

# Popular Science

THE *What's New* MAGAZINE

## SUPER OILS

FOR YOUR CAR

**GUARD YOUR HOME**  
Against Burglars  
with This Uncanny  
Light-Control System

**THOSE EXPENSIVE  
RADIATOR COOLANTS—**  
Do They Really Work?

New Contender for  
Low-Pollution Power:  
**PHILIPS' STIRLING-CYCLE  
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Photos from Space  
Will Solve  
Earthly Problems  
By **WERNHER von BRAUN**

3 Projects You Build  
**HELP CLEAN UP  
THE ENVIRONMENT**

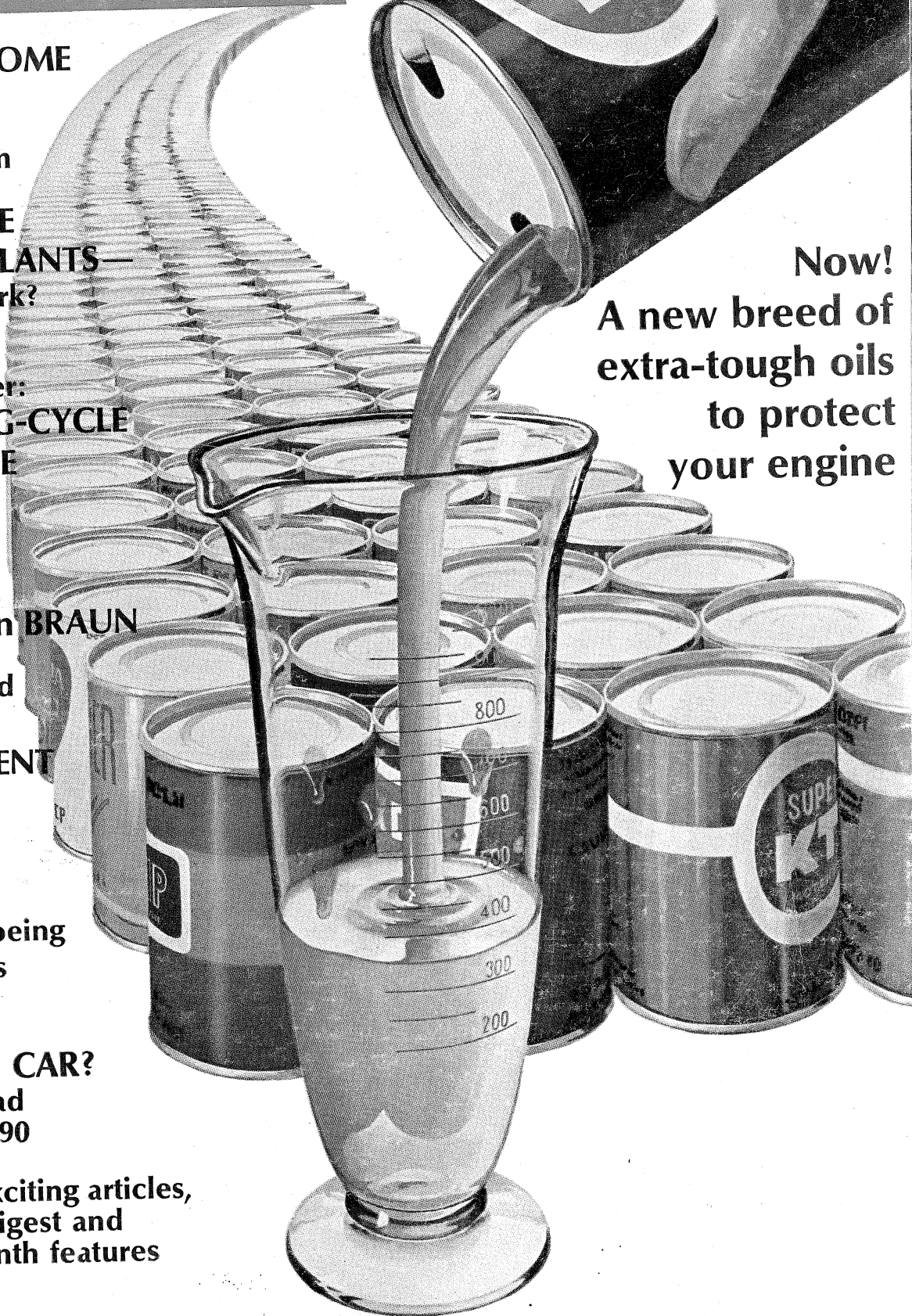
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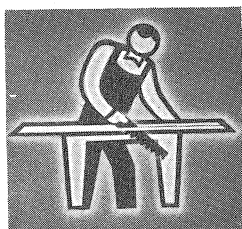
Mowers  
Computers  
water Canoeing  
Ice Makers  
Detectors

**IS A NEW CAR?**  
You to Read  
/ on Page 90

16 other exciting articles,  
it's New Digest and  
10 great every-month features

Now!  
A new breed of  
extra-tough oils  
to protect  
your engine





# SHOP TALK

By ROBERT P. STEVENSON

## Where to get service manuals for home appliances

Several months ago I suggested here that more home-appliance makers ought to make service manuals available to mechanically adept home owners. A major difficulty in the way of this, I have since learned, is that some makers update their manuals by providing supplements in loose-leaf form. Professional repairmen thus can keep current information on a maker's line, but the loose-leaf file would be more than the home owner usually needs. There is a way out, however. Special manuals for particular brands and models are published by Master Publications, 1660 Euclid St., Santa Monica, Calif. 90404. Master does not sell direct, only through appliance-parts distributors. If you can't locate a distributor in your area, Master will supply the name and address of the nearest one or two—from whom you may get needed parts.

## Useful information you may want to write for

Two basement-door installation guides, both free, are offered by the Bilco Co., New Haven, Conn. 06505—one for use if you are building a new home, another if you want to replace an old wooden cellarway . . . If you are fortunate enough to own a potential pond site, you may want a copy of "Ponds for Water Supply and Recreation," booklet AH-387. It's free from the Office of Information, U.S. Department of Agriculture, Washington, D. C. 20250 . . . Kirsch Co., Sturgis, Mich. 49091, has several free folders describing attractive modern wall shelves.

## Ventilating Institute gives sound ratings for exhaust fans

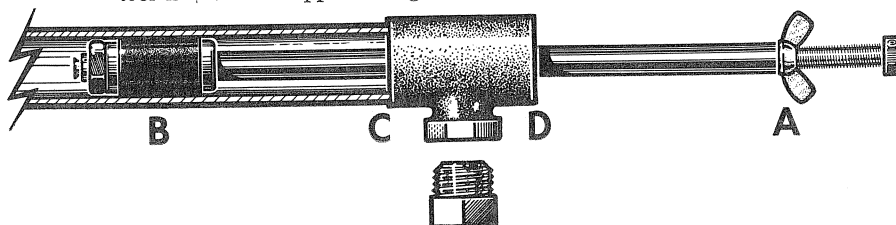
Next time you buy a range hood or an exhaust fan, give a thought to its rating for sound, as well as how much air it moves. The Home Ventilating Institute introduced sound ratings this year for its 12 member manufacturers. Products that have met tests set up at a laboratory at Texas A & M University will carry the label shown. Both sound and air-movement ratings can be found in HVI's "Certified Home Ventilating Products Directory." An architect, builder, or dealer should be able to show you a copy. Sound ratings are stated in sones rather than decibels.



An Institute statement says ratings in sones, internationally recognized units of total loudness, are easy to compare. For example, a rating of two sones is exactly half as loud as a sound rated at four. In decibel ratings, loudness doubles with each additional three decibels. Company catalogs and literature must list both sound and air-movement ratings in 1972.

## A special tool to solve a very special problem

You know the problem—if you've ever cut into and drained a copper plumbing system. Water always shows up just in time to spoil the solder joint you try to make. To stop the drips, many plumbers stuff the line with bread, counting on it being flushed out when the joint has been made. Now, Expando Seal Tools, Spring House, Pa. 19477, has introduced a special tool for the job. Appropriately enough, it's called a Dutch finger. You first place a clean-out tee, facing downward, on the cut tubing and thrust in the tool. Turning wingnut A expands rubber-plug B and you can make a solder joint at C. Remove the tool and any remaining water will run out of the cleanout, enabling you to complete a joint at D. Insert the pipe plug and your connection is complete. The tool is \$4.75 in copper-tubing sizes from 1/2" through 2".



## Light Turns Burglars Away

[Continued from page 100]

diodes at these intersections actuate the light in outlet #6 at these times and no others.

Use as many or as few diodes as you need to get the lighting pattern you've selected. Keep diode leads as short as possible to prevent shorts between adjacent rows or columns. Polarity of diodes is *critical*: All anodes (plain end) are connected to horizontal columns; all cathodes (banded end), to vertical rows.

Bring the six output leads from the circuit board to a six-lug terminal strip mounted on the side of the minibox. Use good quality, insulated, stranded hook-up wire (#20) to connect controller with outlets.

Mounting the controller in a centrally located place in your home will keep interconnecting runs to outlets as short and convenient as possible.

**Wiring the controlled outlets.** Use standard dual outlets (three-prong grounded) in ordinary wiring boxes. Mount each triac on a small square of thin sheet copper, as in the pictorial diagram. Solder the end of the sheet to the socket's neutral terminal. The hot side of the power line goes to the outlet's hot terminal; the line's neutral side to the triac's cathode terminal. The control signal line (from the controller) connects to the triac's gate terminal.

Punch out all access holes in the box for ventilation of the triac. Take care that the copper strip holding the triac touches no box-housing metal, or any other wiring. Mount the receptacle box in a wood or plastic container for added protection and safety. A few holes drilled into the sides of it as well will keep the triac properly ventilated.

A common neon-bulb circuit tester will identify the hot and neutral sides of the power line. The tester glows when connected between hot side and ground, but not when connected between neutral and ground.

**Synchronization.** The pilot lamp (LM) is there to ease synchronizing of the stepping switch with the activators on the timer. Do synchronization in the morning or afternoon, when the controller is off. Turn the timer dial until all activators are past S2's roller. Flip on S1, manually, and slowly press and release S2 until the pilot light comes on. Switch off S1, set the dial to the correct time, and your controller is set up for automatic operation.

Never plug in home appliances—the on/off transients from the stepper switch may harm them. But you can use your people simulator to control up to 250 watts per outlet box, enough for your biggest lamps—and too much for the bravest thief.

**OPERATING PROCEDURES FOR O-SERIES VALVE CHANGING TOOLS**

The O-Series Valve Changing Tools are used to replace full flow valves when system is pressurized. The maximum operating pressure for each size tool is listed in the chart below. The O-Series tools are designed for standard wall (schedule 40) pipe have an operating temperature of 150°F maximum. Contact EST Customer Service directly for information on higher pressure and temperature tools.

1. Close existing valve to be replaced and remove piping from valve on opposite end of system pressure.
2. Thread O-Series Tool Assembly Tube (7) into valve leak tight and fully retract Shaft (1).
3. Firmly hand-tighten the Gland Nut (3).

**WARNING! DO NOT STAND BEHIND TOOL DURING THIS STEP AS THE PRESSURE DIFFERENTIAL MAY CAUSE THE SHAFT TO BE THRUST BACKWARD WHEN THE VALVE IS OPENED.**

4. Slowly rotate valve into the full open position. Should any leakage become evident the Assembly Tube (7) or the Gland Nut (3) may need to be tightened further.
5. Push the Shaft (1) toward the valve so that seal is positioned beyond the valve. While holding Shaft (1) in position tighten the Hex Nut (13) to the installation torque indicated in the chart below.
6. Slowly loosen the Gland Nut (3) to release internal pressure from the Assembly Tube (7). After pressure has been released, loosen the Gland Nut (3) further to fully relax the Gland Seal (5).
7. Slowly unthread the Assembly Tube (7) from valve. Note that the Shaft (1) and Compression Tube (2) should be independent of the Assembly Tube (7) movement. Disengage the Assembly Tube (7) from the valve and remove Assembly Tube (7) from the installed tool Shaft (1).

