

TM-1 Pro Series Hot Tap System



SAFETY and OPERATIONS MANUAL

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TM-1 Pro Series Hot Tapping System Contents

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TM-1 Pro 13 (1" through 3" Kit) includes:

1	Two Speed 1/2" Chuck Milwaukee Hole Hawg with Backing Plate
1	Three Bar Guide Rail Assembly with Feed Screw
1	Threaded Packer Assembly for 1", 1-1/2", 2", 2-1/2", & 3" Taps
5	NPT Threaded Sub Adapters (1", 1-1/2", 2", 2-1/2" & 3")
1	18" Long 5/8" OD 1/2-20 Threaded Boring Bar for 3/4", 1", & 1-1/4" Taps
1	18" Long 5/8" OD 5/8-18 Threaded Boring Bar for 1-1/2" & 2" Taps
1	18" Long 5/8" OD Boring Bar with 2-Bolt head for 2", 2-1/2", & 3" Taps
1	23" Long 5/8" OD Boring Bar with 2-Bolt head for 2", 2-1/2", & 3" Taps
5	HSS Bi Metal Hole Saws (7/8", 1-3/8", 1-3/4", 2-1/4", & 2-3/4")
1	Router Speed Control
1	1/4" Bleeder Valve
1	1/4' x 4-1/4" TapMaster Pilot Drill with Dual Retention Wires
1	3/8" x 4-1/4" TapMaster Pilot Drill with Dual Retention Wires
1	PipeMan 24" Pipe OD Tape Measure
1	Locktite Anti-Seize
1	Accessories Kit with spare retaining rings, set & cap screws, o-rings, and Allen wrenches
1	TM-1 Pro 28" Tool Box
1	TM-1 Pro Safety & Operations Manual
1	One Year Warranty Against Defects in Material & Workmanship



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TM-1 Pro Series Hot Tapping System Contents

TM-1 Pro 14 includes all items in the TM-1 Pro 13 kit plus:	
1	4" Drive Head with shoulder bolt
1	23" Long 5/8" OD Single Bolt Boring Bar
1	28" Long 5/8" OD Single Bolt Boring Bar
1	3-3/4" HSS Bi Metal Hole Saw
1	4" NPT Threaded Sub Adapter
1	4" 150# Companion Flange

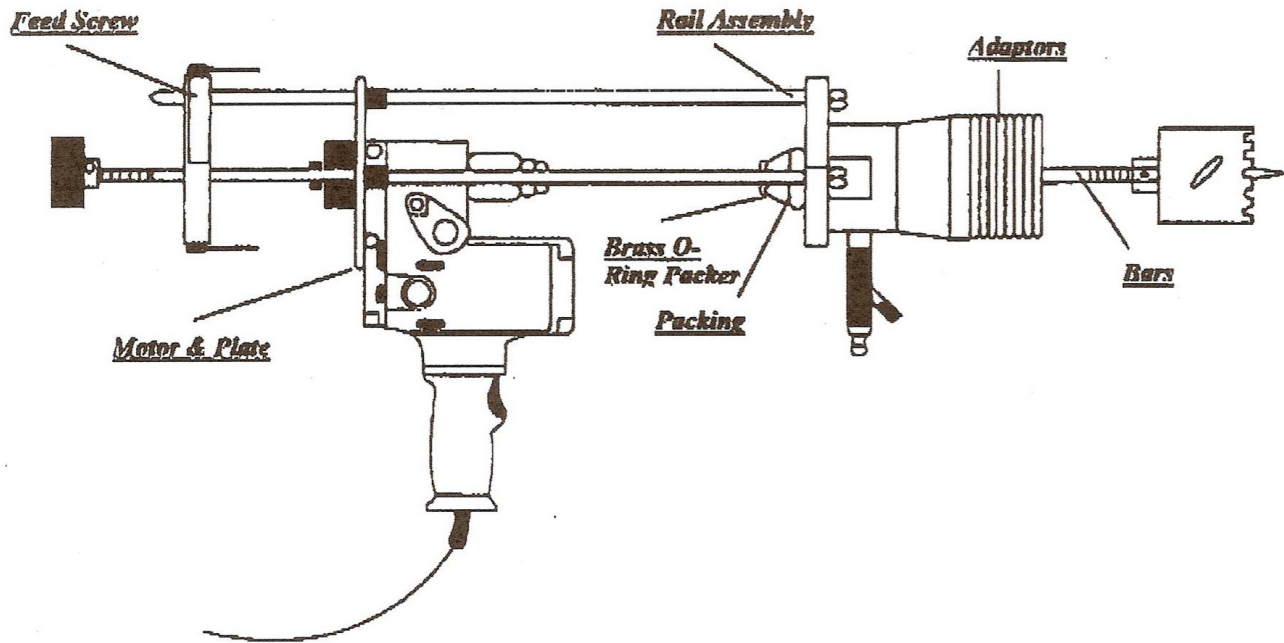
TM-1 Pro 15 includes all items in the TM-1 Pro 13 kit plus:	
1	Threaded Packer Assembly for 6" Taps
1	6" Drive Head with shoulder bolt
1	23" Long 3/4" OD Single Bolt Boring Bar
1	28" Long 3/4" OD Single Bolt Boring Bar
1	5-1/2" HSS Bi Metal Hole Saw
1	6" Flanged Sub Adapter
The TM-1 Pro 16 includes all items in the Pro 13 kit plus the Pro 14 & 15 components	

