

OPERATION MANUAL

92-1755 Rev. 230130
Model 301.5SP 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.

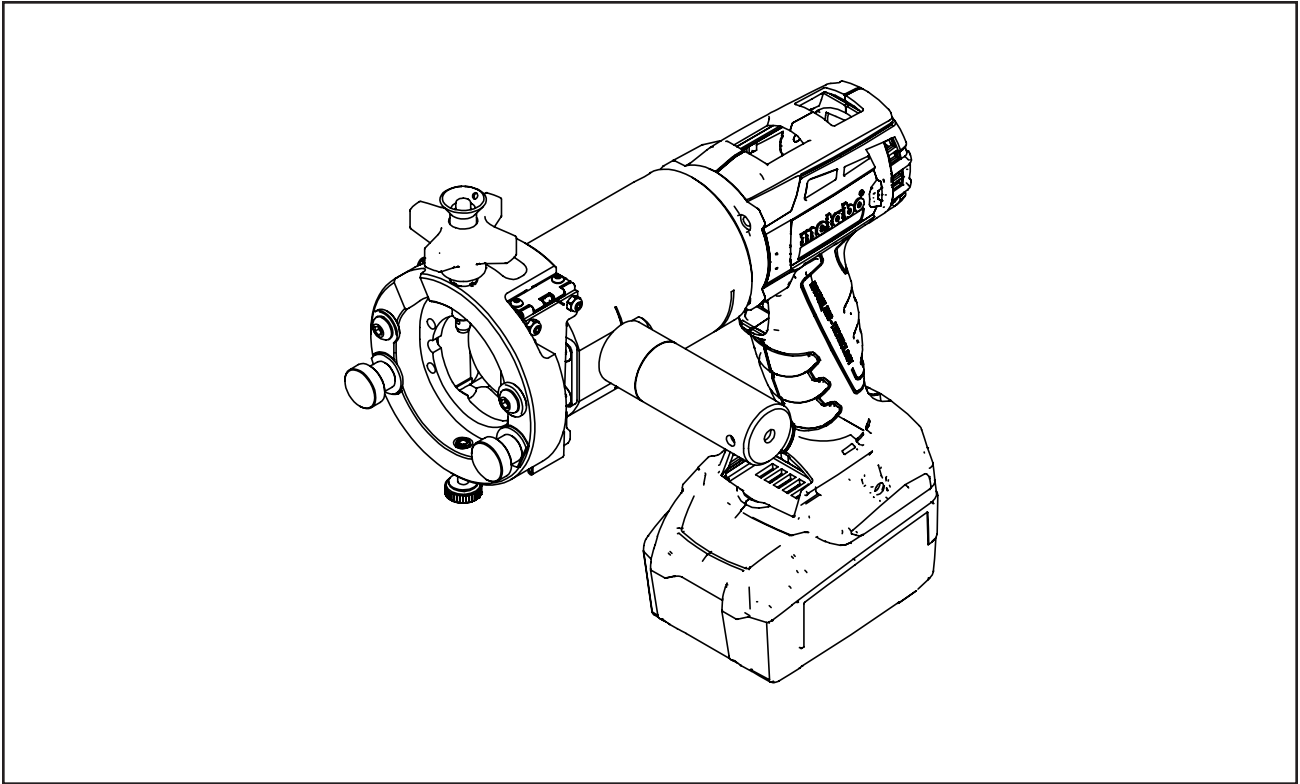


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TRI TOOL INC. Warranty

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 resharpen badly gouged, chipped, or broken tool bits. Seller will return tool bits that are not suitable for resharpening with the tool bits that were resharpened, unless Seller is instructed otherwise. Buyer is responsible for all shipping charges to and from Seller.



1. ABOUT THE MANUAL

1.1 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.

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.

1.3 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 that, if not avoided, will result in serious injury or death.



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



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

2. SAFETY PRECAUTIONS

2.1 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

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.

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.