**CAUTION: DO NOT ATTEMPT TO ADJUST INSTALLED TOOL SHAFT WHEN SYSTEM IS PRESSURIZED.**

8. The valve can now be replaced or repaired as required.
9. With new or repaired valve properly installed onto pressurized system, install the assembly tube over the installed tool Shaft (1) and into the valve leak tight.
10. Firmly hand-tighten the Gland Nut (3).

**WARNING! DO NOT STAND BEHIND TOOL DURING THIS STEP AS THE PRESSURE DIFFERENTIAL MAY CAUSE THE SHAFT TO BE THRUST BACKWARD WHEN THE HEX NUT IS LOOSENED.**

11. Fully loosen the Hex Nut (13) to retract the seal.
12. Pull Shaft (1) back through the valve and into the fully retracted position.
13. Fully close the valve.
14. Slowly loosen the Gland Nut (3) to release internal pressure from the Assembly Tube (7). After pressure has been released, loosen the Gland Nut (3) further to fully relax the Gland Seal (5).
15. Slowly unthread the Assembly Tube (7) from valve and remove tool.



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INSTALLATION TORQUES AND OPERATING PRESSURES							
SIZE	♦ PART NUMBER NEOPRENE SEALS	OLD PART NUMBER	INSTALLATION TORQUE FT-LBS (KG-CM OR M)		PRESSURE PSI (BAR)		
1/2	OSR-0050-N	O-1	10 IN-LBS	11.5 KG-CM	200 PSI	13.7 BAR	
3/4	OSR-0075-N	O-2	2.5 FT-LBS	35 KG-CM	175 PSI	12.0 BAR	
1"	OSR-0100-N	O-3	12 FT-LBS	1.7 KG-M	175 PSI	12.0 BAR	
1-1/4	OSR-0125-N	O-4	12 FT-LBS	1.7 KG-M	150 PSI	10.3 BAR	
1-1/2	OSR-0150-N	O-5	12 FT-LBS	1.7 KG-M	125 PSI	8.6 BAR	
2"	OSR-0200-N	O-6	12 FT-LBS	1.7 KG-M	100 PSI	6.9 BAR	
2-1/2	OSR-0250-N	O-7	12 FT-LBS	1.7 KG-M	80 PSI	5.5 BAR	
3"	OSR-0300-N	O-8	12 FT-LBS	1.7 KG-M	70 PSI	4.8 BAR	
4"	OSR-0400-N	O-9	20 FT-LBS	2.8 KG-M	30 PSI	2.1 BAR	

♦ OPERATING TEMPERATURE TO 150 DEG F (65.5 DEG C)

PARTS LIST			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	SHAFT	
2	1	COMPRESSION TUBE	
3	1	GLAND NUT	
4	2	GLAND SEAL WASHER	
5	1	GLAND SEAL	OSR-XXXX-M-GS
6	1	URETHANE SEAL	OSR-XXXX-FS
7	1	ASSEMBLY TUBE	
8	1	PACKING GLAND	
9	2 (1/2" - 2") 3 (2-1/2" - 4")	TOOL WASHER	
10	1 (1/2" - 2") 2 (2-1/2" - 4")	TOOL SEAL	OSR-XXXX-M-RS
11	1	LOCKNUT (1/2" - 1")	
12	2	JAMNUT (1-1/4" - 4")	
13	2	HEX NUT	
14	1	PIN	
15	3	PACKING (NOT SHOWN) SUPPLIED AS PART OF ITEM 8	OSR-XXXX-PK

"XXXX" PIPE SIZE ROUNDED TO (2) DECIMAL PLACES

"M" DESIGNATES SEAL MATERIAL  
N - NEOPRENE  
V - FLUOROELASTOMER  
(VITON OR EQUIVALENT)

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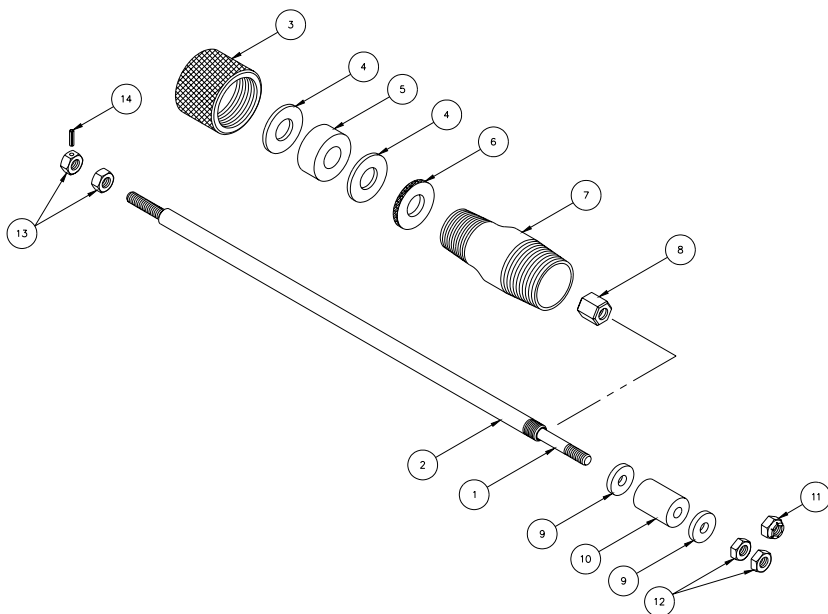
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SPECIALISTS IN TUBE TESTING, SLEEVING AND PLUGGING TECHNOLOGY

AN ISO-9001 REGISTERED COMPANY

**OPERATING INSTRUCTIONS  
TBD VALVE CHANGING TOOL  
1" - 4" SIZE**

SIZE	MAXIMUM PRESSURE	INSTALLATION TORQUE GRIPPER NUT (T1) FT-LB	INSTALLATION TORQUE SEAL NUT (T2) FT-LB
1"	600 PSI	15	15
1-1/4"	550 PSI	45	20
1-1/2"	500 PSI	45	20
2"	450 PSI	65	45
2-1/2"	400 PSI	65	45
3"	350 PSI	85	90
4"	250 PSI	85	90

***WARNING! NEVER USE TBD TOOL IN REVERSE PRESSURE APPLICATIONS. THE LINE PRESSURE MUST ALWAYS PRESSURIZE AGAINST THE BOTTOM WASHER OF THE SEALING ASSEMBLY.***

1. With faulty valve in closed position disconnect downstream pipe from the valve.
2. Hold the tool next to the valve to be changed. Extend the tool so that the seal and grippers will be located in the upstream pipe. Measure the length between the Gripper Compression Nut and the Gland Nut. Use this length to ensure proper tool position when changing valve.
3. Apply thread sealant to Assembly Tube threads. With tool fully retracted thread Assembly Tube to valve leak tight. Tighten Gland Nut to create a seal between the Assembly Tube and the plug shaft.
4. With TBD tool fully retracted, turn faulty valve to open position.

**Caution: If shaft is not fully retracted, fluid pressure could cause shaft to be violently thrust into retracted position.**

5. Push tool shaft through valve until seal and grippers clear valve and are beyond the valve body and located in upstream pipe. The length between the Gripper Compression Nut and the Gland Nut should be the same as measured in step 2.
6. Tighten Gripper Compression Nut (see diagram on page 2) to the installation torque, T1 as shown in the Table above. This will expand the grippers against the pipe ID.
7. Tighten Seal Compression Nut (see diagram on page 2) to the installation torque, T2, as shown in the Table above. This will expand the seals against the pipe ID.
8. To release pressure from the isolated valve, loosen the Gland Nut when all P.S.I. is released. Unthread the Assembly Tube from the valve and remove from the plug shaft.



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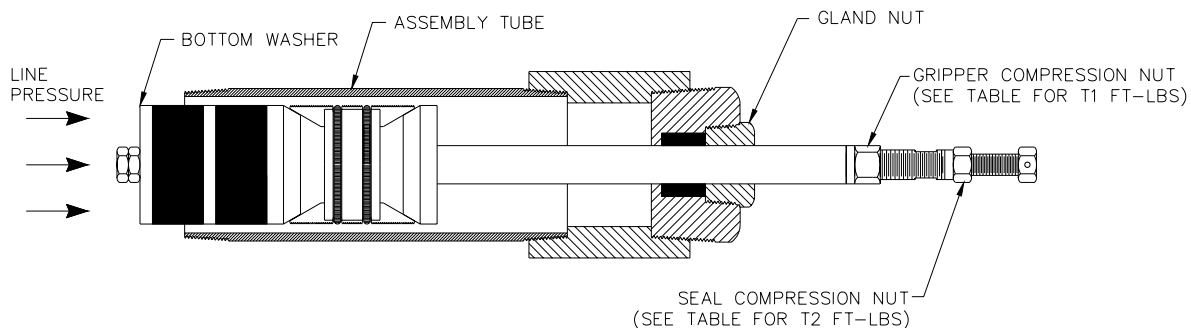
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9. Remove faulty valve and repair or replace as required. Reinstall valve.
10. Apply thread sealant to Assembly Tube threads and install Assembly Tube over plug shaft. Thread Assembly Tube to valve leak tight. Tighten Gland Nut to create a seal between the Assembly Tube and the plug shaft.

**WARNING! KEEP CLEAR OF SHAFT END WHEN LOOSENING SEAL AND GRIPPER COMPRESSION NUTS AS THE DIFFERENTIAL PRESSURE MAY RESULT IN THE TOOL BEING THRUST INTO THE RETRACTED POSITION.**

11. Loosen Seal Compression Nut until seals are fully released. Loosen Gripper Compression Nut until locking feet are fully retracted.
12. Fully retract the tool so that the seal and grippers clear the valve.
13. Move valve to the closed position. Loosen Gland Nut to release pressure. When all pressure has been released unthread the Assembly Tube from the valve and remove with tool.



**WARNING! LINE PRESSURE MUST ALWAYS PRESSURIZE AGAINST THE BOTTOM WASHER OF THE SEALING ASSEMBLY AS SHOWN ABOVE. NEVER USE TBD VALVE CHANGING TOOL IN REVERSE PRESSURE APPLICATIONS.**

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**OPERATING PROCEDURES FOR FPT VALVE CHANGING TOOLS****WARNING!**

- ♦ **STRICT ADHERENCE TO THESE OPERATION INSTRUCTIONS AND INDUSTRY SAFETY PRACTICES COULD PREVENT INJURY TO PERSONNEL.**

**INSTALLATION PROCEDURE.**

1. With faulty valve in closed position and FPT Valve Changing tool fully retracted, install flange/seal housing assembly to faulty valve. **For 6" & 8" tools**, align drain valve with bottom of flange to aid draining of pipe.
2. Install and tighten flange mounting bolts on outer perimeter of tool. (For 6" and 8" valves only).
3. With drain valve in closed position (6" & 8" valves only) and tool fully retracted, turn faulty valve to open position.

**WARNING! IF SHAFT IS NOT FULLY RETRACTED, FLUID PRESSURE COULD CAUSE THE SHAFT TO THRUST VIOLENTLY INTO THE RETRACTED POSITION**

4. If any leaks occur, upper or lower packing gland nut should be further tightened to stop leak.
5. **For 6" & 8" tools**, install pulley bracket over pinned collar.
6. **For 6" & 8" tools**, secure both ends of customer supplied cable to one (1) cable guide on flange/seal housing. Cable loop must be long enough to wrap around pulley bracket assembly.
7. **For 6" & 8" tools**, secure one end of customer supplied jacking winch to second cable guide on flange/seal housing. Secure other end of jacking winch to cable loop.
8. **When Installing / Locking FPT Tool Into A Tank or Header**
  - a. Using jacking winch, push tool through valve so locking linkage of tool will be inside tank or header.
  - b. While holding compression tube from turning, turn main shaft clockwise to allow joggle locking device to expand. Continue tightening until main shaft reaches end of adjustment, with locking linkage at full expansion.
  - c. Slowly begin to retract shaft using jacking winch until toggle locking device seats on inside of tank or header, proceed to Step 10.
9. **When Installing / Locking Tool Into Pipe ID**
  - a. Using jacking winch, push tool through valve so seal and locking linkage clear valve and allow toggle locking device to expand.
  - b. While holding compression tube from turning, turn main shaft clockwise to allow toggle locking device to expand. Continue to tighten shaft until grippers lock onto pipe lid. (Approximately 90 ft-lbs; 100 ft-lbs max).
  - c. Slowly begin to retract shaft using jacking winch. FDT should not move. If movement occurs, take up slack on jacking winch and check installation torque. Proceed to Step 10.



