

Tools, Installation, Operation, Maintenance

Low Pressure "Speedbite", Cone & Thread:
Manual and Machine, Quick Set (QSS) Tooling



Principle of Operation:

Safe, efficient operation of any product is inherently dependent upon its proper installation. In this section the preparation and assembly of low, medium and high pressure connections is explained. Also covered is the assembly procedure for medium and high pressure Cone & Thread Connections as well as anti-vibration collet gland assemblies.

Correct installation procedures are further promoted by providing dimensional information associated with a variety of Parker Autoclave Engineers tube connections as well as the torque required to properly seat numerous Parker Autoclave Engineers components. Several tools developed by Parker Autoclave Engineers are presented to help accomplish proper valve, fitting and tubing installation and maintenance. Video tutorials are available on our website (www.Autoclave.com) and a Setup & Operational DVD is sent with every Cone and Thread Machine.

When installing or maintaining any pressure component, common practice dictates the use of proper safety equipment at all times.

Inside you will find:

- Installation Instructions for Low Pressure "Speedbite" Single Ferrule Bite-Type Compression Fittings
- Part numbers and Installation Instructions for both Medium and High Pressure Manual Cone & Thread Kits and Accessories
- Assembly and Installation Instructions for Anti-Vibration Gland Assemblies
- Part numbers and Specification detail for Cone & Thread Machine (required for all tubing sizes above 9/16")
- Connection Torque Values (for both Standard and Special Materials)
- Connection and Packing Gland Nut Sizes, Torque Wrenches and Crows Foot Wrench Adapters
- Reamer Part Numbers for cleaning up Connection Sealing Surfaces
- Valve Packing, Running and Seating Torque Values
- Male and Female Connection reference drawings with dimensions with connection names
- Manual Make-up and Installation instructions for Quick Set System (QSS) - only 1/4" and 3/8" tube sizes
- Hydraulic Set Up Tool for Quick Set System (HST) - All Sizes
- Part Numbers and Specifications for the Hydraulic Tube Bender (HTB)
- Maintenance and Lubrication site locations for various Parker Autoclave Engineers valves with recommended Lubricants



ENGINEERING YOUR SUCCESS.

Installation: SpeedBite Connection

Speedbite: Single Ferrule Compression Sealing for Pressures to 15,000 psi (1034 bar)

Parker Autoclave Engineers Low Pressure "Speedbite" connections utilize a "bite-type" single ferrule compression fitting (Fig. 1) that when used with typical annealed instrument tubing (ASTM A269) that does not exceed a hardness of 90 HRB (available from Parker Autoclave) is capable of up to 15,000 psi (1034 bar) MAWP. This "bite" prevents the tubing from ejecting at these higher pressures. Designed to meet the standards of ASME B31.3 Chapter IX this connection picks up where standard single and dual ferrule compression fitting capabilities end. Available in sizes from 1/16" to 1/2" (Note: 1/2" size is restricted to 10,000 psi MAWP). Many different Exotic alloys are available (see product literature).

Installation Instructions:

Determine the length of tubing needed (see Fig. 2 on next page) by measuring the fitting to fitting, face- to-face dimension - adding the extra allowance from Table 1 for proper engagement.

Step 1. Cut tubing to length and deburr. To ensure a good joint, tube must be cut off square using a hacksaw or bandsaw (suggest at least 32 teeth per inch minimum) and sawing vice or guide. Deburr external edge with a flat file and the ID of the tube with either the Parker AE deburr tool (p/n 90257) or even the Cone & Thread Reamer tools shown on page 21.



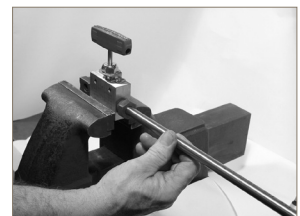
Step 2. Lubricate male threads. (Lubrication not necessary if tube nut has Bonded Dry-Film Lubricant.) Slip gland and sleeve onto tubing.

Note: Be sure to remove gland and sleeve from components and slide them onto the tubing before inserting the tubing into the components. **Make sure larger end of sleeve is toward gland.** Push tubing into valve or fitting until it bottoms out.

Note: A small amount of process tolerable inert grease on the nose of the compression sleeve will improve sealing process.



Step 3. Turn gland until "finger-tight", THEN, TIGHTEN GLAND UNTIL SLEEVE BEGINS TO GRIP TUBING by using wrench, turning until you feel increased resistance. This is what we call "Wrench-Tight". (this differs from standard compression fitting installation)



Step 4. From this "Wrench Tight" position, note starting position of wrench. Tighten gland approximately 1-1/4 turns for the SW and 1/16" & 1/8" W connections. When installing Male Adapter (preformed ferrule tip) fitting, - only 1/8 turn is necessary.



Installation: SpeedBite Connection

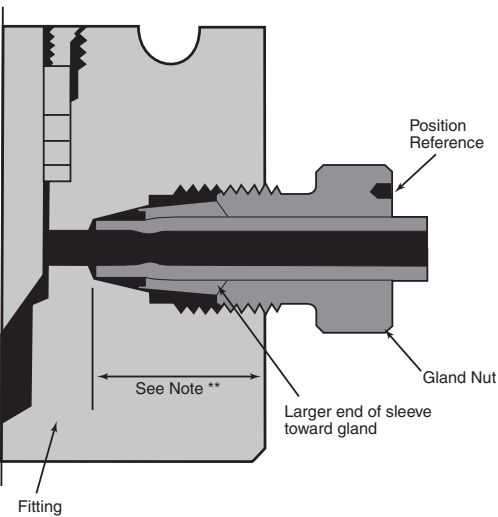
Complete Connection

The illustration below (Fig. 1) shows the condition of sleeve and tubing after completion of “sleeve seating.” The sleeve has cut into the tubing (bite-type) as it moved forward into the tapered seat, upsetting material ahead of it and establishing a shoulder on the tubing to provide positive mechanical support for the tubing end-load. A properly seated sleeve cannot be displaced back and forth along the tubing but may be rotated around the tubing.

Reassembly

To reassemble a connection, insert tubing with sleeve and gland into valve or fitting. Tighten gland “finger-tight”. Tighten gland with a wrench approximately 3/8 of a turn for a gas-tight seal. After frequent reassemblies, it may take less than 3/8 turn to effect a gas-tight seal, and as little as 1/8 of a turn may be sufficient.

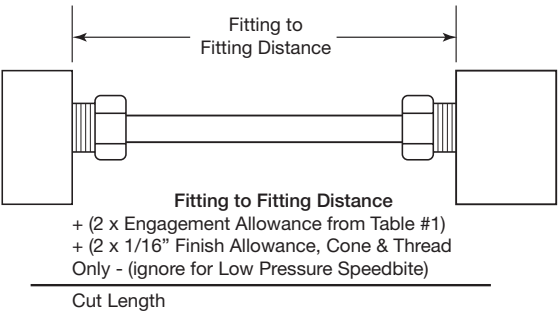
Figure 1



**Table 1: 10V2/SW Series Engagement Allowance	
Nominal Tube OD inches (mm)	Insertion Depth to Shoulder inches (mm)
1/16 (1.59)	0.47 (12)
1/8 (3.18)	0.47 (12)
1/4 (6.35)	0.69 (19)
3/8 (9.53)	0.69 (19)
1/2 (12.70)	0.81 (22)

Note:
* No special torque wrenches or mandrels required.
** Engagement/Insertion Depth; Add this additional length (per tube end) to distance between Fitting-Face & Fitting-Face (see Figure 2 below) Bite into tubing exaggerate for clarity

Figure 2
Determine Tube Length



Fully annealed tubing (hardness max of 90 HRB) with proper outside diameter tolerances is recommended for these connection components.

When installing or maintaining any pressure component, common practice dictates the use of proper safety equipment at all times.

Installation: Coning and Threading Kits



Parker Autoclave Engineers both Medium and High Pressure coning and threading tool kits. Each kit consists of the required tools and other items necessary for your coning and threading needs. All kit items are placed in a hand-carry tool case with top tray.

Medium Pressure Kit (p/n KMCT-MT)

MCT Coning Tool and:

- 1/4, 3/8 and 9/16" collets
- 1/4, 3/8 and both 9/16" (.312" and .359" ID) Coning Blades

402 Threading Die Holder Tool and:

- 1/4, 3/8 and 9/16" guide bushing
- 1/4, 3/8 and 9/16" dies

Options:

Please note: Each Kit includes Reservoir and Support Arm Assembly as shown on page 5.

Coning and Threading Kits

Parker Autoclave Engineers manufactures a manual coning and threading tool for optimum performance with tubing sizes up to 9/16" (14.3 mm) outside diameter. These precision quality manual tools permit on-site end preparation for Parker Autoclave Engineers medium and high pressure tubing installations.

Included with all kits:

Coning Tool Assembly:

- Three Collets
- Collet Nut Wrench
- Three sets of Coning Blades (1/4" to 9/16")
- 3/32" Coning Blade Allen Wrench (p/n 90256)
- Four spare Set Screws (p/n 90254)
- De-burring Tool (p/n 90257)
- One quart of Cutting Oil (p/n P-8784)
- Tool Box with tray

Threading Tool parts include:

- 1/8" Die Allen Wrench (p/n P-0285)
- Die Set Screws (p/n P-0281)
- Threading Tool with Handle
- Three Guide Bushings (1/4", 3/8", 9/16")
- Three Threading Dies (1/4", 3/8", 9/16")
- Laminated Instruction Sheet

High Pressure Kit (p/n KMCT-HT)

MCT Coning Tool and:

- 1/4, 3/8 and 9/16" collets
- 1/4, 3/8 and 9/16" blades
(9/16" blades for 60,000 psi tubing only)

402 Threading Die Holder Tool and:

- 1/4, 3/8 and 9/16" guide bushing
- 1/4, 3/8 and 9/16" dies

Options:

Please note: Each Kit includes Reservoir and Support Arm Assembly as shown on page 5.

Note:

Additional Coning Blades, Collets, and Threading Dies are available for other sizes of tubing. See manual coning and threading tooling chart, Table 1 on page 5 for sizes and part numbers.

Installation: Manual Coning and Threading Tools

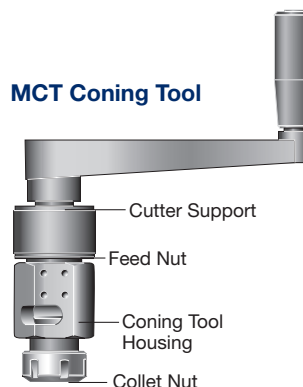
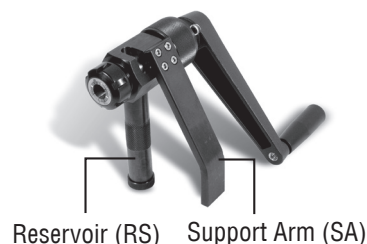
Interchangeable collets for each size tubing provides proper centering of tubing. The cutting feed arrangement permits the operator to control the length of the cut. Interchangeable tool steel cutting blades are used in pairs to assure more accurate and faster coning. They are designed to square-off and finish the tube end as the cone is completed. There is a provision for applying metal cutting lubricants to the cutting zone.

For coning tool with optional support arm (For holding in vise) and chip/oil catch reservoir, add **RS** to suffix of model number. Example: MCTM4-**RS**

For threading operations the threading die holder is designed to hold the appropriate die for any of the standard Parker Autoclave Engineers tubing sizes through 9/16" (14.3 mm) outside diameter. Interchangeable guide bushings properly guide the tool for accurate thread cutting.



P/N 402: Threading Tool (Threading Dies not included)



Note: Collet nut wrench (not shown) supplied with coning tool.