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

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

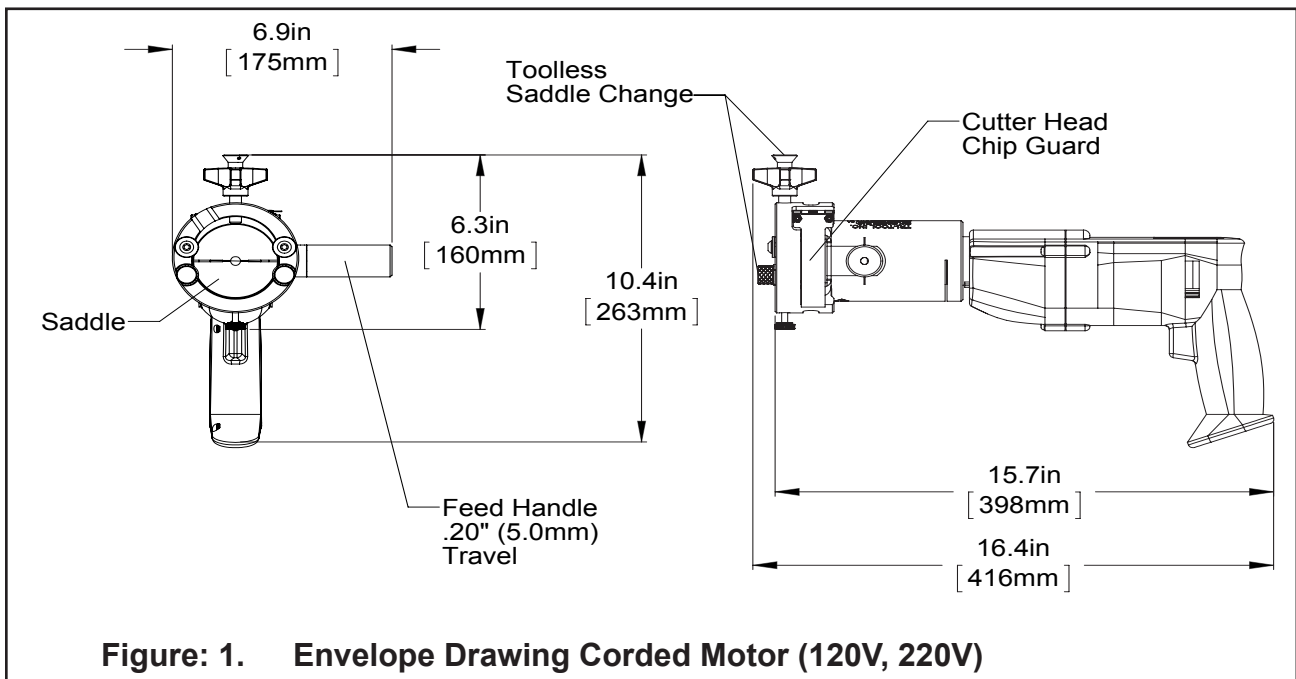
MODEL 301.5SP with Motor

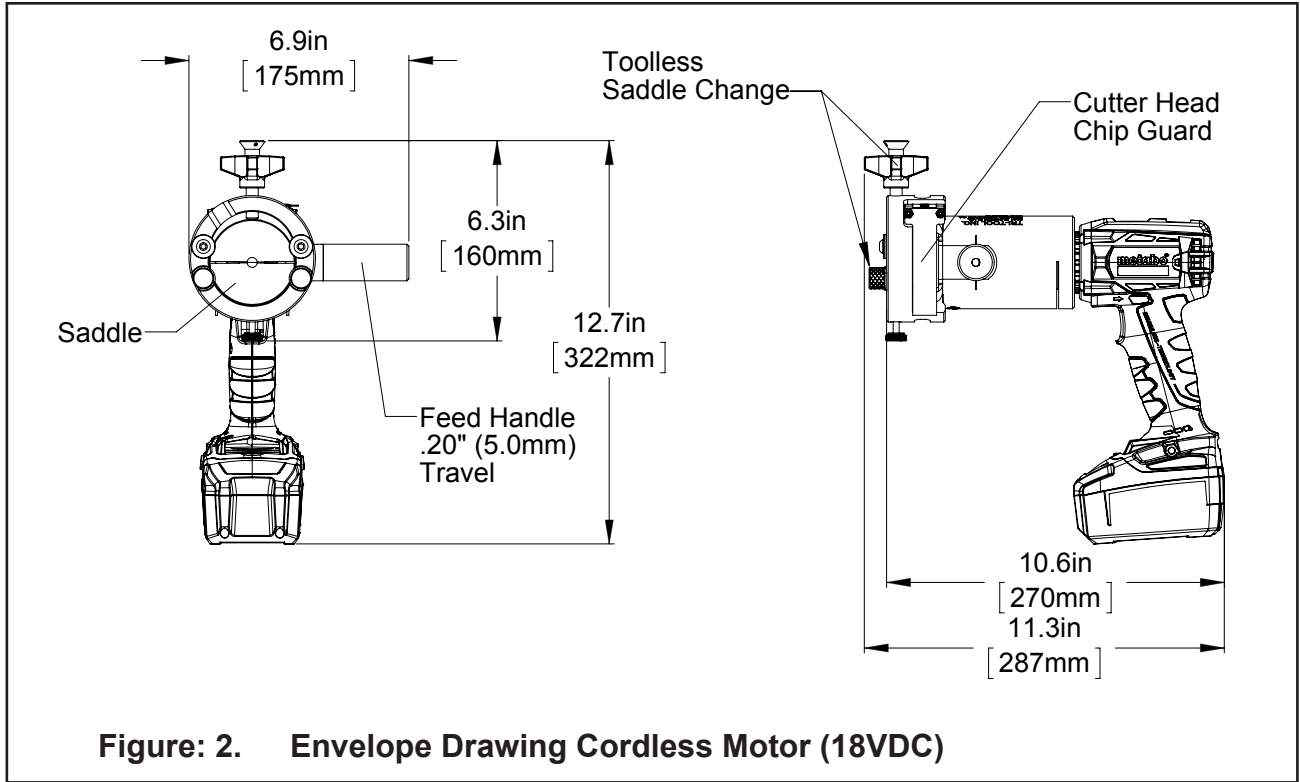
POWER REQUIREMENTS

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)





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: If the chips are not removed, the tool life may be severely shortened.

CAUTION

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

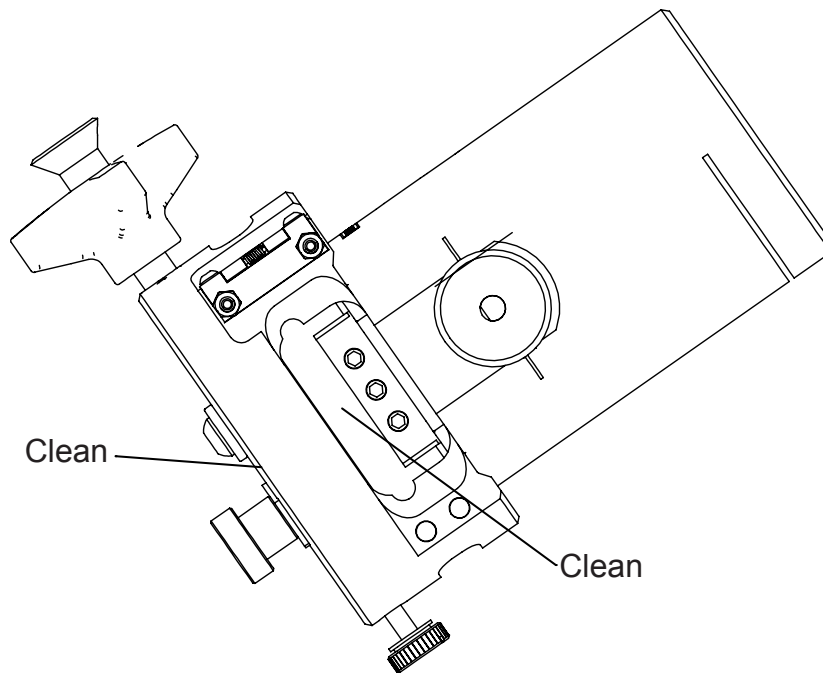


Figure: 3. Sites to Clean

6. OPERATION

6.1 GUIDELINES FOR SELECTING A TOOL BIT



CAUTION: 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

CAUTION

- 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 1.000" (25.4mm) 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 1.000" (25.4mm). 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.