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10. Remove jacking winch.
11. While holding compression tube from turning, turn compression nut clockwise to engage seal. (Approximately 90 ft-lbs; 100 ft-lbs maximum).
12. **For 6" & 8" tools.** Purge valve body by opening drain valve.(Keep clear of valve path while purging). When valve body is purged, loosen lower packing gland nut and unbolt flange/seal housing from faulty valve.
13. **For 2" through 4" tools.** Loosen lower packing gland nut to allow pressure and fluid to escape. Loosen seal housing assembly from fault valve.
14. Remove flange/seal housing over comp tube.
15. Remove faulty valve and repair or replace as required. Reinstall valve in open position.
16. **For 6" & 8" tools**, reinstall flange/seal housing. Bolt up to new valve with drain valve aligned with bottom of flange.
17. Firmly tighten lower packing gland nut.
18. Reinstall jacking winch and tighten to secure valve changing tool.
19. **For 6" & 8" tools**, with drain valve in closed position, loosen compression nut while holding comp tube from turning. Loosen nut fully to retract seals.
20. Keeping clear of FPT end, loosen main shaft while holding comp tube from turning. Loosen nut fully to retract locking linkage.
21. Using jacking winch, fully retract valve changing tool.
22. Turn replaced valve to closed position.
23. Purge valve body.
  - a. **For 2" through 4" tools**, loosen lower packing gland to allow pressure and fluid to escape.
  - b. **For 6" & 8" tools**, purge valve body by opening drain valve.
24. Unbolt / loosen housing assembly and remove tool.

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## HOT TAP TOOLS OPERATING INSTRUCTIONS

**POWER OPERATED TOOLS**

1. Bolt saddle to pipe and install a close nipple and gate valve, of correct size for extended service.
2. Thread the assembly tube to the valve.
3. Open valve and slide hole saw through until pilot drill touches pipe. Tighten main gland by turning clockwise.
4. Attach 1/2" variable speed drill to drill rod. Start drill at proper speed and drill through pipe. When pipe is cut through, coupons will normally spin back into hole saw.
5. Retract hole saw and coupon out through the valve into assembly tube and close valve.
6. Un-thread Hot Tap Tool. Clear valve briefly by opening to flush out chips or cuttings that weren't washed back into assembly tube. Shut off valve and install piping.

**MANUAL TOOLS**

1. Bolt saddle to pipe and install a close nipple and gate valve of correct size for extended service.
2. Thread the assembly tube to the valve.
3. Open valve and slide hole saw through until pilot drill touches pipe. Tighten main gland by turning clockwise.
4. Slide the hex sleeve over the end of the drill or broach assembly. Using the supplied ratchet wrench, begin manual drilling with a clockwise motion, while applying force against the push rod by tightening ratchet support arm. When pipe is cut through, coupon will normally spin back into hole saw.
5. Retract hole saw and coupon out through the valve into assembly tube and close valve.
6. Un-thread Hot Tap Tool. Clear valve briefly by opening to flush out chips or cuttings that weren't washed back into assembly tube. Shut off valve and install piping.

See the following pages for parts list

HTK-3000 HOT TAP KIT #3				
ITEM	PART NUMBER	TOOL SIZE	DESCRIPTION	QTY
1	HTT-2102	3/4	1 1/16 HOLE SAW	1
	HTT-2103	1	7/8 HOLE SAW	1
	HTT-2104	1 1/4	1-1/8 HOLE SAW	1
	HTT-2105	1 1/2	1-5/16 HOLE SAW	1
	HTT-2106	2	1-3/4 HOLE SAW	1
	HTT-2007	1 1/2 - 6	ARBOR	1
2	HTT-2001-M	3/4 - 1 1/4	1/4 DRILL ROD ASSY	1
3	HTT-2000-M	1/2	1/2 DRILL ROD ASSY	1
4	HTT-2005	1 1/2 - 3	7/16 BROACH ASSY	1
6	HTT-2201	1/2	1/2 ASSEMBLY TUBE	5-1/8 LG 1
	HTT-2202	3/4	3/4 ASSEMBLY TUBE	5-1/8 LG 1
	HTT-2203	1	1" ASSEMBLY TUBE	5-1/8 LG 1
	HTT-2204	1 1/4	1-1/4 ASSEMBLY TUBE	5-3/8 LG 1
	HTT-2205	1 1/2	1-1/2 ASSEMBLY TUBE	6-5/8 LG 1
	HTT-2206	2	2" ASSEMBLY TUBE	6-1/8 LG 1
7	HTT-2020	1/2 - 3	POWER GLAND ASSY	1

**QUESTIONS?** Contact EST Customer Service at any of the following locations with questions.

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On the Internet: [www.expansionseal.com](http://www.expansionseal.com)

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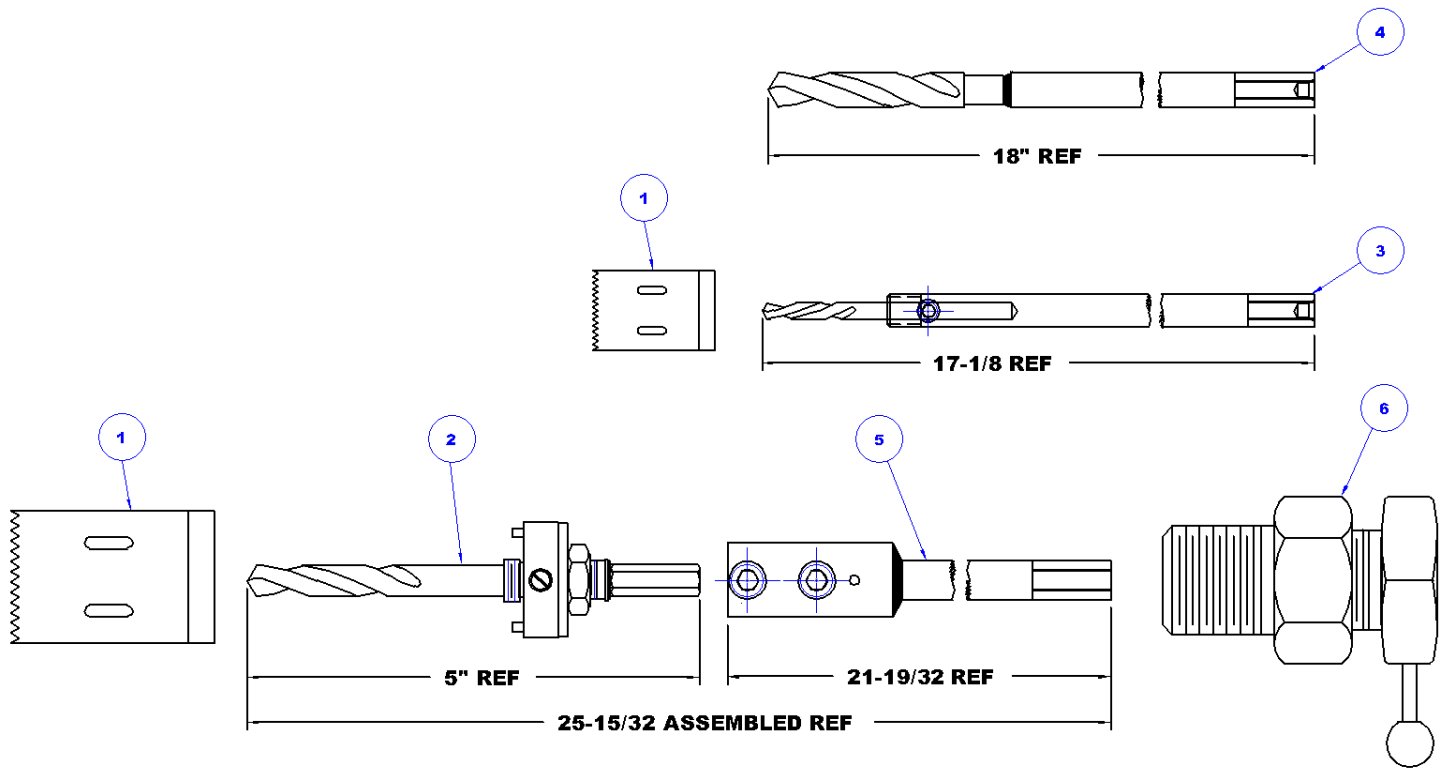


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## HOT TAP KIT #2, POWER OPERATED 1/2" TO 2" NOMINAL TAPS, P/N: HTK-2000



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HTK-9000 HOT TAP TOOL KIT #9					
ITEM	SALES NUMBER	TOOL SIZE	DESCRIPTION	QTY	
1	HTT-2102	3/4	1 1/16 HOLE SAW	1	
	HTT-2103	1	7/8 HOLE SAW	1	
	HTT-2104	1 1/4	1 1/8 HOLE SAW	1	
	HTT-2105	1 1/2	1 5/16 HOLE SAW	1	
	HTT-2106	2	1 3/4 HOLE SAW	1	
	HTT-2107	2 1/2	2 1/8 HOLE SAW	1	
	HTT-2108	3	2 3/4 HOLE SAW	1	
	HTT-2109	4	3 1/2 HOLE SAW	1	
	HTT-2110	5	4 1/2 HOLE SAW	1	
	HTT-2111	6	5 1/2 HOLE SAW	1	
2	HTT-2007	1 1/2 - 6	ARBOR	1	
3	HTT-2001-M	3/4 - 1 1/4	1/4 DRILL ROD ASSY	1	
4	HTT-2000-M	1/2	1/2 DRILL ROD ASSY	1	
5	HTT-2005	1 1/2 - 3	7/16 BROACH ASSY	1	
6	HTT-2009	4 - 6	7/16 BROACH ASSY	1	
7	HTT-2201	1/2	1/2 ASSEMBLY TUBE	5 1/8 LG	1
	HTT-2202	3/4	3/4 ASSEMBLY TUBE	5 1/8 LG	1
	HTT-2203	1	1" ASSEMBLY TUBE	5 1/8 LG	1
	HTT-2204	1 1/4	1 1/4 ASSEMBLY TUBE	5 3/8 LG	1
	HTT-2205	1 1/2	1 1/2 ASSEMBLY TUBE	6 5/8 LG	1
	HTT-2206	2	2" ASSEMBLY TUBE	6 1/8 LG	1
	HTT-2207	2 1/2	2 1/2 ASSEMBLY TUBE	6 3/8 LG	1
	HTT-2208	3	3" ASSEMBLY TUBE	6 5/8 LG	1
	HTT-2209	4	4" ASSEMBLY TUBE	7 1/4 LG	1
	HTT-2210	5	5" ASSEMBLY TUBE	8 3/4 LG	1
8	HTT-2020	1 1/2 - 3	6" ASSEMBLY TUBE	9 5/8 LG	1
	HTT-2020		POWER GLAND ASSY		
9	HTT-2025	4 - 6	POWER GLAND ASSY	1	

