

CONING AND THREADING TOOL OPERATION TUBING CONNECTION PROCEDURES



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KMT WATERJET SYSTEMS 2008



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CONING AND THREADING TOOL OPERATION

TUBING CONNECTION PROCEDURES

1. Overview

Safe and proper operation is dependent on correctly prepared and installed connections. High pressure tubing and fittings must be appropriately rated and sized. Tubing lengths must be coned and threaded prior to installation.



Failure to use properly rated components may result in component failure causing equipment damage, personal injury or death.

2. Measurements and Dimensions

Tubing must be cut to the proper length, both ends of the tubing must then be coned, threaded and deburred.

To determine the tube length, measure the distance between the fittings, and add two times the engagement allowance shown in Table 1. The required cone and thread dimensions illustrated in Figure 1 are provided in Tables 2 and 3.

Table 1
Engagement Allowance (EA)

Tube Size	Engagement Allowance	Tube Length
1/4" MP	0.55" (14.0 mm)	
3/8" MP	0.69" (17.5 mm)	
9/16" MP	0.84" (21.3 mm)	
3/4" MP	1.01" (25.7 mm)	
1" MP	1.47" (37.3 mm)	
1/4" HP	0.49" (12.4 mm)	
3/8" HP	0.68" (17.3 mm)	
9/16" HP	0.86" (21.8 mm)	
1" HP	1.60" (40.6 mm)	

Figure 1: Cone and Thread Dimensions

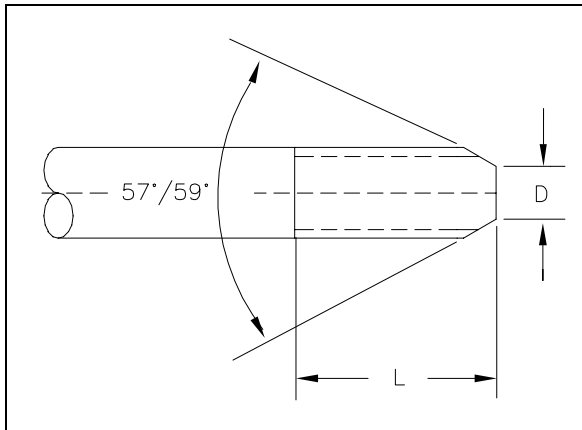


Table 2
Cone and Thread Dimensions
Medium Pressure Connections

Tube OD	Tube ID	D (Maximum)	L (Maximum)	Thread UNF-LH
1/4" (6.35 mm)	0.109" (2.77 mm)	0.140" (3.6 mm)	0.34" (8.6 mm)	1/4" - 28
3/8" (9.52 mm)	0.203" (5.16 mm)	0.250" (6.4 mm)	0.44" (11.2 mm)	3/8" - 24
9/16" (14.29 mm)	0.312" (7.92 mm)	0.406" (10.3 mm)	0.50" (12.7 mm)	9/16" - 18
3/4" (19.05 mm)	0.438" (11.13 mm)	0.562" (14.3 mm)	0.62" (15.7 mm)	3/4" - 16
1" (25.40 mm)	0.562" (14.27 mm)	0.718" (18.2 mm)	0.78" (19.8 mm)	1" - 14

Table 3
Cone and Thread Dimensions
High Pressure Connections

Tube OD	Tube ID	D (Maximum)	L (Maximum)	Thread UNF-LH
1/4" (6.35 mm)	0.083" (2.11 mm)	0.125" (3.2 mm)	0.56" (14.2 mm)	1/4" - 28
3/8" (9.52 mm)	0.125" (3.18 mm)	0.219" (5.6 mm)	0.75" (19.1 mm)	3/8" - 24
9/16" (14.29 mm)	0.188" (4.78 mm)	0.281" (7.1 mm)	0.94" (23.9 mm)	9/16" - 18

