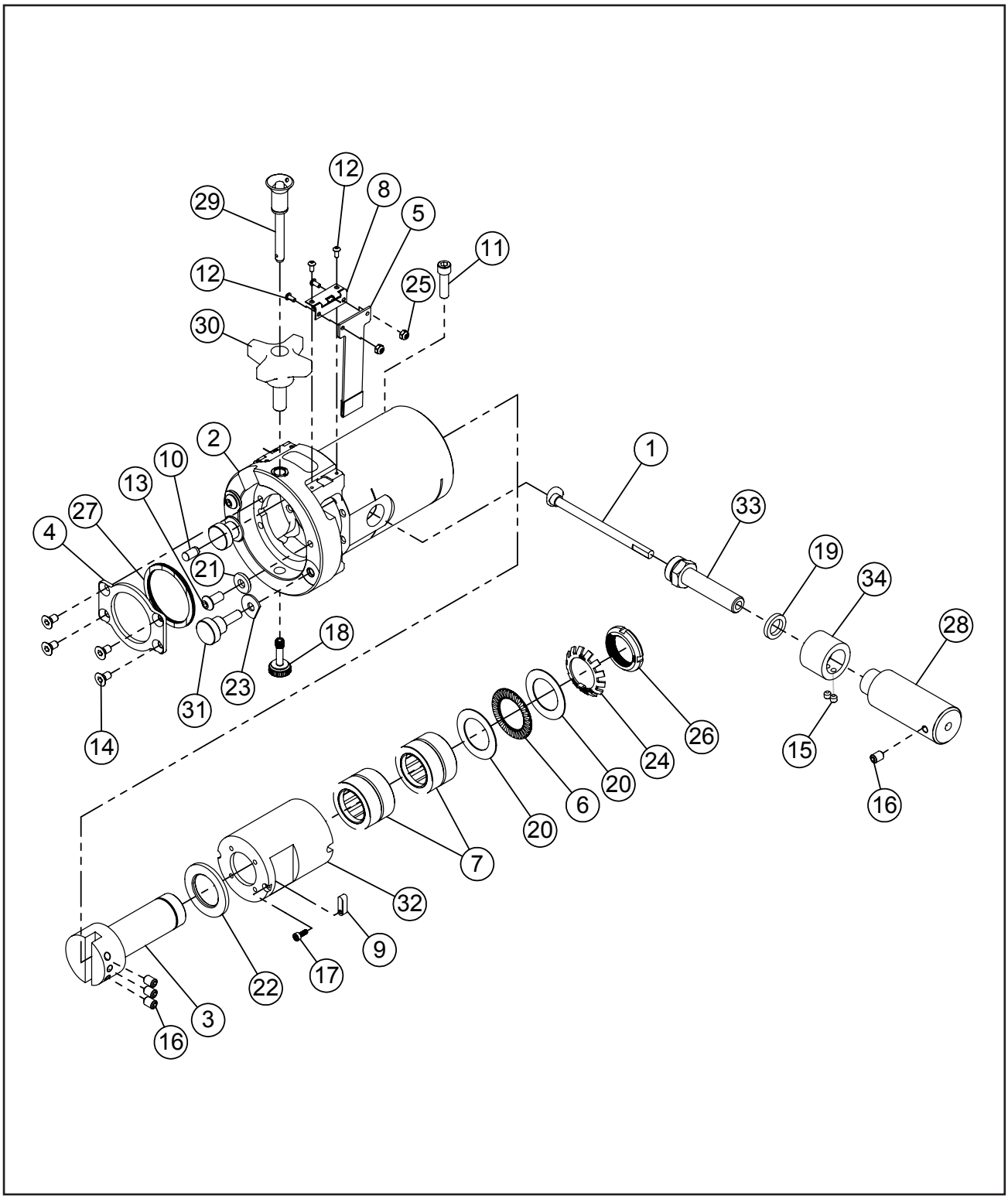
11. ACCESSORIES

Tri Tool offers the following accessories for the Model 301.5SP Tube Squaring Machine:

- Electric Foot Pedal
- Saddles
- Tool Bits
- Bench Top Stand (P/N 60-0112)
- Battery Charger Assy:
  - 120V Standard (P/N 30-6143)
  - 220V Optional (P/N 30-6144)
- Battery 18V 5.2ah (30-6142)