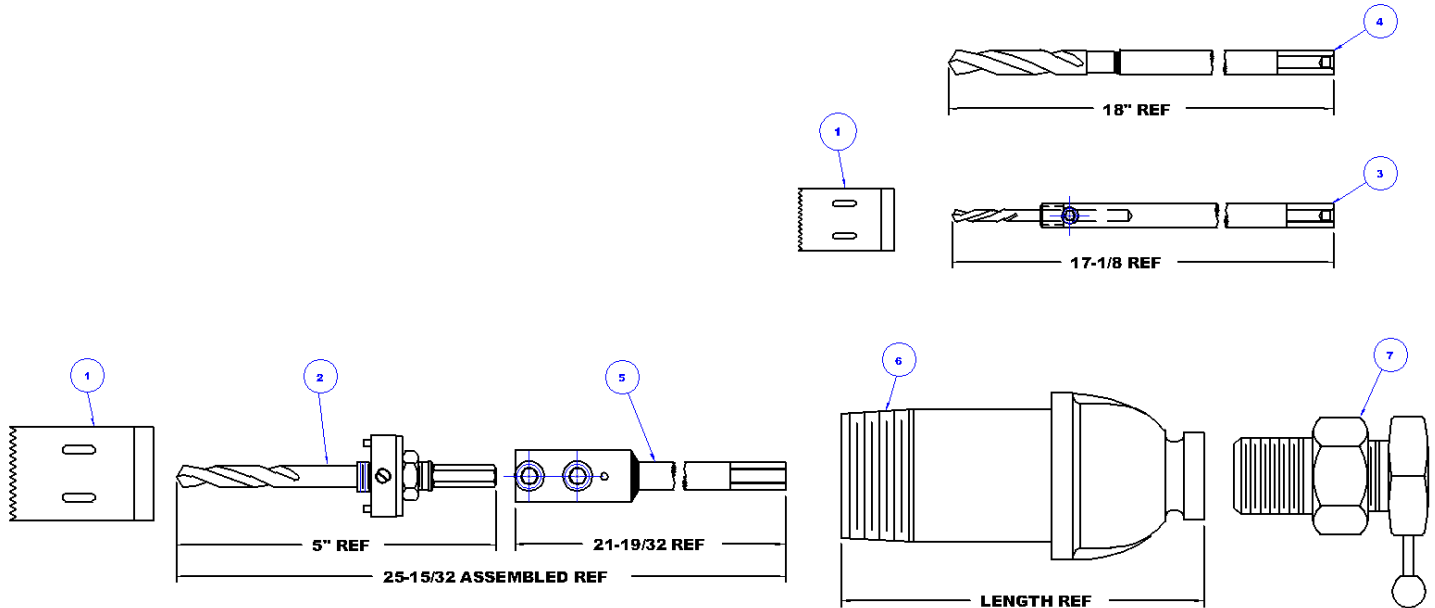


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### HOT TAP KIT #3, POWER OPERATED 1/2" TO 2" NOMINAL TAPS, P/N: HTK-3000



HTK-3000 HOT TAP KIT #3					
ITEM	PART NUMBER	TOOL SIZE	DESCRIPTION		QTY
1	HTT-2102	3/4	11/16 HOLE SAW		1
	HTT-2103	1	7/8 HOLE SAW		1
	HTT-2104	1 1/4	1-1/8 HOLE SAW		1
	HTT-2105	1 1/2	1-5/16 HOLE SAW		1
	HTT-2106	2	1-3/4 HOLE SAW		1
2	HTT-2007	1 1/2 - 6	ARBOR		1
3	HTT-2001-M	3/4 - 1 1/4	1/4 DRILL ROD ASSY		1
4	HTT-2000-M	1/2	1/2 DRILL ROD ASSY		1
5	HTT-2005	1 1/2 - 3	7/16 BROACH ASSY		1
6	HTT-2201	1/2	1/2 ASSEMBLY TUBE	5-1/8 LG	1
	HTT-2202	3/4	3/4 ASSEMBLY TUBE	5-1/8 LG	1
	HTT-2203	1	1" ASSEMBLY TUBE	5-1/8 LG	1
	HTT-2204	1 1/4	1-1/4 ASSEMBLY TUBE	5-3/8 LG	1
	HTT-2205	1 1/2	1-1/2 ASSEMBLY TUBE	6-5/8 LG	1
	HTT-2206	2	2" ASSEMBLY TUBE	6-1/8 LG	1
7	HTT-2020	1/2 - 3	POWER GLAND ASSY		1

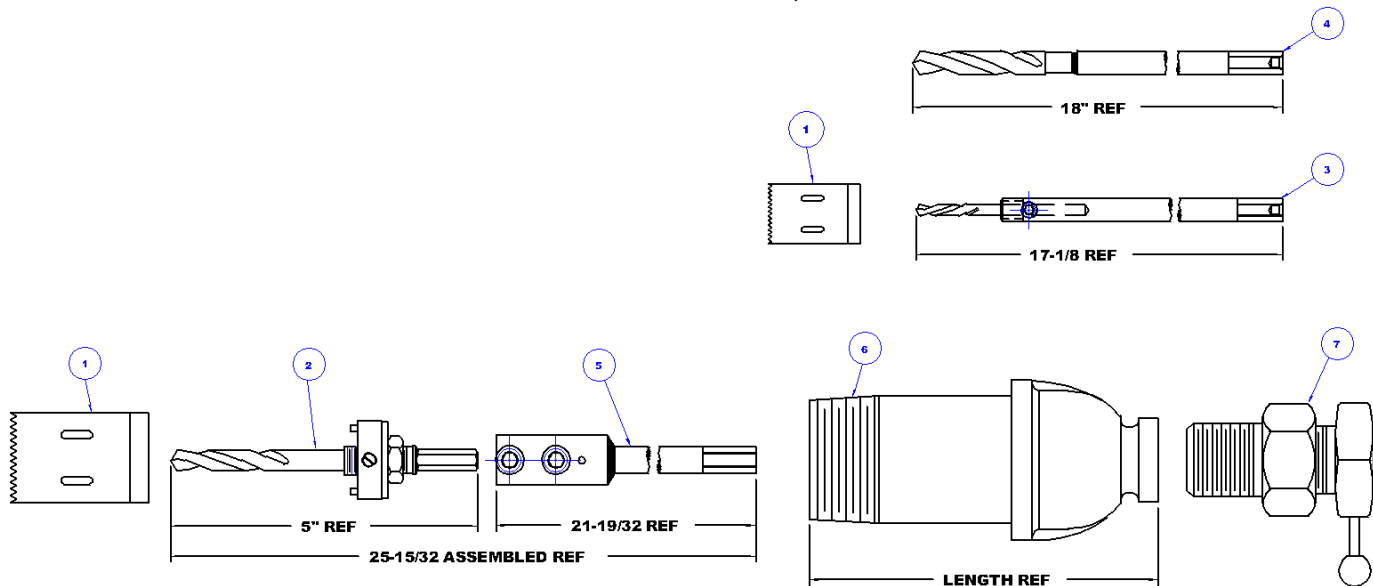


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## HOT TAP KIT #3A, POWER OPERATED 1/2" TO 3" NOMINAL TAPS, P/N: HTK-3500



HTK-3500 HOT TAP KIT #3A					
ITEM	SALES NUMBER	TOOL SIZE	DESCRIPTION		QTY
1	HTT-2102	3/4	11/16 HOLE SAW		1
	HTT-2103	1	7/8 HOLE SAW		1
	HTT-2104	1 1/4	1-1/8 HOLE SAW		1
	HTT-2105	1 1/2	1-5/16 HOLE SAW		1
	HTT-2106	2	1-3/4 HOLE SAW		1
	HTT-2107	2 1/2	2-1/8 HOLE SAW		1
	HTT-2108	3	2-3/4 HOLE SAW		1
2	HTT-2007	1 1/2 - 6	ARBOR		1
3	HTT-2001-M	3/4 - 1 1/4	1/4 DRILL ROD ASSY		1
4	HTT-2000-M	1/2	1/2 DRILL ROD ASSY		1
5	HTT-2005	1 1/2 - 3	7/16 BROACH ASSY		1
6	HTT-2201	1/2	1/2 ASSEMBLY TUBE	5-1/8 LG	1
	HTT-2202	3/4	3/4 ASSEMBLY TUBE	5-1/8 LG	1
	HTT-2203	1	1" ASSEMBLY TUBE	5-1/8 LG	1
	HTT-2204	1 1/4	1-1/4 ASSEMBLY TUBE	5-3/8 LG	1
	HTT-2205	1 1/2	1-1/2 ASSEMBLY TUBE	6-5/8 LG	1
	HTT-2206	2	2" ASSEMBLY TUBE	6-1/8 LG	1
	HTT-2207	2 1/2	2-1/2 ASSEMBLY TUBE	6-3/8 LG	1
7	HTT-2208	3	3" ASSEMBLY TUBE	6-5/8 LG	1
	HTT-2020	1/2 - 3	POWER GLAND ASSY		1

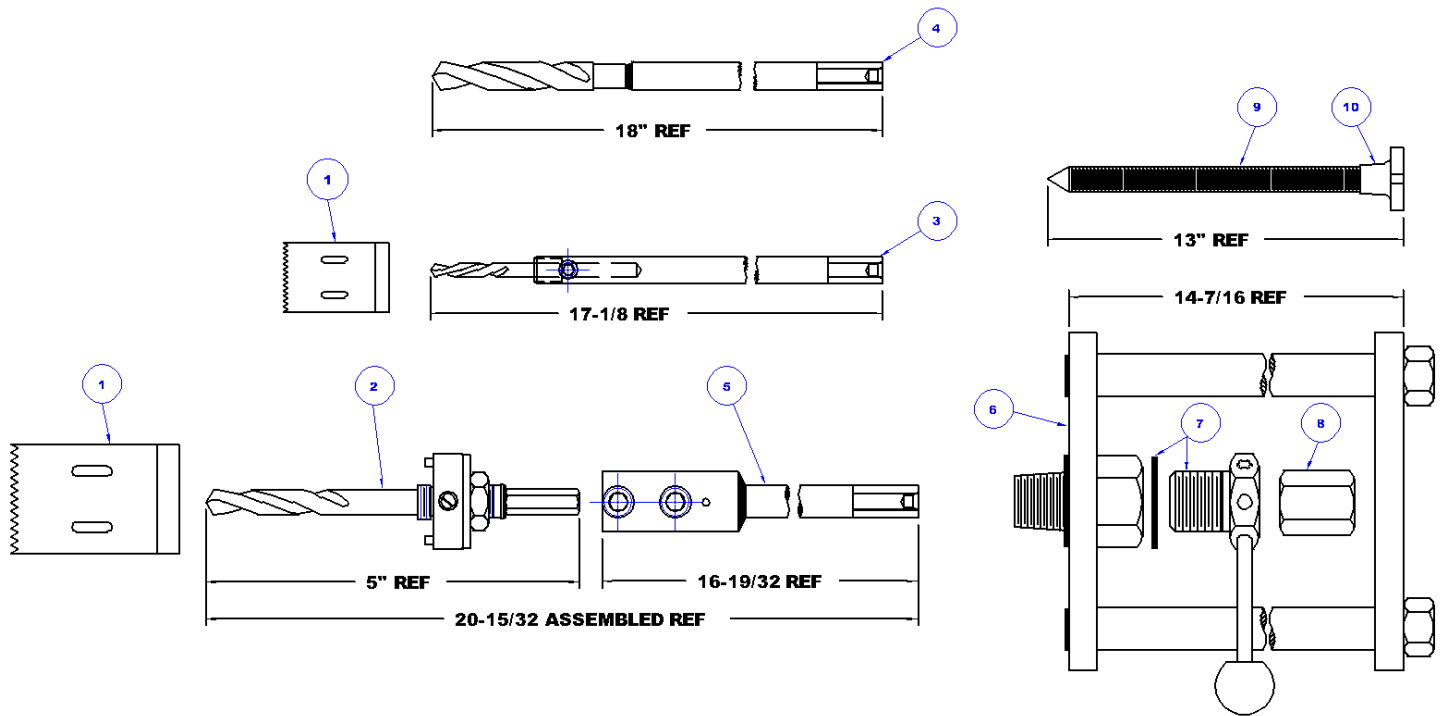


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## HOT TAP KIT #4, MANUALLY OPERATED 1/2" TO 2" NOMINAL TAPS, P/N: HTK-4000



HTK-4000 HOT TAP KIT #4				
ITEM	SALES NUMBER	TOOL SIZE	DESCRIPTION	QTY
1	HTT-2102	3/4	11/16 HOLE SAW	1
	HTT-2103	1	7/8 HOLE SAW	1
	HTT-2104	1 1/4	1-1/8 HOLE SAW	1
	HTT-2105	1 1/2	1-5/16 HOLE SAW	1
	HTT-2106	2	1-3/4 HOLE SAW	1
2	HTT-2007	1 1/2 - 6	ARBOR	1
3	HTT-2001-M	3/4 - 1 1/4	1/4 DRILL ROD ASSY	1
4	HTT-2000-M	1/2	1/2 DRILL ROD ASSY	1
5	HTT-2005-M	1/2 - 2	7/16 MANUAL BROACH ASSY	1
6	HTT-2015-M	1/2 - 2	HOT TAP FRAME	1
7	HTT-2020-M	1/2 - 2	MANUAL GLAND ASSY	1
8	HTT-2019-M	1/2 - 2	HEX SLEEVE	1
9	HTT-2016-M	1/2 - 2	MANUAL PUSH ROD	1
10	HTT-2017-M	1/2 - 2	MANUAL PUSH ROD KNOB	1
11	HTT-2018-M	1/2 - 2	HOT TAP RATCHET	1



