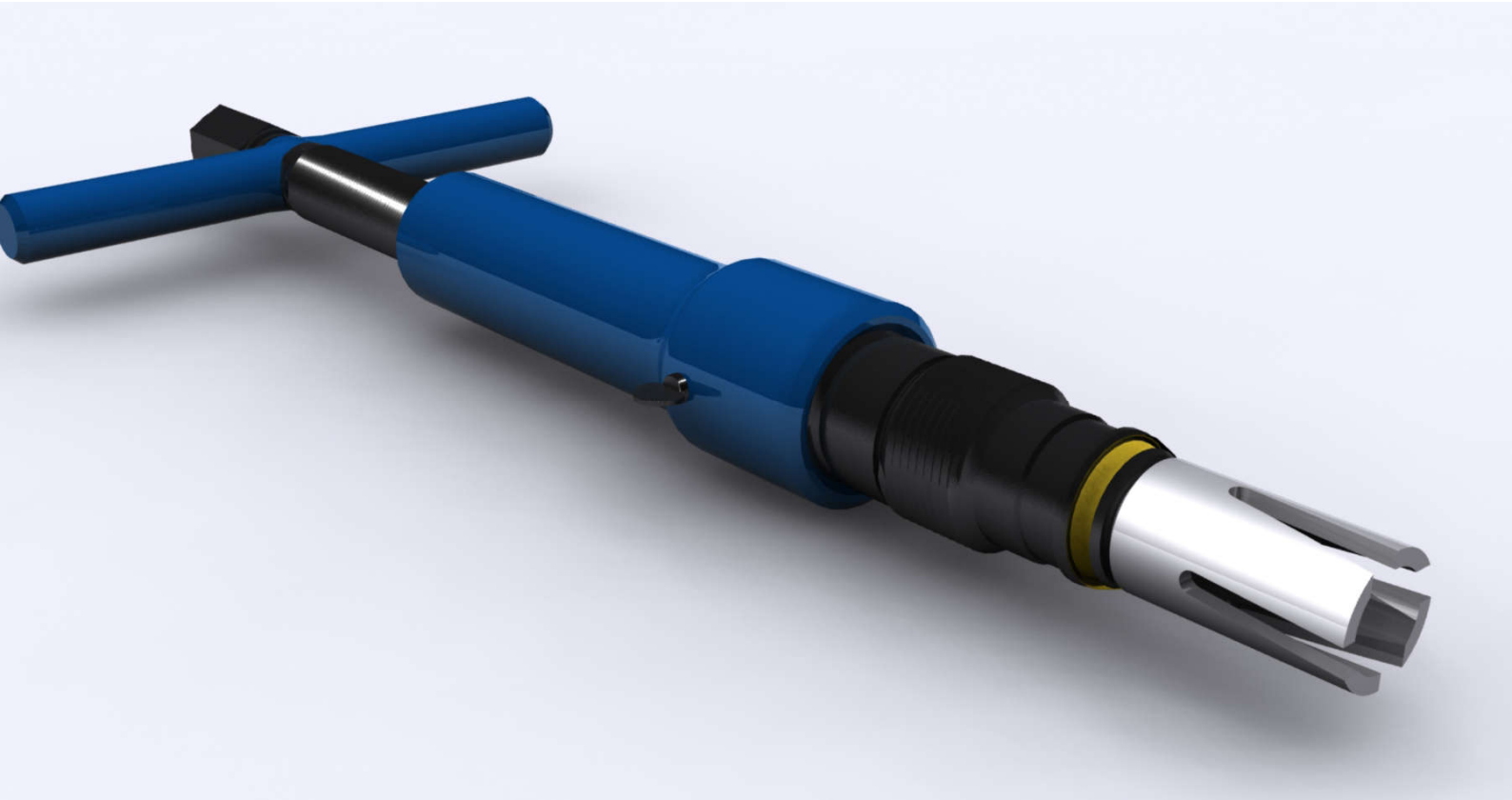
COSASCO®

COSASCO® TWO-INCH SYSTEM HOT TAP KIT

Work Instruction



11841 Smith Avenue
Santa Fe Springs, CA 90670
Tel: (562) 949-0123 • (800) 635-6898
Fax: (562) 949-3065

P/N: 741045revP
www.cosasco.com

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Revision History Record

ECN No	Page No.	Rev	Date	Description of Change	Issue	Reviewed	Approved
	ALL	-	2/12/13	Draft – Issued for comment	KR	ENG	RA
	ALL	A	4/11/13	Added Disclaimer Notes	KR	ENG	RA
	2, 8,10	B	8/20/13	Added Revision History, updated Scope of Document and Pre Job Preparation.	KR	ENG	RA
	12	C	12/12/13	Added Warning – Deviation from Work Instruction	KR	ENG	RA
	ALL	D	01/28/14	Annual Review – No changes	KR	ENG	RA
	10	E	05/28/14	Updated - maximum cutter depth	KR	ENG	RA
	10,17	F	09/15/14	Added step 5.3 and step 8.4	KR	ENG	RB
	12.14	G	12/25/14	Added warning notice, Annual review	JL	ENG	RB
	ALL	H	03/30/15	Added note on footer about latest revision	KR	ENG	RA
	10	J	05/20/15	Updated the operating temperature range	RB	ENG	RA
	ALL	K	12/15/15	Annual Review/Update Cover and Name to Cosasco Throughout Document.	KR	ENG	RA
	18	L	11/29/16	Updated section 8.1	KR	RB	RA
	4,14, 18	M	3/30/17	Changed word Tap to Chaser	MP	ENG	RA
	13	M	3/30/17	Changed words Tapping Equipment to Tools & Equipment	MP	ENG	RA
	ALL	N	28/11/17	Annual Review	JL	AA	DS
21133	ALL	P	23/11/18	Annual Review and insert ECN No	JL	MR	DS

CONTENTS

1 IMPORTANT INSTRUCTIONS

Cosasco is committed to providing the safest and highest quality products, services, and training for the industries it serves. We are committed to ensuring that all users of our equipment work safely and efficiently. We have designed this work instruction to emphasize safe working practices, and as much as possible, to convey the full benefit of our knowledge and collective experience in the maintenance and service of the Cosasco Two-Inch System Hot Tap Kit. This work instruction is not meant to be a sole source of instruction or training. Because these tools are used in a broad range of environments and applications, it is important that the owner and operation personnel have been assessed, certified, and deemed competent in all safety, work management and additional risk assessment requirements in the application of this procedure.

WARNING 	Comply with all information on the product, in this work instruction, and in Cosasco System Safety Awareness Training that apply to the product. Do not allow untrained or inexperienced personnel to work with this product. Use Cosasco parts and work procedures specified in this work instruction.

BE SURE ALL PERSONNEL READ AND FOLLOW THE INSTRUCTIONS IN THIS WORK INSTRUCTION AND ALL PRODUCT WARNINGS.

Product Owners (Purchasers)

1. Use the correct product for the environment and pressures present. If you are unsure, discuss your needs with your Cosasco representative.