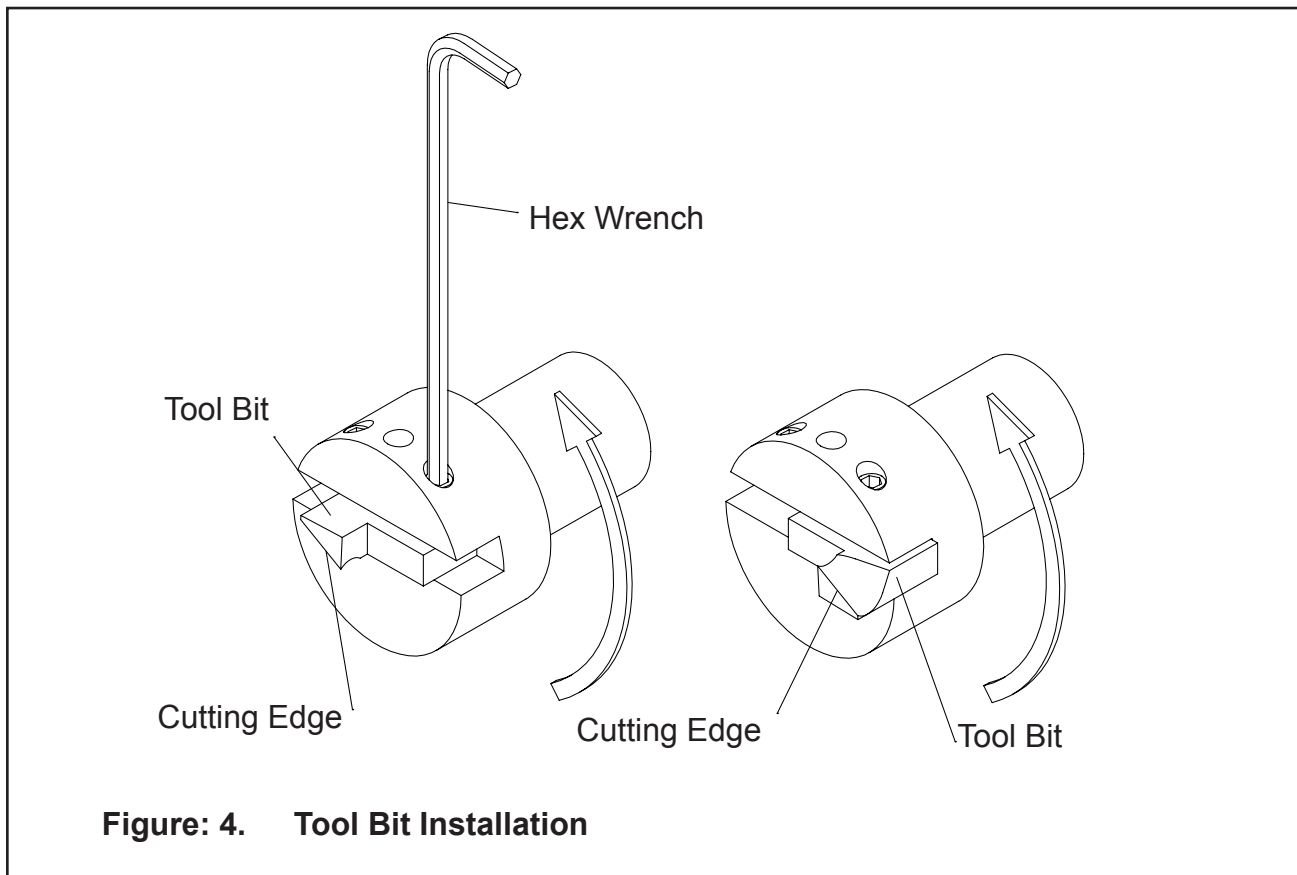
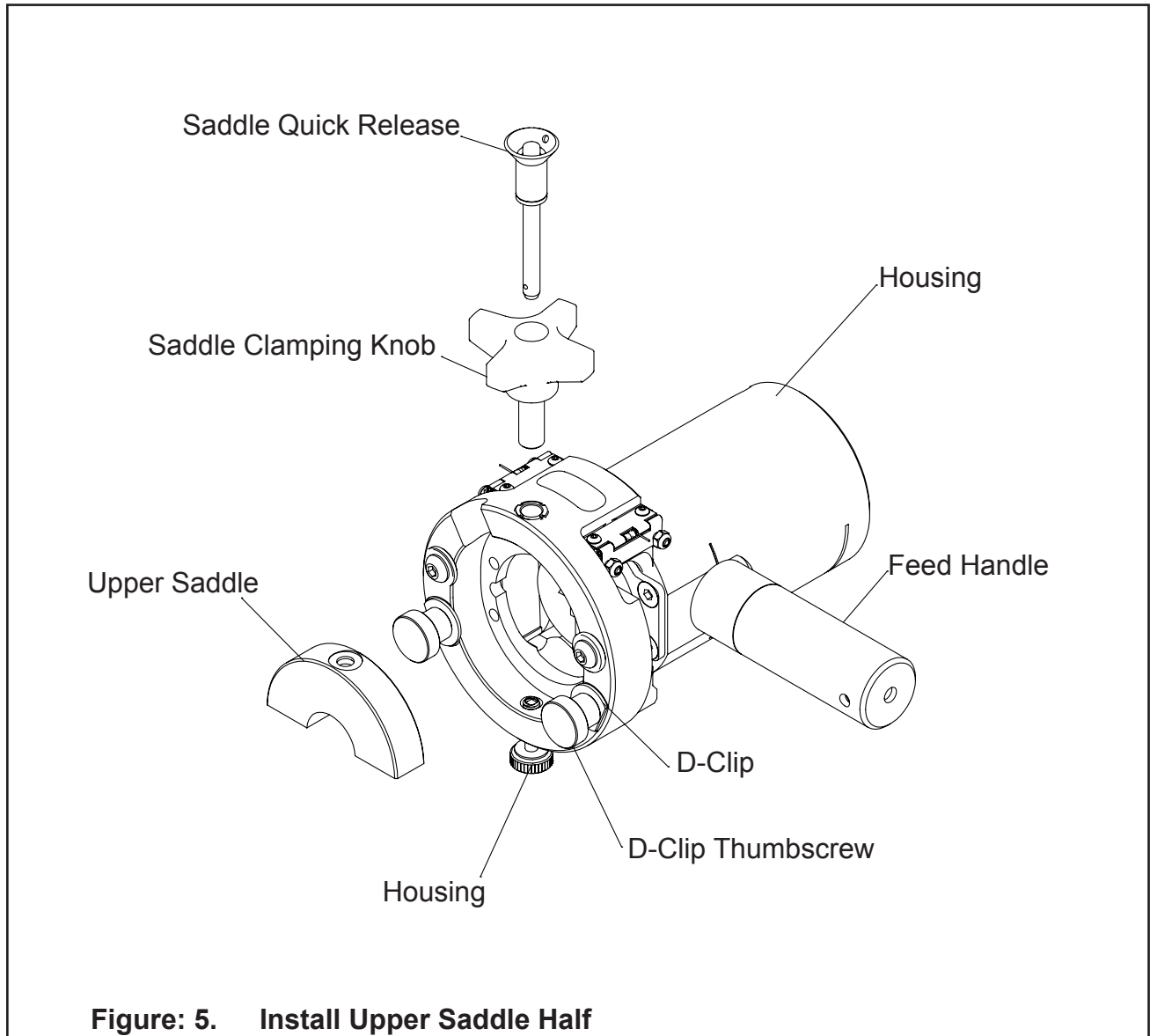


Figure: 4. Tool Bit Installation

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.



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.