Optional Components
3/4" NPT Threaded Sub Adapter
1-1/4" NPT Threaded Sub Adapter
Silicone O-rings for High Temperature Applications
Replacement Parts and Accessories

TM-1 Pro Series Accessories

Item	Size	Description	Use
	1/4"-28 x 3/8"	Alloy Steel Cup Point Socket Set Screw	For 1/2"-20T Boring Bar Pilot Set Screws
	5/16"-18 x 3/8"	Alloy Steel Cup Point Socket Set Screw	Blue Plate Guiderail & Blue Base Guiderail
	5/16"-24 x 1/2"	Alloy Steel Cup Point Socket Set Screw	Top of Packing Gland & 5/8"-18T Boring Bar Pilot Set Screw
	#114	Small Bauna-N O-ring	Inside Packing Gland
	#117	Medium Bauna-N O-ring	Inside Packing Gland
	#132	Large Bauna-N O-ring	Packing Gland at Adapter
	1/4"-28 x 7/16"	Black-Oxide Alloy Steel Socket Head Cap Screw	Cap Screw for 2"-3" Cutter
	5/16"-24 x 5/8"	Black-Oxide Alloy Steel Socket Head Cap Screw	Cap Screw for 4"-6" Drive Head/Cutter
	1/4" shoulder dia x 1" shoulder length x 10-24 thread	Alloy Steel Shoulder Screw	For 4"-6" Drive Heads
	3/8" x 15/16"-10-24 thread	Nylon-Insert Hex Locknut	For 4"-6" Drive Heads
	1/8"	Small Hex Key	For Small Set Screw
	5/32"	Medium Hex Key	For Set Screws & Cap Screws
	3/16"	Large Hex Key	For Set Screws & Cap Screws
	7/8" Shaft Diameter	External Retaining Ring	For Backing Plate
	1" Shaft Diameter	External Retaining Ring	For Standard Packing Gland
	1-1/8" Shaft Diameter	External Retaining Ring	For 6" Packing Gland
	0.024 oz tube	Loctite C5-A 51277	Thread Anti-Seize
	24"	OD Tape	Measuring Pipe Outside Diameter
	1/4"x4-1/4"	Pilot w/Dual Wires	Pilot for 1/2"-20T Boring Bar
	3/8"x4-1/4"	Pilot w/Dual Wires	Pilot for 5/8"-18T Boring Bar
	1/4"	Jomar T-82 Mini Ball Valve	Sub-Adapter Bleed Valve

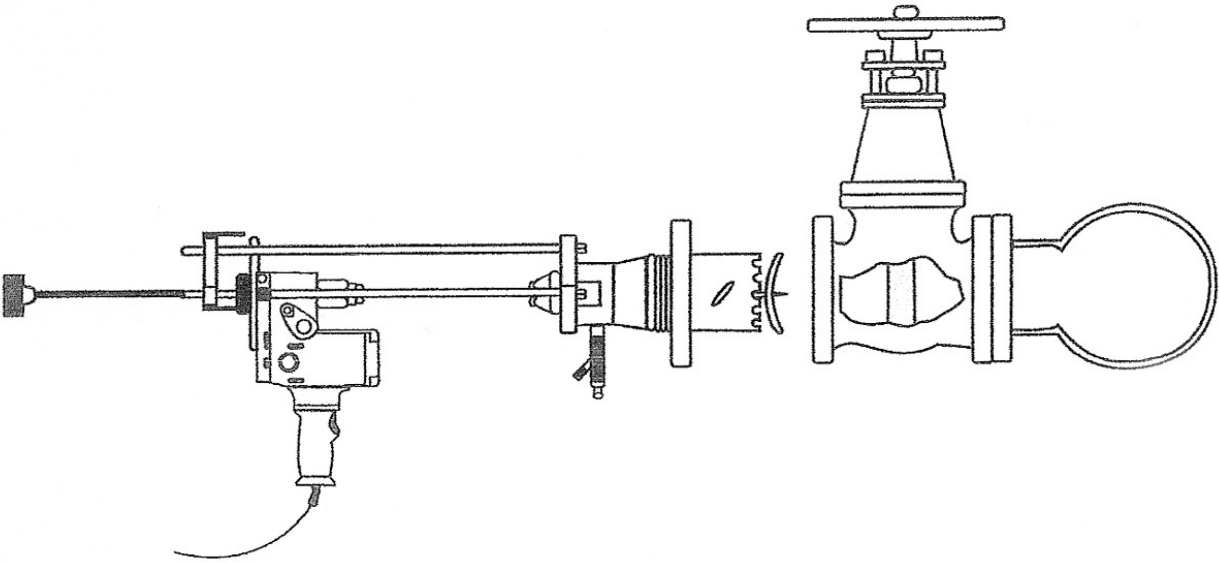
Specifications for the TM-1 Pro Hot Tapping System