12. ILLUSTRATED PARTS BREAKDOWN

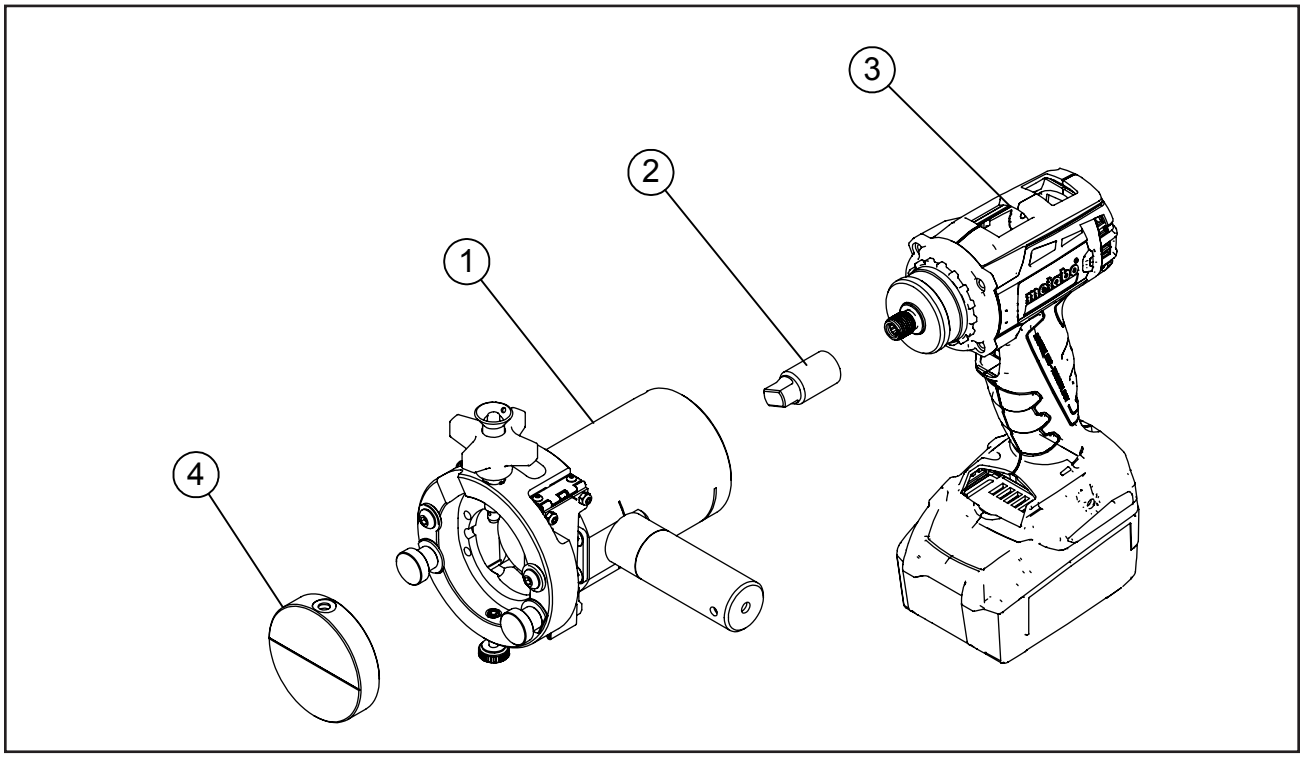
MODEL 301.5SP P/N (02-2989)



Parts List, Model 301.5SP Sub-Assy (Ref. P/N 02-2989)

