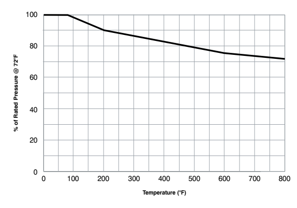
Technical Information

CERTIFIED
ISO-9001:2000



MAXIMATOR has been designing and manufacturing high pressure equipment for more than thirty years and has a worldwide reputation for quality and reliability. Our work is based on a certified quality management system (DIN EN ISO 9001) - the fundamental asset for successfully implementing technical knowledge and experience in the field of compl x systems.

Product features:

- Maximator´s Quality Management System meets all requirements of DIN EN ISO 9001, TÜV Certification
- All valves, fittings and tubing a e designed in accordance with the European Pressure Equipment Directive 97/23/EC.
- Pressure vs. Temperature chart for 316 cold worked stainless steel.

At Maximator our industry experience is unparalleled. Wheter General Industrial, Oil & Gas, Water Jet, Chemical or Petrochemical applic tions, our teams of experienced engineers and highly trained professionals have worked in the high pressure industry for decades and are prepared to support your needs. Our guiding principles are safety, quality and dependability. Our comprehensive inventory will ensure quick delivery that is unmatched in today´s environment.

Note: When selecting multiple items, the pressure rating would be that of the lowest rated component.

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Technical Information

» Pressure vs. Temperature Chart

Technical Information

The information in this section is presented as general data for assisting a user in the selection of valves, fittings and tubing for elevated pressure and/or temperature applications in liquid or gas plumbing systems.

Maximator´s medium, high and ultra-high pressure valves, fittings and tubing are good for most services from light vacuum up to 152,000 psi, depending on the pressure series selected. Coned and threaded type tube fittings, standard on all Maximator valves and fittings, can be used for most liquids and gases including lighter gases such as Hydrogen and Helium.

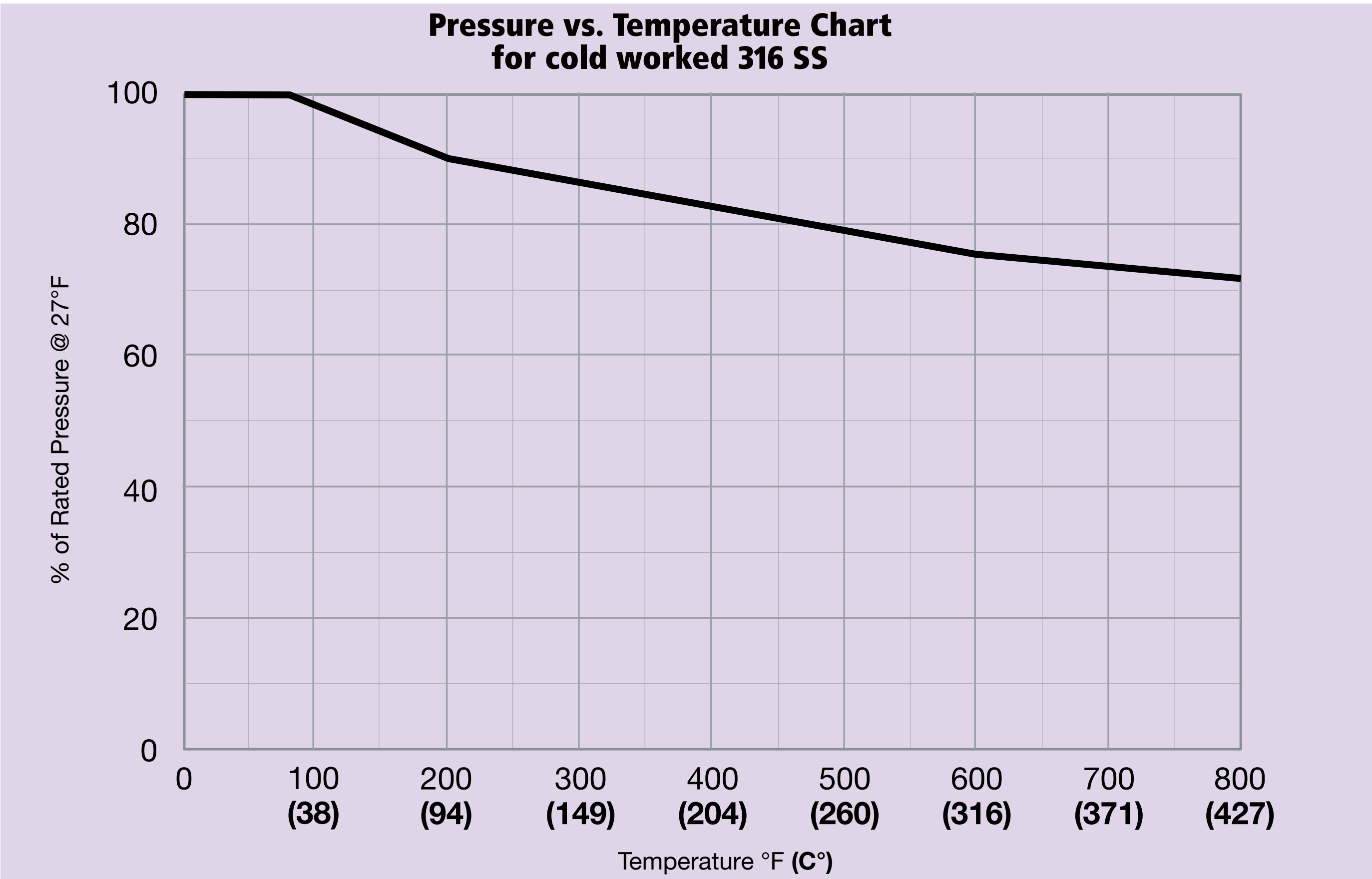
Compatibility of the valve, fitting and tubing materials with the actual process fluid is ultimately the responsibility of the user.