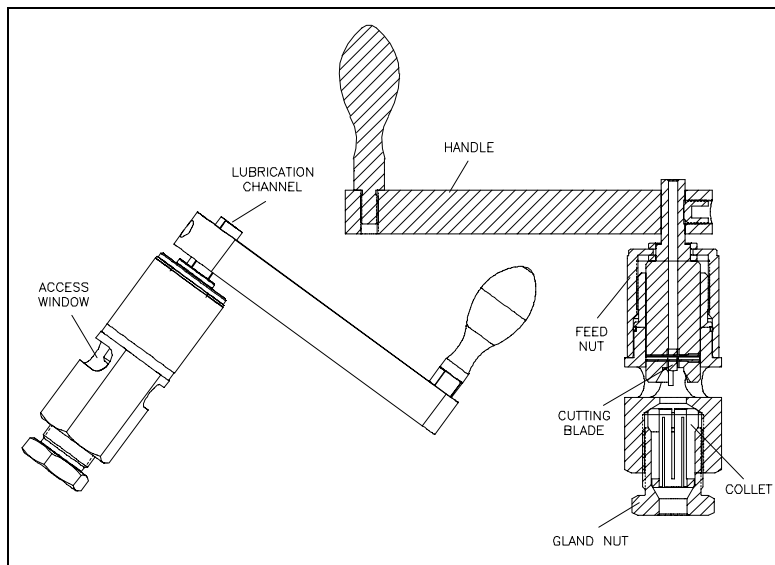
3. Tube Coning

Operating instructions for both hand and power coning tools are provided in this section. Concentricity between the tube and cutting blade on the hand coning tool is maintained by the collet. The power tool easily adapts to any power hand drill to quickly prepare multiple tube ends.

Hand Coning

1. Place the body of the coning tool in a vise allowing adequate clearance for the rotation of the handle. Position the tool so the handle is elevated slightly to allow the lubricant to flow to the cutting blade.

Figure 2: Hand Coning Tool



2. Turn the feed nut counter-clockwise to retract the cutting blade past the access window.
3. Loosen the gland nut and insert the tubing through the collet. The end of the tubing should be even with the access window, but should not contact the cutting blade. Loosely tighten the gland nut to slightly grip the tubing.
4. Turn the feed nut counter-clockwise 1/4 turn to retract the cutting blade away from the tubing, and tighten the gland nut with a wrench.
5. Apply a liberal amount of lubricant to the exposed end of the tubing, the cutting blade and through the lubrication channel at the handle.

Apply lubricant frequently and liberally throughout the cutting operation. Medium weight cutting oil with high sulfur content is recommended.

6. Turn the feed nut clockwise until the cutting blade contacts the end of the tubing, and then back the nut off 1/4 turn.
7. In a smooth, continuous motion, turn the handle in a clockwise direction. Simultaneously turn the feed nut in a clockwise direction to establish a constant feed. Do not remove too much material at once; the cutting blade should make light, uninterrupted cuts.

NOTE

Before interrupting the cut, back the cutting blade away from the tubing. Use compressed air or a small brush to remove the accumulation of chips from the blade and the tubing throughout the coning operation.

8. Continue the operation until the blade begins to cut the land area at the base of the cone. Turn the handle several more rotations to face-off the end of the cone.
9. Retract the cutting blade, loosen the gland nut and remove the tubing. Inspect the cone for surface finish and completeness.

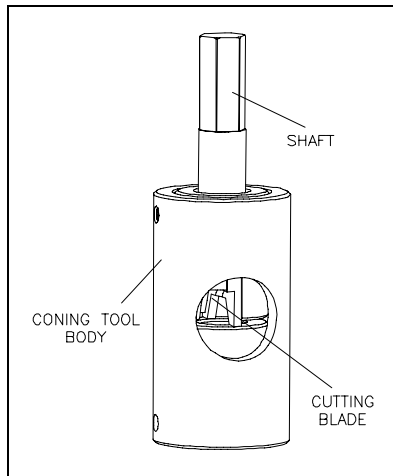
NOTE

Clean the machining chips from the blade and from the collet before coning the next tube.

Power Coning

1. Secure the tubing in a tube vise. No more than the recommended length of tubing should extend beyond the face of the vice. See Table 4, Recommended Extension Length.

Figure 3: Power Coning Tool



2. Mount the coning tool in a 3/8-inch or 1/2-inch, variable speed power drill. Lubricate the end of the tube and slide the coning tool on the tubing.
3. Apply steady pressure against the end of the tubing while the cone is being cut. The tool can be removed for inspection any time during the coning operation.