2. Inform, educate, and train all personnel in the proper installation, operation, and maintenance of this product.
3. To ensure proper performance, only competent, field experienced and trained personnel should install, operate, repair and maintain this product.
4. Save this work instruction for future reference.

Product Operation Personnel (Personnel):

1. Read and understand all instructions and operating procedures for this product.
2. Follow all warnings, cautions, and notices marked on, and supplied with, this product.
3. Follow all instructions during the installation, operation, and maintenance of this product.

4. To prevent personal injury, ensure that all components are in place prior to and during operation of the product.

5. If you do not understand an instruction, or do not feel comfortable following the instructions, contact an Cosasco service technician for clarification or assistance.

6. If this work instruction is not correct for your Cosasco product, contact your regional Cosasco office and Cosasco will provide you with the requested work instruction.

7. Use only replacement parts specified by Cosasco. Unauthorized parts and procedures can affect this product's performance, safety, and invalidate the warranty. "Look-a-like" substitutions may result in improper operation and may result in serious injury or death.

8. Save this work instruction for future reference.

2 DISCLAIMER

This disclaimer relates to the use of these work instructions by non-Cosasco persons and entities.

Any person or organization utilizing this work instruction, for any purpose, does so at their own risk. Rohrback Cosasco Systems, Inc., its affiliates and employees assume no liability arising from the use of, or reliance on the information provided in any Cosasco work instructions.

Information provided in this work instruction should not be considered as all-encompassing or suitable for all situations, conditions or environments. Each individual and the organization he or she represents are responsible for implementing their own program of training and safety awareness in connection with this work instruction.

Application of information furnished by this work instruction does not guarantee that the information furnished will meet applicable USA (including OSHA), United Kingdom, or any other country's health or safety standards or requirements or, that by implementing any of the programs you or your company will comply with such rules and regulations. Always seek the advice of your legal, medical or other advisors before using this information.

3 SAFETY WARNINGS

It is imperative that the following safety warnings are taken into important consideration before and during use of Cosasco Hot Tap Equipment. Failure to follow these warnings could result in serious injury or worse.