Maximator can assist in applications but is not an authority on all process fluids. Some special applications such as Oxygen service require special cleaning and that option is available from Maximator.

Below is a reference chart showing the effects of pressure versus temperature of cold worked 316 stainless steel material.

Other factors such as creep resistance, packing design and materials, corrosion resistance, cyclic conditions, and other process variables may affect the use of components at elevated temperatures. Consult factory when operating above 800°F.

Pressure vs. Temperature Chart for cold worked 316 SS



Note: The above pressure temperature chart is for 316 cold worked materials, this chart does not account for the temperature rating of packing or o-ring material which could be the limiting factor. Contact factory for other material limitations.

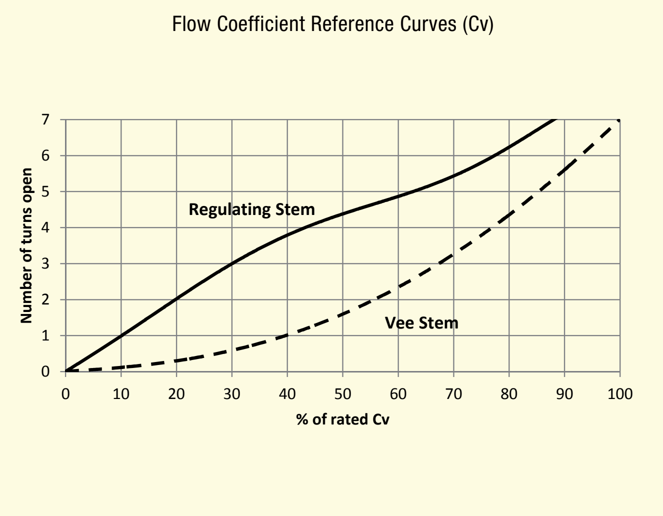
Temperature Table Valves, Fittings and Tubings