Apply lubricant frequently and liberally throughout the cutting operation. Medium weight cutting oil with high sulfur content is recommended.

- The tool will stop cutting when the tube angle and facing is complete.

NOTE

Clean the machining chips from the blade and body of the tool before coning the next tube.

Table 4
Recommended Extension Length

1/4" Tubing	1.25-1.50" (31.8-38.1 mm)
3/8" Tubing	1.25-1.50" (31.8-38.1 mm)
9/16" Tubing	1.75-2.00" (44.5-50.8 mm)
3/4" Tubing	3.00-3.50" (76.2-88.9 mm)
1" Tubing	3.00-3.50" (76.2-88.9 mm)

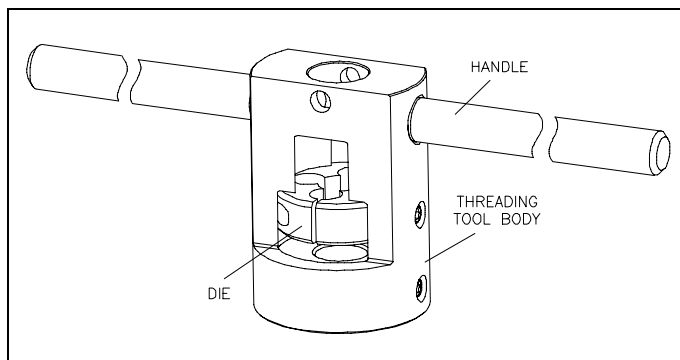
4. Tube Threading

Tubing must be coned with either a lathe or coning tool prior to threading. Operating instructions for both hand and power threading tools are provided in this section.

Hand Threading

- Secure the coned tubing in a tube vise. No more than the recommended length of tubing should extend beyond the face of the vice. See Table 4, Recommended Extension Length.

Figure 4: Hand Threading Tool



- Apply lubricant to the end of the tube and slide the threading tool on the tubing.

3. Grip the handles of the tool firmly, apply steady pressure and turn the tool counter-clockwise. Approximately every half turn, reverse direction to break off and remove the chips.

Apply lubricant frequently and liberally throughout the cutting operation. Medium weight cutting oil with high sulfur content is recommended.

4. Continue threading until the proper thread length is reached. See Table 2 or 3, Column L. Remove the tool from the end of the tubing.

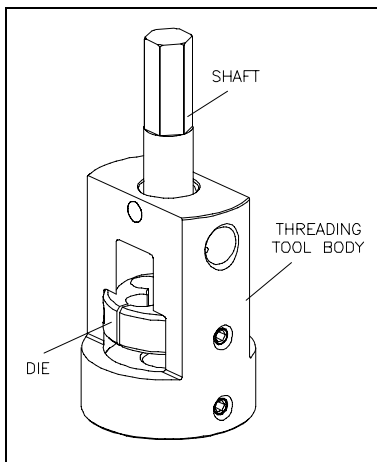
NOTE

Clean the machining chips from the die and body of the tool before threading the next tube.

Power Threading

1. Secure the coned tubing in a tube vise. No more than the recommended length of tubing should extend beyond the face of the vice. See Table 4, Recommended Extension Length.

Figure 5: Power Threading Tool



2. Mount the threading tool in a 3/8-inch or 1/2-inch, variable speed power drill. Apply lubricant to the end of the tube and slide the threading tool on the tubing.
3. Make sure the drill is set to turn counter-clockwise. Apply steady pressure against the end of the tubing while the threads are being cut.

Apply lubricant frequently and liberally throughout the cutting operation. Medium weight cutting oil with high sulfur content is recommended.

4. Continue threading until the proper thread length is reached. See Table 2 or 3, Column L. Reverse the direction of the drill and remove the threading tool.

NOTE

Clean the machining chips from the die and body of the tool before threading the next tube.

5. Medium and High Pressure Connections

When installing discharge piping it is essential that all burrs be carefully removed and the tubing sections purged with clean compressed air prior to assembly. Lightly spraying the inside of the tube with a carrier fluid, such as WD-40, before purging with air will help carry the burrs.