Table 1

	Tube Size		Coning Tools and Components Catalog Number			Threading Tools and Components Catalog Number				
	Outside Diameter inches (mm)	Inside Diameter inches (mm)	Tool with Collet and Blades	Collet	Coning Blades (set of 2)	Holder with Die and Bushing	Die Holder	Threading Die		Bushing Guide
								Order No.	Size-Type*	
Parker AE Medium Pressure	1/4 (6.35)	.109 (2.77)	MCTM4	90248	CT4BX	402A	402	P-0214	1/4 - 28	1010-0343
	3/8 (9.53)	.203 (5.16)	MCTM6	90250	CT6BX	402C	402	P-0215	3/8 - 24	1010-0344
	9/16 (14.3)	.312 (7.92)	MCTM920	90251	CT9BX	402E	402	P-0216	9/16 - 18	1010-0345
	9/16 (14.3)	.359 (9.12)	MCTM910	90251	CT9BXX	402E	402	P-0216	9/16 - 18	1010-0345
Parker AE High Pressure	1/4 (6.35)	.083 (2.11)	MCTH4	90248	CT4B	402A	402	P-0214	1/4 - 28	1010-0343
	5/16 (7.92)	.062 (1.57)	MCTH5	90249	CT5B	402B	402	P-0205	5/16 - 24	1030-0343
	3/8 (9.53)	.125 (3.18)	MCTH6	90250	CT6B	402C	402	P-0215	3/8 - 24	1010-0344
	9/16 (14.3)	.188 (4.78)	MCTH960	90251	CT9B	402E	402	P-0216	9/16 - 18	1010-0345
	9/16 (14.3)	.250 (6.35)	MCTH940	90251	CT9B40	402E	402	P-0216	9/16 - 18	1010-0345

Options:

Cutting Oil: **P-8784** (quart)

Laminated Instruction Sheet: **90286**

Coning Tool plus Support Arm Assembly: **MCT-SA**

Coning Tool plus Reservoir Assembly: **MCT-RES**

* All threads for Parker AE medium pressure and high pressure tubing are LH national fine (class 2).

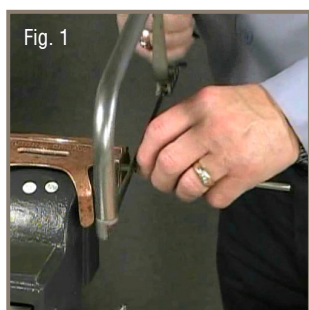
Note: Manual coning and threading tools for 3/4" (19.1 mm) and 1" (25.4 mm) outside diameter tubing are not available. Model AEGCTM-2 Power Coning-and-Threading Machine is recommended for this tubing.

A minimum of 3" (76 mm) straight length is required to perform coning and threading operation with manual coning tool.

Installation: Manual Coning and Threading Procedure

Manual Kit Procedure

1. Cut tubing to length (see Table 2, Dwg. 1 below) and square off the end using hacksaw with at least 32 teeth per inch or abrasive cut-off wheel. (Fig.1)



Allow extra length for proper engagement into the connection as listed in Table 2.

Additional 1/16" should be added to each end to compensate for coning/end facing.

Note: When cutting tubing with abrasive cut off wheel, tubing should not be over heated affecting material properties.

TABLE 2: Engagement Allowance

	Connection Tubing Size	Type OD x ID	Engagement Allowance in (mm)
Medium Pressure (to 20,000 psi)	SF250CX	1/4 x .109	.55 (14.0)
	SF375CX	3/8 X .203	.69 (17.6)
	SF562CX10	9/16 x .359	.81 (21)
	SF562CX20	9/16 x .312	.84 (21.3)
	SF750CX10	3/4 x .516	1.00 (25.4)
	SF750CX20	3/4 x .438	1.00 (25.4)
	SF1000CX10	1 x .688	1.38 (35)
	SF1000CX20	1 x .562	1.46 (37)
High Pressure (to 60,000 psi)	SF1500CX	1-1/2 x .937	1.88 (47.6)
	F250C	1/4 x .083	.50 (12.7)
	F375C	3/8 x .125	.69 (17.5)
	F562C	9/16 x .188	.87 (22)
	F562C40	9/16 X .250	.84 (21)
	F562C40-312	9/16 x .312	.80 (20.32)
Ultra-High Pressure (to 150,000 psi)	F1000C43	1 x .438	1.62 (41.1)
	F250C100	1/4 x .083	1.18 (30.0)
	F375C100	3/8 x .125	1.10 (28.0)
	F562C100	9/16 x .188	.84 (21.3)
	F312C150	5/16 x .062	1.18 (30.0)

Manual coning and threading tools are not available for any tubing sizes over 9/16" OD, see Coning and Threading Machine section.
All dimensions for reference only and subject to change.

Drawing 1:

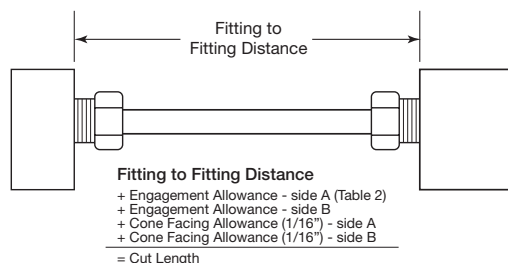


TABLE 3: Tubing Coning

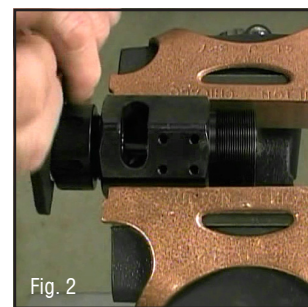
	Tubing O.D. Inches	Cone Length inches (mm)	Number of Turns
Medium Pressure (to 20,000 psi)	1/4"	.11 (2.79)	2
	3/8"	.13 (3.30)	3-1/2
	9/16" (CX-10)	.13 (3.30)	2-1/2
	9/16" (CX-20)	.16 (4.06)	3
High Pressure (to 60,000 psi)	1/4"	.13 (3.30)	3
	3/8"	.16 (4.06)	3
	9/16" (C40)	.28 (7.11)	5-1/2
	9/16" (C40-312)	.21 (5.33)	4-1/2
Ultra-High Pressure (to 150,000 psi)	9/16"	.21 (5.33)	4-1/2
	1/4" (C100)	.13 (3.30)	3
	3/8" (C100)	.16 (4.06)	3
	9/16" (C100)	.21 (5.33)	5 1/2
	5/16"	.19 (4.83)	3-1/2

Manual coning and threading tools are not available any tubing sizes over 9/16" OD, see Coning and Threading Machine section.
All dimensions for reference only and subject to change.

2. Install the collet and collet nut into the bottom of the coning tool housing. Remove the cutter support feed nut from the coning tool housing and install the cutters. This can be done by backing out the four set screws in the cutter support.

Note: When installing new blades, be sure the blades are flat against the holder. There should be no space between the blades and the holder.

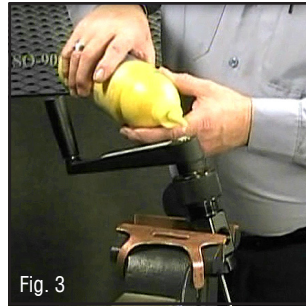
3. Place the coning tool housing (or optional support arm), without the feed nut/ cutter support assembly, in a vise. The vise should be equipped with soft jaws, and the housing should be placed in the vise to allow lubricant to flow to the cutters and cone.



4. Slide the tubing through the collet until the end of the tube appears in the coning tool housing window (see Drawing in Table 3 above). Line the end of the tube with the edge of the window as marked above and tighten the collet nut firmly in place using the collet nut wrench (Fig. 2).

Installation: Manual Coning and Threading Procedure

5. Install the feed nut/cutter support assembly into the coning tool housing. Rotate the feed nut clockwise until the top of the cutters just contact the top of the tube. **Do not** rotate the feed nut any further at this point.

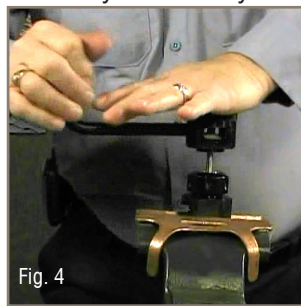


6. Apply cutting oil through the lubricant opening in the end of the cutter holder or directly through the housing window (Fig. 3). A medium weight high sulphur content cutting fluid is recommended. Use the cutting oil freely during the coning operation.

7a. The distance the feed nut travels from its start position can be used to gauge the amount of travel to properly cone the tube. The amount of travel is shown in Table 3, pg 6 and is labeled "Cone Length".

7b. Another method to determine proper cone length is to count the number of turns of the feed nut. The number of turns required is listed in Table 3 under the heading "Number of Turns". This includes enough advancement of the feed nut to face-off the tube and square the edge that forms the seal surface. The feed nut is supplied with a position indicator (drilled hole) to help determine the number of turns.

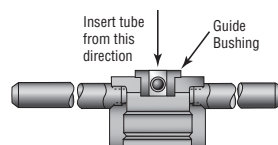
8. Rotate the handle in a clockwise direction while simultaneously **slowly turning** the feed nut in a clockwise direction. Rotate the feed nut slowly and evenly to smoothly cone the tube. Loosen collet nut, remove tubing and visually inspect the cone. Use deburring tool to remove any burr on inside edge of tube after coning.



Manual Threading

9. Using the Coning Tool Body to hold the tubing for threading, clamp in vise, and slide the threading tool over the tube through the guide bushing (Fig. 4).

10. Apply a medium weight, high sulphur cutting oil to threading area (Exception: Hydrogen service - Sulphur not recommended)



11. Apply pressure to the top of the threading tool to start the cutting action. The threads are left handed, so turn

the threader **counterclockwise** to thread the tube. The threading tool may need to be periodically rotated clockwise to break and discharge metal chips. Apply lubricant freely during the threading process.

Note: The lead in chamfer (larger chamfer) on the die flutes toward guide bushing.

12. Continue to rotate die holder counterclockwise while applying cutting oil generously throughout the process until threads of the following lengths have been cut. See number of turns required in Table 5 (page 8), or length in Table 4 below.

13. After tube is coned, threaded and de burred, check for proper thread fit and length with a new collar of the proper size.

Note: Remember to flush all tubing prior to installation with a fluid that is compatible with the process fluid being used.

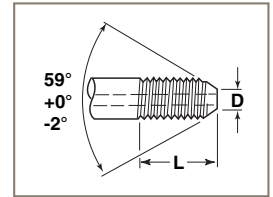


TABLE 4 - Inches (mm)

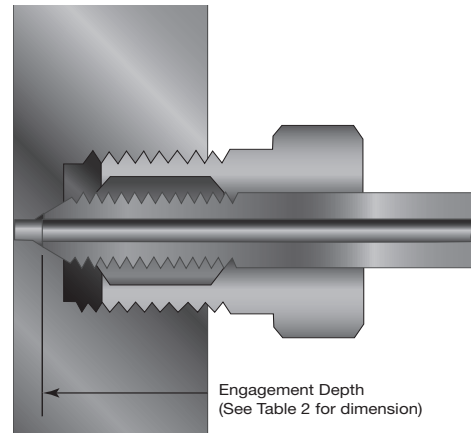
Male Connection	Tube Size O.D. x I.D.	Dimensions		Thread Size and Type *
		D	L (max)	
SM250CX	1/4" x .109 (6.35 x 2.77)	.141 (3.58)	.42 (10.7)	1/4" - 28
SM375CX	3/8" x .203 (9.53 x 5.16)	.25 (6.35)	.49 (12.3)	3/8" - 24
SM562CX20	9/16" x .312 (14.29 x 7.92)	.406 (10.31)	.62 (15.7)	9/16" - 18
SM562CX10	9/16" x .359 (14.29 x 9.12)	.438 (11.13)	.59 (15.0)	9/16" - 18
SM750CX20	3/4" x .438 (19.05 x 11.13)	.562 (14.27)	.73 (18.5)	3/4" - 16
SM750CX10	3/4" x .516 (19.05 x 13.11)	.578 (14.68)	.72 (18.2)	3/4" - 16
SM1000CX20	1" x .562 (25.4 x 14.27)	.719 (18.26)	.96 (24.5)	1" - 14
SM1000CX10	1" x .688 (25.4 x 17.48)	.812 (20.62)	.88 (22.3)	1" - 14
SM1500CX	1-1/2" x .937 (38.10 x 23.78)	1.062 (26.97)	1.14 (29.0)	1-1/2" - 12
M250C	1/4" x .083 (6.35 x 2.10)	.125 (3.18)	.59 (15.1)	1/4" - 28
M375C	3/8" x .125 (9.53 x 3.18)	.219 (5.56)	.79 (20.1)	3/8" - 24
M562C	9/16" x .187 (14.29 x 4.78)	.281 (7.14)	1.04 (26.4)	9/16" - 18
M562C40	9/16" x .250 (14.29 x 6.35)	.312 (7.92)	1.01 (25.7)	9/16" - 18
M562C40-312	9/16" x .312 (14.29 x 7.92)	.406 (10.31)	.93 (23.6)	9/16" - 18
M1000C43	1" x .438 (25.4 x 11.13)	.562 (14.27)	1.10 (27.9)	1" - 14
M250C100	1/4" x .083 (6.35 x 2.10)	.125 (3.18)	.66 (16.8)	1/4" - 28
M375C100	3/8" x .125 (9.53 x 3.18)	.219 (5.56)	.70 (17.8)	3/8" - 24
M562C100	9/16" x .187 (14.29 x 4.78)	.281 (7.14)	1.04 (26.4)	9/16" - 18
M312C150	5/16" x .062 (7.94 x 1.57)	.125 (3.18)	.73 (18.5)	5/16" - 24

*Thread is left-hand national fine (Class 2). All dimensions for reference only and subject to change.