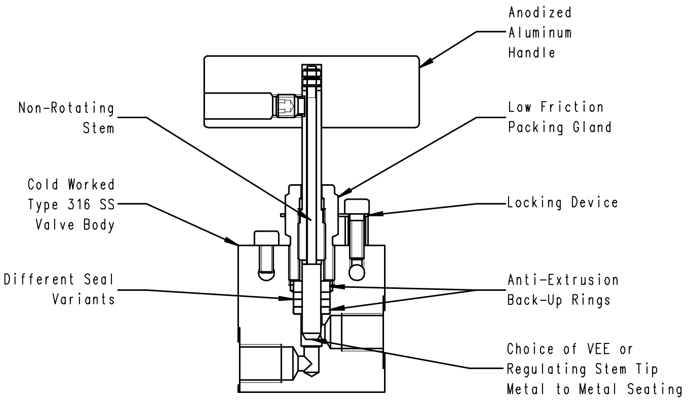
Series	Product	Medium Temperature min.	Medium Temperature max.	Ambient Temperatur	Remarks
Medium Pressure, High Pressure and Ultra High Pressure Series Tubing and Fittings	TU, N, F, X, T, L, BF, A, AVA, C, G, M, P, TC, UF	-423°F **(-252°C)**	1200°F **(650°C)**		
Pipe Fittings	F, X, T, L, BF	-330°F **(-200°C)**	520°F **(270°C)**		Recommendation: 1°F **(-17°C)** to 400°F **(204°C)** depending on application
Pipe Valves	15V.....	-60°F **(-50°C)**	450°F **(230°C)**		Recommendation: 1°F **(-17°C)** to 400°F **(204°C)** depending on application
	15V.....-B	-100°F **(-73°C)**	300°F **(150°C)**		
Medium Pressure Valves, High Pressure Valves	21V..... - 65V.....	-60°F **(-50°C)**	450°F **(230°C)**	-4°F to 140°F **(-20°C to 60°C)**	
	21V.....-B - 65V.....-B	-100°F **(-73°C)**	300°F **(150°C)**		
	21V.....-TG - 65V.....-TG	-60°F **(-50°C)**	600°F **(315°C)**		
	21V.....-GY - 65V.....-GY	-60°F **(-50°C)**	800°F **(425°C)**		
	21V.....-HT - 65V.....-HT	-60°F **(-50°C)**	1200°F **(650°C)**		
	21V.....-LT - 65V.....-L	-423°F **(-252°C)**	450°F **(230°C)**		
Ball Valve	..B......	-4°F **(-20°C)**	300°F **(150°C)**		
Check Valves	...OC.. (Standard: FKM)	-4°F **(-20°C)**	390°F **(200°C)**		depending on O-Ring Material
	...BC..	-330°F **(-200°C)**	660°F **(350°C)**		
Safety Head Assembly	...SH..	-423°F **(-252°C)**	660°F **(350°C)**		
Filter	...DF..	-423°F **(-252°C)**	660°F **(350°C)**		
	...CF..	-423°F **(-252°C)**	660°F **(350°C)**		
Rupture Disc	RD-...	-100°F **(-73°C)**	660°F **(350°C)**		Burst Pressure set at 68°F **(20°C)**, other-wise Temperature needs to be specifie
Actuator	.....Y.....	-60°F **(-50°C)**	450°F **(230°C)**	-4°F to 140°F **(-20°C to 60°C)**	
	...-B-Y...	-100°F **(-73°C)**	300°F **(150°C)**		
Ball Valve Actuator	DA/SA	-4°F **(-20°C)**	300°F **(150°C)**	-4°F to 200°F **(-20°C to 95°C)**	
	EL/EH			-0,5°F to 160°F **(-18°C to 70°C)**	

Pipe Valves

1

Pressures to 15,000 psi (1,050 bar)



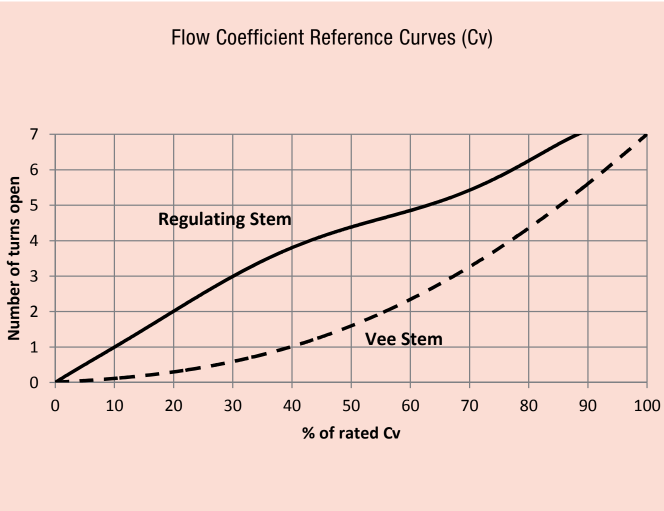


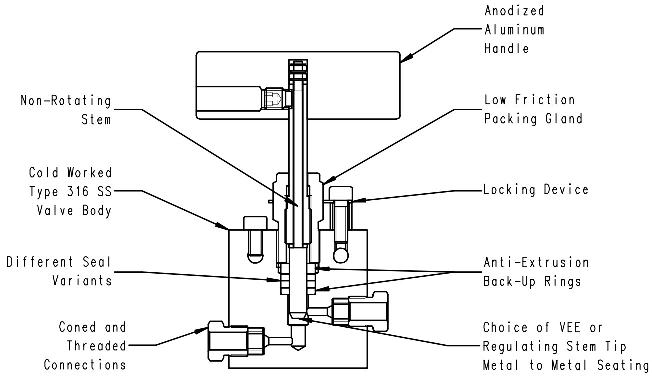
Valve Shown: 15V4B071

Medium Pressure Valves

2

Pressures to 22,500 psi (1,550 bar)