Specifications:

- Hot Tapping Range:
3/4" through 4.00" NPT valve sizes. Hole saws 11/16" through 3.75" diameter.
(6.00" with ANSI/MJ Drilled Flange Adapter and separate 6" packing gland.
- Pressure Rating:
300 psig., cold working pressure
- Temperature Limit:
250 degrees Fahrenheit with standard seals
- Hydro-test Pressure:
350 psig., cold, non-shock
- Boring Bar Stroke (standard maximums possible):
Short boring bar = 13.75"
Long boring bar = 48.00"
- Feed Screw Stroke:
3" to 8.5" – Positional at any locations, covering approximately 15" of cutter feed
- Power Motor:
Standard electric motor = 300 free rpm; 120v, 60 HZ.
Optional air motor available
- Weight:
27lbs. (machine and electric motor only)

Hot Tapping Diagram through valve.



TM-1 Pro Assembly Instructions

IMPORTANT:

PLEASE READ the ENTIRE MANUAL BEFORE ASSEMBLY or POWER-UP

CAUTION: The following assembly instructions are to acquaint the TapMaster TM-1 Pro Hot Tap Machine user with how this machine is assembled.

Do not attempt to power up or use the machine until you read and understand this entire manual.

NOTE: The machine you have received has shipped partially assembled into several “sub-assemblies” that will be referred to in the following overall assembly instructions.

These sub-assembly names and component parts are:

- Feed Assembly
 - Guide Rail Assembly
 - Boring Bar Assembly
 - Packer Assembly
- A. Insert the Packer Assembly, threaded end first, into the large hole in the guide rail assembly, from the Guide rail side. You may lightly tighten screw to temporarily hold the two assemblies together. (Usually ship assembled)
- B. Select a valve sub-adapter to fit whatever connection thread or flange is to be hot tapped. Grease sub-adapter gasket and the threads on the Packer assembly. Press gasket into the female threaded end of your selected sub-adapter. Screw this sub-adapter onto the Packer assembly and use a wrench to tighten this joint.
- C. If you do not have a pilot drill with dual wires pre-installed, bend as needed wire(s) into an “L” shape with approximately equal legs. Slip one of these legs through the hole in the front of the pilot drill. Using a pushing while twisting motion simultaneously bend both legs of the bend wire towards the back of the drill and continue to do this until the wires ends are well down and nearly into the drill flutes. A properly installed wire should protrude about 1/16” from one side of the drill O.D. when the opposite leg is pressed flush with the drill O.D. into one of the flutes.

- D. Select the boring bar that will accommodate the hole saw you have selected to make your hot tap. Remove screw from the bar. Slip the pilot drill into the end of the boring bar with the flat on the shank of the pilot oriented towards the threaded hole that screw engages. Continue pushing the pilot into the boring bar until you see the first edge of the shank flat pass under the hole and fully disappear. This position presents a full flattened area for screw to bear against, while allowing the maximum length of the pilot drill to protrude. Lightly grease the screw, install it and tighten firmly, but not with so much force that it will be difficult to remove later.
- E. The 11/16" through 1-3/16" hole saws simply butt up against the shank of the boring bar. **Always apply anti-seize material before screwing on any hole saws.** Firmly screw these sizes onto the end of the bar and snug them up. Larger cutters fit boring bars with arbors. For these, rotate the knurled thrust plate. Screw your selected hole saw onto this boring bar until it bottoms out against the thrust plate. Now, observing the driver holes drilled into the back of the hole saw, back the saw off (up to ½ turn) until these driver holes are seen to perfectly align with the retracted driver pins. Turn the pin driver to extend the driver pins into these holes. Continue extending these pins until pin driver contacts the thrust plate. Firmly tighten this joint either by hand or with modest assistance of channel-locks,
- F. Lightly lube both the selected boring bar and the o-rings inside the packer assembly. While turning and slightly wiggling the boring bar/cutter/pilot assembly, insert its tri-lobed end through the sub-adapter, and gently ease your way through the o-rings. Continue this until about a foot of the boring bar protrudes from the back of the packer assembly.