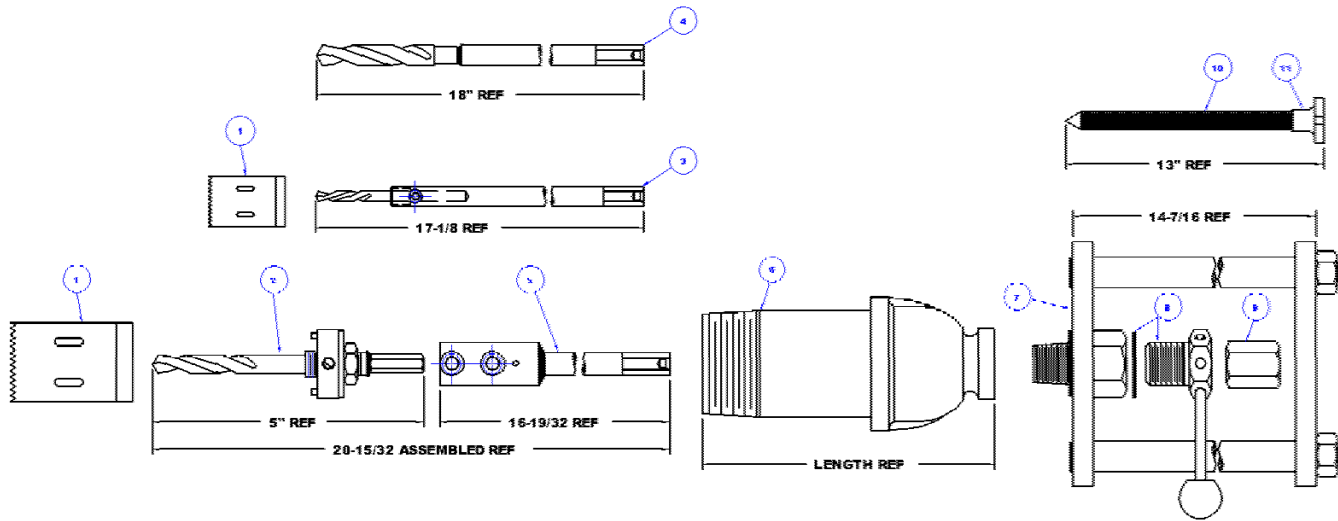
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## HOT TAP KIT #5, MANUALLY OPERATED 1/2" TO 2" NOMINAL TAPS, P/N: HTK-5000



HTK-5000 HOT TAP KIT #5					
ITEM	SALES NUMBER	TOOL SIZE	DESCRIPTION		QTY
1	HTT-2102	3/4	11/16 HOLE SAW		1
	HTT-2103	1	7/8 HOLE SAW		1
	HTT-2104	1 1/4	1-1/8 HOLE SAW		1
	HTT-2105	1 1/2	1-5/16 HOLE SAW		1
	HTT-2106	2	1-3/4 HOLE SAW		1
2	HTT-2007	1 1/2 - 6	ARBOR		1
3	HTT-2001-M	3/4 - 1 1/4	1/4 DRILL ROD ASSY		1
4	HTT-2000-M	1/2	1/2 DRILL ROD ASSY		1
5	HTT-2005-M	1/2 - 2	7/16 MANUAL BROACH ASSY		1
6	HTT-2201	1/2	1/2 ASSEMBLY TUBE	5-1/8 LG	1
	HTT-2202	3/4	3/4 ASSEMBLY TUBE	5-1/8 LG	1
	HTT-2203	1	1" ASSEMBLY TUBE	5-1/8 LG	1
	HTT-2204	1 1/4	1-1/4 ASSEMBLY TUBE	5-3/8 LG	1
	HTT-2205	1 1/2	1-1/2 ASSEMBLY TUBE	6-5/8 LG	1
	HTT-2206	2	2" ASSEMBLY TUBE	6-1/8 LG	1
7	HTT-2015-M	1/2 - 2	HOT TAP FRAME		1
8	HTT-2020-M	1/2 - 2	MANUAL GLAND ASSY		1
9	HTT-2019-M	1/2 - 2	HEX SLEEVE		1
10	HTT-2016-M	1/2 - 2	MANUAL PUSH ROD		1
11	HTT-2017-M	1/2 - 2	MANUAL PUSH ROD KNOB		1
12	HTT-2018-M	1/2 - 2	HOT TAP RATCHET		1

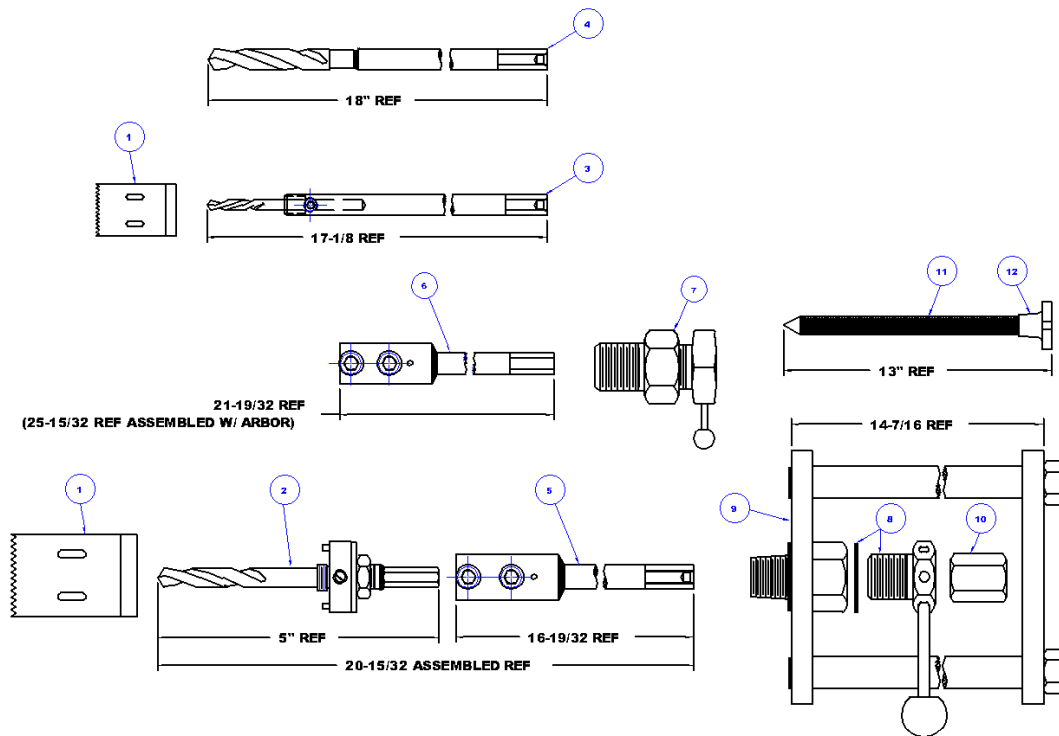


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## HOT TAP KIT #6, POWER & MANUALLY OPERATED 1/2" TO 2" NOMINAL TAPS, P/N: HTK-6000



HTK-6000 HOT TAP KIT #6				
ITEM	SALES NUMBER	TOOL SIZE	DESCRIPTION	QTY
1	HTT-2102	3/4	11/16 HOLE SAW	1
	HTT-2103	1	7/8 HOLE SAW	1
	HTT-2104	1 1/4	1-1/8 HOLE SAW	1
	HTT-2105	1 1/2	1-5/16 HOLE SAW	1
	HTT-2106	2	1-3/4 HOLE SAW	1
2	HTT-2007	1 1/2 - 6	ARBOR	1
3	HTT-2001-M	3/4 - 1 1/4	1/4 DRILL ROD ASSY	1
4	HTT-2000-M	1/2	1/2 DRILL ROD ASSY	1
5	HTT-2005-M	1/2 - 2	7/16 MANUAL BROACH ASSY	1
6	HTT-2005	1 1/2 - 3	7/16 POWER BROACH ASSY	1
7	HTT-2020	1/2 - 3	POWER GLAND ASSY	1
8	HTT-2020-M	1/2 - 2	MANUAL GLAND ASSY	1
9	HTT-2015-M	1/2 - 2	HOT TAP FRAME	1
10	HTT-2019-M	1/2 - 2	HEX SLEEVE	1
11	HTT-2016-M	1/2 - 2	MANUAL PUSH ROD	1
12	HTT-2017-M	1/2 - 2	MANUAL PUSH ROD KNOB	1
13	HTT-2018-M	1/2 - 2	HOT TAP RATCHET	1

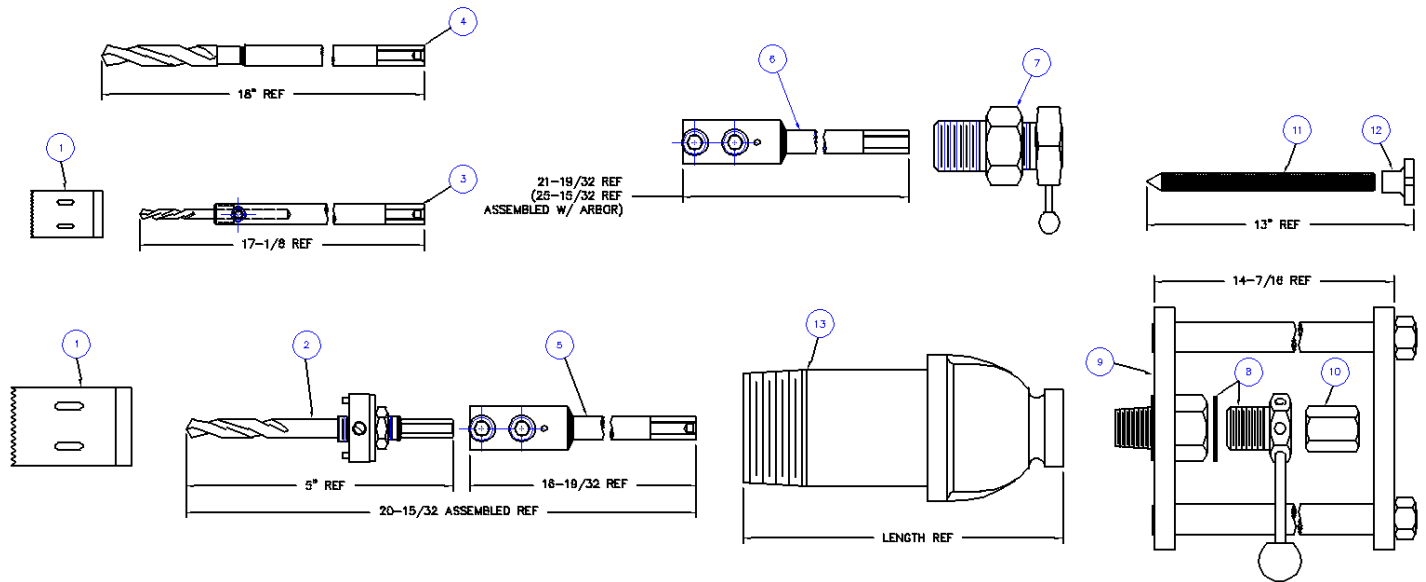


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## HOT TAP KIT #7, POWER & MANUALLY OPERATED 1/2" TO 2" NOMINAL TAPS, P/N: HTK-7000