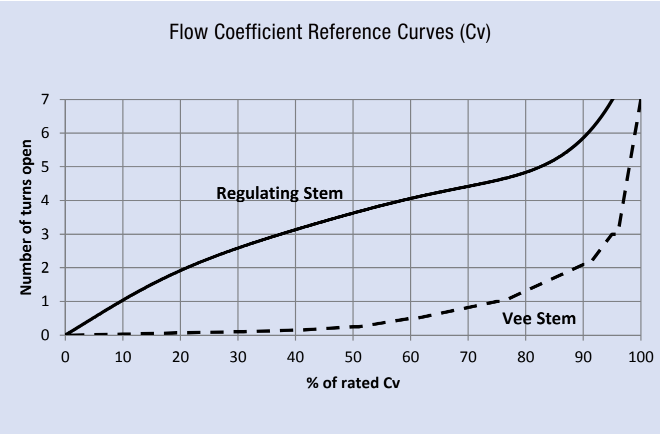


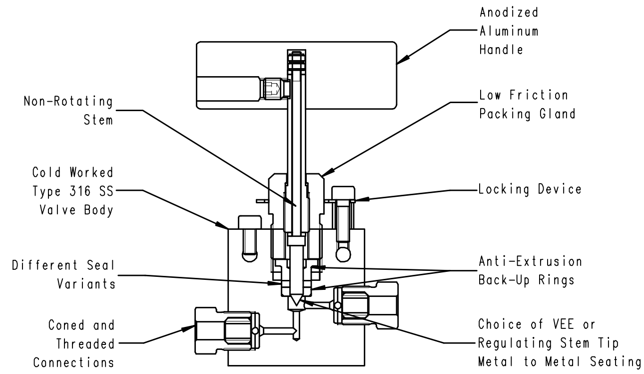


Valve Shown: 21V4M071

Products for Sour Gas Applications
Pipe Valves & Fittings to 15,200 psi (1,050 bar)
Adapters and Couplings
Medium Pressure to 22,500 psi (1,550 bar)
Accessories
High Pressure to 65,000 psi (4,500 bar)
Tools
Ultra High Pressure to 152,000 psi (10,500 bar)
Technical Information
Valve Actuators
Customized Solutions
Ball Valves to 21,000 psi (1,500 bar)

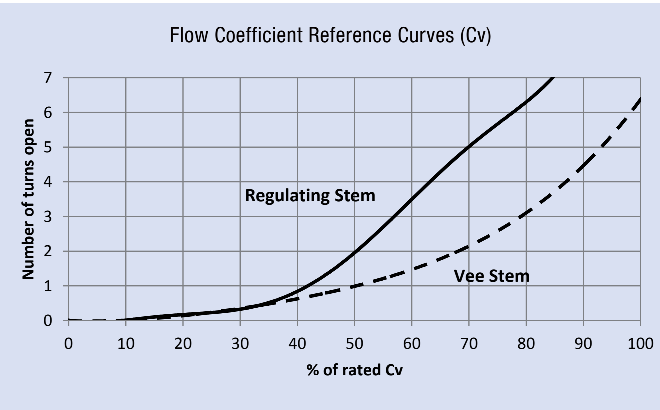
Pressures to 36,000 psi (2,500 bar)