1. Safe operation requires two experienced and competent operators.
2. Do not use this hot tap equipment unless you have been trained and are competent in its safe operation.
3. Make sure you have complied with all plant safety requirements and environmental regulations.
4. Identify the type of media its pressure and temperature. Review material safety data information on the media prior to operation.
5. Ensure you have all the required safety equipment for the given media, "i.e. hard hat, safety glasses, protective clothing, safety gloves, respirator, spill safety equipment, etc...
6. Any actions which could vary system pressure such as surges caused by opening and closing of valves and chokes must be delayed until completion of retrieval operations.
7. Ensure you have enough clearance for safe operation.

4 SCOPE OF DOCUMENT

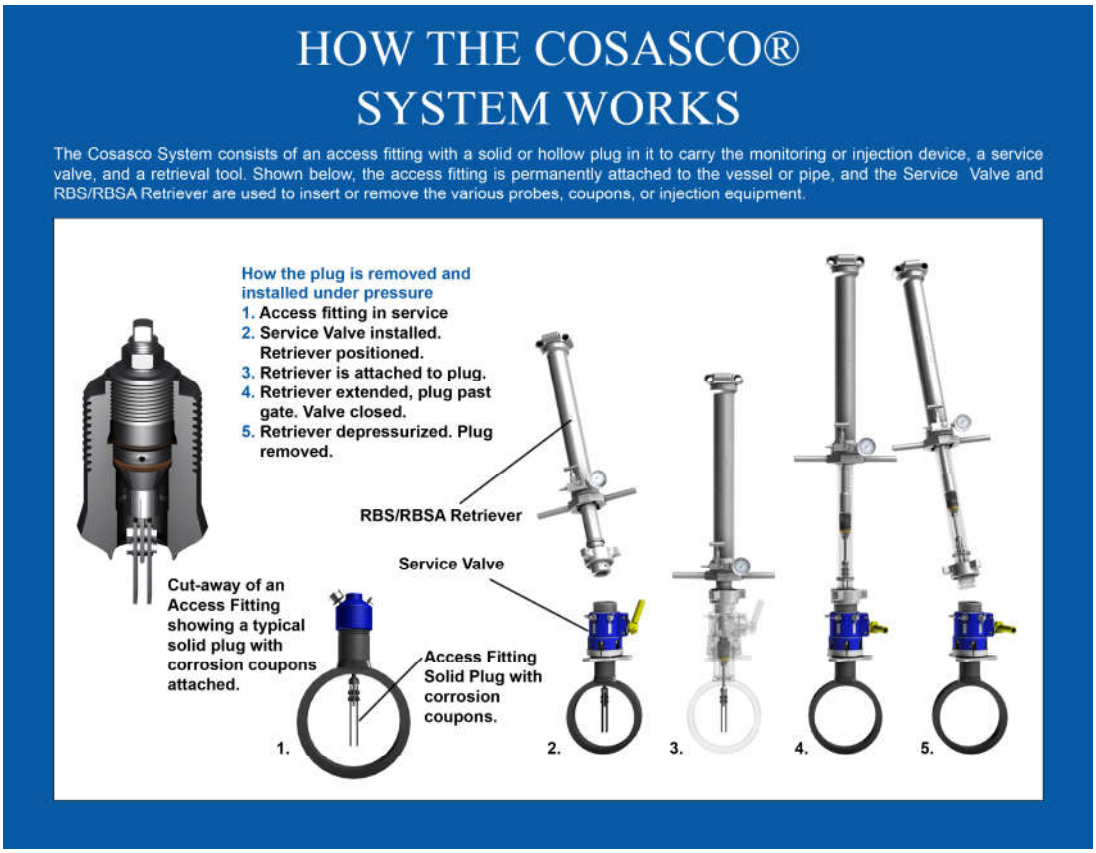
This document details the procedure for the installation and proper use of the Cosasco System Hot Tap Kit online.

This document also includes details of special tools which are used in conjunction with the Hot Tap Kit and covers the use of the Cosasco System Hot Tap Kit while vessels and production pipework are under normal pressurised conditions.

This document is not to be used as a training manual in the use of the fore mentioned equipment and is intended for use by Cosasco trained and qualified personnel who have been assessed, certified, and deemed competent in all safety, work management and additional risk assessment requirements in the application of this procedure. The lead technician is responsible for the strict adherence to this work instruction.