HTK-7000 HOT TAP KIT #7					
ITEM	SALES NUMBER	TOOL SIZE	DESCRIPTION		QTY
1	HTT-2102	3/4	11/16 HOLE SAW		1
	HTT-2103	1	7/8 HOLE SAW		1
	HTT-2104	1 1/4	1-1/8 HOLE SAW		1
	HTT-2105	1 1/2	1-5/16 HOLE SAW		1
	HTT-2106	2	1-3/4 HOLE SAW		1
2	HTT-2007	1 1/2 - 6	ARBOR		1
3	HTT-2001-M	3/4 - 1 1/4	1/4 DRILL ROD ASSY		1
4	HTT-2000-M	1/2	1/2 DRILL ROD ASSY		1
5	HTT-2005-M	1 1/2 - 2	7/16 MANUAL BROACH ASSY		1
6	HTT-2005	1 1/2 - 3	7/16 POWER BROACH ASSY		1
7	HTT-2020	1/2 - 3	POWER GLAND ASSY		1
8	HTT-2020-M	1/2 - 2	MANUAL GLAND ASSY		1
9	HTT-2015-M	1/2 - 2	HOT TAP FRAME		1
10	HTT-2019-M	1/2 - 2	HEX SLEEVE		1
11	HTT-2016-M	1/2 - 2	MANUAL PUSH ROD		1
12	HTT-2017-M	1/2 - 2	MANUAL PUSH ROD KNOB		1
13	HTT-2201	1/2	1/2 ASSEMBLY TUBE	5-1/8 LG	1
	HTT-2202	3/4	3/4 ASSEMBLY TUBE	5-1/8 LG	1
	HTT-2203	1	1" ASSEMBLY TUBE	5-1/8 LG	1
	HTT-2204	1 1/4	1-1/4 ASSEMBLY TUBE	5-3/8 LG	1
	HTT-2205	1 1/2	1-1/2 ASSEMBLY TUBE	6-5/8 LG	1
	HTT-2206	2	2" ASSEMBLY TUBE	6-1/8 LG	1
14	HTT-2018-M	1/2 - 2	HOT TAP RATCHET		1

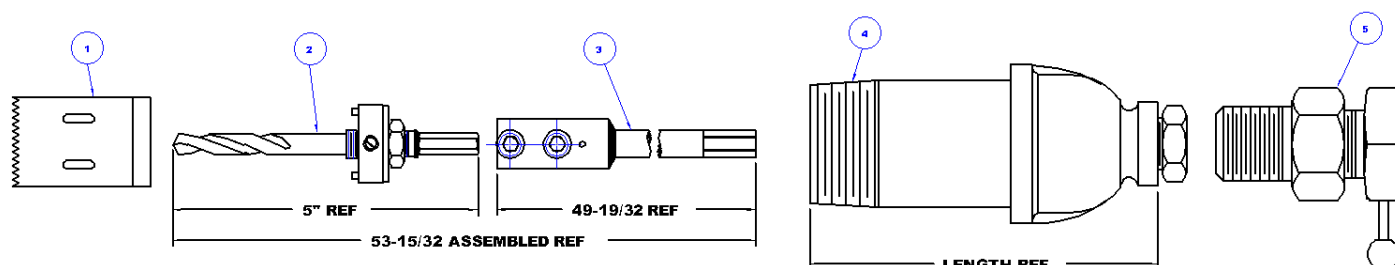


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# **HOT TAP KIT #8, POWER OPERATED** **4" TO 6" NOMINAL TAPS. P/N: HTK-8000**



HTK-8000 HOT TAP TOOL KIT #8					
ITEM	SALES NUMBER	TOOL SIZE	DESCRIPTION		QTY
1	HTT-2109	4	3-1/2 HOLE SAW		1
	HTT-2110	5	4-1/2 HOLE SAW		1
	HTT-2111	6	5-1/2 HOLE SAW		1
2	HTT-2007	1 1/2 - 6	ARBOR		1
3	HTT-2009	4 - 6	7/16 BROACH ASSY		1
4	HTT-2209	4	4" ASSEMBLY TUBE	7-1/4 LG	1
	HTT-2210	5	5" ASSEMBLY TUBE	8-3/4 LG	1
	HTT-2211	6	6" ASSEMBLY TUBE	9-5/8 LG	1
5	HTT-2025	4 - 6	POWER GLAND ASSY		1

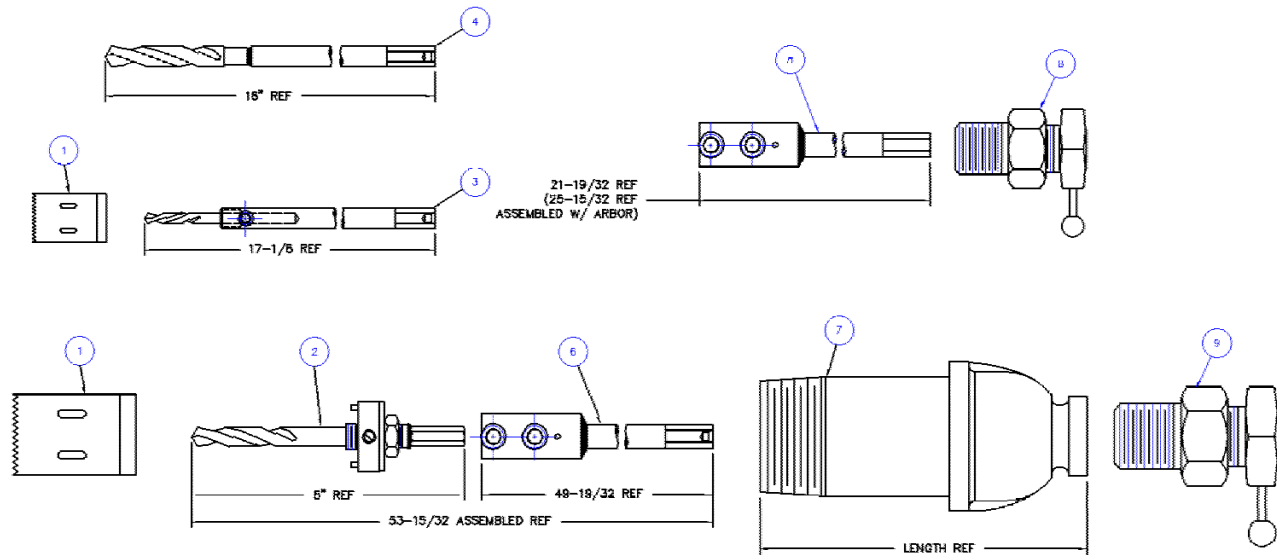


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## HOT TAP KIT # 9, POWER OPERATED 1/2" TO 6" NOMINAL TAPS. P/N: HTK-9000



HTK-9000 HOT TAP TOOL KIT #9					
ITEM	SALES NUMBER	TOOL SIZE	DESCRIPTION		QTY
1	HTT-2102	3/4	11/16 HOLE SAW		1
	HTT-2103	1	7/8 HOLE SAW		1
	HTT-2104	1 1/4	1-1/8 HOLE SAW		1
	HTT-2105	1 1/2	1-5/16 HOLE SAW		1
	HTT-2106	2	1-3/4 HOLE SAW		1
	HTT-2107	2 1/2	2-1/8 HOLE SAW		1
	HTT-2108	3	2-3/4 HOLE SAW		1
	HTT-2109	4	3-1/2 HOLE SAW		1
	HTT-2110	5	4-1/2 HOLE SAW		1
	HTT-2111	6	5-1/2 HOLE SAW		1
2	HTT-2007	1 1/2 - 6	ARBOR		1
3	HTT-2001-M	3/4 - 1 1/4	1/4 DRILL ROD ASSY		1
4	HTT-2000-M	1/2	1/2 DRILL ROD ASSY		1
5	HTT-2005	1 1/2 - 3	7/16 BROACH ASSY		1
6	HTT-2009	4 - 6	7/16 BROACH ASSY		1
7	HTT-2201	1/2	1/2 ASSEMBLY TUBE	5-1/8 LG	1
	HTT-2202	3/4	3/4 ASSEMBLY TUBE	5-1/8 LG	1
	HTT-2203	1	1" ASSEMBLY TUBE	5-1/8 LG	1
	HTT-2204	1 1/4	1-1/4 ASSEMBLY TUBE	5-3/8 LG	1
	HTT-2205	1 1/2	1-1/2 ASSEMBLY TUBE	6-5/8 LG	1
	HTT-2206	2	2" ASSEMBLY TUBE	6-1/8 LG	1
	HTT-2207	2 1/2	2-1/2 ASSEMBLY TUBE	6-3/8 LG	1
	HTT-2208	3	3" ASSEMBLY TUBE	6-5/8 LG	1
	HTT-2209	4	4" ASSEMBLY TUBE	7-1/4 LG	1
	HTT-2210	5	5" ASSEMBLY TUBE	8-3/4 LG	1
		HTT-2211	6	6" ASSEMBLY TUBE	9-5/8 LG
8	HTT-2020	1 1/2 - 3	POWER GLAND ASSY		1
9	HTT-2025	4 - 6	POWER GLAND ASSY		1



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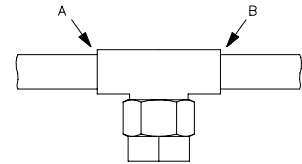
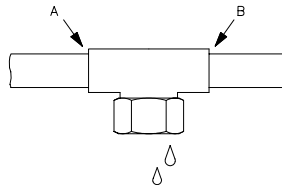
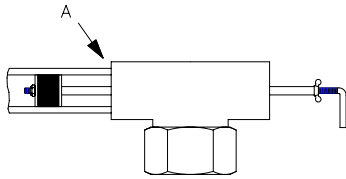
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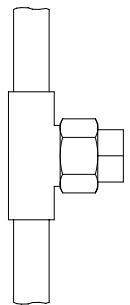
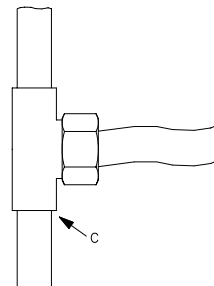
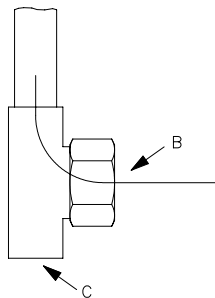
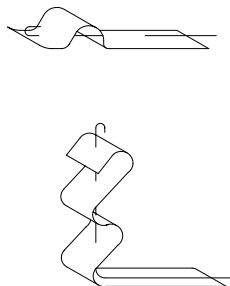
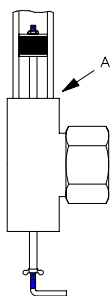


## SOLDERING AID TOOLS OPERATING INSTRUCTIONS

The Soldering Aid Tools are used to temporarily stop residual water flow to perform any soldering work. The tools operate by inserting the seal past the area of the required work and hand tightening the wing nut to compress the seal and stop flow.

**Horizontal Runs**

1. The tool requires the use of a clean out "T" fitting to divert flow. Slip an inverted clean out "T" onto the copper service and then insert and expand the proper size Soldering Aid Tool. Remove plug from clean out "T" and Solder service line to the clean out "T" at A.
2. Relax seal and remove Soldering Aid Tool. "T" fitting will divert flow to allow further line work. Solder at B.
3. When all work is complete pipe dope the clean out "T" and replace plug. Clean and dry tools prior to storage. Replace worn or damaged parts. Call EST Customer Service for replacement parts.

**Vertical Runs**

1. The tool requires the use of a clean out "T" fitting to divert flow. Slip an inverted clean out "T" onto the copper service and then insert and expand the proper size Soldering Aid Tool. Remove plug from clean out "T" and Solder service line to the clean out "T" at A.
2. Remove Soldering Aid Tool and select proper width Ceramic Wick. Insert Extractor wire through the Wick, bend into shape and insert through cleanout "T". Pack first through side of "T" fitting B and then through the bottom C. For tighter packing moisten wick and wring out damp-dry.
3. With ceramic wick stopping the drips, perform all soldering below "T" fitting at C. When soldering is complete remove wick and screw in cleanout "T" plug. Clean and dry tools prior to storage. Replace any worn or damaged parts. Call EST Customer Service for replacement parts.

**QUESTIONS?** Contact EST Customer Service at any of the following locations with questions.

In USA and Canada: tel: 800-355-7044, fax: 215-721-1101, e-mail: [info@expansionseal.com](mailto:info@expansionseal.com)  
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 In Asia: tel: +65-6745-8560, fax: +65-6742-8700, e-mail: [estasia@singnet.com.sg](mailto:estasia@singnet.com.sg)  
 On the Internet: [www.expansionseal.com](http://www.expansionseal.com)

**Expansion Seal Technologies** is part of the EST Group of companies. **EST Group** provides a complete range of repair products, services and replacement parts covering the life cycle of tubular heat exchangers and condensers; additionally EST provides products and services to facilitate pressure testing pipe, piping systems, pressure vessels and their components. Visit EST Group on the internet at [www.estgrp.com](http://www.estgrp.com).