NOTE: When using the long boring bar, the subsequent assembly instructions would normally be executed out on a job site since this extended travel boring bar protrudes too far from the back of the machine to attach the motor and feed assemblies when the cutter is retracted properly up into the sub-adapter.

You are again cautioned not to attempt to power up or use this machine until you read and understand this entire manual.

- G. Note that the driver on the motor is a standard “Jacobs-type” chuck (and industrial version of those found on home electric drills) which uses a large toothed key to effect final tightening. Never use a key that is not exact size of the one furnished with the machine (there are many sizes) and never use a worn or damaged key. Rotate the chuck ring on the front of the power motor to fully open the jaws of the chuck. With the motor chuck facing the tri-lobe of the boring bar, align the guide rail holes on the motor assembly onto and down the guide rails until the chuck engages at least 1/2" over the tri-lobe end of the boring bar. Begin rotating the chuck ring to tighten the chuck. Observe where the three jaws of the chuck are aligned and rotate the boring bar so that the flats of the tri-lobe will be the surface contacted by flats of the tri-lobe will be the surface contacted by the chuck jaws. Continue tightening the chuck and snug it by hand. Engage the chuck key fully and tighten the chuck firmly. Remove the chuck key from the chuck. Push the motor/boring bar assembly forward towards the packer.
- H. Rotate the feed screw until the feed pad is up against the feed nut and the feed knob is in its furthest possible position from the top guide plate. By tightening the three brass tipped set screws, you can adjust the feed screw to any position on the guard rails. Fully retract the three keepers so that the guide rail mating holes are completely open. Now, with the feed pad facing the motor, align the three mating holes of the top guide plate with the guide rails and slip the guide plate on to the rails.
- I. Move the motor/boring bar assembly back along the guide rails toward the locked on feed assembly until the back of the motor rests against the feed pad. If the hole saw bottoms out inside the valve sub-adapter before the motor contacts the feed pad, you may have to adjust the feed screw to advance the feed pad into engagement with the motor. In most field circumstances, the motor will be so far forward along the guide rails that the feed assembly must be disengaged and moved up.

The machine is now fully assembled.

Continue on with this manual before doing anything else to or with this machine.

-- SAFETY FIRST --

IT IS STRONGLY RECOMMENDED THAT NOVICE OPERATORS OF THE TM-1 PRO SERIES HOT TAPPING MACHINE MAKE THEIR FIRST COUPLE OF TAPS WITH THIS EQUIPMENT ON A NON-PRESSURIZED MOCK-UP OF THE ACTUAL INSTALLATIONS THAT ARE EXPECTED TO BE ENCOUNTERED IN THE FIELD UNDER PRESSURE. THIS ALLOWS THE NOVICE TO GAIN EXPERIENCE WITH THE COMPLEX STEPS THAT FOLLOW HEREIN AND TO GET A FEEL FOR THE DRILLING, CUTTING AND TORQUE CHARACTERISTICS OF THIS MACHINE. YOU ARE WARNED THAT FAILURE TO TRAIN ON NON-PRESSURIZED HOT TAP CONNECTIONS PRIOR TO ATTEMPTING REAL PRESSURIZED HOT TAP CONNECTIONS IS EXTREMELY RISKY AND COULD LEAD TO A HOT TAP FAILURE WITH POSSIBLE SERIOUS PERSONAL INJURY AND/OR PROPERTY DAMAGES.

STOP!!

Think...

You are about to begin hot tapping; a process probably very different than any other you have done before.

Remember...

Once you begin to hit pressure, you may be committed, with no opportunity of correcting earlier errors or problems.

Operator Safety Instructions

- 1.1 Read and understand this entire operator's manual before attempting to operate this machine or performing maintenance on it. Keep this operator's manual with the hot tap machine at all times. If you have any trouble understanding or complying with any of the safety notes or procedures, or any of the hot tapping procedures hereunder, do not attempt to use this machine. **Stop and get experienced professional assistance.**
- 1.2 Inspect the equipment. Don't assume that someone else has checked anything or that something is still tight and has checked anything or that something is still tight and secure from the last job. Check everything.
 - 1.2a Look at all movable parts for free operation and lack of obstruction.
 - 1.2b Make sure that the cutter and pilot are both tight.
 - 1.2c Make sure that the sub-adapter gasket is in place and that the sub-adapter/packing gland joint is tight. – **See Section 2.1 for greater detail** –
- 1.3 Ground this tool. This tool is equipped with a U.L. listed ground fault circuit interrupt device (GFI) to protect the operator from most types of incidents of electric shock. This GFI **cannot** function unless it is plugged into a properly wired and grounded electrical outlet of the three-hole, three conductor type.