Piping must be installed without torsional or bending stresses and proper supports and guides must be provided. Torsional stress will cause premature component failure.

Pure Goop anti-seize compound must be applied to the threads and contact surfaces of all stainless steel components prior to assembly. Failure to lubricate components with Pure Goop will result in galling, rendering the components useless.

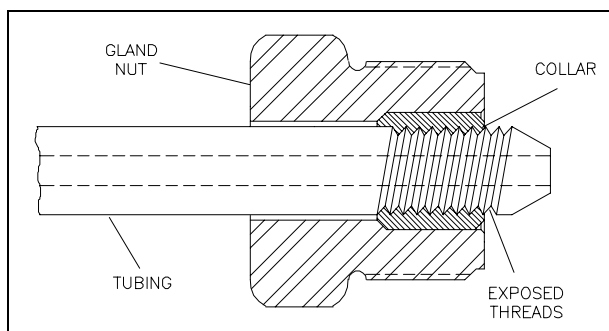


Do not use any other anti-seize compound. Apply Pure Goop **only to stainless steel** components.

Standard Connections

Standard connections are used for general applications where internal pressure is the only load on the tubing.

Figure 6: Standard High Pressure Connections



1. Deburr the tubing ID and thoroughly clean the tubing threads.
2. Slip the gland nut onto the tubing.

3. Apply Pure Goop to the threads on the tubing. Screw the collar onto the threaded end of the tubing leaving 1-1/2 to 2-1/2 threads exposed on the tubing between the collar and the coned tubing.
4. Apply Pure Goop to the male threads on the gland nut and insert the tubing into the connection. Engage the gland nut and tighten finger tight.
5. Tighten the gland nut to the torque specifications in Table 5.



Proper piping supports and guides must be provided. End connections will not support the tubing load alone.

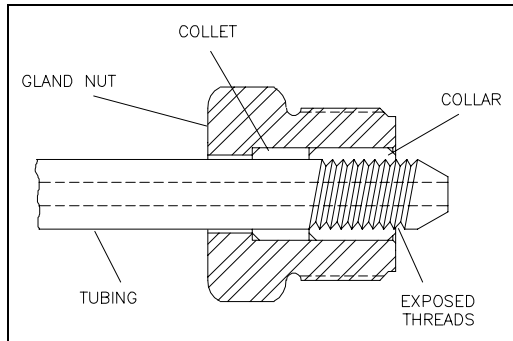
Table 5
Torque Specifications

	Medium Pressure	High Pressure
1/4" Tubing	20 ft-lb (27 Nm)	25 ft-lb (34 Nm)
3/8" Tubing	30 ft-lb (41 Nm)	50 ft-lb (68 Nm)
9/16" Tubing	55 ft-lb (75 Nm)	110 ft-lb (149 Nm)
7/8" Tubing	90 ft-lb (122 Nm)	
1" Tubing	125 ft-lb (170 Nm)	150 ft-lb (203 Nm)

Anti-Vibration Connections

The bending stresses resulting from excessive vibration or shock on the threaded area of the tubing can cause premature failure at the back of the thread. When tubing will be subjected to vibration, rotation and movement, anti-vibration connections must be used. The anti-vibration collet gland transfers the stress to the unthreaded section of the tubing, and the gripping action of the collet strengthens the entire assembly.

Figure 7: Anti-Vibration Connections



1. Deburr the tubing ID and thoroughly clean the tubing threads.
2. Slip the gland nut and the collet onto the tubing.
3. Apply Pure Goop to the threads on the tubing. Screw the collar onto the threaded end of the tubing leaving 1-1/2 to 2-1/2 threads exposed on the tubing between the collar and the coned tubing.
4. Apply Pure Goop to the male threads on the gland nut and insert the tubing into the connection. Engage the gland nut and tighten finger tight.
5. Tighten the gland nut to the torque specifications in Table 5.

When a flexible whip is used to allow cutting nozzle movement, anti-vibration fittings and proper supports and guides must be provided to prevent failures from non-water related stresses. The whip will only flex in a single plane without being subjected to torsional stress. The use of high pressure swivels is strongly recommended.