Installation: Cone & Thread Make-up Procedure

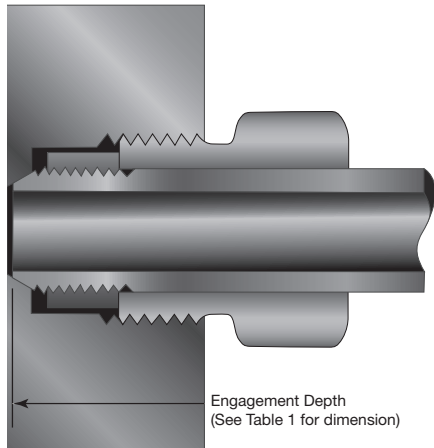
Approximate Number of Turns to Thread Tubing

TABLE 5 (Manual Threading)		
Male Connection	Number of Turns	Shortest Nipple w/Manual Tool = Length
SM250CX	9	3.5"
SM375CX	9	3.5"
SM562CX10/20	8-1/2	3.7"
M250C	13-1/2	3.75"
M375C	15-3/4	4.25"
M562C	14-1/4	4.5"
M562C40	14-1/4	4.5"
M562C40-312	14-1/4	4.5"
M250C100	15-1/4	4.0"
M375C100	13-1/2	4.0"
M562C100	14-1/4	4.5"
M312C150	13-1/2	4.0"

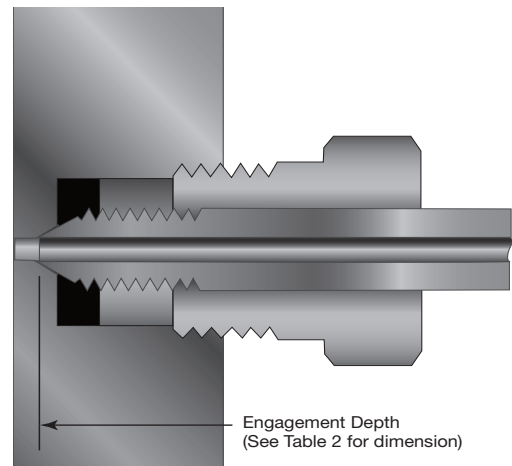


Completed Parker Autoclave Engineers
High Pressure & 9/16" F562C100 Ultra High Pressure
Connections

Engagement Depth Illustrations



Completed Parker Autoclave Engineers
Medium Pressure & 1" F1000C43 Connection



Completed Parker Autoclave Engineers
Ultra High Pressure Connections
1/4", 3/8" and 5/16"

Installation: Cone & Thread Make-up Procedure

Assembly and Makeup of Connection

1. Inspect seat cone and tube cone to verify free of all lines and surface imperfections with tube face and cone edge completely smooth. Lubricate male threads of gland nut and collar/gland contact surface with a metal flake based thread lubricant. (see recommended lubricants on page 25-26 of this catalog)

Slip gland nut on tubing as shown (Fig. 5) and thread collar on tubing (turning counter-clockwise) until 1-1/2 to 2 full threads are exposed between collar and cone (Fig. 6).

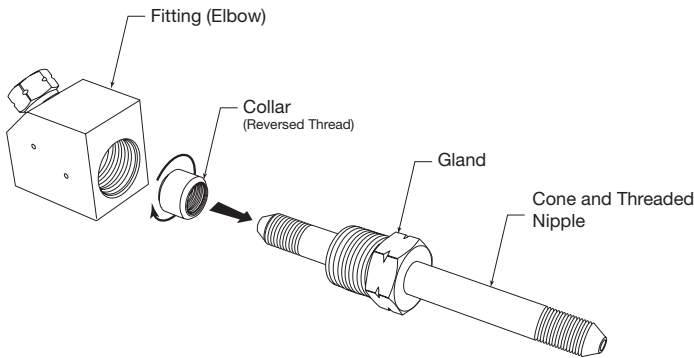


Figure 5

Note: A small amount of process tolerable lubricant, such as silicone grease or any lubricating oil, on the cone tip will help with the sealing process.

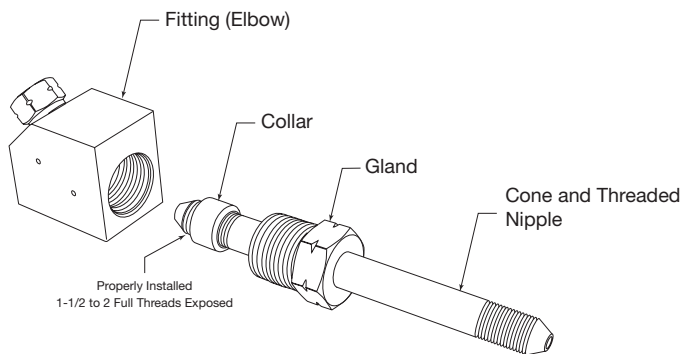


Figure 6

2. Insert tubing in connection, engage gland nut and tighten "finger-tight" at least 4 complete turns (Medium Pressure) and 5-6 Turns (High Pressure) - angular misalignment will not allow rotation with fingers and could cause leakage or gland nut gall - remove and determine cause of misalignment and correct.

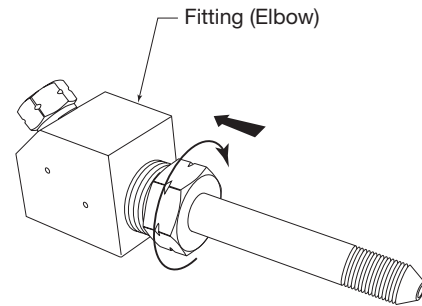


Figure 7

3. Tighten gland nut with torque wrench (REQUIRED) to specified values on page 16 or 17. When tightening, the use of an additional wrench is recommended to hold the fitting or valve body if not otherwise anchored.

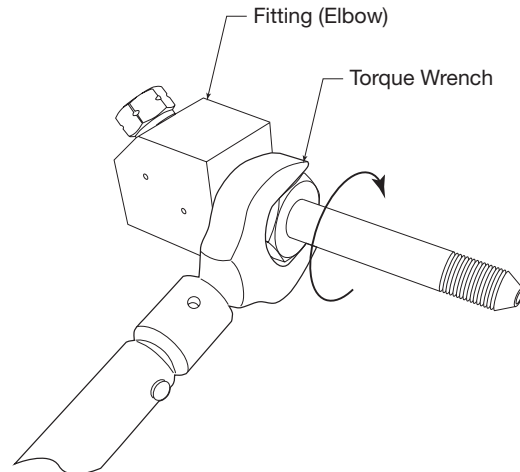


Figure 8

Cautionary Note: The torque used to seal Cone and Thread Connections is typically much less than used on compression fittings (1/8 to 1/4 turn of gland nut from finger-tight)

Recommended Thread Anti-Seize (Not for use on coned surfaces)

Copper Anti-Seize Lubricant:

P-3580 (16 oz. can)

P-3580-8 (8 oz. can)

Moly Paste (50-70%) Anti-Seize Lubricant:

P-9766 (16 oz. can)

(See recommended lubrication sites on pages 23-24)

Specifications: Coning & Threading Machine Ordering



Benefits

- Coning and Threading of Parker Autoclave Engineers Medium and High Pressure Tubing.
- Separate heads for coning and threading are powered by a single motor and drive system.
- New design collet / support system allows for easier coning and threading of long tube lengths.
- New design tube depth gauge eliminates movement of tubing during the threading operation.

Features

- 1/2-HP TEFC motor, capacitor start
- Pop-Open die prevents thread damage; no reversing necessary on threading
- Complete tooling available; order separately
- Supplied with oil pump and reservoir
- Optional oil reservoir heater for operation below 65° F (18.3°C)
- CE marked on 220 VAC units standard
- Unit mounted on stand with locking casters for ease of mobility and stability
- Guard option - see next page

Ordering Procedure

Tooling must be ordered separately see Table 2 listing

TABLE 1: Ordering Part Numbers

Model	Description
AEGCTM-2	115 VAC 60Hz
AEGCTM-2E-CE	220 VAC 50hz - CE Marked
AEGCTM-2WOH	Standard units with Oil Heater
AEGCTM-2EWOH-CE	

Approximate Dimensions:

56" Height x 28" Width x 20" Depth
(142cm x 71cm x 51 cm)

Shipping Weight:

350 pounds (158.7 Kg)

Cutting Oil:

Part Number: P-8699, 3-1/2 Gallon (11.36 liter) equals Reservoir Capacity

Note 1: A minimum of 5 inches (127mm) straight length of tubing is required to perform coning and threading operations.

Video Aids Available (Coning and Threading DVD):

Part Number: P-9930-D

TABLE 2: Tooling

Tube Size Inches (mm)	Collet Only (set)	Cutters Only (set)	Die Chasers (set)	Complete Set
1/4" x .109 (6.35 x 2.77)	Not Recommended - Contact Factory			
1/4" x .083 (6.35 x 2.10)	Not Recommended - Contact Factory			
5/16" x .062 (7.94 x 1.57)	CTM5C-2	CTM5B	AEGCTM5D	AEGCTM5-2
3/8" x .203 (9.53 x 5.16)	CTM6C-2	CTM6BX	AEGCTM6D	AEGCTM6X-2
3/8" x .125 (9.53 x 3.18)	CTM6C-2	CTM6B	AEGCTM6D	AEGCTM6-2
9/16" x .359 (14.29 x 9.12)	CTM9C-2	CTM9BXX	AEGCTM9D	AEGCTM9XX-2
9/16" x .312 (14.29 x 7.92)	CTM9C-2	CTM9BX	AEGCTM9D	AEGCTM9X-2
9/16" x .187 (14.29 x 4.78)	CTM9C-2	CTM9B	AEGCTM9D	AEGCTM9-2
9/16" x .250 (14.29 x 6.35)	CTM9C-2	CTM9B40	AEGCTM9D	AEGCTM940-2
3/4" x .516 (19.05 x 13.11)	CTM12C-2	CTM12BX	AEGCTM12D	AEGCTM12X-2
3/4" x .438 (19.05 x 11.13)	CTM12C-2	CTM12B	AEGCTM12D	AEGCTM12-2
1" x .688 (25.4 x 17.48)	CTM16C-2	CTM16BX	AEGCTM16D	AEGCTM16X-2
1" x .562 (25.4 x 14.27)	CTM16C-2	CTM16B	AEGCTM16D	AEGCTM16-2
1" x .438 (25.4 x 11.13)	CTM16C-2	CTM16BXX	AEGCTM16D	AEGCTM16XX-2

Oil / Chip Guard

A threading die oil/chip guard is now standard on our AEGCTM machines. This guard prevents oil and metal chips from being ejected onto the operator.