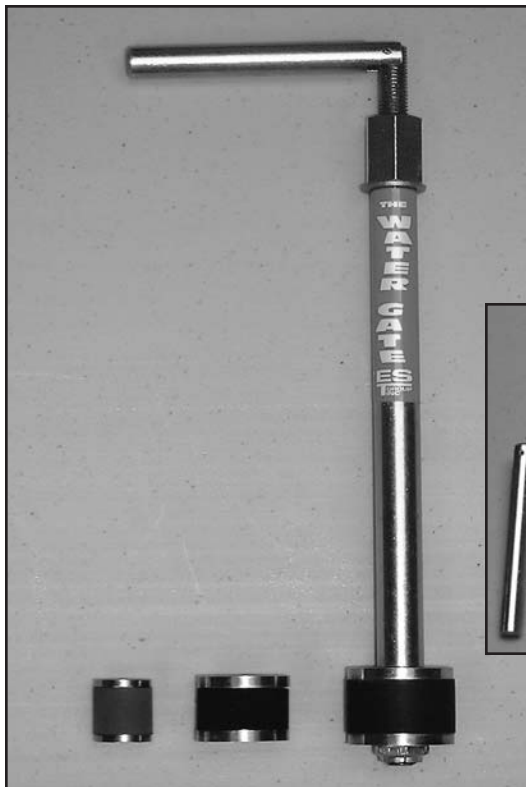


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# The Water Gate Plumber's Tool

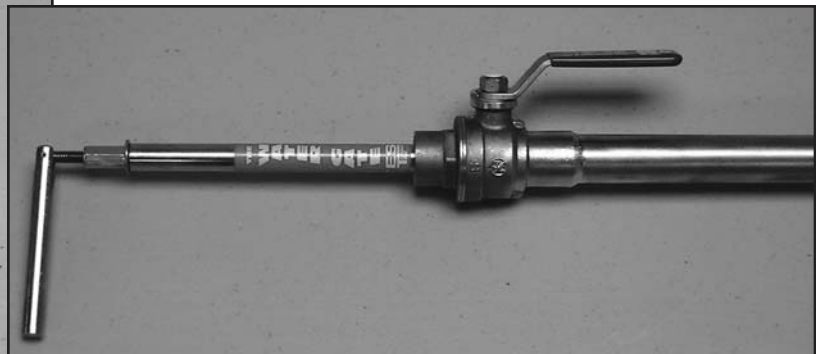


Water Gate Kit #1 Shown.  
Fits 1/2", 3/4" & 1" Sizes

*Water Gate Plumber's Tool*

*Tapping Tools*

*Valve Changing Tools*



***There will be no leaks!***

Now work faster and better so that you can move on to the next job that's waiting. The Water Gate allows you to change out a valve, solder or glue on fittings and test lines all with the same tool, while under pressure. The seals are able to withstand temperatures as low as -20°F or as high as 225°F so you can work on refrigeration and boiler applications.

No need to buy multiple tools because you get 3 sizes in each Water Gate.

- Three Tools In One!
- Install or replace valves & tees with water in line
- Works with full port ball and gate valves
- Works on Copper, steel or PVC lines.
- Eliminates the need to shut off water to the rest of the building
- No need to drain, bread clog or freeze lines
- Pressure Rated to 65psi
- Replacement Seals available
- Customer satisfaction since 1968
- Made in the USA!



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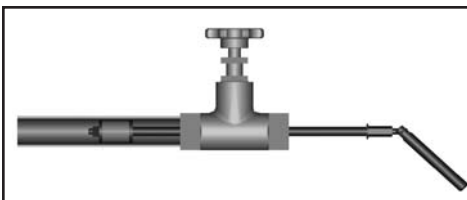
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**AN ISO-9001 REGISTERED COMPANY**



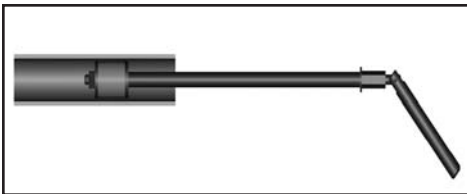
Kit Part Number	Description
WGK-1000	Kit #1: Includes 1/2", 3/4" & 1" Seals
WGK-2000	Kit #2: Includes 1-1/4", 1-1/2", & 2" Seals

**The Water Gate tool is easy to use. Just follow these simple steps.**



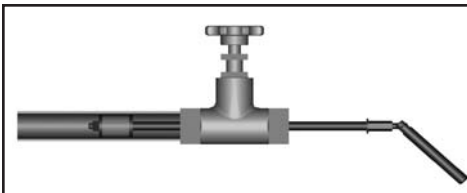
#### Step One

Insert the appropriately sized Water Gate tool through the valve and into the pipe. Holding the handle, tighten the compression nut with a wrench to expand seal element. Caution: holding compression nut and turning handle may loosen lock nut.



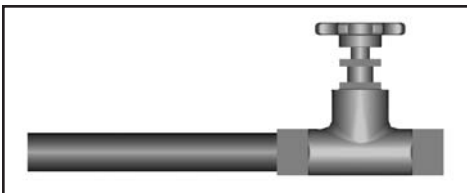
#### Step Two

Remove the valve.



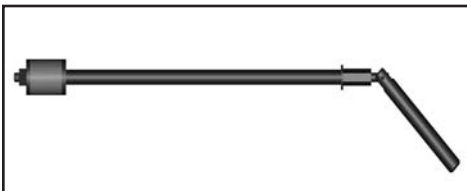
#### Step Three

Install new valve as required to insure a leak tight connection.



#### Step Four

Loosen the compression nut to relax the seal element and withdraw the Water Gate tool from the valve.



#### Replacement Seal & Washer Sets

1. Remove the lock nut from the end of the tool.
2. Remove the Seal assembly and replace with desired Seal assembly.
3. Replace the lock nut.



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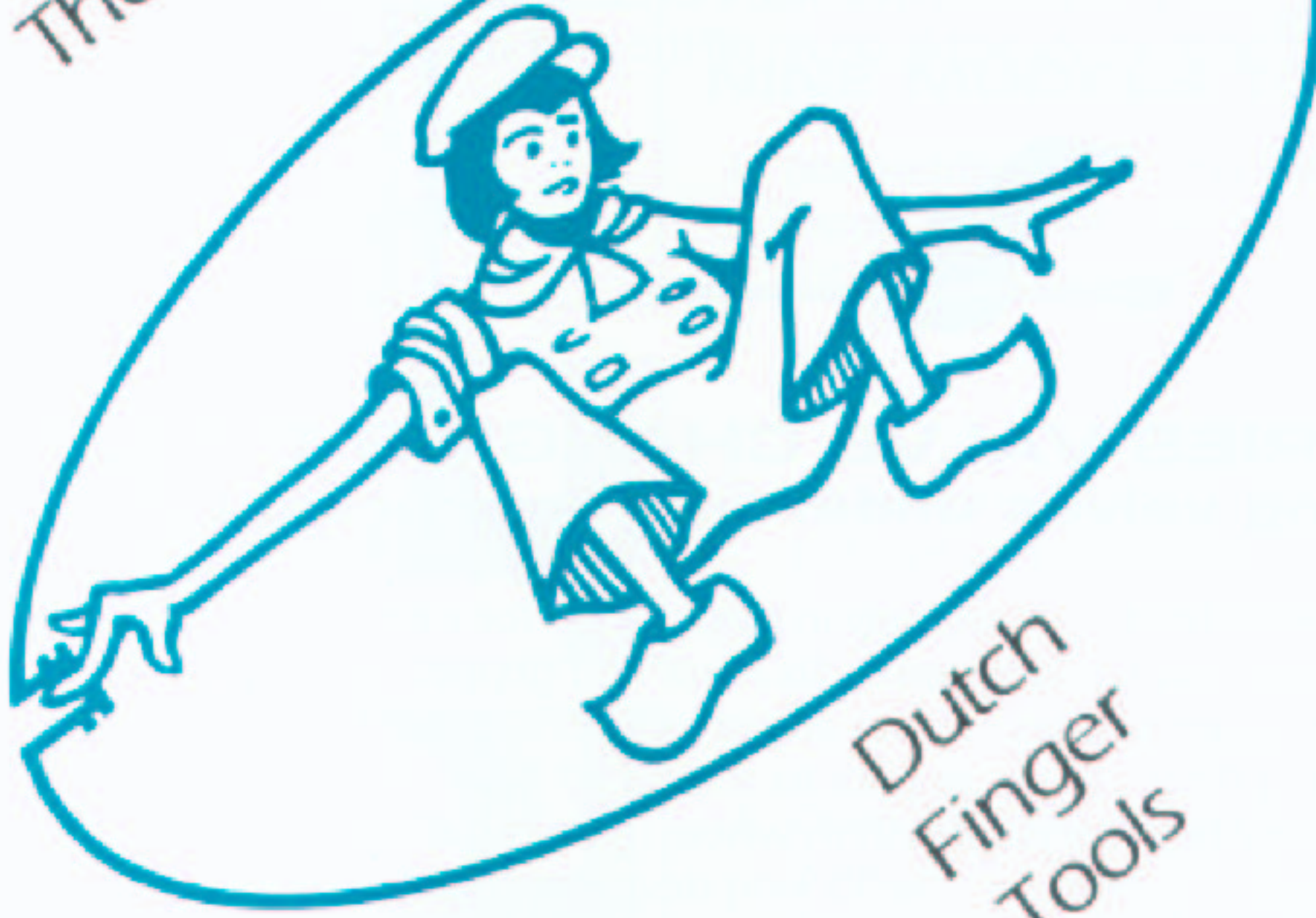
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The Original



Dutch  
Finger  
Tools

## UNDER-PRESSURE PERFORMERS

O-SERIES VALVE CHANGING TOOLS  
TBD SERIES VALVE CHANGING TOOLS  
FPT SERIES VALVE CHANGING TOOLS  
HOT TAP TOOLS  
SOLDERING AID TOOLS

## Expansion Seal Technologies

(Formerly Expando Seal Tools)