6. Parts List

To facilitate the ordering of replacement parts, item numbers in the following tables correspond to the identifying numbers in the accompanying figures.

Use the following information to contact the Customer Service Department at KMT Waterjet Systems.

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wj.service@kmtgroup.com

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Spare Parts Manager
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Wasserstrahl Schneidetechnik
Auf der Laukert 11
D-61231 Bad Nauheim
Germany

Phone +49-6032-997-119
Fax +49-6032-997-271
Email order.spares@kmt-waterjet.com

Table 6
Hand Coning Tools

Item	Part Number	Description
Medium Pressure (20,000 psi)		
1	20444558	Hand Coning Tool Assembly, .25
	20444576	Hand Coning Tool Assembly, .38
	20444583	Hand Coning Tool Assembly, .56
	20444591	Hand Coning Tool Assembly, .75
	20444599	Hand Coning Tool Assembly, 1.0
2	20455206	Coning Blade, .25
	20455209	Coning Blade, .38
	20455212	Coning Blade, .56
	20455215	Coning Blade, .75
	20461494	Coning Blade, 1.0
High Pressure (30,000 psi)		
1	20444625	Hand Coning Tool Assembly, 1.0
2	20461500	Coning Blade, 1.0
High Pressure (60,000 psi)		
1	05108832	Hand Coning Tool Assembly, .25
	05108857	Hand Coning Tool Assembly, .38
	05108840	Hand Coning Tool Assembly, .56
	49832850	Hand Coning Tool Assembly, .75
2	05108808	Coning Blade, .25
	05108824	Coning Blade, .38
	05108816	Coning Blade, .56
	49838337	Coning Blade, .75

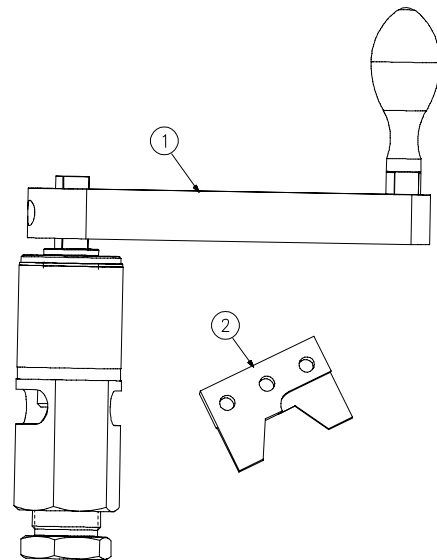


Table 7
Power Coning Tools

Item	Part Number	Description
Medium Pressure (20,000 psi)		
1	20444667	Power Coning Tool Assembly, .25
	20444674	Power Coning Tool Assembly, .38
	20444682	Power Coning Tool Assembly, .56
	20444690	Power Coning Tool Assembly, .75
	20444708	Power Coning Tool Assembly, 1.0
2	20455206	Coning Blade, .25
	20455209	Coning Blade, .38
	20455212	Coning Blade, .56
	20455215	Coning Blade, .75
	20461494	Coning Blade, 1.0
High Pressure (30,000 psi)		
1	20444724	Power Coning Tool Assembly, 1.0
2	20461500	Coning Blade, 1.0
High Pressure (60,000 psi)		
1	05109897	Power Coning Tool Assembly, .25
	05109889	Power Coning Tool Assembly, .38
	05109871	Power Coning Tool Assembly, .56
	49832892	Power Coning Tool Assembly, .75
2	05108808	Coning Blade, .25
	05108824	Coning Blade, .38
	05108816	Coning Blade, .56
	49838337	Coning Blade, .75