The guard is a swing away Plexiglass design providing protection from splashing oil or thrown chips while allowing full access to the die head.

A retrofit guard option is available to upgrade machines already in operation (~2 models). The kit will contain all required items along with instructions.

Example:

AEGCTM-2GK (Retrofit kit catalog number)

Coning & Threading Machine Operation

Note:

Detailed Operational Instructions are supplied with the machine in two forms, printed or USB jump drive. Refer to these instructions for tooling installation, machine adjustment, and maintenance instructions. Download from our website at www.Autoclave.com.



Installation: QSS Manual/Wrench Assembly Instructions (Sizes: 1/4" to 3/8" only)

Step 1:

Cut tubing to length and deburr. Allow extra length for proper engagement (per table below).

Outside Diameter Tube Size inches (mm)	Extra Allowance for Engagement** inches (mm)
1/4" (6.35)	0.75 (19.05)
3/8" (9.53)	0.81 (20.64)

Step 2:

Slip gland nut and sleeve onto tubing.

Note: Be sure to remove gland and sleeve from components and slide them onto the tubing before inserting the tubing into the components.

Make sure larger end of sleeve is toward gland.

Push tubing into valve or fitting until it bottoms.

If process tolerable, a slight amount of inert grease on the nose of the compression sleeve is recommended to improve sealability. Lubrication of the gland threads will also aid in assembly.

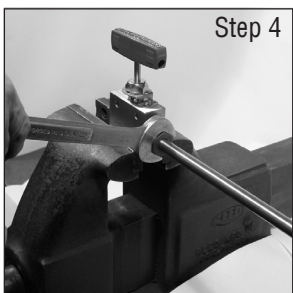
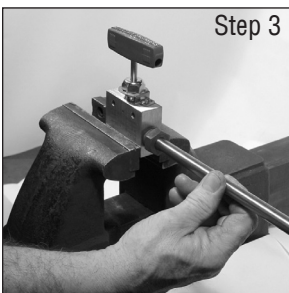
Step 3:

Rotate Gland Nut "finger-tight" and then a bit more with wrench until Sleeve begins to Grip Tubing (wrench-tight).

Step 4:

Note starting position of wrench.[†]

Starting now at the "wrench-tight" position, turn 1-1/4 turns to complete the QSS connection.*



Completed Connection

The illustration below shows the condition of sleeve and tubing after completion of "sleeve setting." The sleeve has cut into the tubing as it moved forward into the tapered seat, upsetting material ahead of it and establishing a shoulder on the tubing to provide positive mechanical support for the tubing end-load. A properly set sleeve cannot be displaced back and forth along the tubing but may be rotated around the tubing.

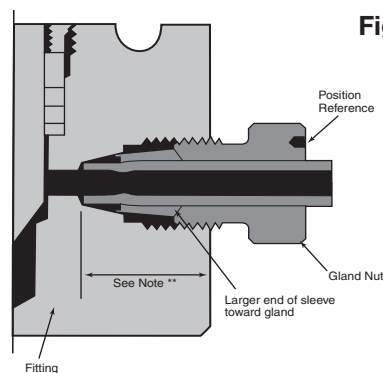


Figure 1

Bite into tubing exaggerated for clarity

Reassembly and Adapter/Plug Connection

To reassemble a connection, insert tubing with sleeve and gland nut into valve or fitting, finger tight. Rotate to "wrench-tight" position and then 1/4 turn more for gas-tight seal or use Torque Chart in Step 6 on next page. Male Adapters and Plugs do not require same torque to seal, see chart below:

QSS Male Adapter or Plug Torque	
Size	Torque
1/4"	10 ft-lbs
3/8"	20 ft-lbs
9/16"	45 ft-lbs
3/4"	100 ft-lbs
1"	225 ft-lbs

Notes:

** Distance tubing protrudes into connection from face of fitting.

[†] A small blind hole on the face of the gland is provided for a starting position reference.

Parker Autoclave Engineers Medium Pressure tubing is required for these connection components.

When assembling tubing into fittings such as in rack systems, alignment of tubing is critical in connection port make up. Do not force tubing into alignment with connections as bending stress will effect the sealing capability of the connections.

Installation: QSS Hydraulic Preset Instructions (Sizes: 1/4" to 3/4")

Step 1:

Cut tubing to length and deburr. Allow extra length for proper engagement (per table below).

Outside Diameter Tube Size inches (mm)	Extra Allowance for Engagement** inches (mm)
1/4" (6.35)	0.75 (19.05)
3/8" (9.53)	0.81 (20.64)
9/16" (14.27)	1.25 (31.75)
3/4" (19.04)	1.63 (41.28)
*1" (25.40)	1.75 (44.455)

** Distance tubing protrudes into connection from face of fitting.

Step 2:

Slip gland nut and sleeve onto tubing. Lubricate the nose of the compression sleeve or the tapered die surface with a moly-based metal to metal lubricant. We recommend Jetlube MP-50. Make sure larger end of sleeve is toward gland nut. Push tubing into hydraulic set tool until it bottoms into the setting die.

Step 3:

Thread gland nut into cap until the hex touches the top surface.

Step 4:

Pressurize cylinder up to the set pressure (per table below.)

DO NOT EXCEED THE SET PRESSURE IN CHART BELOW.

AS WITH ALL HIGH PRESSURE EQUIPMENT, USE CAUTION DURING OPERATION. SET TOOL MAWP IS 10,000 PSI (690 BAR)

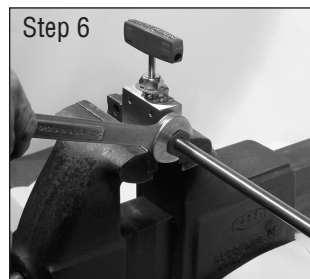
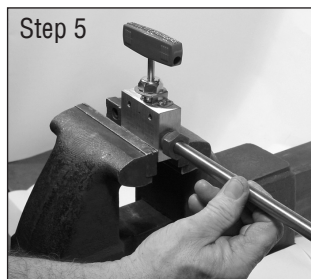
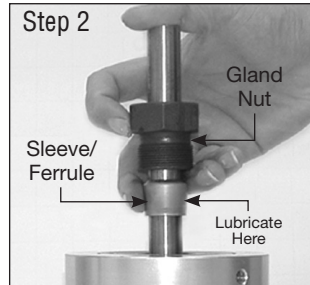
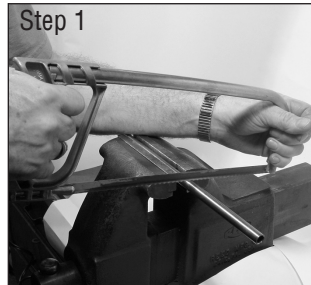
Outside Diameter Tube Size inches (mm)	Set Pressure for Full Tubing Bite inches (mm)
1/4" (6.4) and 3/8" (9.5)	4500 (310) to 5000 (344)
9/16" (14.3)	9000 (620) to 10000 (690)
3/4" (19.0)	8000 (552) to 10000 (690)
*1" (25.4)	9000 (620) to 9500 (655)

Vent all pressure from hydraulic cylinder. Remove gland assembly from preset tool and inspect biting end of sleeve. Looking inside the biting end of the sleeve you should see a shoulder pushed up from the tubing material. A properly set sleeve must spin freely to achieve a seal. If the sleeve is seized in place after setting, discard and make another.

Do not set a sleeve more than once.

Step 5:

Install gland assembly into valve/fitting. If process tolerable, a slight amount of inert grease on the nose of the compression sleeve should be used to aid sealing. Lubrication of gland threads will also aid in assembly. Turn to "Wrench-Tight" position where torque to turn increases dramatically.



Step 6:

Note starting position of wrench.† Tighten gland nut 1/4 turn to complete the QSS connection. Since the mechanical bite has already been completed with the hydraulic set tool, it is permissible to vary the torque to achieve sealing.

Size (in)	Required Torque ft.-lbs. (Nm)	Max. Torque ft.-lbs. (Nm)	Torque Wrench Adapter Size	Wrench Adapter Part #
1/4"	30 (40)	50 (70)	5/8"	AE003321
3/8"	35 (50)	75 (100)	3/4"	AE003322
9/16"	90 (120)	175 (240)	1-3/16"	AE003324
3/4"	175 (240)	325 (440)	1-1/2"	AE000170
*1"	375 (500)	635 (860)	1-3/4"	AE001067

Not for use with Male Adapters or Plugs (see chart on previous page)

† A small blind hole on the face of the gland is provided for a starting position reference.

Completed Connection

The hydraulically set sleeve has cut into the tubing as it moved forward into the tapered seat, upsetting material ahead of it and establishing a shoulder on the tubing to provide positive mechanical support for the tubing end-load. A properly set sleeve cannot be displaced back and forth along the tubing but may be rotated around the tubing.

Installation: QSS Hydraulic Preset (HST-912) Instructions & Overview

Reassembly & Adapter/Plug Connection

To reassemble a connection, insert tubing with sleeve and gland nut into valve or fitting, finger tight. Rotate to “wrench-tight” position, then 1/4 turn more for gas-tight seal or use torque chart shown in Step 6 on page 13. Male Adapters and Plugs do not require same torque to seal, see chart on page 12.

Parker Autoclave Engineers Medium Pressure tubing is required for these connection components.

When assembling tubing into fittings such as in rack systems, alignment of tubing is critical in connection make up.

Do not force into alignment with connections as bending stress will effect the sealing capability of the connections.

Hydraulic Sleeve Set Tool (HST-912)

The hydraulic set tool requires minimal assembly and is easy to use. There are three models available; a manual hydraulic pump, an air operated hydraulic pump and a complete stand mounted system with air pumps and tooling for all five connection sizes.

The HST-912 Parker Autoclave hydraulic sleeve set tool is designed for use with the QS Series glands, sleeves and Parker Autoclave tubing. This tool is required to set the sleeve for the 9/16" and 3/4" sizes and recommended for the 1/4" and 3/8" sizes. It not only produces the required bite into the tubing, it is much easier than trying to set the sleeve the conventional method. The tool comes in a self contained portable, lockable case complete with hand or air pump, cap and dies for all sizes up to 3/4".

HST-912 Specifications

Hand Pump: Single stage hydraulic (standard)

Hydraulic Cylinder: 10,000 psi, 2.5" 25 ton

Base & Housing: Aluminum anodized

Die and Cap: Precision hardened steel

Gauge: 15,000 psi (1034 bar)

Operating Pressure: 0 to 10,000 psi (0 to 690 bar).

Required Air Pressure: 30 psi (2.1 bar) minimum 120 psi (8.3 bar) maximum

Reservoir Capacity: 24 cu. in. (393cm³)

Air lubricator/air separator is recommended for air operated units.

! CAUTION !

Do not operate Hydraulic Cylinder without setting sleeve and tube as this may result in damage to the die housing!