Item No	Part No.	Description	Qty
1	14-0153	SHAFT,ASSY,CAM FEED	1
2	19-1734	HOUSING ASSY, 301.5SP	1
3	20-1643	SHAFT,SPINDLE	1
4	24-4359	PLATE,SPRING RETAINER	1
5	24-4392	PLATE ASSY,CHIPGUARD	2
6	29-0208	BEARING,THRUST, 1-9/16 X 1 X 5/64	1
7	29-0745	BEARING,ROLLER,1 X 1-1/2 X 1	2
8	30-6118	HINGE,SPRING	2
9	31-0377	KEY, 5MM X 5MM 16MM RBE	1
10	32-0116	PIN,DOWEL,1/4 DIA X 1/2	1
11	33-0041	SCREW,CAP,1/4-20 X 7/8	1
12	33-0265	SCREW,BUTTON,#4-40 X 1/4	8
13	33-0285	SCREW,BUTTON,1/4-20 X 1/2	2
14	33-0417	SCREW,FLAT,#10-32 X 3/8	4
15	33-0487	SCREW,SET,10-24 X 3/16 CUP PT	2
16	33-0501	SCREW,SET,1/4-20 X 3/8 CUP PT	4
17	33-2711	SCREW,CAP,M3 X 8MM SS	1
18	33-4222	SCREW,CAPTIVE,1/4-20	1
19	34-0060	WASHER,FLAT,DEL,1/2 X 3/4 X1/8	1
20	34-0216	WASHER,THRUST,1 X 1-9/16 X 1/32	2
21	34-0304	WASHER,.265""ID X.750""OD X.090"	2
22	34-0705	WASHER,THRUST,DELRIN	1
23	34-0708	WASHER,CLIPPED,1/4 X 3/4 X .044	2
24	34-0709	WASHER,LOCK,WT	1
25	35-0253	NUT,LK,#4-40	4
26	35-1031	NUT,LOCK,NT	1
27	40-0502	SPRING,WAVE,1.60 ID X 2.00 OD	1
28	41-0264	HANDLE,CAM FEED	1
29	41-0265	HANDLE,QUICK RELEASE,1/4 DIA	1
30	42-0299	KNOB ASSY, ADJUST	1
31	42-0300	KNOB,ROUND,1/4-20	2
32	46-0742	SLEEVE,CAM FEED	1
33	46-0743	SLEEVE,CAM SHAFT	1
34	46-0744	SLEEVE,INDICATOR DIAL	1

MODEL 301.5SP CORDLESS,18V METABO (P/N 01-2221)



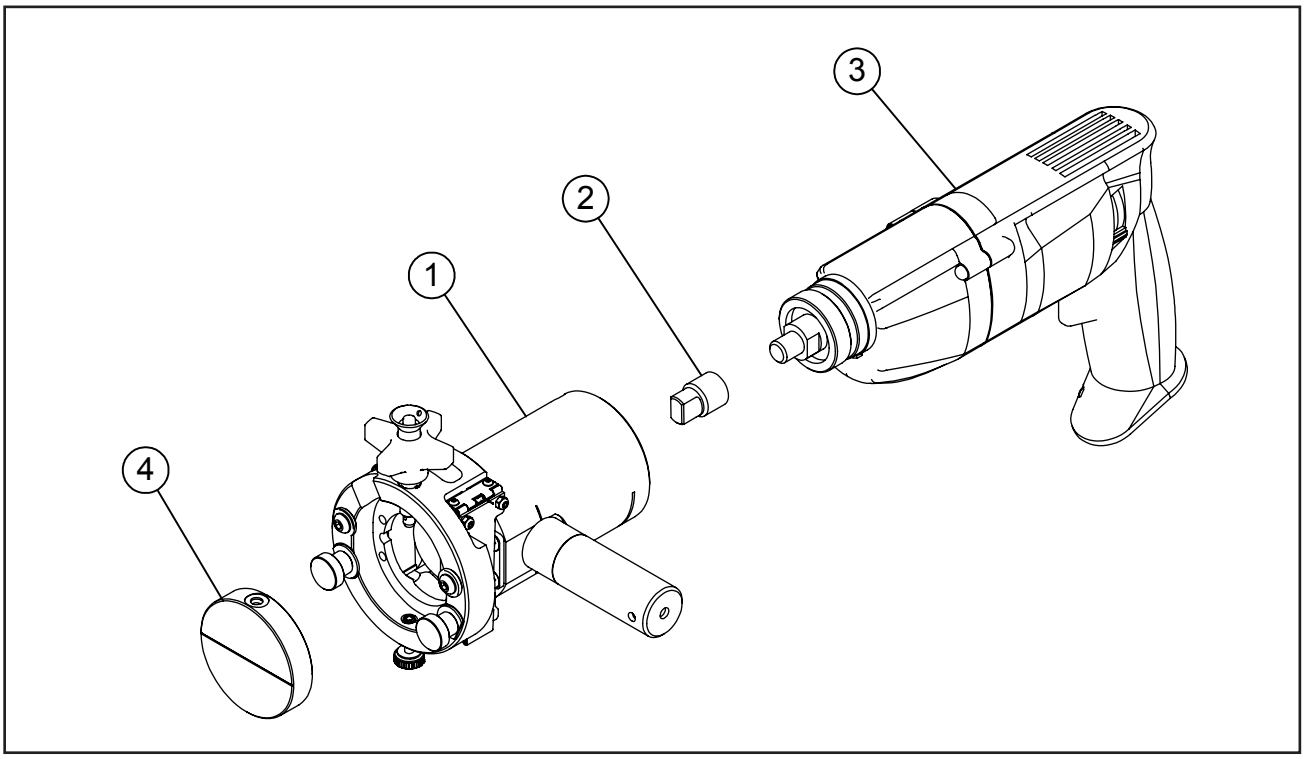
Parts List, Model 301.5SP Cordless,18V Metabo 120V (P/N 01-2221)