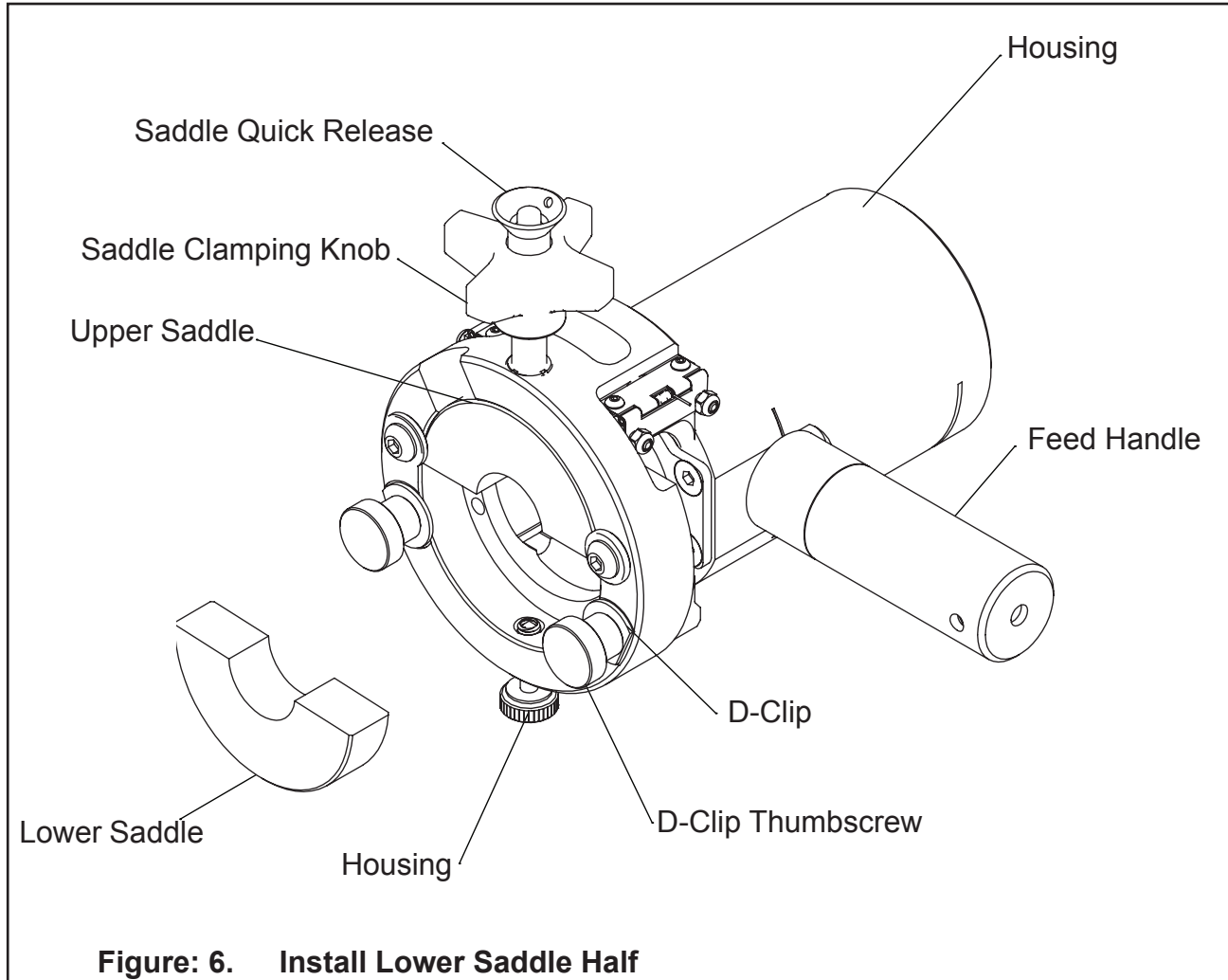


Figure: 6. Install Lower Saddle Half

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: 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.

CAUTION

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

CAUTION

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" (3.2mm) 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" (6.4mm)	255	318	382
.375" (9.5mm)	170	212	255
.500" (12.7mm)	127	159	191
.750" (19.1mm)	85	106	127
1.00" (25.4mm)	64	80	95
1.25" (31.8mm)	51	64	76
1.50" (38.1mm)	42	53	64
2.00" (50.8mm)	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" (.08mm to .15mm) 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.

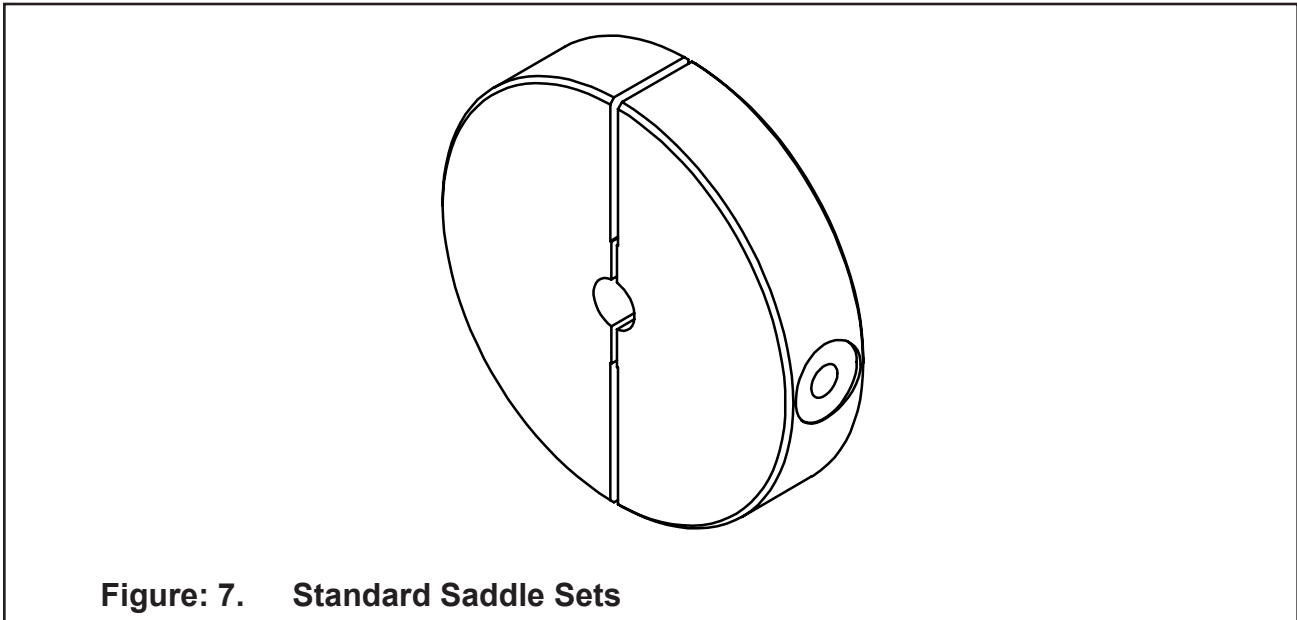
Stainless steel, which work hardens, must be worked with a heavy enough feed to prevent work hardness (.003" to .006" or .08mm to .15mm feed)

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



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

Model 301.5SP Tube Squaring Machine

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	
		.500"	12.70 mm	67-4806	
1/2"	.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	
	19/32"	.591"	15.00 mm	67-4816	
		.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"	17.15mm	67-4824		
		.677"	17.20mm	67-4825		
		.681"	17.30mm	67-4826		
		11/16"	.688"	17.48mm	67-4827	
			.709"	18.00mm	67-4828	
		23/32"	.718"	18.24mm	67-4829	
		3/4"	.750"	19.05mm	67-4830	
		25/32"	.781"	19.84mm	67-4831	
			.787"	20.00mm	67-4832	
			.790"	20.07mm	67-4833	
			13/16"	.813"	20.65mm	67-4834
		.825"		20.96mm	67-4835	
		1/2"		.840"	21.34mm	67-4836
				.844"	21.44mm	67-4837
.848"	21.55mm			67-4838		
27/32"	.854"			21.70mm	67-4839	
	.859"			21.83mm	67-4840	
	.866"			22.00mm	67-4841	
	.875"			22.23mm	67-4842	
29/32"	.896"			22.75mm	67-4843	
	.906"			23.00mm	67-4844	
15/16"	.938"			23.83mm	67-4845	
31/32"	.969"			24.61mm	67-4846	
	.984"			25.00mm	67-4847	
1"	1.000"			25.40mm	67-4848	
3/4"				1.050"	26.67mm	67-4849
		1.059"	26.90mm	67-4850		
		1.063"	27.00mm	67-4851		
		1-1/16"	1.071"	27.20mm	67-4852	
			1.102"	27.99mm	67-4853	
		1-1/8"	1.125"	28.58mm	67-4854	
		1-5/32"	1.156"	29.36mm	67-4855	
			1.181"	30.00mm	67-4856	
		1-3/16"	1.188"	30.18mm	67-4857	
			1.218"	30.94mm	67-4858	