5 HOW THE COSASCO® SYSTEM WORKS

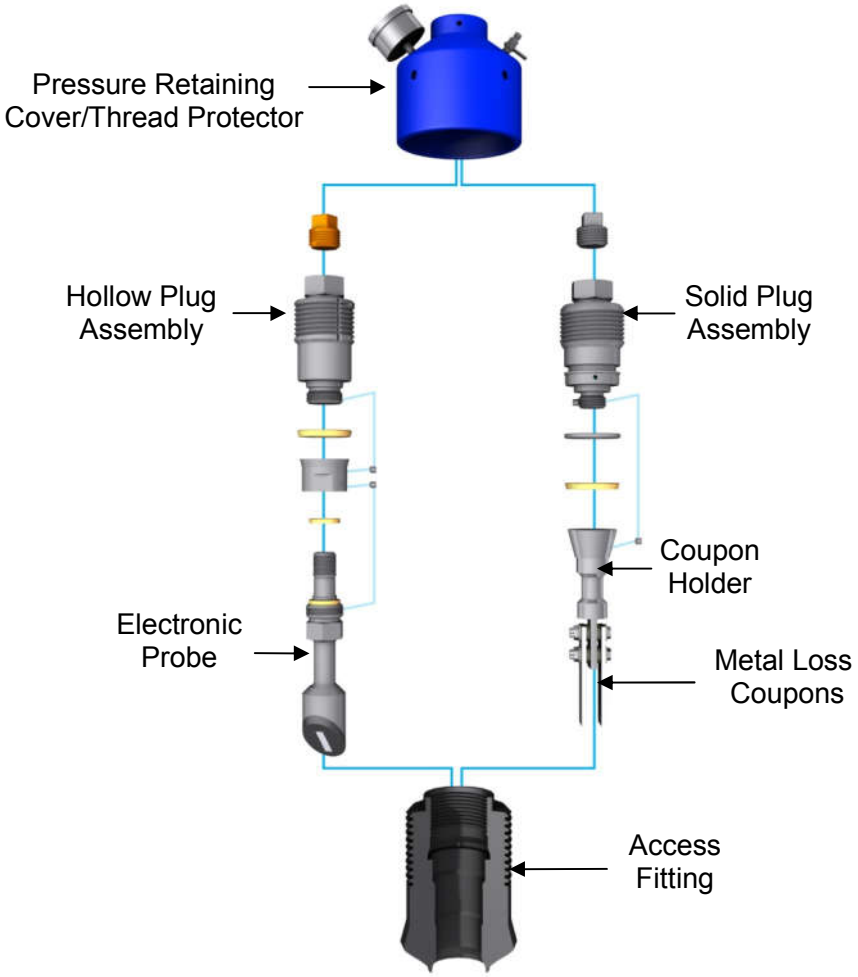
5.1 *Access Fittings*



The Cosasco Access Fitting Assembly is the key to the concept of “Access under pressure - any time, any place”. When used with a Cosasco Retriever and Service Valve, the Access Fitting Assembly permits safe, easy insertion and retrieval of corrosion and erosion monitoring systems as well as preventive maintenance devices for injecting inhibitors or for sampling, etc. while under full operating pressure.

The Cosasco Access Fitting Body is available in several standard mounting configurations, including Flarweld, Buttweld, Socketweld, NPT, and Flanged. Access Fitting bodies are available in a wide variety of materials. Typically, the Access Fitting body material will be chosen to be compatible with the pipe or vessel material. The Access Fitting consists of the body, a hollow or solid plug assembly, and a pressure retaining or protective cover.