HST-912 Bill of Materials	Part Number
Hydraulic Cylinder	90588
Gauge	90594
Adapter	90593
Housing	101F-3408
Hydraulic Pump	P-1893
Hose	P-1894
1/4" Die	HSTD4
3/8" Die	HSTD6
9/16" Die	HSTD9
3/4" Die	HSTD12
1/4" Cap	HSTC4
3/8" Cap	HSTC6
9/16" Cap	HSTC9
3/4" Cap	HSTC12
Moly Paste, 1 lb. Can	P-9766
10 to 150 ft-lbs, Torque Wrench, 1/2" Drive	AE003325
50 to 250 ft-lbs, Torque Wrench, 1/2" Drive	AE003326
5/8" Crows Foot Wrench Adpt, 1/2" Drive	AE003321
3/4" Crows Foot Wrench Adpt, 1/2" Drive	AE003322
1-3/16" Crows Foot Wrench Adpt, 1/2" Drive	AE003324
1-1/2" Crows Foot Wrench Adpt, 3/4" Drive	AE000170
1-3/4" Crows Foot Wrench Adpt, 3/4" Drive	AE001067
Adjustable Spanner Wrench	P-1970

Ordering Information

HST-912:

Complete tool kit with hand pump (Sizes 1/4" to 3/4")

HST-912TW:

Complete tool kit as above with torque wrench and adapters

HST-912A:

Complete tool kit as above with air-operated, foot activated pump (Air Operated Pump #P-1948)

HST-912ATW:

HST-912A tool kit with torque wrench and adapters

HST-S:

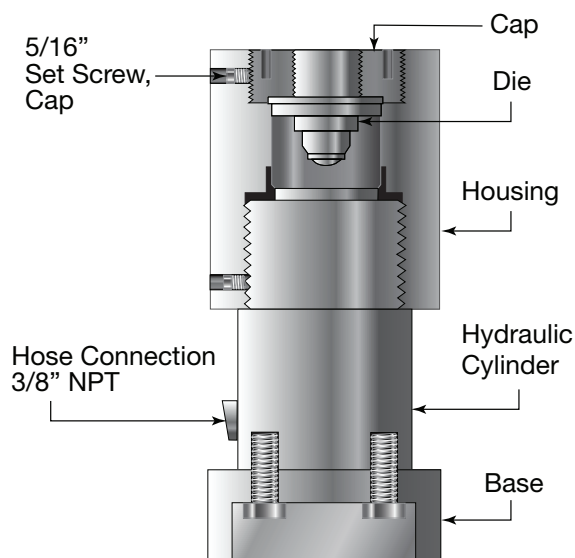
Complete Double Air-Drive Press Stand System with dies, torque wrenches and tooling for all tubing sizes including 1".

Installation: QSS Hydraulic Preset (HST-912) Instructions

HST-912 Cap and Die Changeout Instructions

To switch tooling to another size only requires interchanging two (2) parts.

1. Using a 5/32" Allen Wrench, loosen the 5/16" set screw that locks the threaded cap from rotating.
2. Use the included spanner wrench to rotate and remove the threaded steel cap from aluminum housing.
3. Turn the tool assembly upside down to remove the die from inside the housing.
4. Install the die of the appropriate connection size you wish to use. The solid side of the die should be facing down towards the hydraulic cylinder.
5. Install the appropriate size cap to match the size of the die. Insert cap with the spanner holes facing up. Rotate the cap with the spanner wrench until it bottoms out on the shoulder side of the housing.
6. Thread in the 5/16" set screw until it bottoms out on the cap threads. Tighten set screw to prevent movement during use.



Heavy Duty Torque Wrenches and Heavy Duty Crows Foot Wrench Adapters

Recommended for use with Parker Autoclave Quick Set System (QSS) and Flared Cone Connection (FCC) Fittings and Valves. (will work with standard products)

Torque Wrench	Torque Range
AE003325	10 to 150 ft. lbs (10 to 203 Nm), 1/2" Drive
AE003326	75 to 250 ft. lbs (102 to 339 Nm), 1/2" Drive
AE003327	100 to 600 ft. lbs (136 to 814 Nm), 3/4" Drive

Heavy Duty Torque Wrench Adapters		
Wrench Adapter Number	Packing Gland or Tube Nut Hex Size (inches)	
AE005904	1/2" x 1/2"	
AE005905	9/16" x 1/2"	
AE003321	5/8" x 1/2"	
AE003322	3/4" x 1/2"	
AE005906	13/16" x 1/2"	
AE005907	7/8" x 1/2"	
AE003323	15/16" x 1/2"	
AE005908	1" x 1/2"	
AE005909	1-1/16" x 1/2"	
AE003324	1-3/16" x 1/2"	
AE005910	1-3/8" x 1/2"	
AE000170	1-1/2" x 3/4"	
AE001067	1-3/4" x 3/4"	
AE005911	1-7/8" x 3/4"	
AE003826	2" x 3/4"	
AE000171	2-3/4" x 3/4"	
AE005590	1/2" Drive to 3/4" Drive Adapter	

Standard Duty Torque Wrenches (old style) can be found on page 16

Operation/Maintenance: Torque Values

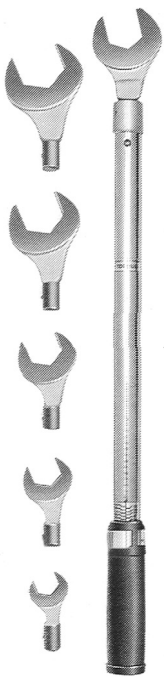
Medium & High Pressure Connection, Valve Packing, Running and Seating

Parker Autoclave Engineers Micrometer Adjustable Torque Wrenches

Torque Wrench	Torque Range
P-1680	20 to 150 ft. lbs (27 to 203 Nm)
91020	75 to 250 ft. lbs (102 to 339 Nm)
See Heavy Duty Torque Wrenches on Page 15	100 to 600 ft. lbs (136 to 814 Nm)

Accurate tightening for all Parker Autoclave Engineers valve packing glands and tube nuts is essential. The wrench can be adjusted to the ranges shown above and is used with interchangeable wrench adapters for hex sizes from 1/2" through 1-7/8". Part numbers for wrench adapters are listed below.

Wrench adapters sold separately.

Standard Wrench Adapters		
Wrench Adapter Number	Packing Gland or Tube Nut Hex Size (inches)	
P-1681	1/2	
P-1682	9/16	
P-1683	5/8	
P-9813	3/4	
P-1685	13/16	
P-1686	7/8	
P-1687	15/16	
P-9901	1	
P-1688	1-1/16	
P-1689	1-3/16	
P-1690	1-3/8	
P-6040	1-1/2	
91269 †	1-3/4	
P-10076 †	1-7/8	

† Part numbers shown for replacement requirements only. For new orders use Heavy Duty wrench adapters and Wrench found on page 15.

Heavy Duty Torque Wrenches and Open Face Wrench Adapters are available.

Please see page 15 for product detail and part numbers

Full Pressure Connection Gland Torque

(For CW 316 Stainless Steel & Medium Pressure 2507 Super Duplex Materials)

	Connection Type	Gland Nut Hex Size (inches)	Required Torque ¹	Required Torque Dry-Moly Coated	Pressure MAWP PSI (Bar)
			ft.-lbs. (N.m)		
Medium Pressure	SF250CX (1/4" MP)	1/2	20 (27)	15 (21)	20,000
	SF375CX (3/8" MP)	5/8	30 (41)	20 (27)	20,000
	SF562CX10 (9/16" MP)	15/16	55 (75)	40 (55)	15,000
	SF562CX20 (9/16" MP)	15/16	55 (75)	40 (55)	20,000
	SF750CX10 (3/4" MP)	1-3/16	75 (102)	55 (75)	15,000
	SF750CX20 (3/4" MP)	1-3/16	90 (122)	70 (95)	20,000
	SF1000CX10 (1" MP)	1-3/8	135 (187)	100 (136)	15,000
	SF1000CX20 (1" MP)	1-3/8	135 (187)	100 (136)	20,000
	SF1500CX (1-1/2" MP)	1-7/8	200 (272)	160 (217)	15,000

High Pressure	F250C (1/4" HP)	5/8	25 (34)	-	60,000
	F375C (3/8" HP)	13/16	50 (68)	-	60,000
	F562C (9/16" HP)	1-3/16	75 (102)	-	60,000
	F562C40 (9/16" HP-40K)	1-3/16	60 (82)	-	40,000
	F1000C43 (1" HP-43K)	1-3/8	180 (244)	-	43,000

Ultra High Pressure	F250C100 (1/4" UHP-100K)	3/4	50 (68)	-	100,000
	F375C (3/8" UHP-100K)	3/4	105 (143)	-	100,000
	F562C (9/16" UHP-100K)	1-3/16	125 (170)	-	100,000
	F375C (5/16" UHP-150K)	3/4	70 (95)	-	150,000

¹ Required torque shown is for manually lubricated (liquid or paste anti-seize) glands. For torque reduction when using glands supplied with Dry-Moly coating see "Reduced Pressure/Special Material" Chart on next page.

For torques at lower working pressures (specialty materials) see "Special Material" Torque Chart on next page.

Operation/Maintenance: Torque Values

Reduced Pressure/Special Material Torque Table: Pressure psi (bar) vs. Torque ft.-lbs. (N.m)

Note: ALL Parker Autoclave Engineers Pressure Containing products will have Maximum Allowable Working Pressure (@ Room Temperature) indelibly marked at an easy to read location. Most "Special Materials" are rated to a pressure less than our standard Cold Worked UNS S31600/S31603 316/316L Stainless Steel Material and use of the chart below is necessary for proper installation of Cone & Thread Connections at these lower pressures.

Use of this chart is also recommended when application pressure is less than the MAWP rating on the part. This will create a seal circle in the connection at a point before max insertion depth is reached - enhancing the lifetime of the product.

Connection	Pressure psi (bar) vs. Torque ft-lb (N.m)										** Dry-Moly Coat Torque Reduction
	Minimum	5,000 (345)	10,000 (690)	15,000 (1034)	20,000 (1379)	25,000 (1724)	30,000 (2068)	40,000 (2758)	50,000 (3447)	60,000 (4137)	
SF250CX (1/4" MP)	10 (13.6)	10 (13.6)	10 (13.6)	15 (20.3)	20 (27.1)	-	-	-	-	-	25%
SF375CX (3/8" MP)	10 (13.6)	10 (13.6)	15 (20.3)	25 (33.9)	30 (40.7)	-	-	-	-	-	30%
SF562CX10 (9/16" MP)	20 (27.1)	30 (40.7)	45 (61)	55 (74.6)	-	-	-	-	-	-	30%
SF562CX20 (9/16" MP)	15 (20.3)	15 (20.3)	30 (40.7)	40 (54.2)	55 (74.6)	-	-	-	-	-	
SF750CX10 (3/4" MP)	25 (33.9)	40 (54.2)	60 (81.3)	75 (101.7)	-	-	-	-	-	-	30%
SF750CX20 (3/4" MP)	20 (27.1)	25 (33.9)	45 (61)	70 (94.9)	90 (122)	-	-	-	-	-	
SF1000CX10 (1" MP)	40 (54.2)	65 (88.1)	115 (156)	135 (183)	-	-	-	-	-	-	25%
SF1000CX20 (1" MP)	35 (47.5)	50 (67.8)	100 (136)	115 (156)	135 (183)	-	-	-	-	-	
SF1500CX (1-1/2" MP)	110 (149)	110 (149)	160 (217)	200 (271)	-	-	-	-	-	-	20%
F250C (1/4" HP)	10 (13.6)	10 (13.6)	10 (13.6)	10 (13.6)	10 (13.6)	15 (20.3)	15 (20.3)	20 (27.1)	25 (33.9)	25 (33.9)	N/A
F375C (3/8" HP)	10 (13.6)	10 (13.6)	10 (13.6)	15 (20.3)	20 (27.1)	25 (33.9)	25 (33.9)	35 (47.5)	45 (61)	50 (67.8)	N/A
F562C (9/16" HP)	15 (20.3)	15 (20.3)	15 (20.3)	20 (27.1)	25 (33.9)	35 (47.5)	40 (54.2)	50 (67.8)	65 (88.1)	75 (102)	N/A
F562C40 (9/16" HP)	15 (20.3)	15 (20.3)	15 (20.3)	25 (33.9)	30 (40.7)	40 (54.2)	45 (61)	60 (81.3)	-	-	N/A
F562C40-312 (9/16" HP-40K)	25 (34)	25 (34)	25 (34)	35 (47.5)	45 (61)	55 (74.6)	65 (88.1)	85 (115)	-	-	N/A
F1000C43 (1" HP 43K)	30 (40.7)	50 (67.8)	65 (88.1)	75 (101.7)	100 (136)	125 (170)	150 (203)	180 (244)	-	-	25%
	-	-	-	-	-	60,000 (4137)	70,000 (4825)	80,000 (5515)	100,000 (6895)	150,000 (10340)	
F250C100 (1/4" UHP)	-	-	-	-	-	20 (27)	30 (41)	35 (48)	50 (68)	-	N/A
F375C100 (3/8" UHP)	-	-	-	-	-	40 (54)	60 (81)	75 (102)	105 (143)	-	N/A
F562C100 (9/16" UHP)	-	-	-	-	-	75 (102)	90 (122)	100 (136)	125 (170)	-	N/A
F312C150 (5/16" UHP)	-	-	-	-	-	35 (48)	35 (48)	35 (48)	45 (61)	70 (95)	N/A
**All special material glands dry moly coated will have lower set torques. Reduce the torque found or computed from chart above percentages shown in this column.											