WARNING: Failure to use a grounded fault circuit interrupt device (GFI) and to plug this machine into a properly wired and grounded three conductor cord or receptacle exposes the operator and those around to possible serious or fatal electrical shock. Never use this machine with a damaged or suspect GFI or with an extension cord with the ground pin removed or damaged. No device, including this GDI can protect against all types of electrical shock, including, but not limited to, faults or defects in wiring on the supply side of the receptacle this GFI is plugged into; or, actually contacting both hot and neutral wires.

- 1.4 Know what you're hot tapping. Know exactly what material is contained in the pipe or vessel, along with its temperature and pressure. Hot or dangerous materials require special handling and experience. Ask for Safety Specialist and Hot Tapping Specialist assistance if you have any reason to feel a tap is out of the ordinary or that the pressurized product is hazardous.
- 1.5 Avoid explosive or dangerous operation environments.
 - 1.5a This tool's motor sparks. Do not operate it in an explosive, gaseous, or a dusty atmosphere. The spark is capable of touching off an explosion.
 - 1.5b Don't operate this machine in dark locations. You must be able to see well to operate this machine safely.
 - 1.5c Don't operate this machine from an out-of-balance or over reached position. The powerful motor on this machine could get tight in the hot tap and the counter-torque could throw you from balance.

- 1.6 Disconnect power cord before servicing. Making any adjustment to this machine or changing the cutter/pilot must be done only with the cord disconnected.
- 1.7 Wear safe apparel. This machine rotates with incredible power. You cannot resist or overpower its rotation. No loose clothing or jewelry can be worn that could become caught or entangled in moving parts.
- 1.8 Use safety equipment.
 - 1.8a Safety glasses are required.
 - 1.8b Ear protection is required.
 - 1.8c Rubber gloves and footwear are recommended when working outdoors or in damp areas.
 - 1.8d Face or dust respirator may be required due to either the contents of the pipe/vessel being hot tapped, or, due to hazardous dust from the pipe/vessel wall material.
 - 1.8e Consult a Safety Specialist if needed.
 - 1.8f If the product inside the pipe or vessel being hot tapped is a hazardous material, you must get professional safety assistance prior to hot tapping; and, you must follow all of that Safety Professional's safety equipment recommendations and procedures.
- 1.9 Keep alert. Do not operate this machine if ill or if drowsy from fatigue or medication. Keep bystanders away and do not allow distractions or horseplay around you when operation this machine.
- 1.10 Don't abuse the cord. Never carry this machine by its cord or yank the cord to disconnect. Keep the cord away from heat, oil, and sharp edges.
- 1.11 Avoid accidental starts. Don't move or carry the plugged in machine with your finger on the motor trigger. Be sure the trigger is off when plugging in this tool.
- 1.12 Stay within specifications. Never exceed the Model specifications printed herein. Never use this machine on pressures higher than 300 psig; and, generally avoid pressure over 150 psig, especially if you are inexperienced at hot tapping and/or the use of the T-1 machine.

Hot Tapping Instructions

Note: a hot tap can be as safe as drilling a hole in a wall...

or

...a hot tap can destroy your tapping machine, injure you or others...

or

it can result in a total pressure system shutdown;

It depends on whether or not proper procedure and instructions are carefully followed.

2.1 Look your equipment over. Make certain that you have checked:

2.1a Is that cutter sharp and tight?

Danger: Attaching no cutter at all, or attaching a hole saw smaller than 11/16" diameter to any of the standard boring bars could result in the violent uncontrolled ejection of the boring bar from the pressurized machine, resulting in serious or fatal personal injury and significant spillage of the hot tapped product. Only special boring bars, packers and procedures from TapMaster OEM parts, designed to handle cutters under 11/16" diameter with the T-1 machine may be used for cutters under 11/16" diameter.

2.1b Is the pilot drill sharp and tight?

2.1c Is the pilot's coupon catcher wire adjusted to protrude from the flutes and yet be bent enough to keep from falling out of its hole?

Most hot tap problems are caused by starting a job with a cutter or pilot that "looks just good enough for one more cut." Cutters and pilots are inexpensive compared to the costs of a failed hot tap. In doubt?—Replace it!

2.1d Are the o-rings right for the job and in good condition?

2.1e Is the boring bar lightly lubed and free of dirt?

2.1f Is the motor chuck tight on the boring bar?

2.1g Is the chuck key removed and clear of rotating parts?

2.1h Is the gasket in place between the valve sub-adapter and the machine; and, is that sub-adapter tightly screwed onto the packing gland?

2.1i Is the ground fault interrupter in place and the machine plugged into a properly wired and grounded 3-wire power supply of the correct voltage and frequency?

2.1j Are the feed screw set screw fully tightened onto the guide rail?

2.1k Is the motor and boring bar backed up all the way, and does the cutter/pilot retract far enough to close the valve to be hot tapped?