Flarweld **Buttweldolet** **Socketweld** **NPT** **Flanged**

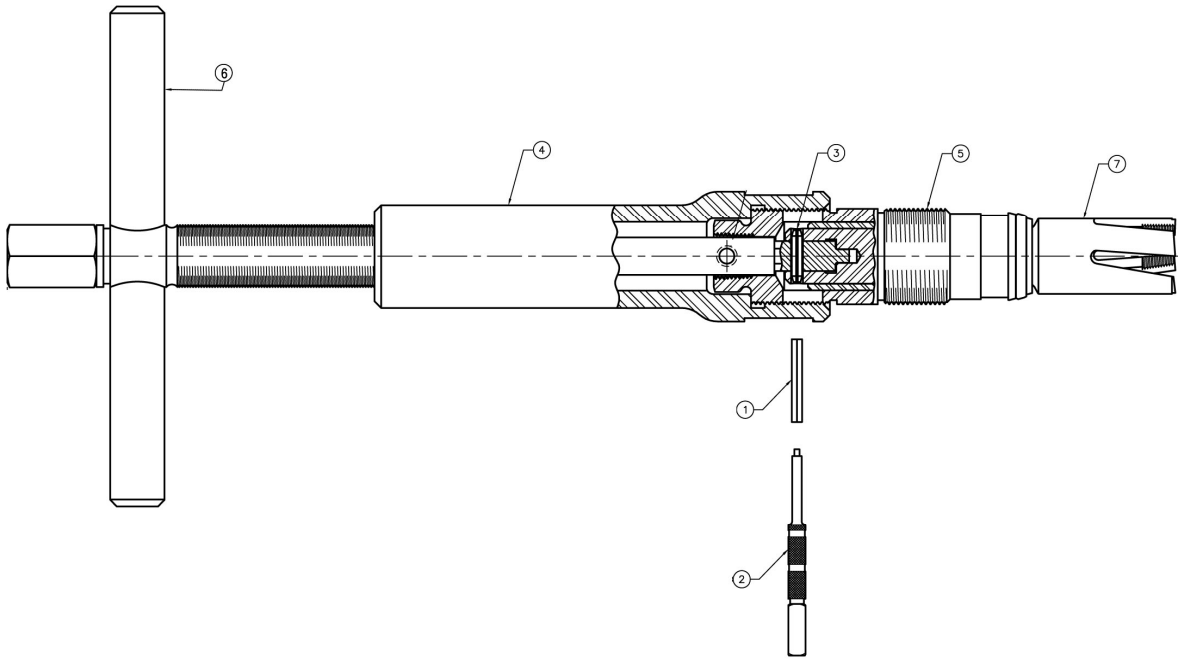


5.2 *The Hot Tap Kit*

The hot tap cutter will trepan (or mill) a hole that will allow free passage into the line for any Cosasco Two Inch System compatible tools and probes. The trepanning cutter is designed to retain the slug cut from the pipe wall to minimise swarf and chippings being dropped into the line. Two different tooth designs (6 tooth and 4 tooth) are provided to facilitate the hot tapping of both thin and heavy wall thickness. The square end mill is provided for preparation of the pipe wall prior to trepanning and for removal of weld impingement and finishing of pre-cut holes.

The Cosasco System hot tap will operate in any position and cut any grade of pipe or vessel wall. Operating range is 1 to 3600 psi (248 bar) at temperatures from -40 to +300°F (-40 to +148°C). The cutter can be driven manually with a ratchet type wrench or with an air driven motor. The cutter feed is regulated manually with a feed screw and handle assembly to provide accurate and variable cutter feed. The maximum pipe wall thickness which can be successfully hot tapped is 1.50”.

Item Number	Description
1	Large Spring Pin
2	Drift Pin
3	Small Spring Pin
4	Hot Tap Body
5	Hot Tap Plug
6	Translation Handle (Field Screw)
7	Cutter



5.3 Servicing & Pressure Testing of Hot-Tap Kit Equipment

IMPORTANT!	Hot-Tap Kit, Retriever and Service Valve must be pressure tested prior to use to ensure safe operation of tools!

All Hot Tap Kit, Retrieval Tools and Service Valves must be pressure tested prior to use. The Field Technician using the equipment must possess current pressure test certificates for the Hot Tap, Retrieval and Service Valve equipment prior to commencing on-line retrievals operations.

6 PRE JOB PREPARATION

The following three sections discuss the major steps required, prior to starting any use of the Cosasco System Hot Tap Tool online. The lists in the following sections are prompts and are not intended to replace client Risk Assessments or Job Safety Analysis which will also have to be completed prior to work start.

6.1 *Site Survey*

It is necessary to perform a Job Step Analyses at each work location prior to work start to ensure the following variable information is known:

- Scaffolding or any additional access requirements to ensure safe access and egress to work site
- Any potential hazards around the worksites such as slip, trip or fall hazards
- Emergency access & egress routes
- The pipe line media or purging media used which the equipment and operators will be exposed to
- Means of raising alarm in emergency situations
- Pressures and temperatures of the lines to be operated on.

6.2 *Documentation & Communication*

Prior to work start the following documentation must be generated and reviewed:

- Permit to Work, as specified by the client
- Client specific Risk Assessment or Job Step Analyses, with Cosasco personnel input
- Critical Step Checklist
- SAFR Location Sheet
- Personnel competency certificates

A toolbox talk will be performed by the Cosasco lead Engineer, including but not limited to the following:

- The main steps involved in the job
- Equipment to be used
- Review of work permit and risk assessment
- PPE required
- Means of communication with Control Room personnel
- Actions to be taken in the event of an emergency
- Control room is aware of work party location
- All personnel involved with the work are aware of all control measures and are competent to be involved in the work
- Work party are aware of any other work taking place in close proximity to worksite

- Any additional hazards identified during this talk should be reviewed and control measures implemented

6.3 *On-site equipment and Worksite Checks*

Upon completion of the steps in section 6.1 and 6.2 final checks should be made at the worksite prior to work start including equipment checks and worksite checks as follows:

Worksite

- Ensure any scaffolding to be worked on is certified
- Check previously identified escape routes are still clear
- Test means of communication with control room
- Double check PPE is in good condition and fit for purpose
- Identify any other work parties in proximity work location

Tools & Equipment

- Inspect the hot tap equipment and hand tools to be used are in good condition and are fit for purpose and are onsite.