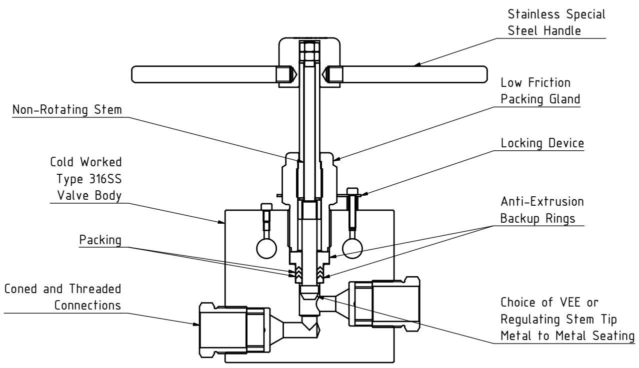




Valve Shown: 36V4H071

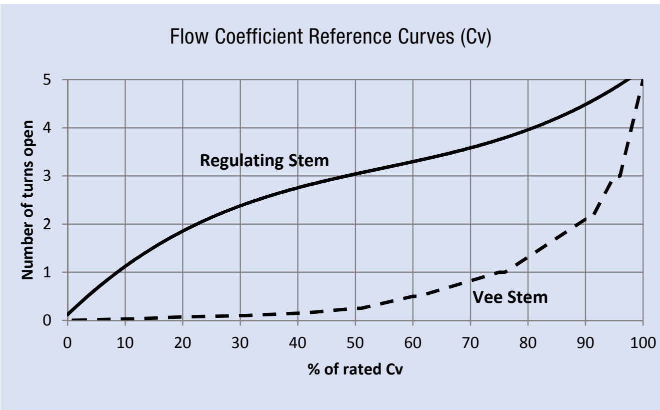
Pressures to 43,000 psi (2,965 bar)

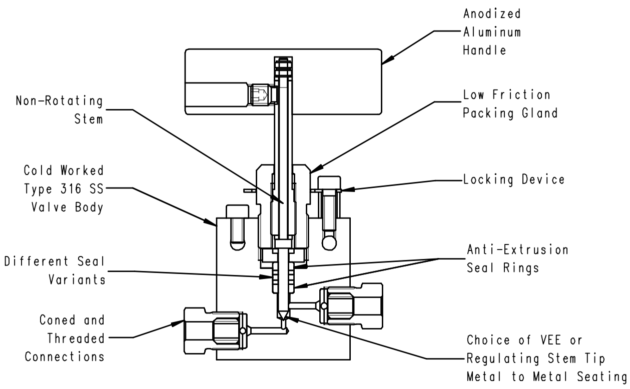




Valve Shown: 43V16M071

Pressures to 65,000 psi (4,500 bar)





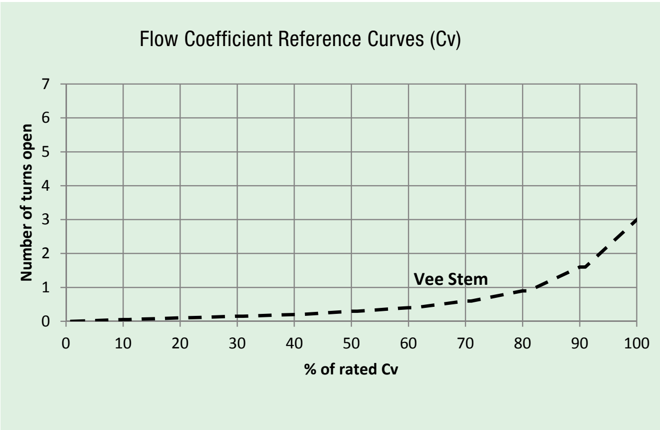
Valve Shown: 65V4H071

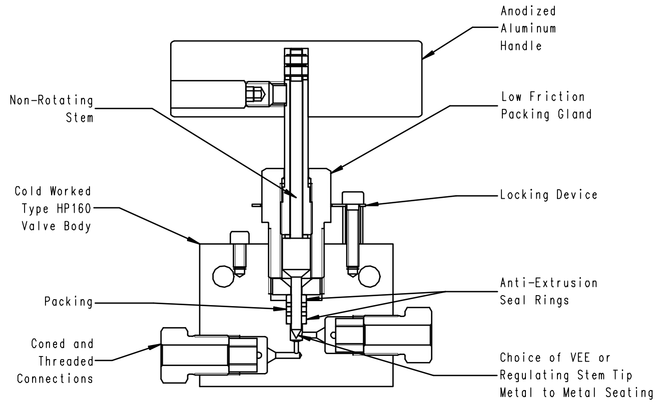
Products for Sour Gas Applications
Pipe Valves & Fittings to 15,200 psi (1,050 bar)
Adapters and Couplings
Medium Pressure to 22,500 psi (1,550 bar)
Accessories
High Pressure to 65,000 psi (4,500 bar)
Tools
Ultra High Pressure to 152,000 psi (10,500 bar)
Technical Information
Valve Actuators
Customized Solutions
Ball Valves to 21,000 psi (1,500 bar)