Needle Valve Stem Maximum Running and Seating Torques * (Typical Values)

Valve Series	Tube Size (inches)	Running Torque	Seating Torque	Pressure psi (bar)
		inch-lbs. (N.m)		
10V <small>(1/4" to 1/2" For Reference Only)</small>	1/8	25 (3)	35 (4)	15,000 (1034)
	1/4	40 (5)	50 (6)	15,000 (1034)
	3/8	40 (5)	50 (6)	15,000 (1034)
	1/2	60 (7)	80 (9)	10,000 (690)
SW	1/4	25 (3)	35 (4)	15,000 (1034)
	3/8	40 (5)	50 (6)	15,000 (1034)
	1/2	70 (8)	90 (10)	10,000 (690)
15SM 10P12-16 15QS12 & 16	9/16	60 (7)	105 (12)	15,000 (1034)
	3/4	210 (24)	290 (34)	15,000 (1034)
	1	180 (20)	580 (64)	15,000 (1034)
	1-1/2	1100 (124)	1560 (176)	15,000 (1030)
20SM 15P4-9 15QS4-9 20DBNV12	1/4, 3/8	40 (5)	55 (6)	20,000 (1379)
	9/16	60 (67)	110 (12)	20,000 (1379)
	3/4	300 (34)	360 (41)	20,000 (1379)
	1	360 (41)	600 (68)	20,000 (1379)
15Y	Various	65 (7)	144 (16)	15,000 (1034)
43Y	1	25 (3)	45 (5)	43,000 (2965)
50Y	9/16	85 (10)	180 (20)	50,000 (3450)
20GV	Various	50 (6)	55 (6)	20,000 (1379)
30GV	Various	50 (6)	55 (6)	30,000 (2068)
30SC	1	360 (41)	600 (68)	30,000 (2068)
43SC	1	720 (82)	800 (90)	43,000 (2965)
40SC	9/16	360 (41)	445 (50)	40,000 (2758)
30VM 20DBNV	1/4	40 (5)	55 (6)	30,000 (2068)
	3/8	45 (5)	55 (6)	30,000 (2068)
	9/16	50 (6)	55 (6)	30,000 (2068)
40VM	9/16	40 (5)	55 (6)	40,000 (2758)
60VM	1/4, 3/8, 9/16	65 (7)	70 (8)	60,000 (4137)
100VM	1/4, 5/16, 3/8	100 (11)	120 (14)	100,000 (6895)
	9/16	460 (52)	520 (59)	100,000 (6895)
150V	5/16	312 (35)	384 (43)	150,000 (10340)

* These are not specifications.

Note: All valve stem torques are based on standard PTFE packing.
For valves with option "TG" (PTFE Glass) or "GY" (graphite, yarn packing), the following equations should be used to estimate torques.

Option "TG"

Running Torque = Running Torque (x 1.1)

Seating Torque = Running Torque (x 1.1) + Seating Torque - Running Torque

Option "GY"

Running Torque = Running Torque (x 2)

Seating Torque = Running Torque (x 2) + Seating Torque - Running Torque

Parker AE Flat Top/Bottom Adapters

	Size (inches)	Maximum Working Pressure psi (bar)	Connection	Required Torque ft. - lbs. (N.m)
Flat Top Gasket	9/16-18	10,000 (690)	F562FT	60 (81.3)
Flat Bottom Gasket	7/16-20	10,000 (690)	F437FB	25 (33.9)
	9/16-18	10,000 (690)	F562FB	40 (54.2)
	3/4-16	5,000 (345)	F750FB	60 (81.3)

Parker AE Packing Glands

	Tube/Pipe O.D. Size (inches)	Packing Gland Hex (inches)	Required Torque ¹ ft. - lbs. (N.m)
10V (1/4" to 1/2" For Reference Only)	1/8	1/2	12 (16)
	1/4	13/16	40 (54)
	3/8	13/16	40 (54)
	1/2	13/16	30 (41)
SW	1/4	5/8	30 (41)
	3/8	5/8	40 (54)
	1/2	13/16	50 (68)
15P 10P 15SM 20SM 15QS	1/4, 3/8	5/8	40 (54)
	9/16	13/16	80 (109)
	3/4	13/16	Note 2
	1	1-3/8	20 (27)
	1-1/2	1-5/16	550 (745)
20DBNV	3/8, 9/16	13/16	40 (54)
	3/4	15/16	Note
15Y	3/4	15/16	130 (176)
	1	1-1/16	150 (203)
43Y	1	1	150 (203)
50Y	9/16	15/16	85 (115.2)
20GV	Various	13/16	40 (54)
30GV	Various	13/16	40 (54)
30SC/43SC	1	1-3/8	230 (312)
40SC	9/16	15/16	140 (190)
30VM	1/4, 3/8, 9/16	13/16	40 (54)
40VM	9/16	13/16	40 (54)
60VM	1/4, 3/8, 9/16	13/16	60 (81)
100VM	1/4, 3/8	15/16	60 (81)
	9/16	15/16	150 (203)
150V	5/16	1-3/8	150 (203)
10VRMM	9/16	9/16	20 (27)
30VRMM	3/4	13/16	50 (68)
60VRMM	1/4, 3/8	13/16	50 (68)
15PVRMM	1/2 NPT	13/16	40 (54)

Note 1: Torque may vary $\pm 10\%$. Torque values apply to standard PTFE packing.
For graphite yarn packing, add 25% to the above values.

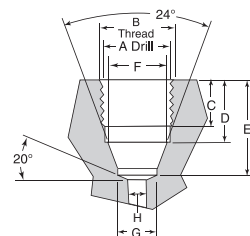
Note 2: 3/4 turn past finger tight with hex wrench.

Operation: Female Port Connection Dimensions

Parker Autoclave SpeedBite SW* (SW Series Valves)

15,000 psi (1/2" = 10,00 psi) Maximum Pressure

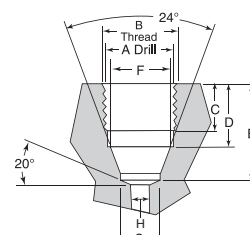
Tube Outside Diameter (Inches)	Connection Type	Dimensions - inches (mm)							
		A	B	C	D	E	F	G	H
1/4	SW250	29/64 (11.5)	1/2 -20	.34 (8.6)	.44 (11.1)	.69 (17.5)	.35 (8.9)	"F" .257 (6.5)	.128 (3.3)
3/8	SW375	37/64 (14.7)	5/8 -18	.38 (9.6)	.47 (11.9)	.75 (19.1)	.48 (12.1)	"W" .386 (9.8)	.250 (6.4)
1/2	SW500	3/4 (19.1)	13/16 -16	.38 (9.6)	.50 (12.7)	.81 (20.6)	.60 (15.21)	.516 (13.11)	.375 (15.21)



Parker Autoclave SpeedBite W* (10V2 Valve only - other sizes reference only)

15,000 psi Maximum Pressure

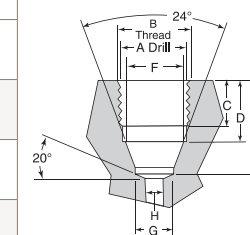
Tube Outside Diameter (Inches)	Connection Type	Dimensions - inches (mm)							
		A	B	C	D	E	F	G	H
1/16	W062	"Q" .332 (8.4)	3/8 -24	.22 (5.6)	.31 (7.9)	.47 (11.9)	.19 (4.8)	#30 .129 (3.3)	.055 (0.94)
1/8	W125								
1/4	W250	11/16 (17.4)	3/4 -16	.38 (9.6)	.44 (11.1)	.69 (17.7)	.35 (8.9)	"F" .257 (6.5)	.188
Reference only									
3/8	W375	11/16 (17.4)	3/4 -16	.38 (9.6)	.44 (11.1)	.69 (17.76)	.48 (12.1)	"W" .386 (9.8)	.250
Reference only									



Parker Autoclave QSS (QS Series Valves)

15,000 psi Maximum Pressure

Tube Outside Diameter (Inches)	Connection Type	Dimensions - inches (mm)							
		A	B	C	D	E	F	G	H
1/4	QSF250	29/64 (11.5)	1/2 -20	.34 (8.6)	.44 (11.1)	.69 (17.5)	.34 (8.6)	"F" .257 (6.5)	.157 (4.0)
3/8	QSF375	37/64 (14.7)	5/8 -18	.38 (8.6)	.47 (11.9)	.75 (19.1)	.48 (12.1)	.038 (9.7)	.250 (6.4)
9/16	QSF562	7/8 (22.2)	15/16 -16	.57 (14.5)	.704 (17.9)	1.25 (31.8)	.712 (18.1)	.57 (19.3)	.359 (9.1)
3/4	QSF750	1-3/16 (30.2)	1-1/4 -18	.83 (21.08)	1.00 (25.4)	1.56 (39.6)	0.95 (24.1)	.76 (19.3)	.516 (14.6)
1	QSF1000	1-9/16 (39.7)	1-5/8 -16	.75 (19.1)	.88 (22.2)	1.56 (39.6)	1.24 (31.5)	1.02 (26.0)	.688 (17.5)



Note:

All dimensions are shown for reference only and should not be considered as actual machining dimensions.

* Port ("H") sizes may vary in certain adapters in catalog and over-ride dimension given above.

All threads are manufactured to a class 2A or 2B fit.

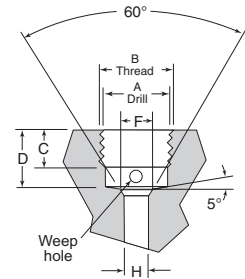
For prompt service. Parker Autoclave Engineers stocks select products. Consult factory. All general terms and conditions of sale, including limitations of our liability, apply to all products and service sold.

Operation: Female Port Connection Dimensions

Parker Autoclave Medium Pressure SF** (SM Series Valves)

20,000 psi Maximum Pressure

Tube Outside Diameter (Inches)	Connection Type	Dimensions - inches (mm)					
		A	B	C	D	F	H
1/4	SF250CX	25/64 (9.9)	7/16 -20	.28 (7.1)	.50 (12.7)	.19 (4.8)	.109 (2.8)
3/8	SF375CX	33/64 (13.1)	9/16 -18	.38 (9.6)	.63 (16.0)	.31 (7.9)	.203 (5.2)
9/16	SF562CX10* SF562CX20	3/4 (19.1)	13/16 -16	.44 (11.1)	.75 (19.1)	.50 (12.7)	.359 (9.1) .312 (7.9)
3/4	SF750CX10* SF750CX20	61/64 (24.2)	3/4 -14 see Note 1	.50 (12.7)	.94 (23.9)	.63 (16.0)	.516 (13.1) .438 (11.1)
1	SF1000CX10* SF1000CX20	1-19/64 (32.9)	1-3/8 -12	.81 (20.6)	1.31 (33.3)	.88 (22.4)	.688 (17.5) .562 (14.3)
1-1/2	SF1500CX	1.790 (45.47)	1-7/8 -12	1.00 (25.4)	1.59 (40.38)	1.38 (35.05)	.937 (23.80)



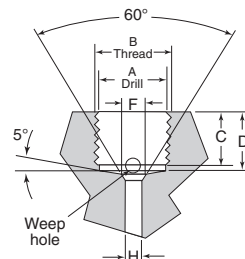
* Connection used in fittings but rated for 20,000 psi (1379 bar). CX10 connection versions are typically rated to 15,000 psi

Note 1: 3/4-14 is a straight pipe thread.