WARNING 	If a situation arises during the execution of this Work Instruction, which requires a deviation, then an approved Job Step Analysis will be required before continuing with the operations at the monitoring location concerned. The JSA must be approved by Cosasco and by the Operator of the site before proceeding with the deviation. Site specific work permit policies should be followed to ensure site management are fully aware of the deviation to the standard procedures. No further steps may be taken at the monitoring location concerned until this is completed. Work may proceed as per the work scope at the next applicable monitoring location whilst the JSA is reviewed and issued for approval.

7 HOT TAPPING OF THE 2" SYSTEM ACCESS FITTINGS ONLINE

7.1 *Pre-Cutting/Milling Preparation*

1. Determine required hot tap cutter travel.

   Minimum cutter travel = (A + PW – 5) inches

   Where:

   A = Access fitting body height **PW** = Pipe wall thickness

2. In order to verify the position of the cutter tip through the hot tap the following distance should be measured. The distance **D** from the shoulder of the hot tap body to the top of the drive nut at touchdown of the centre of the cutter teeth on the pipe-wall prior to the tapping.

   Note: The heat produced in welding the access fitting can generate distortion of the internal threads. The full penetration root pass can leave a weld deposit on the inner periphery of the base of the access fitting body. These conditions can create difficulties for subsequent hot tapping and/or probe and coupon insertion.

3. Visually inspect the internal and external threads on the access fitting body. The external acme threads should be cleaned and any damage repaired with a file. The thread chaser should be used to clean up the internal threads and to correct possible warpage (see section 5 Special tools and Procedures).

7.2 *Milling (Reaming)*

1. Attach the square end mill to the hot tap assembly and liberally smear the mill with cutting compound. Thread the hot tap hollow plug into the access fitting body with the square end mill in the fully retracted position. Tighten the hot tap plug to a tight fit. Slowly advance the hot tap translation handle while rotating the drive shaft in a clockwise direction using a ratchet drive until touch-down of the end mill on the pipe wall. **Note:** This procedure should be used for all metals except cast iron, which should be cut dry.
2. Measure the length **D** as in **7.1.2** above. The outer diameter of the end mill exactly fits the bore of the access fitting body, thus the initial cutting action serves to align the body bore if distorted. Subsequent cutting action at the base of the body bore will remove the weld impingement and will flatten the curvature of the pipe wall to give the hot tap cutter an improved bite. **Note:** The depth of cut of the square end mill is limited to ⅛ inch due to the increasing drag caused by the non-cutting portions.
3. Once the square end mill has reached its maximum cutting depth retract it fully or until the translation handle stops in a counter clockwise motion. Remove the hot tap assembly with the square end mill from the access fitting body. The chip removing magnet assembly, the magnetic swab assembly and the thread chaser assembly should be used to clean the swarf

and chippings from the internal threads of the fitting (see section 8 Special tools and Procedures).

7.3 *Cutting*

Select a cutter. There are two types of trepanning cutter for use where retention of the slug is essential:

- 6 tooth cutter for small diameter or thin wall (12 mm or less) pipes.
- 4 tooth cutter for greater wall thickness pipes.

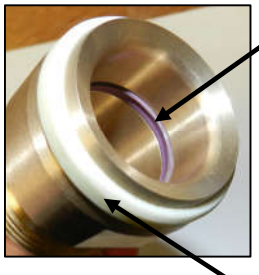
IMPORTANT!	Photographs of all the cutters used at each location should be taken before and after completion of each cut. A record of these photographs should be kept for future reference.

Note: For pipe wall thicknesses of ¼" or less, it is not always possible to retain the slug, even using a 6 tooth cutter. The best technique to attempt this is to only remove a minimal amount of pipe wall with the square end mill prior to cutting. This will provide the maximum amount of material for the cutter to 'bite' into and potentially retain the slug.

Cutting is either done by hand ratchet or using an air driven motor. A 1 inch socket fits the top of the drive nut. Cutting speed will be approximately 0.025 inches per minute (½ turn of the translation handle per minute). As the cutter blade progresses into the pipe wall, the swarf produced may slow the cutting speed. As a result of this, a certain amount of "re-cutting" may be necessary, i.e. backing off the translation handle ¼ turn anti-clockwise and then re-cutting.

1. Check the hot tap primary packing and replace it if it is deformed or has swarf embedded in it. Then check the hot tap poly pack seal (inside the H/T gland) prior to installing the cutter and replace if damaged or shows signs of excessive wear. Inspect the hot tap for proper assembly and that the cutter teeth are in good condition.

Hot Tap Gland (P/N 126436)



2. Attach the cutter to the hot tap assembly and liberally smear it with cutting compound. Thread the hot tap hollow plug into the access fitting again. Ensure the cutter is fully retracted and does not become jammed into the pipe. It is good practice to begin turning the drive shaft nut by hand 3 to 4 threads before the packing seats. If the cutter meets no obstruction, the hot tap plug should be tightened into the access fitting with an appropriate spanner. **Note:** This procedure should be used for all metals except cast iron, which should be cut dry.