Model 301.5SP Tube Squaring Machine

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

8.2 SHORT PERCH SADDLES

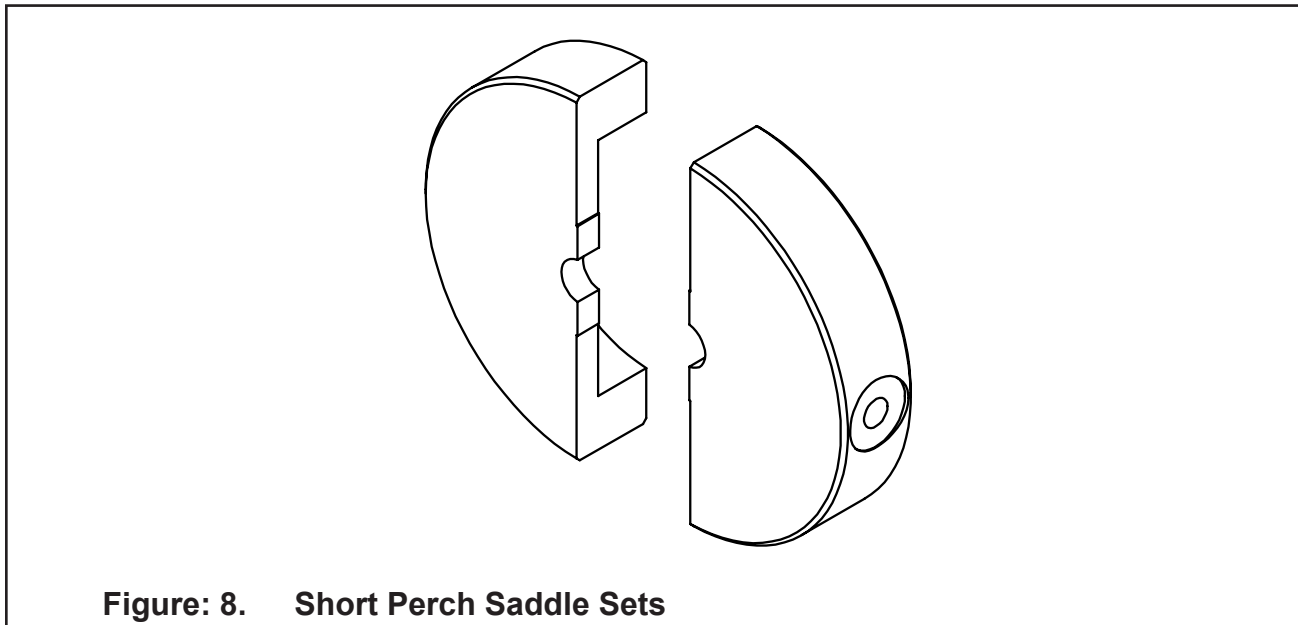


Figure: 8. Short Perch Saddle Sets

SHORT PERCH SADDLE SET PART NUMBERS

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

SHORT PERCH SADDLE SET PART NUMBERS

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

SHORT PERCH SADDLE SET PART NUMBERS

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

SHORT PERCH SADDLE SET PART NUMBERS

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

9. TOOL BITS

9.1 TOOL BITS FOR STANDARD SADDLES

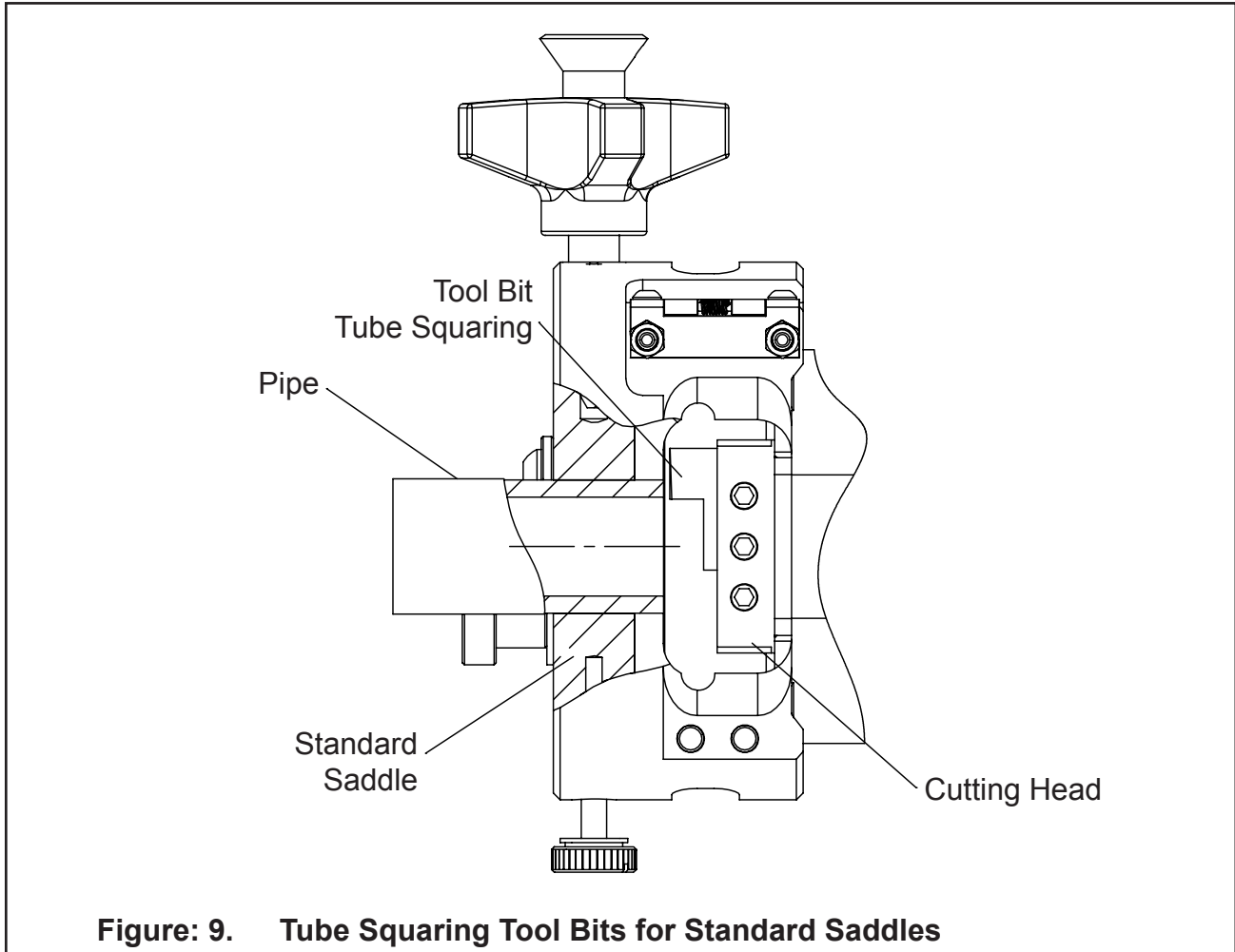


Figure: 9. Tube Squaring Tool Bits for Standard Saddles

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" (3.2mm OD thru 38.1mm OD)	.125" (3.2mm)	CS SS 316L SS	.750" (16.1mm)	Durabit 1