Parker Autoclave High Pressure F** (30, 43 SC and 30, 40, 60VM Valves)

60,000 psi Maximum Pressure

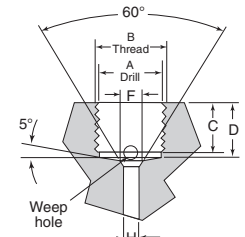
Tube Outside Diameter (Inches)	Connection Type	Dimensions - inches (mm)					
		A	B	C	D	F	H
1/4	F250C	33/64 (13.1)	9/16 -18	.38 (9.7)	.44 (11.1)	.17 (4.3)	.094 (2.4)
3/8	F375C	11/16 (17.4)	3/4 -16	.53 (13.5)	.62 (15.7)	.26 (6.6)	.125 (3.2)
9/16	F562C	1-3/64 (26.6)	1-1/8 -12	.63 (16.0)	.75 (19.1)	.38 (9.7)	.188 (4.8)
9/16	F562C40	1-3/64 (26.6)	1-1/8 -12	.63 (16.0)	.75 (19.1)	.38 (9.7)	.250 (6.4)
9/16	F562C40-312	1-3/64 (26.6)	1-1/8 -12	.63 (16.0)	.75 (19.1)	.47 (12)	.312 (7.9)
1	F1000C43	1-19/64 (32.9)	1-3/8 -12	.81 (20.6)	1.31 (33.3)	.88 (22.4)	.438 (11.1)



Parker Autoclave Ultra High Pressure F**C100 & F**C150 (100VM and 150V Valves)

100,000 and 150,000 psi Maximum Pressure

Tube Outside Diameter (Inches)	Connection Type	Dimensions - inches (mm)					
		A	B	C	D	F	H
1/4	F250C100	37/64 (14.7)	5/8 -18	.63 (16.0)	1.06 (26.9)	.25 (6.4)	.094 (2.4)
3/8	F375C100	37/64 (14.7)	5/8 -18	.63 (16.0)	1.06 (26.9)	.25 (6.4)	.125 (3.2)
9/16	F562C100	1-3/64 (26.6)	1-1/8 -12	.63 (16.0)	.75 (19.1)	.38 (9.7)	.188 (4.8)
5/16	F312C150	37/64 (14.7)	5/8 -18	.63 (16.0)	1.06 (26.9)	.25 (6.4)	.094 (2.4)



Note:

All dimensions are shown for reference only and should not be considered as actual machining dimensions.

All threads are manufactured to a class 2A or 2B fit.

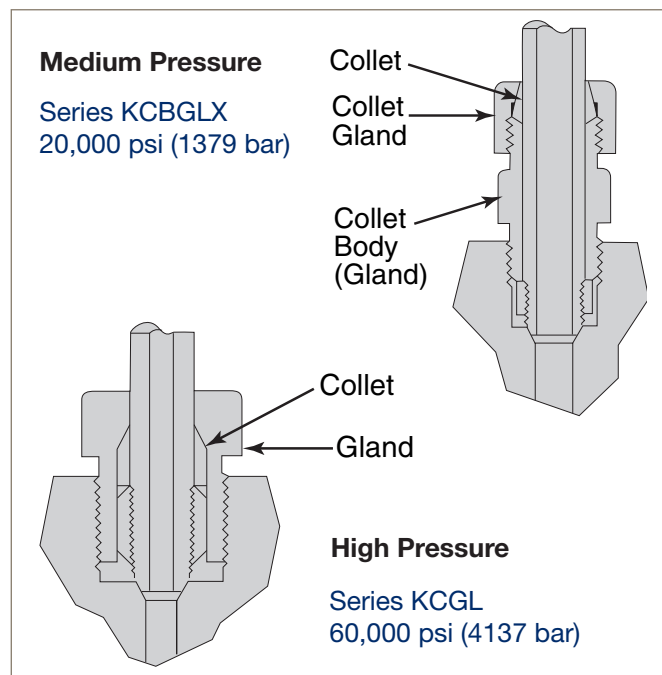
Installation: Anti-Vibration Collet Gland/Reseating Tools & Instructions

Assembly Procedures

Anti-vibration collet gland assembly replaces the standard gland nut.

1. Cone and thread tubing as defined on pages 6-9.
2. Slide collet assembly onto tube and install collar as described in the assembly and makeup of connections on page 8. One or two threads should be exposed between the collar and cone.
3. Lubricate male threads on glands (medium pressure anti-vibration assemblies supplied with a baked on dry film lubricant. Lubrication not required.)
4. Tighten collet body (elongated gland) to specified torque on page 16-17. The high pressure collet will grip the tube when the connection gland is tightened.
5. For the medium pressure collet gland assembly, hand tighten the collet gland in place and further tighten 1-1/4 turns with a wrench. When tightening the medium pressure anti-vibe collet nut, hold the collet body with a wrench to prevent the body from turning and over tightening. This will lock the collet against the tube. For subsequent retightening of the medium pressure anti-vibration collet gland, use 3/4 turns past finger tight.

Medium & High Pressure Antivibration Gland Assemblies



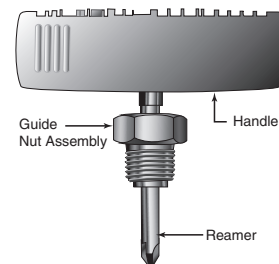
Note: Always use a back-up wrench on collet body to prevent over tightening of collet body into connection.

See individual Cone & Thread Fitting Brochures for additional information and ordering details.

Reseating Tool

For female TUBING CONNECTION cone seat

1. Clamp fitting in soft-jawed vise.
2. Thread gland nut into connection and tighten to 10 ft. lbs. (13.6 N.m).
3. Apply a medium weight high sulfur cutting oil generously through opening in nut. Cutting oil P-8784.
4. Insert reamer through guide bushing and press down firmly while rotating clockwise approximately two full turns, relieving pressure gradually toward end of second turn.
5. Remove reamer, guide nut and bushing and inspect cone seat.
6. Repeat steps 2,3,4 and 5, if necessary, until cone surface has been restored and finish is smooth.
7. Clean fitting thoroughly to remove all chips and residue.



Connection Type	Reamer Complete	Guide Nut Assembly	Reamer	Handle
SF250CX	P-0270CX	A101A-2005	P-0270	202D-0596
SF375CX	P-0271CX	A2020-7310	P-0271	202D-0596
SF562CX	P-0272CX	A2030-7310	P-0896	202D-0596
SF750CX	P-1726CX	A102A-3376	P-1726	201D-0595
SF1000CX	P-1727CX	A102A-3375	P-1727	201D-0595
SF1500CX	91409	-	91409-R	-
F250C	P-0270C	A1010-0453	P-0270	202D-0596
F375C	P-0271C	A1020-0453	P-0271	202D-0596
F562C	P-0272C	A1030-0453	P-0272	202D-0596
F562C/C40	P-0272C	A1030-0453	P-0272	202D-0596
F562C40-312	P-0272C	A1030-0453	P-0272	202D-0596
F1000C43	P-1727CX	A102A-3375	P-1727	201D-0595
F250C100	P-0271C150	A2040-7310	P-0271	202D-0596
F375C100	P-0271C150	A2040-7310	P-0271	202D-0596
F562C100	P-0272C	A1030-0453	P-0272	202D-0596
F312C150	P-0271C150	A2040-7310	P-0271	202D-0596

Operation: Hydraulic Tube Bender (HTB)



Required Air Pressure: 30 psi (2.1 bar) minimum 120 psi (8.3 bar) maximum.

Reservoir Capacity: 24 cu. in. (393cm³).

Available with optional hydraulic pressure gauge and gauge adapter. A lubricator/air separator is recommended for air operated units.

HTB Bend (Mandrel) Radius

Shoe Catalog Number	Tube Size Inches (mm)		†† Rated Pressure (bar)	†† Bend Inside Radius inches (mm)	Minimum Length Required 90° Bend inches (cm)
	Outside Diameter	Inside Diameter			
201A-6014	1/4 (6.35)	.083 (2.10)	60,000 (4137)	1.75 (44.5)	8 (20.3)
201A-6014	1/4 (6.35)	.109 (2.77)	20,000 (13794)	1.75 (44.5)	8 (20.3)
201A-6014	3/8 (9.53)	.125 (3.18)	60,000 (4137)	1.75 (44.5)	8 (20.3)
201A-6014	3/8 (9.53)	.203 (5.16)	20,000 (13794)	1.75 (44.5)	8 (20.3)
N/A **	5/16 (7.94)	.062 (1.57)	150,000 (10342)	6.00 (152.4)	8 (20.3)
201A-6016	9/16 (14.29)	.188 (4.78)	60,000 (4137)	2.62 (66.5)	14 (35.6)
201A-6016	9/16 (14.29)	.250 (6.35)	40,000 (2758)	2.62 (66.5)	14 (35.6)
201A-6016	9/16 (14.29)	.312 (7.92)	20,000 (13794)	2.62 (66.5)	14 (35.6)
201A-6016	9/16 (14.29)	.359 (9.12)	15,000 (1034)	2.62 (66.5)	14 (35.6)
201A-6018	3/4 (19.05)	.438 (11.13)	20,000 (13794)	3.50 (88.9)	16 (405.6)
201A-6018	3/4 (19.05)	.516 (13.11)	15,000 (1034)	3.50 (88.9)	16 (40.6)
201A-6020	1 (25.4)	.438 (11.13)	43,000 (2965)	4.62 (117.3)	22 (55.8)
201A-6020	1 (25.4)	.562 (14.27)	20,000 (13794)	4.62 (117.3)	22 (55.8)
201A-6020	1 (25.4)	.688 (17.48)	15,000 (1034)	4.62 (117.3)	22 (55.8)

Annealed Parker Autoclave Engineers pressure tubing may also be bent on HTB tube bender using bending shoe sizes specified above.

* HTB bending shoes are constructed of heat-treated aluminum alloy and designed specifically for use with Parker Autoclave Engineers' heavy wall stainless tubing. They are not intended for bending such components as commercial pipe. Because of diameter differences, such misuse could fracture the bending shoe.

** Information on bending 150,000 psi (10342 bar) tubing is included here for reference only. This tubing should not be bent on HTB hydraulic tube bender because of the 6" required minimum radius.

†† Pressure rating of the bent tube will be reduced. Consult the Technical Application section for pressure rating at various bend radii, or contact Technical Help department with tube OD, ID, and Bend Radius for assistance (IPDAETech-nical@parker.com)

All dimensions for reference only and subject to change.

Single Pass Bending: High Pressure Tubing

The Parker Autoclave Engineers hydraulic tube bender is designed for 1/4" to 1" heavy wall tubing and provide fast, accurate and reliable bending with only one setup. The tube bender is complete with pump, cylinder, frame and bending shoes which are self contained in a portable, lockable case.

(Order number: **HTB**)

HTB Features:

Dimensions: 27.5"W x 14.0"H x 14.0"D
69.9cm x 35.6cm x 35.6cm).