2.1l Is the bleed-off valve installed and secure?

- 2.2 Look at the jobsite.
- 2.2a Is there a safe secure place for you to stand both when attaching the machine and when operating it?
- 2.2b Where would you move quickly if there were an emergency?
- 2.2c Do plant/building safety and operation people know that you are about to hot tap (and have any required permits been signed)?
- 2.2d Have you verified with someone responsible on-site that the pipe contents are what the work ticket claims they are?
- 2.3 Look at the hot tap connection.
- 2.3a Does the weld to the pipe look good and porosity free?
- 2.3b Does the joint from the connection to the valve look properly made up?
- 2.3c Does the valve open and close completely?

Remember that when the seating lugs of a gate valve sticks out into the I.D. of the valve, when fully open, you must deduct twice that amount when determining what cutter will pass through that bore.

- 2.3d Take a spare cutter and hand pass it through the hot tap connection I.D. assembly, making sure it reaches the pipe/vessel to be hot tapped, unobstructed.
- 2.3e Is there enough room between the cutter O.D. and the connection I.D. to contain the number of chips you expect to generate? (Heavy pipe walls and plate walls generate a lot of chips.)
- 2.3f Are all of the bolts/packing nuts on the valve tight?
- 2.3g Measure the distance from the end of the valve to the nearest surface of the pipe/vessel to be tapped inside the connection. Write the dimensions down.
- 2.4 Making the tap.
- 2.4a Move the boring bar/cutter & pilot assembly until the pilot drill point is flush with the face of the sub-adapter. Mark the position on the boring bar where it meets the back of packing gland. Now fully retract the boring bar/cutter assembly (back away from the hot tap).
- 2.4b Attach the fully retracted tapping machine to the tapping valve.
- 2.4c Open the bleed-off valve on the machine a crack.
- 2.4d Close the tapping valve to be sure you will be able to get off the connection when the hot tap is finished.
- 2.4e Open the tapping valve.
- 2.4f ALWAYS Pressure test the entire assembly.

Caution: Test pressures higher than the present operation pressure of the pipe/vessel being hot tapped can crush or seriously damage that pipe or vessel.

- 2.4g Move the boring bar forward to the position you just marked as the “pilot drill flush.” Measure the boring bar length from the back of the packing gland to the nose of the motor chuck. Write the dimension down.
- 2.4h Gently push the boring bar and motor assembly into the hot tap connection until you feel the pilot drill contact the pipe.
- 2.4i Re-measure the boring bar length from the back of the packing gland to the nose of the motor chuck. Write this dimension down. Subtract this new dimension from the one written down from step #2.4.7 above. Does the remainder equal the hot tap connection dimension written down in step #2.4.7 above? (You may have to taken into consideration your sub-adapter to valve thread make-up.)
- 2.4j Turn the feed screw until the feed pad is lightly touching the motor cover.
- 2.4k Back off the feed screw 1/8th turn.
- 2.4l Connect the GFI protected power cord into a grounded properly wired power source. Following the GFI manufacturer’s instructions, furnished with the GFI, push the “Test” button on the GFI to verify that it is working properly. Reset the GFI.
- 2.4m Lightly tap or joggle the power trigger on the motor to get a partial boring bar rotation to verify that nothing is binding the machine.

Caution: Some models of this machine have a selector switch that controls the direction of the power motor’s rotation. This machine must be operated with the cutter turning in a clockwise direction when observed from the rear, facing the hot tap. Rotating the cutter of pilot in a counter-clockwise direction could lead to serious cutter/pilot damage and hot tap failure.

- 2.4n Optionally, the lower guide plate torque screw may now be tightly secured to inhibit torque response or motion of the motor assembly. Many operators prefer to leave this screw loose to have better feel of how much “bite” the cutter/pilot is taking. This torque screw is only to reduce operator fatigue during long multiple hot tap projects. It may not totally resist motor torque, resulting in “surprise” spinning of the motor/guide rail assembly.

Warning: In a serious cutter jamming situation, this torque screw may not be able to control motor torque response. Never operate this machine from a position or in a situation where a “run away” motor could endanger you or others around you.

- 2.4o Pull the motor trigger and gently turn the feed screw clockwise until light force is exerted on the pilot drill, and it begins to drill the pipe.

Caution: Be gentle here. Remember you are turning a 3/8” drill with a very powerful motor and feeding it with the thrust advantage of a screw thread. Keep the pilot cutting; but this requires very little force.

- 2.4p Continue drilling until the first sound or sign of pressure being hit is encountered from the bleed-off valve. Immediately stop the motor and back off on the screw 1/8th turn.