9.2 TOOL BITS FOR SHORT PERCH SADDLES

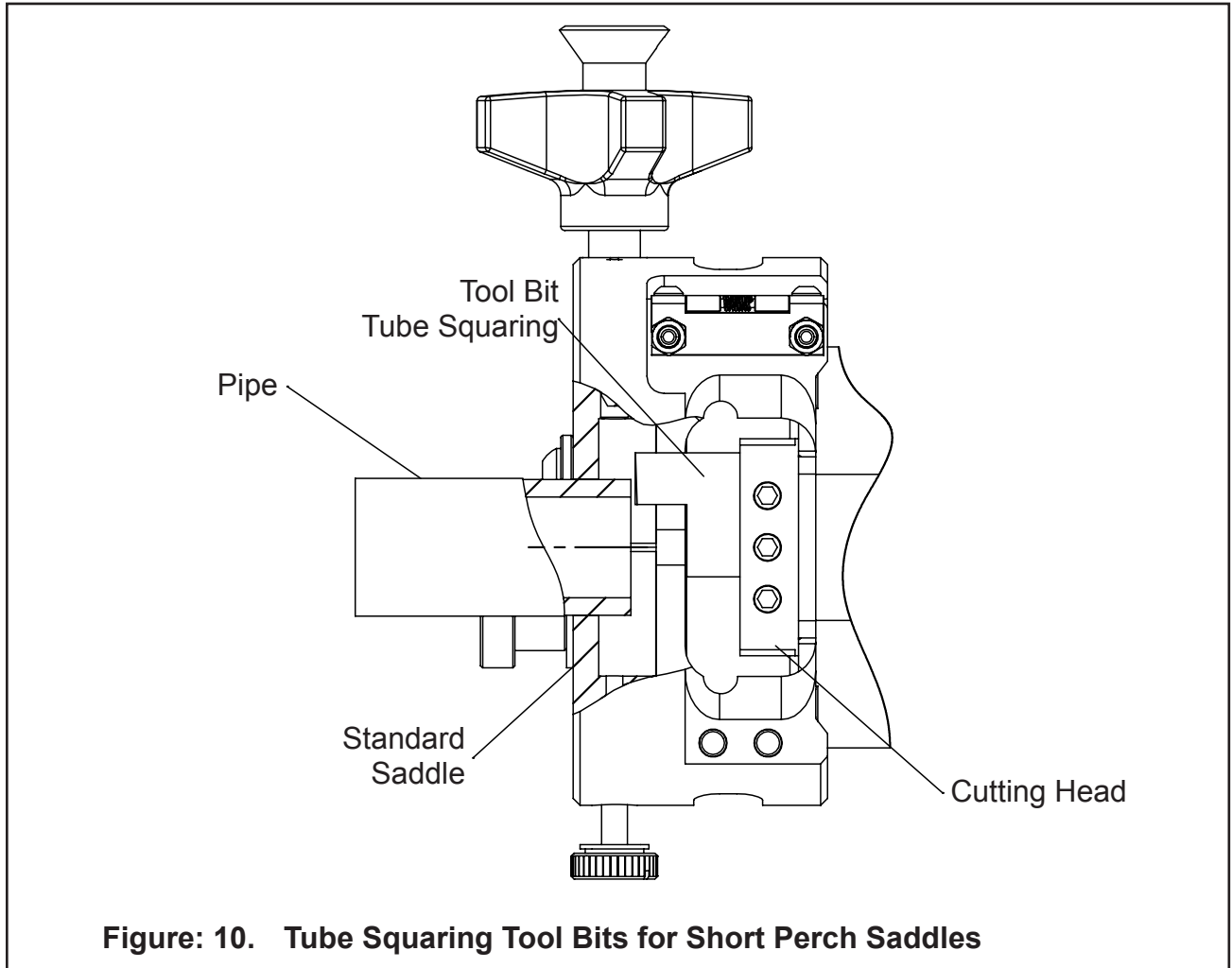


Figure: 10. Tube Squaring Tool Bits for Short Perch Saddles

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" (3.2mm OD thru 38.1mm OD)	.125" (3.2mm)	CS SS 316L	1.160" (29.5mm)	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: Tube or Pipe is Slipping in the Saddles

- The saddles are not in full contact with the pipe or tube.
 - The clamping pressure is too light.
 - Scale and/or other foreign material is present on the pipe or tube.
 - Weld seams, swelling, or bumps under the saddles are preventing full contact.
 - Dull tool bits are causing extra force in the axial and/or radial direction.
-

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: Loss of Hydraulic Power

The hydraulic supply pressure is too low.
The hydraulic filter is plugged.
The hydraulic line size is insufficient.
The hydraulic line is too long.

Problem: Tool Bit does not Reach Work

Incorrect tool blocks are installed.
Incorrect tool bit is installed.

Problem: Hydraulic Motor does not Start

The hydraulic power supply is shut off.
The hydraulic motor is damaged and will not run free.

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

11. ACCESSORIES

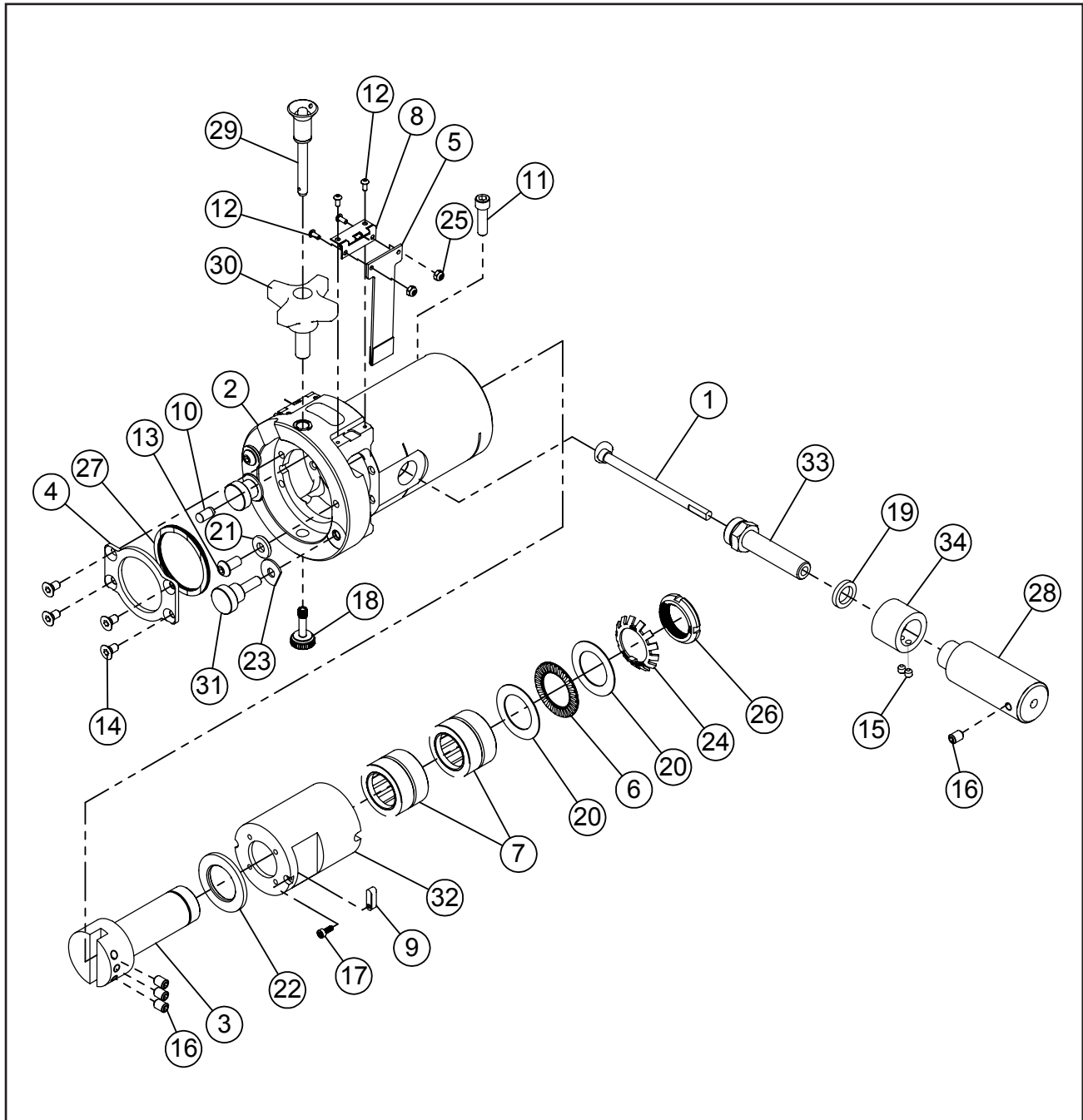
Tri Tool offers the following accessories for the Model 301.5SP Tube Squaring Machine:

- 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)

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12. ILLUSTRATED PARTS BREAKDOWN

MODEL 301.5SP P/N (02-2989)

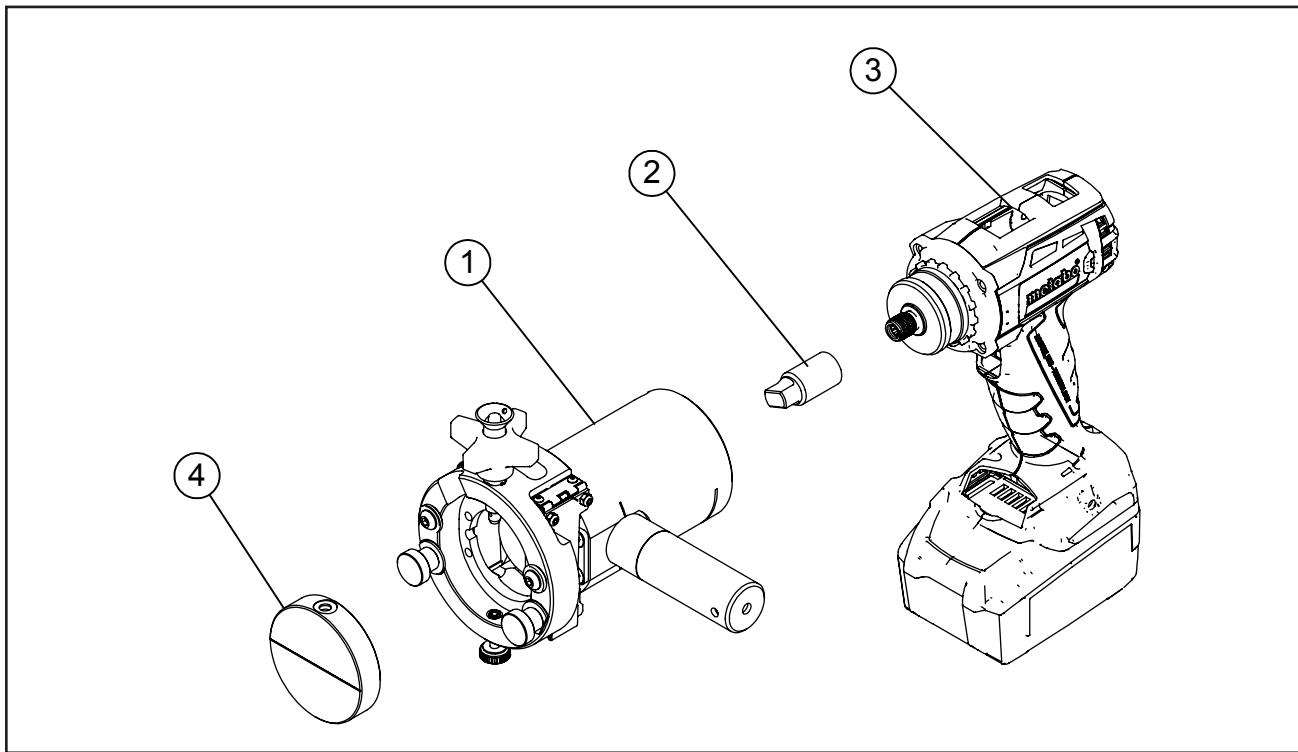


Model 301.5SP Tube Squaring Machine

Parts List, Model 301.5SP (P/Ns 02-2989)

Item No.	Part No.	Description	Qty
1	14-0153	ASSY, SHAFT, CAM FEED, 301.5SP	1
2	19-1734	HOUSING ASSY, 301.5SP	1
3	20-1643	SHAFT, 301.5SP SPINDLE	1
4	24-4359	PLATE, SPRING RETAINER, 301.5SP	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 SQ X 16 MM, BER	1
10	32-0116	DOWEL PIN (DIA .250 x 1.25)	1
11	33-0041	SCREW, CAP (1/4-20 x .88)	1
12	33-0265	SCREW,BUTTON,#4-40 X 1/4	8
13	33-0285	SCREW, BUTTON HEAD (1/4-20 x .50)	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 8 MM, SS	1
18	33-4222	SCREW,CAPTIVE,1/4-20	1
19	33-4443	SCREW, ADJUSTMENT	1
20	34-0060	WASHER	1
21	34-0216	WASHER,THRUST,1 X 1-9/16 X 1/32	2
22	34-0304	WASHER,.265"ID X .750"OD X .090"	2
23	34-0705	WASHER, THRUST, DELRIN, 301.5SP	1
24	34-0708	WASHER,CLIPPED,1/4 X 3/4 X .044	2
25	34-0709	WASHER,LOCK,WT	1
26	35-0253	NUT,LK,#4-40	4
27	35-1031	NUT,LOCK,NT	1
28	40-0502	SPRING,WAVE,1.60 ID X 2.00 OD	1
29	41-0264	HANDLE, CAM FEED, 301.5SP	1
30	41-0265	HANDLE,QUICK RELEASE,1/4 DIA	1
31	42-0297	KNOB, ADJ SADDLE, 301.5SP	1
32	42-0300	KNOB,KNRULED,1/4-20 X 3/4	2
33	46-0742	SLEEVE, CAM FEED, 301.5SP	1
34	46-0743	SLEEVE, CAM SHAFT	1
35	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)