Weight: 55 lbs. (29.9 Kg)

Single-stage hydraulic hand pump (standard)

Ram retractor valve relieves system pressure after bending. The spring loaded ram retracts for easy removal of tubing after bending is completed.

Quick release pivot pins lock and unlock easily for tube removal.

One-piece shoe locking pin locks bending shoe securely but allows for quick release to interchange shoes.

Rugged bending frame is lightweight, aircraft quality, aluminum alloy.

Precision one-piece bending shoes are permanent mold, heat-treated, aircraft quality, aluminum alloy.

Air-operated hydraulic pump option can be furnished in place of standard hand pump. (Add "-A" to order number) Operating pressure 0 to 10,000 psi (0 to 690 bar).

Maintenance: Lubrication Guide

General Information

For reliable operation and long life of hand valves, air valves, relief valves, check valves and safety heads, Parker Autoclave Engineers strongly recommends proper lubrication of all components that are subject to friction during assembly and /or operation. This is especially important where metal to metal contact occurs such as on connection gland threads, packing gland threads and stem threads. Without proper lubrication, the high loads imposed on these threads may cause the parts to weld (or gall) together from the high metal to metal contact forces and friction heat. Lubrication is also essential for the effective sealing and long life of o-rings, especially those that are used in dynamic sealing applications. The performance of metal to metal seals will be improved with lubrication but, they do not absolutely require it.

Lubricant selection is strongly dependent on the application of the given component. Process fluids, fluid temperature, ambient environment temperature, materials and other factors are important in selecting a lubricant. This manual gives some basic guidelines in the proper selection and application of lubricants. The end user must ultimately determine the suitability of a lubricant based on process requirements.

Note: Parker Autoclave Engineers assumes no liability in selecting lubricant for customer applications.

Lubrication Sites

1. Speedbite, Medium Pressure and High Pressure Connections in all valves and fittings

- Prior to assembly, the connection gland should be lubricated on the threads and on the area that is in contact with the sleeve or collar. Parker AE provides as standard a dry molybdenum disulfide lubricant on Speedbite glands unless specified otherwise. If process tolerable, a small amount of any lubricant (or process fluid) on the end of the tube cone or connection sleeve will help to maximize the metal-to-metal sealing process. This inherently provides for better sealing of gases.

2. Hand Valves - Ideally, the non-rotating stem should be lubricated along the shank that fits into the threaded stem sleeve as well as on the surfaces that are in contact with the stem washers. The threaded stem sleeve should be lubricated on the stem threads and at the ends (see Figure 1). The packing gland should be lubricated on the external threads and on the end that is in contact with the packing washer. For valves with replaceable seats,

the external threads on the seat retainer and the portion of the seat retainer in contact with the seat should be lubricated.

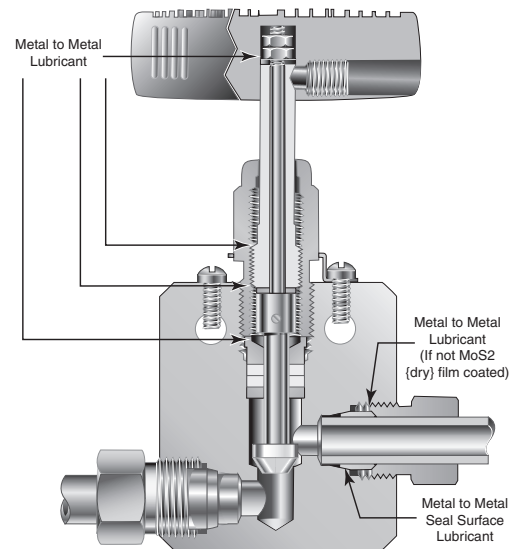


Figure 1
Hand Valve Lubrication Sites

3. Air Valves - The packing gland and seat retainer (if the valve has a replaceable seat) should be lubricated in the same manner as the hand valve. Threads should also be lubricated on all of the yoke screws (for yoke style valves) and on the retainer insert (on other air operated valves).

For piston type air operators, o-ring lubricant should be applied to the inside of the operator housing, on the center rod and on all the o-rings, on the pistons and divide plates.

4. Check Valves - The gland nut should be lubricated on the external threads and at the end where it contacts the cover. The cover should be lubricated at the sealing surface where it contacts the body. For o-ring check valves, a small amount of o-ring lubricant on the o-ring will help swell the elastomer and aid sealing. Refer to Figure 3 for lubrication sites on check valves.

Maintenance: Lubrication Guide

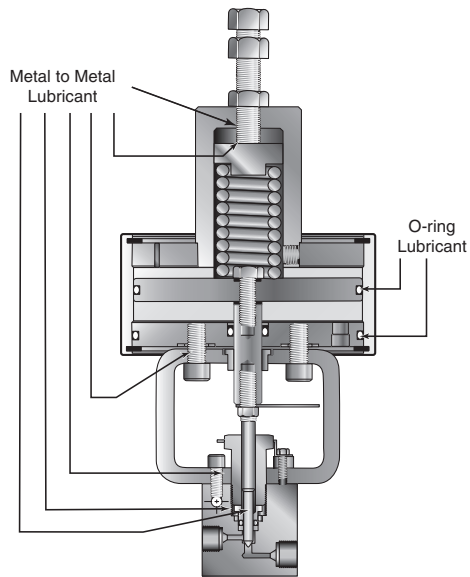


Figure 2
Air Valve Lubrication Sites

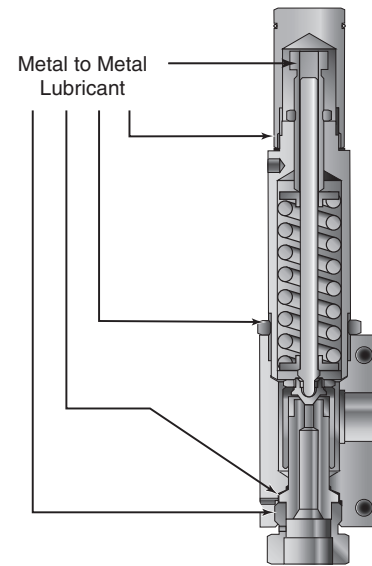


Figure 4
Relief Valve Lubrication Sites

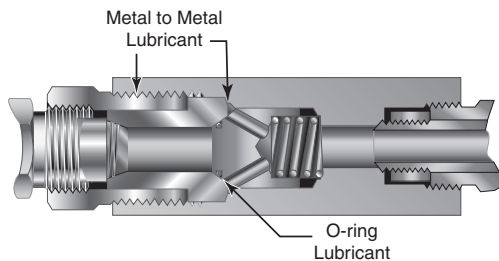


Figure 3
Check Valve Lubrication Sites

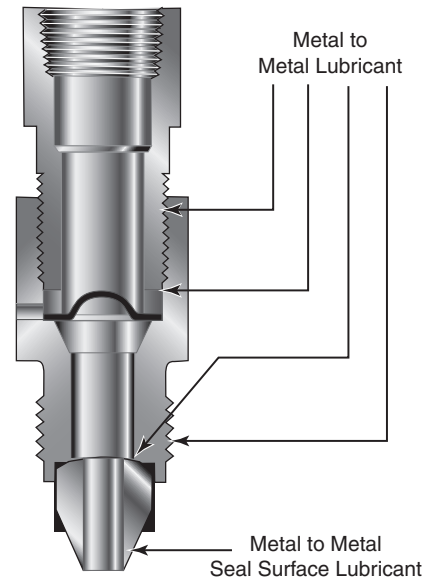


Figure 5
Safety Head and 2-piece Male/Female Adapter
Lubrication Sites

5. **Relief Valves** - Threads should be lubricated on the cap, spring cylinder, adjustment bolt and on the seat gland. Refer to Figure 4 for lubrication sites on the relief valve.

6. **Safety Heads** - The threads and end of the hold down nut should be lubricated. Refer to Figure 5 for lubrication sites on the safety head.

Maintenance: Lubrication Guide

Parts that will move against each other during assembly or operation should be lubricated at the points/areas of contact.

Recommended Lubricants

Note: This information is provided for reference only. The manufacture of the lubricant should be contacted for specific information based on your application. Refer to the material safety data sheets for information on safe usage and storage methods for these lubricants.

1. Jet Lube SS-30™ - This lubricant consists of pure copper flakes that are homogenized into a non-melting, nonvolatile viscous carrier. It is fortified with anti-oxidants, rust and corrosion inhibitors. Jet Lube SS-30 is the standard lubricant for Parker Autoclave VFT components with sliding metal to metal contact surfaces. The surfaces are copper coated and prevents seizure, galling and heat freeze. SS-30 comes in the form of a thick oil that can be easily brushed on the surfaces to be lubricated. The absolute service temperature range is from -65° to 1800°F (-55 to 982°C). Jet Lube SS-30 is not recommended for extreme low temperature applications or processes that will not tolerate the presence of copper.

2. Jet Lube MP-50 Moly Paste - This is a thick paste that contains molybdenum disulfide (MoS₂). This lubricant is suitable for preventing seizure and galling of parts at absolute temperatures of -300 to 750°F (-184 to 399°C). It is recommended for metal to metal components that are exposed to temperatures of less than 0°F. Other lubricants may solidify under these conditions and prevent the effective operation of dynamic components.

3. DuPont Krytox 240AC - Krytox is a non-flammable fluorinated grease used for metal to metal lubrication in valves that are cleaned and designated for oxygen service. It comes in the form of a white grease and has a recommended absolute service temperature range of -15 to 500°F (-26.1 to 260°C).

4. Molykote® 55 O-ring Grease (See also DC 111) (Dow Corning) - This grease is used for static lubrication between rubber and metal parts in actuators, ball valves and o-ring check valves. It is a silicone based lubricant and meets Military Specifications MIL-G-4343. It is not recommended for use on silicone rubber o-rings and seals. It has a recommended absolute service temperature range of -85 to 350°F (-65 to 177°C).

5. Neolube DAG 156 - This is a dry film lubricant for valves used in Navy Nuclear service. It consists of graphite particles in a thermoplastic resin and isopropanol and meets Military Specification MIL-L-24131B. The dry film form allows tight control of impurities that are required for these applications. It has an absolute service temperature of -100 to 400°F.

6. Lubriplate Pure Tac, NSF H-1 Registered, Extremely Tacky, Food Grade Greases - This grease is used for dynamic lubrication between rubber and metal parts in pneumatic systems such as piston style air operators. A tacky, adhesive, highly water resistant grease for medium to slow dynamic speeds. It has a recommended absolute service temperature range of 0 to 350°F (-17.8 to 177°C).

Maintenance: Lubrication Guide

Lubrication Selection Guide

Lubrication	Part Number	Application	Absolute Service Temperature Range
Jet-Lube SS-30	P-3580 (1 lb.) P-3580-8 (8 oz.)	Metal to Metal, Standard	-65°F to 1800°F (-18°C to 982°C)
Jet-Lube Moly Paste MP-50	1lb = P-9766	Metal to Metal, Low Temperature	-300°F to 750°F (-185°C to 398°C)
Krytox 240 AC	53893	Metal to Metal, Oxygen Clean Components	-15°F to 500°F (-26°C to 260°C)
MolyKote 55 Dow Corning	90085	O-ring and Packing Lubricant	-85°F to 350°F (-65°C to 177°C)
Neotube DAG 156	90406	Metal to Metal, Nuclear Service	-100°F to 400°F (-73°C to 204°C)
LubriPlate Pure Tac	P-9981	Food Service O-ring Lubricant	0°F to 350°F (-18°C to 177°C)

Notes:

Specific applications may require other service temperature ranges.

¹SS-30 and MP-50 Moly Paste are registered trademarks of Jet Lube Inc.

²Krytox is a registered trademark of E.I. duPont de Nemours & Co., Inc.

³DAG is a registered trademark of Acheson Industries, Inc.

⁴Molykote and Dow Corning are registered trademarks of Dow Corning Corp