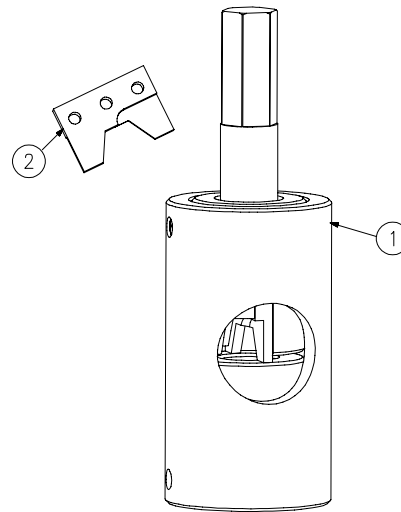


Table 8
Hand Threading Tools

Item	Part Number	Description
Medium Pressure (20,000 psi)		
1	05108865	Hand Threading Tool Assembly, .25
	05108873	Hand Threading Tool Assembly, .38
	05108881	Hand Threading Tool Assembly, .56
	20444633	Hand Threading Tool Assembly, .75
	20444641	Hand Threading Tool Assembly, 1.0
2	05108899	Thread Die, .25
	05108915	Thread Die, .38
	10078301	Thread Die, .56
	20461488	Thread Die, .75
	20461491	Thread Die, 1.0
High Pressure (30,000 psi)		
1	20444641	Hand Threading Tool Assembly, 1.0
2	20461491	Thread Die, 1.0
High Pressure (60,000 psi)		
1	05108865	Hand Threading Tool Assembly, .25
	05108873	Hand Threading Tool Assembly, .38
	05108881	Hand Threading Tool Assembly, .56
	49832868	Hand Threading Tool Assembly, .75
2	05108899	Thread Die, .25
	05108915	Thread Die, .38
	10078301	Thread Die, .56
	49838311	Thread Die, .75

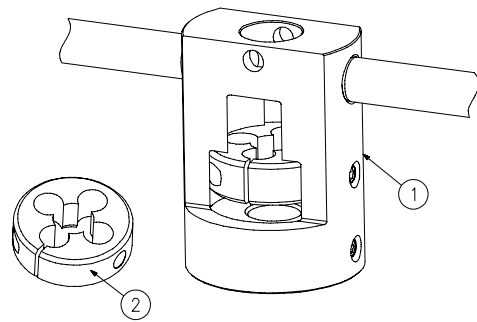


Table 9
Power Threading Tools

Item	Part Number	Description
Medium Pressure (20,000 psi)		
1	05122742	Power Threading Tool Assembly, .25
	05120258	Power Threading Tool Assembly, .38
	05122759	Power Threading Tool Assembly, .56
	49832843	Power Threading Tool Assembly, .75
	20444649	Power Threading Tool Assembly, 1.0
2	05108899	Thread Die, .25
	05108915	Thread Die, .38
	10078301	Thread Die, .56
	20461488	Thread Die, .75
	20461491	Thread Die, 1.0
High Pressure (30,000 psi)		
1	20444649	Power Threading Tool Assembly, 1.0
2	20461491	Thread Die, 1.0
High Pressure (60,000 psi)		
1	05122742	Power Threading Tool Assembly, .25
	05120258	Power Threading Tool Assembly, .38
	05122759	Power Threading Tool Assembly, .56
	49832843	Power Threading Tool Assembly, .75
2	05108899	Thread Die, .25
	05108915	Thread Die, .38
	10078301	Thread Die, .56
	49838311	Thread Die, .75

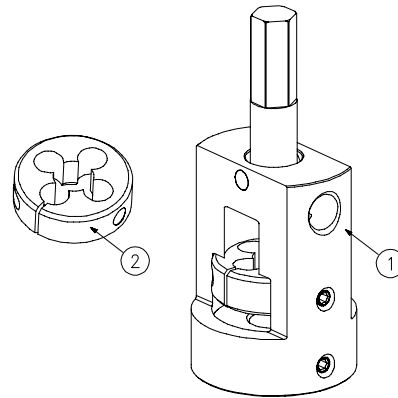




Table 10
Tube Vises and Benders

Part Number	Description
05108782	Tube Vise, .25
05108790	Tube Vise, .38
05108774	Tube Vise, .56
49832876	Tube Vise, .75
20440071	Tube Vise, 1.0
20455404	Tube Bender, .25 - .75 tube
20417734	Radius Block, .25, 1.25 bend radius
20417701	Radius Block, .38, 1.75 bend radius
20417708	Radius Block, .56, 2.62 bend radius
20417726	Tube Bending Kit, includes tube bender with .25, .38 and .56 radius blocks