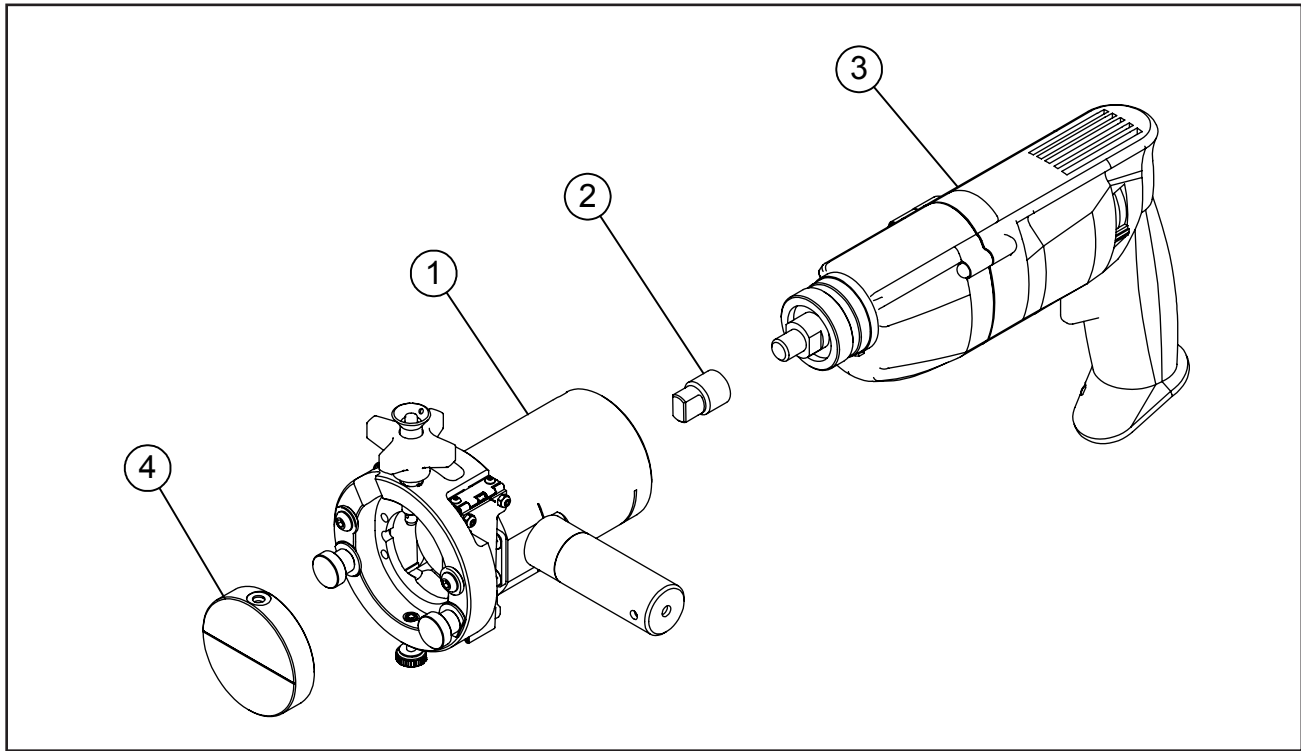
Item No	Part No.	Description	Qty
1	02-2989	MODEL 301.5SP SUBASSY	1
2	27-1505	ADAPTER, DRIVE, 301.5-CORDLESS	1
3	58-0317	MOTOR, CORDLESS, 18V, METABO, MOD CW	1
4	67-XXXX	SADDLE, (REFER TO SADDLE SECTION)	
NOT SHOWN			
	30-6143	CHARGER, METABO, 18V, 5.2AH120V	1
	36-0008	WRENCH, L, 3/16 HEX	1
	36-0018	WRENCH,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

Model 301.5SP Tube Squaring Machine

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

Model 301.5SP Tube Squaring Machine

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

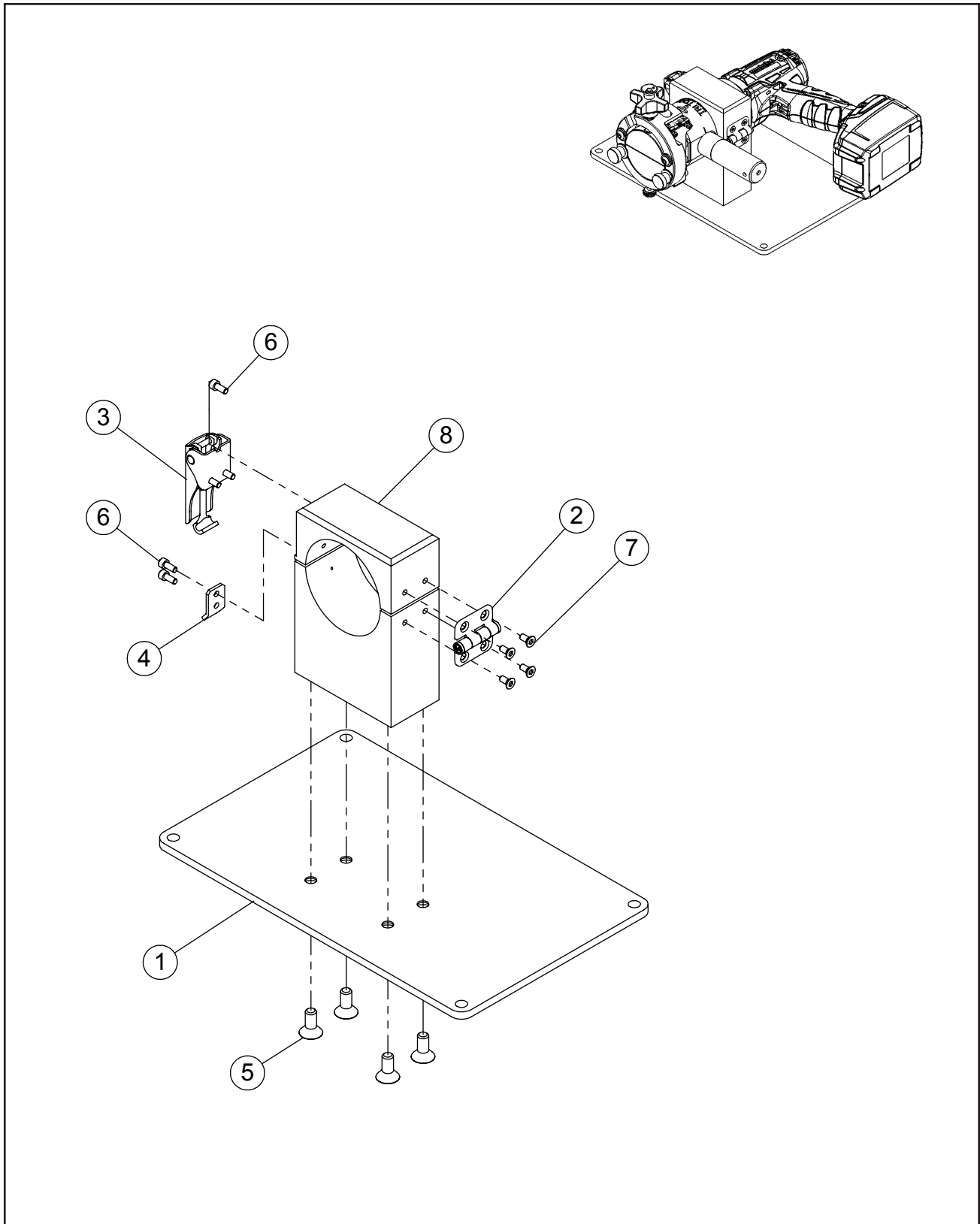
Parts List, Model 301.5SP Corded,100V Bosch (P/N 01-2225)

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

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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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