Leaders in Tube Testing and Plugging Technology

# PLUMBER'S STOOL TOOLS

# ES GROUP INC



## O-SERIES VALVE CHANGING TOOLS

### Changing valves under low-medium pressure

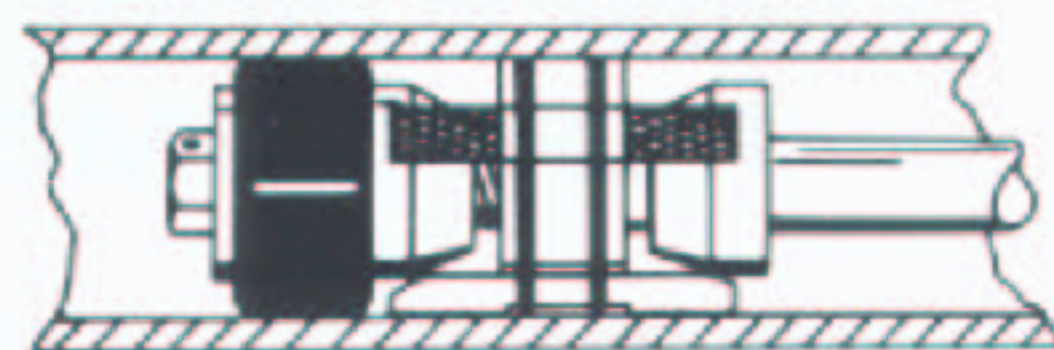
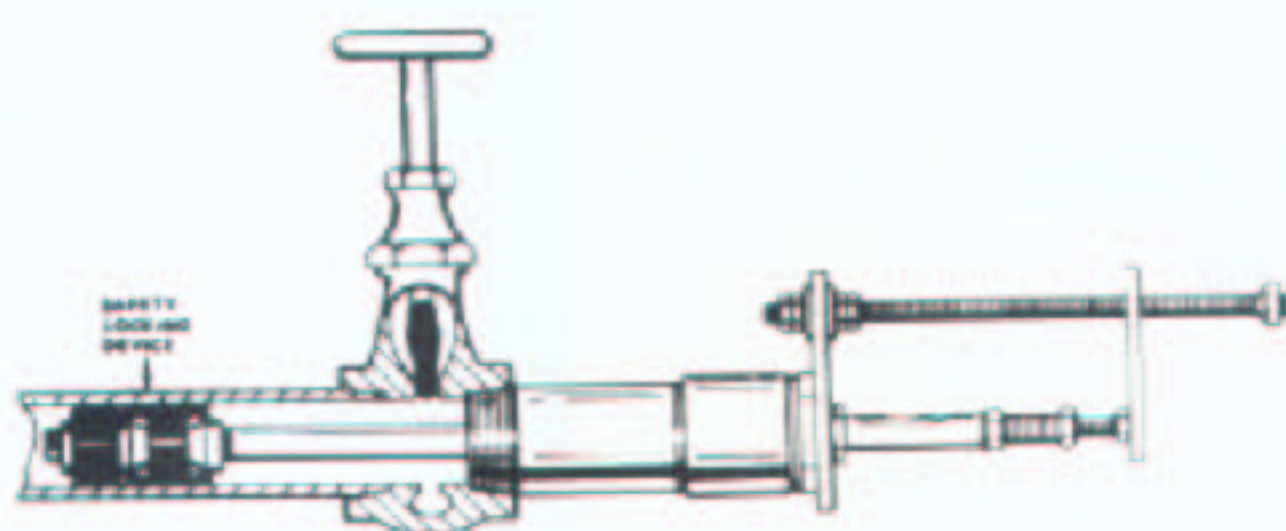
Easy to use for quick valve change and maintenance operations under fluid or vapor system pressure. Expanded neoprene seal locks sealing element in pipe. The complete selection of O-Series tool sizes is applicable on all types of full flow valves in sizes up to 4". Rugged plated carbon steel construction. Neoprene seals resist temperatures up to 260 ° F. Optional materials include stainless steel construction with viton or silicone seals. Available on an off-the-shelf basis for your needs.



## TBD SERIES VALVE CHANGING TOOLS

### Changing valves under extreme pressure

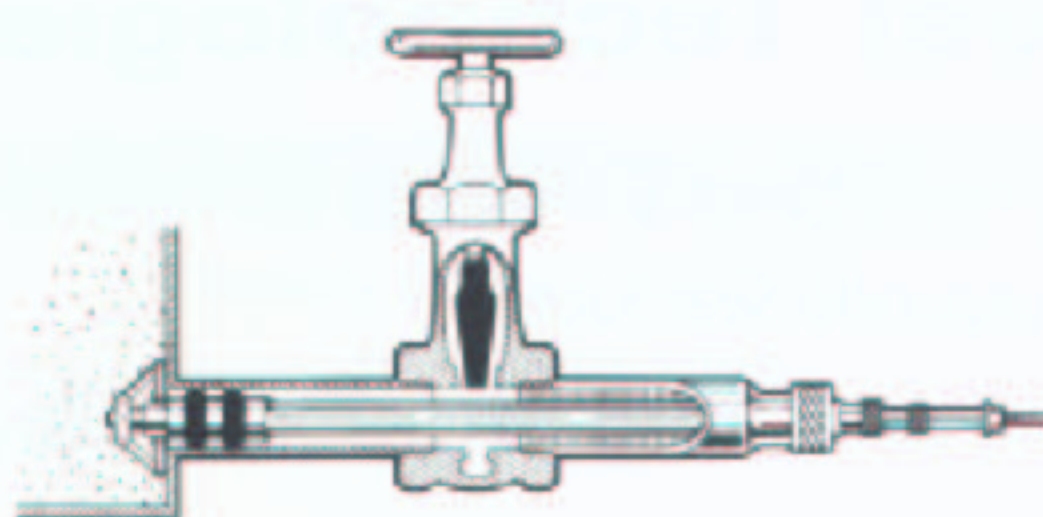
In-line locking device holds seal securely in place. Ideal for safe, dependable use with high pressure or oily liquid systems. Six hardened grippers engage the inside pipe wall via two locking cones. Cones adjust independently of expansion seal, allowing the locking device to be set prior to sealing off flow. The TBD Series tools are applicable in any high pressure system where there is sufficient length of pipe on the pressure side to accommodate the locking device and seal. Plated or painted carbon steel is standard with neoprene seals. Stainless steel with viton or silicone seals are optional, also with longer or shorter lengths.



## FPT SERIES VALVE CHANGING TOOLS

### Changing tank valves under extreme pressure

Safe, positive engagements are assured with two main neoprene seals and an in-tank/in-header toggle locking device. Recommended for use with oily liquids or any pressure system with complete safety. Equipped with fittings for easy attachment of a come-along to move sealing element through valve. Special seals are available for use in changing saddle flanged valve or gaskets on pipe taps.



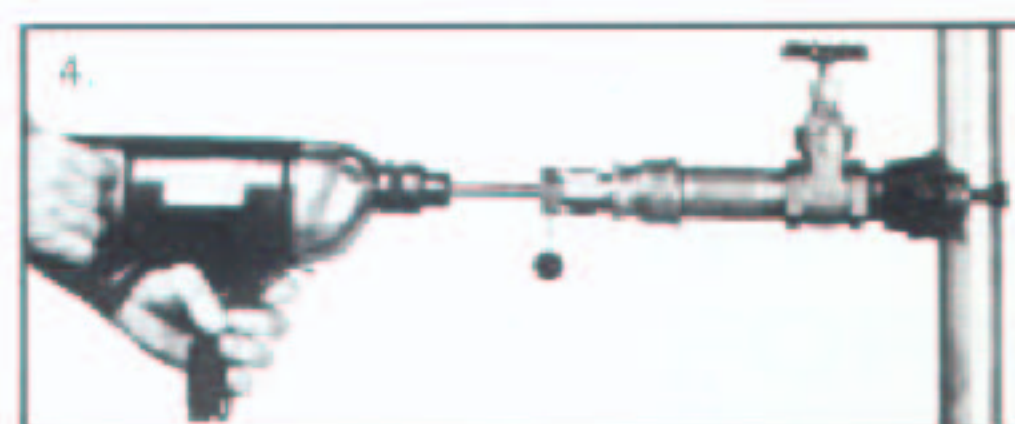
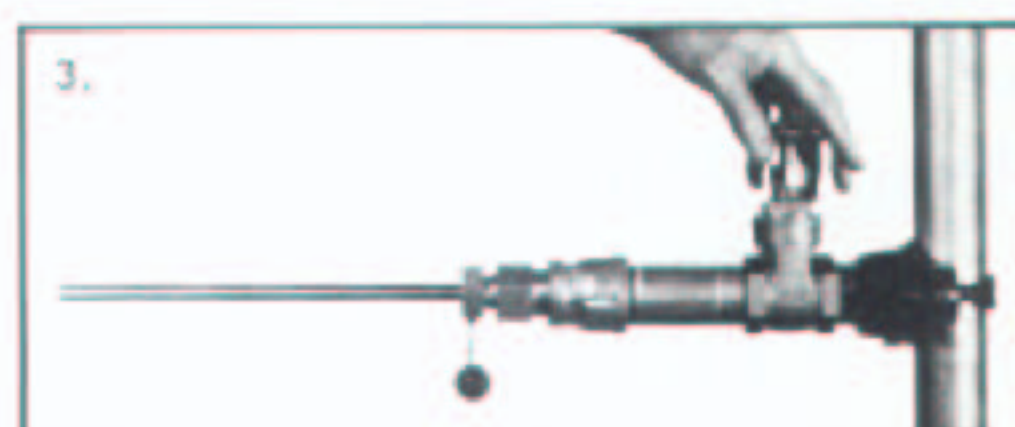
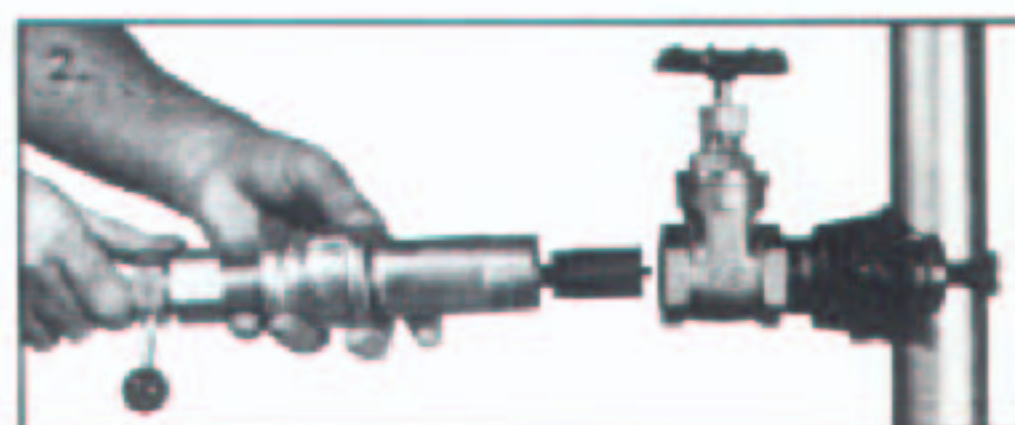


# HOT TAP TOOLS

## Tap existing lines without shutting off system pressure

Safe, quick way to tap existing lines under pressure without shutting down system pressure. Carbon steel construction. Hole saws are replaceable and good for one dozen hot taps. Models available for electric, air or manual operation.

### POWER OPERATED



### SEVEN EASY STEPS & NINE MODELS TO CHOOSE FROM

1. Bolt saddle to pipe and install a close nipple and gate valve of correct size for extended service.
2. Attach assembly tube and hole saw to valve and thread on.
3. Open valve and push hole saw through until pilot drill touches pipe. Tighten main gland.
4. Attach 1/2" variable speed drill to drill rod. Start drill at proper speed and drill through pipe. When pipe is cut through, coupon will spin back into hole saw.
5. Retract hole saw and coupon out through the valve into assembly tube and close valve.
6. Remove tapping tool.
7. Clear valve briefly by opening to flush out chips or cuttings that weren't washed back into assembly tube. Shut off valve and install piping.



## SOLDERING AID TOOLS

### Easy way to solder when you encounter residual water

Eliminates the drips when used in conjunction with an inverted clean out "T" - you'll sweat any joint the first time every time. Can be used on vertical runs as well as horizontal runs. Standard materials are plated carbon steel with neoprene seals, stainless steel with viton or silicone seals are optional.

### Choose from three Soldering Aid Kits



Kit #1: Includes 1/2" thru 1" tools.

Kit #2: Includes 1/2" thru 2" tools.

Kit #3: Includes 1/2" thru 3" tools.



Available sizes: 1/2", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2", 3"

### Three easy steps for horizontal runs



**STEP 1** Slip an inverted clean out "T" on to the copper service - insert and expand proper size Soldering Aid. Solder at A, water is held back by Soldering Aid.



**STEP 2** After soldering at A, remove Soldering Aid and solder at B. Water will run out inverted clean out "T" and will not affect any sweat joints beyond point B.



**STEP 3** After completing job (beyond point B) - Pipe dope the clean out plug and insert in clean out "T" - Job is finished.

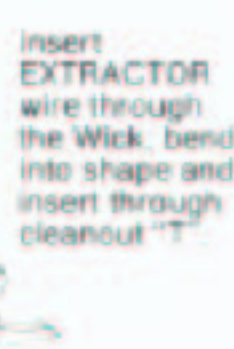
### Four easy steps for vertical runs



**STEP 1** Insert Soldering Aid through cleanout "T" with plug removed - expand Tool and Solder at A.



**STEP 2** Remove Soldering Aid and select proper width Ceramic Wick and



Insert EXTRACTOR wire through the Wick, bend into shape and insert through cleanout "T". Pack first through opening B and then through C. For tighter packing moisten Wick and wring-out damp-dry.



**STEP 3** With Ceramic Wick stopping the drips, Solder at C - leave Wick in pipe until you finish Soldering rest of job.



**STEP 4** When Soldering is complete, remove Wick and screw in cleanout "T" Plug. Job is complete.



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