3. When cutting by hand the drive nut is turned clockwise using a ratchet spanner until the cutter touches down on the pipe wall and begins cutting. The cutter should be fed slowly at first by turning the translation handle clockwise. After cutting a short distance, (2 - 2½ turns of the translation handle) back off the cutter and retighten the hot tap plug in the access fitting. Cutting should be continued at a sufficiently slow and even rate to produce a smooth cut.

4. When cutting using an air driven motor the drive nut should be rotated clockwise with the air motor and the translation handle slowly rotated clockwise until touchdown on the pipe wall. As cutting commences a slightly faster rotation of the feed screw handle should be applied until a smooth cutting action is achieved. The actual feed rate will vary with motor speed (a 60 rpm motor is recommended), motor power and the pipe material. Too slow a feed will cause excessive wear on the cutter teeth while too fast a feed will tend to cause the teeth to dig in to the pipe wall, stalling the motor and teeth pulling it out of the operator's hands.

Note: When cutting thick-walled pipe (¾ inch or greater), the build up of swarf and chippings produced during cutting is likely to prevent the cutter from advancing freely. After cutting approximately half way through the pipe wall (calculated from the reduction in length **D** as measured in **7.3** above), the translation handle should be backed off while continuing to turn the drive nut clockwise.

5. After cutting a maximum of 10mm, the cut should be cleared of swarf.
6. Loosen the setscrews on the hot tap body 3 to 4 turns and using an adjustable wrench or 1⅛" open-ended spanner to apply positive clockwise pressure on the hot tap plug, loosen the hot tap body until the holes in the body line up with the spring pin.
7. Turn the drive nut and translation handle together until the spring pin is centred in the holes. **Partially** drive out the short spring pin using the drift pin and brass hammer. Leave a portion of one end of the spring pin to rest on one side of the gland, hot tap plug and cutter. This will release the drive shaft and prevent the cutter from dropping into the pipe or vessel.
8. Remove the hot tap body and drive shaft from the hot tap plug and cutter and drive in the long spring pin (1½" long) in the vacated hole on the opposite side from the remaining portion of the short spring pin. This will remove the remainder of the short spring pin and retain the cutter during retrieval.
9. The hot tap plug assembly should then be retrieved with the retriever and service valve as per the online work instruction for the equipment which is onsite. This would be one of the following:

- **741038** – COSASCO® RBS/RBSA RETRIEVER AND DOUBLE ISOLATION SERVICE VALVE
- **741027** – COSASCO® RBS/RBSA RETRIEVER AND SINGLE ISOLATION SERVICE VALVE
- **741039** – COSASCO® RSL RETRIEVER AND DOUBLE ISOLATION SERVICE VALVE
- **741036** – COSASCO® RSL RETRIEVER AND SINGLE ISOLATION SERVICE VALVE

10. As per the procedures in the online retrieval work instructions, any metal swarf/chippings remaining in the internals of the access fitting should be removed with the chip removing magnet assembly and the threads cleaned with the magnetic swab. See section 5 special tools and retrievers.
11. After the internals of the access fitting have been cleaned of metal swarf/chippings reinstall the hot tap plug and cutter using the reverse of steps 9 to 5.

Note: Check the hot tap plug primary packing and replace it if it is deformed or has swarf embedded in it.

12. Restart cutting from steps 1 to 11. When the cutter is close to breaking through the pipe wall, stop cutting and retighten the hot tap plug with a suitable spanner.
13. On breaking through the pipe wall the translation handle should begin to turn freely. Continue feeding the cutter into the pipe another ¼" to clean the hole of any residual weld root or swarf build up.
14. Repeat steps 9 and 10.
15. As per the online retrievals work instruction the Cosasco® 2" system device can now be installed in the access fitting.

8 SPECIAL TOOLS & PROCEDURES

There are a number of ancillary tools and which can aid with the hot tapping of an access fitting and may be essential in some circumstances as mentioned during earlier stages of this procedure.

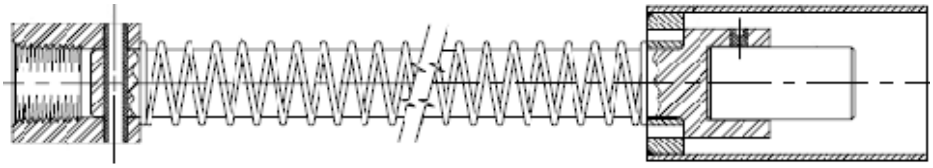
Below are a commonly used ancillary tools and the procedure for their safe and effective use:

8.1 *Thread Chaser Assembly*

1. Engage the thread chaser to the access fitting until the 1st thread chaser contacts the first access fitting internal thread.
2. Slowly turn the thread chaser until it is engaged with the first internal thread of the access fitting then continue turning clockwise for a further 14 turns. It may be necessary to work the chaser clockwise and anti-clockwise at times depending on how much debris is encountered during insertion. Keep chasing until chaser runs smoothly over the fitting threads.
3. Rotate the thread chaser anti-clockwise approx. 14 turns to unscrew it from the access fitting.
4. Repeat this process until the internal threads of the access fitting are clear.