- 2.4q Use the bleed-off valve to control the bleeding of air from inside the connection and hot tap machine. When you are sure that the machine is purged of air and filled with the product being hot tapped, close the bleed-off.
- 2.4r Check the machine and connections for any leaks. If there are any machine leaks or joint leaks above the valve, these may be corrected by retracting the boring bar, closing the valve, and fixing the leak. Leaks in connection assembly below the valve closure cannot usually be fixed except by Expert Leak Control Division specialists.
- 2.4s With the absence of leaks, restart the motor and gently feed the pilot back to work. As the pilot finishes the pilot hole there is usually some free distance to feed before the hole saw begins to cut. Do not confuse this with a complete cut. Some people have.
- 2.4t Stop the T-1 drill motor when a rasping noise tells you that the hole saw has made contact with the pipe. Back off the feed screw 1/8th turn. Measure the distance from the packing gland back to the motor chuck nose. Write the dimension down. This critical dimension might be necessary as a reference “cut starting point” should any problems develop during the remainder of the hot tap.

Caution: On cuts where the connection and hole saw size approach or equal the header size you must also take another measurement.

Make certain that the cutter has contacted the pipe wall.

Measure the distance up the boring bar, from the packing gland back, equal to 1/2 the header diameter. Mark that point, preferably with a full circumferential band of tape, etc. As you resume the cut this mark or tape line will slowly advance towards the packing gland back as the cutting progresses. Never hot tap deeper than the point at which this mark or tape line meets the packing gland back or you may cut through the back of the pipe.

- 2.4u Start the hole saw cutting with a firm steady feed. Avoid jerky feed movements. Listen to the motor, and feel the counter-torque (if you have the torque screw loose). Control the pressure of your feed in such a way that the cutting sound and counter-torque is steady.

As the cut nears completion, the cutting often gets more difficult and lighter feed is required.

- 2.4v You will know when the cut is completed by motor speed-up, sound change, and feed screw loosens (relative to when cutting).
- 2.4w Stop the motor.
- 2.4x Disconnect the power cord.
- 2.4y Push down (in towards the new hole) on the boring bar/motor assembly without the use of the feed screw. If the pressure is so high that you feel that you cannot easily handle the boring bar/motor assembly for safe retraction, you must back it out all the way with the feed screw. If pressure is low enough for you to “float” the bar in and out, hold it securely and remove the feed screw assembly.
- 2.4z Back out the boring bar until it stops.
- 2.4aa Verify that the distance now from the packing gland back to the motor chuck nose is the

same as (or greater than) the one written down in step #2.4.7 above. If not, you are hung up on something in the connection and must work the bar up and down until free and the full dimension is attained.

2.4bb Close the hot tapped valve.

2.4cc Depressurize and drain the machine through the bleed-off valve.

Caution: Without exceptional procedures, hot taps will always spill some of the hot tapped material when the machine is removed. Be prepared.

Know what hazards are related to the escape to atmosphere of the product you are hot tapping. Even water can cause hazards or damage.

In hazardous environments or confined spaces, piping can be run to the bleed-off to carry away the trapped pressure and product to a safe area or receptacle.

Valves will, on rare occasions, leak after a hot tap due to a hot tapping chip caught in the seat. Be prepared for some blow. Working the gate/ball/plug with the bleed-off partially open (if that is safe) will usually clear the chip.

2.4dd Disconnect the TM-1 drill motor.

2.4ee Wipe the outboard area of the valve bore free of your cutting chips that may have fallen there.

2.4ff Plug, cap, or blind the valve if piping connection is not immediate. Tag the valve as "live."

2.4gg Extend the boring bar and remove the pilot retainer screw. Remove the pilot drill, which will have the coupon on it. Drop the coupon over the back of the pilot. (This avoids damage to the drill wire.)

2.4hh Tag the coupon and give it to the local on-site system authority or retain it for later reference.

2.4ii Immediately wipe down the machine, removing chips and traces of the hot tapped product.

2.4jj Lightly coat of spray moving parts, other than the motor, with light oil or displacement fluid like WD-40.

2.4kk Inspect the machine for anything that needs attention or re-tightening. Don't assume that you or the next operator will catch any damage or looseness before the next tap. Fix it now.