Item No	Part No.	Description	Qty
1	02-2989	MODEL 301.5SP SUBASSY	1
2	27-1505	ADAPTER, DRIVE, 301.5-CORDLESS	1
3	58-0317	MOTOR, CORDLESS, 18V, METABO, MOD CW	1
4	67-XXXX	SADDLE, (REFER TO SADDLE SECTION)	
	NOT SHOWN		
	30-6143	CHARGER, METABO, 18V, 5.2AH120V	1
	36-0008	WRENCH, L, 3/16 HEX	1
	36-0018	WRENCH, T, 1/8 HEX	1
	86-0373	CASE AND LINER 301.5SP METABOCORDLESS	1

Parts List, Model 301.5SP Cordless,18V Metabo 220V (P/N 01-2222)

Item No	Part No.	Description	Qty
1	02-2989	MODEL 301.5SP SUBASSY	1
2	27-1505	ADAPTER,DRIVE,301.5-CORDLESS	1
3	58-0320	MOTOR,CORDLESS,18V,METABO,MOD CW,220V	1
	NOT SHOWN		
	30-6143	CHARGER, METABO, 18V, 5.2AH120V	
	36-0008	WRENCH, L, 3/16 HEX	1
	36-0018	WRENCH, T, 1/8 HEX	1
	86-0373	CASE AND LINER 301.5SP METABOCORDLESS	1

MODEL 301.5SP CORDED, 120V METABO (P/N 01-2223)



Parts List, Model 301.5SP Corded,120V Metabo (P/N 01-2223)

Item No	Part No.	Description	Qty
1	02-2989	MODEL 301.5SP SUBASSY	1
2	27-1506	ADAPTER, DRIVE, 301.5SP METABO 120V	1
3	58-0277	MOTOR, C.W.ELEC, METABO, 120V	1
4	67-XXXX	SADDLE, (REFER TO SADDLE SECTION)	
	NOT SHOWN		
	36-0008	WRENCH, L, 3/16 HEX	1
	36-0018	WRENCH, T, 1/8 HEX	1
	86-0374	CASE AND LINER 301.5SP METABO CORDLESS	1

Parts List, Model 301.5SP Corded,220V Metabo (P/N 01-2224)

Item No	Part No.	Description	Qty
1	02-2989	MODEL 301.5SP SUBASSY	1
2	27-1506	ADAPTER, DRIVE, 301.5SP METABO 120V	1
3	58-0321	MOTOR, C.W.ELEC, METABO, 220V	1
	NOT SHOWN		
	36-0008	WRENCH, L, 3/16 HEX	1
	36-0018	WRENCH, T, 1/8 HEX	1
	86-0374	CASE AND LINER 301.5SP METABO CORDED	1

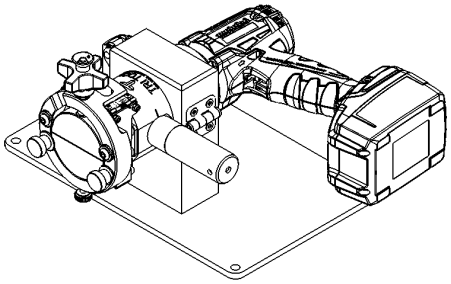
Parts List, Model 301.5SP Corded,100V Bosch (P/N 01-2225)