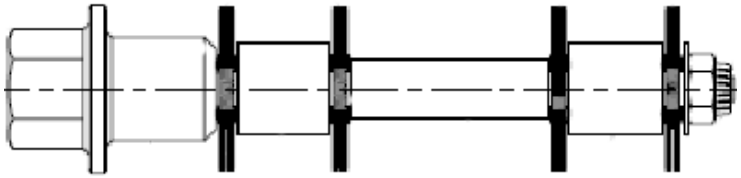
8.2 *Chip Removing Magnetic Assembly*

1. Push the thread protecting end of the tool down into the access fitting.
2. Once installed push the top end down several times to catch as much of the metal swarf from the internal base of the access fitting.

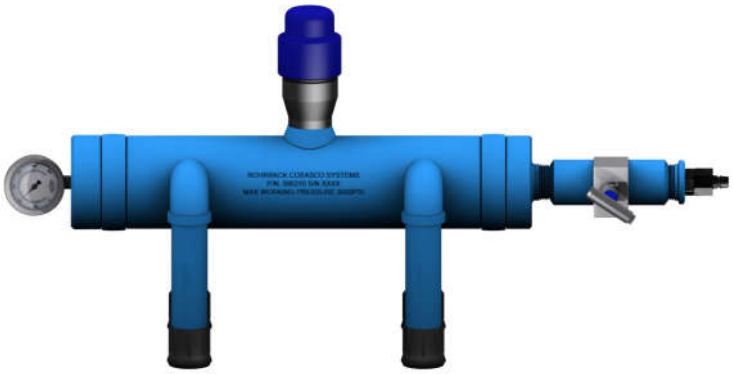


8.3 *Magnetic Swab Assembly*

1. Push the tip of the swab assembly down into the fitting and up in a brushing motion to push as much of the swarf out of the internal access fitting threads and onto the magnetic shaft.



8.4 *Pressure Testing Procedure*



Cosasco Pressure Test Rig

IMPORTANT!	Hot-Tap Kit, Retriever and Service Valve must be pressure tested prior to use to ensure safe operation of tools!

All Hot-Tap Kit Equipment must be pressure tested prior to use. The Field Technician using the equipment must possess current pressure test certificates for the Hot-Tap Kit equipment prior to commencing hot-tapping operations.

1. The Hot-Tap plug, with a cutter installed, should be installed in to the fitting on the pressure test rig.
2. The back pressure pump should be filled with hydraulic oil and a connecting hose (of a suitable pressure rating) used to connect the pump outlet to the quick coupler inlet fitted to the test rig.
3. With the pump on "Pressure Hold" and at its low-pressure setting hand pump the oil into the pressure test rig.
4. Leave pressurized for 15 minutes during each stage and observe that there is no pressure drop on the pressure test rig gauge.

Note - There may be some drop in pressure during the 15 minute test period due to the compression of air still in the system and also due to oil being drawn back into the hand pump. If any pressure loss is due to leakage, this will be visible and immediately apparent.

5. Pressure test the equipment, in stages, to the following pressures:

- 5% of pressure rating of equipment.
- 10% of pressure rating of equipment.
- 20% of pressure rating of equipment.
- 50% of pressure rating of equipment.
- 100% of pressure rating of equipment.
- 150% of pressure rating of equipment.

6. After completing all six tests in step 5, release pressure in the hydraulic pump Check the pressure gauges on the test rig are at zero.
7. The Hot-Tap plug can now be removed from the test rig.
8. Complete a pressure test certificate for the hot-tap equipment.
9. A scanned copy of the original should also be filed accordingly.

9 HOT TAP KIT MAINTENANCE

The 2 inch Hot Tap requires little care and maintenance except that which is required by any precision tool.

The threaded areas should be inspected during assembly for nicks and kept lubricated. Minor thread repair should be done with thread files. Emery paper can be used to smooth the tops of the threads if they become sharp. The Hot Tap gland should be kept clean and lubricated.

Dropping or rough handling of the gland may cause it to become out of shape. If so, placing the gland on the cutter shank and tapping it with a brass hammer can bring it back into round. If this is not possible then the gland requires replacement.

Cosasco • sales@cosasco.com • www.cosasco.com