Now you are ready to make a practice tap



Pipe Outside Diameter Guide

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PIPE SIZE	STEEL & PLASTIC		CAST IRON			ASBESTOS-CEMENT			SIMPLEX-A/C			COPPER	PIPE SIZE
	TYPE	TYPE	CURRENT D.I. PIPE SIZE	AWWA 1908 Class	O.D.	TYPE	M.E. O.D.	R.B. O.D. Min. Max.	TYPE	M.E. O.D.	R. B. O.D.	O.D.	
1/2"	STD.	0.84										0.63	1/2"
5/8"												0.75	5/8"
3/4"	STD.	1.05										0.88	3/4"
1"	STD.	1.32										1.13	1"
1 1/4"	STD.	1.66										1.38	1 1/4"
1 1/2"	STD.	1.90										1.63	1 1/2"
2"	STD.	2.38			2.50							2.13	2"
2 1/2"	STD.	2.88										2.63	2 1/2"
3"	O.D.	3.00	3.96	A	3.80	cl 100	3.74	4.00	cl 100	3.70	3.95	3.13	3"
	STD.	3.50	-	B, C, D	3.96	cl 150	3.84	4.10	cl 150	3.88	4.13		
			-			cl 200	3.84	4.29	cl 200	4.20	4.45		
3 1/2"	STD.	4.00											3 1/2"
4"	O.D.	4.00	4.80	A	4.80	cl 100	4.64	4.79 5.14	cl 100	4.70	4.70	4.13	4"
	STD.	4.50	-	B, C, D	5.00	cl 150	4.81	4.97 5.27	cl 150	4.85	4.85		
			-			cl 200	4.81	5.22 5.57	cl 200	5.20	5.20		
4 1/2"	STD.	5.00											4 1/2"
5"	STD.	5.56										5.13	5"
6"	O.D.	6.00	6.90	A, B	6.90	cl 100	6.91	7.05 7.40	cl 100	6.76	6.76	6.13	6"
	RIV.	6.25	-	C, D	7.10	cl 150	6.91	7.07 7.37	cl 150	6.95	6.95		
	STD.	6.63	-	E, F	7.22	cl 200	6.91	7.26 7.56	cl 200	7.50	7.50		
			-	G, H	7.38	-	-	-	-	-		
7"	RIV.	7.25											7"
STD.	7.63												
8"	O.D.	8.00	9.05	A, B	9.05	cl 100	9.11	9.22 9.57	cl 100	8.88	8.88	8.13	8"
	RIV.	8.25	-	C, D	9.30	cl 150	9.11	9.27 9.57	cl 150	9.15	9.15		
	STD.	8.63	-	E, F	9.42	cl 200	9.11	9.39 9.74	cl 200	9.76	9.76		
			-	G, H	9.60	-	-	-	-	-		
9"	STD.	9.63											9"
10"	O.D.	10.00	11.10	A, B	11.10	cl 100	11.24	11.42 11.77	cl 100	11.18	11.18	11.70	10"
	RIV.	10.25	-	C, D	11.40	cl 150	11.66	11.82 12.12	cl 150	11.70	11.70		
	STD.	10.75	-	E, F	11.60	cl 200	11.66	11.77 12.12	cl 200	12.20	12.20		
			-	G, H	11.84	-	-	-	-	-		
12"	O.D.	12.00	13.20	A, B	13.20	cl 100	13.44	13.69 14.04	cl 100	13.36	13.36	14.46	12"
	RIV.	12.25	-	C, D	13.50	cl 150	13.92	14.08 14.38	cl 150	13.96	13.96		
	STD.	12.75	-	E, F	13.76	cl 200	13.92	14.03 14.38	cl 200	14.46	14.46		
			-	G, H	14.08	-	-	-	-	-		
14"	O.D.	14.00	15.30	A, B	15.30	cl 100	15.07	15.40 15.80	cl 100	15.56	15.56	16.88	14"
	RIV.	14.25	-	C, D	15.65	cl 150	16.22	16.38 16.73	cl 150	16.26	16.26		
	STD.	14.75	-	E, F	15.98	cl 200	16.22	16.48 16.88	cl 200	16.88	16.88		
			-	G, H	16.32	-	-	-	-	-		
16"	O.D.	16.00	17.40	A, B	17.40	cl 100	17.15	17.54 17.94	cl 100	17.76	17.76	19.30	16"
	RIV.	16.25	-	C, D	17.80	cl 150	18.46	18.62 18.97	cl 150	18.50	18.50		
	STD.	16.75	-	E, F	18.16	cl 200	18.46	18.79 19.19	cl 200	19.30	19.30		
			-	G, H	18.54	-	-	-	-	-		
18"	O.D.	18.00	19.50	A, B	19.50	cl 100	19.90	20.44				21.20	18"
	RIV.	18.25	-	C, D	19.92	cl 150	20.94	21.20					
20"	O.D.	20.00	21.60	A, B	21.60	cl 100	22.12	22.50				23.54	20"
	RIV.	20.25	-	C, D	22.06	cl 150	23.28	23.54					
	STD.	20.75	-	G, H	23.02	-	-					
22"	STD.	22.00											22"
24"	O.D.	24.00	25.80	A, B	25.80	cl 100	26.48	27.17				28.22	24"
	RIV.	24.25	-	C, D	26.32	cl 150	27.96	28.22					

NOTE: Due to variation in pipe O.D. and specifications, dimensions listed above are approximate. The O.D. of the pipe should be determined before ordering. 2012a