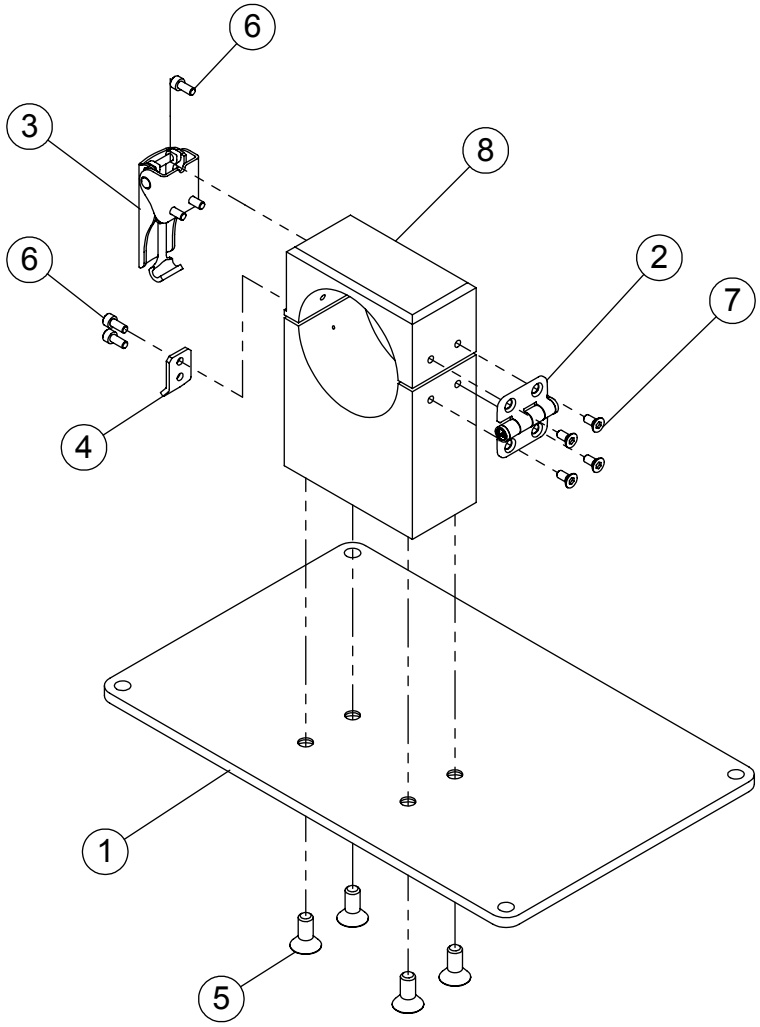
Item No	Part No.	Description	Qty
1	02-2989	MODEL 301.5SP SUBASSY	1
2	27-1522	ADAPTER, DRIVE, 301.5SP-BOSCH	1
3	58-0322	MOTOR, MOD, ELECTRIC, 100V, JAPAN	1
	NOT SHOWN		
	36-0008	WRENCH, L, 3/16 HEX	1
	36-0018	WRENCH, T, 1/8 HEX	1
	86-0374	CASE AND LINER 301.5SP METABO CORDED	1

Parts List, Model 301.5SP Corded,100V Makita (P/N 01-2398)

Item No	Part No.	Description	Qty
1	02-2989	MODEL 301.5SP SUBASSY	1
2	27-1553	ADAPTER, DRIVE, 301.5SP-MAKITA 100V	1
3	58-0331	MOTOR, MOD, 100V MAKITA, JAPAN	1
	NOT SHOWN		
	36-0008	WRENCH, L, 3/16 HEX	1
	36-0018	WRENCH, T, 1/8 HEX	1
	86-0374	CASE AND LINER 301.5SP METABO CORDED	1

MOUNTING BASE ASSEMBLY (P/N 60-0112)





Parts List, Mounting Base Assembly (P/N 60-0112)

Item No	Part No.	Description	Qty
1	24-4381	PLATE,BASE,301.5SP	1
2	30-6133	HINGE,STAINLESS	1
3	30-6134	LATCH, CONCEALED DRAW, STAINLESS	1
4	30-6135	LATCH, CONCEALED KEEPER	1
5	33-0369	SCREW,FLAT,5/16-18 X 3/4	4
6	33-4235	SCREW,BUTTON,#8-32 X 3/8, SS	5
7	33-2691	SCREW,FLAT,#8-32 X 3/8 SS	4
8	48-3916	BLOCK,LATHE STAND CLAMP	1
	NOT SHOWN		
	30-2061	LABEL,TRI TOOL	1

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 safety triggers on the machine.

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!

TRI TOOL
BUILDING PERFORMANCE

3041 Sunrise Blvd.
Rancho Cordova, CA 95742
(800) 345-5015
(916) 288-6100
www.tritool.com