Ultra High Pressure Valves

4

Pressures to 101,000 psi (7,000 bar)

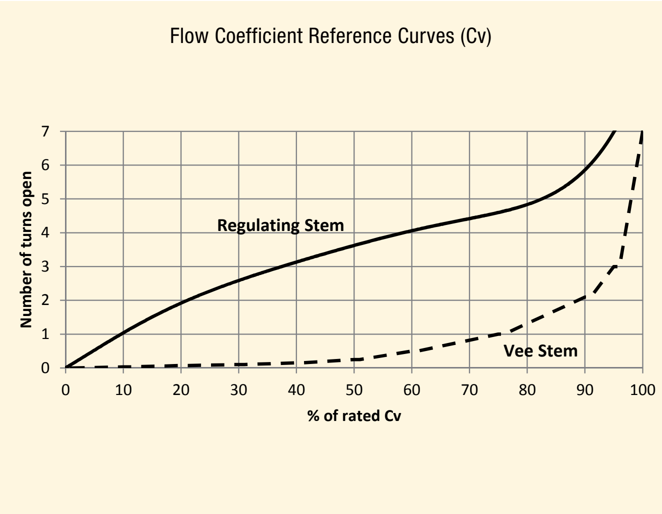


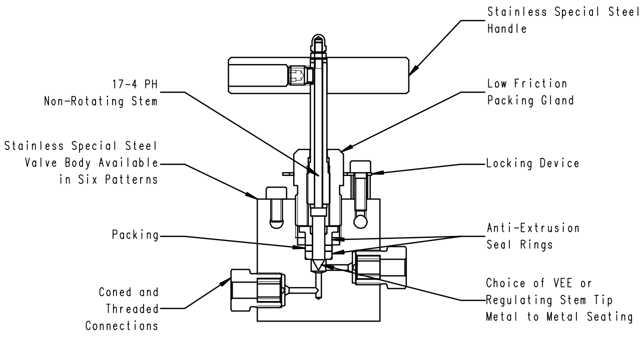


Valve Shown: 101V5UO71

High Pressure Valves for Sour Gas Applications

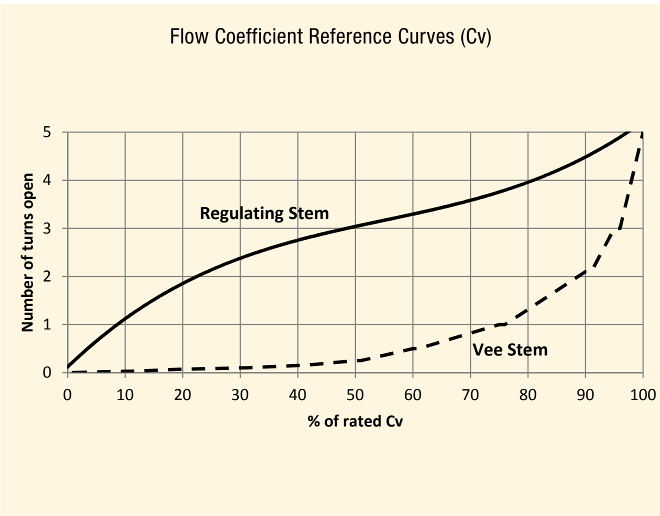
Pressures to 22,500 psi (1,550 bar)

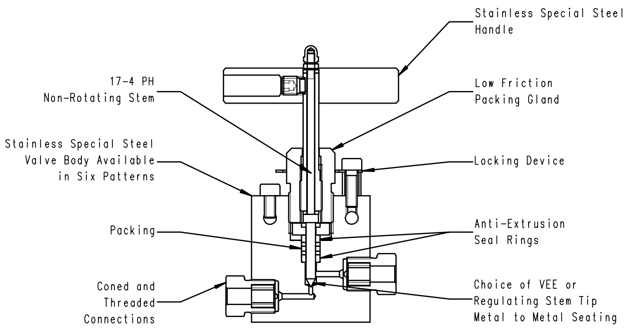




Valve Shown: 22V4H071-SOG

Pressures to 30,000 psi (2,070 bar)





Valve Shown: 30V4H071-SOG

Assembly instructions and technical data

» Valves | Fittings | Tubing

Products for Sour Gas Applications
Pipe Valves & Fittings to 15,200 psi (1,050 bar)
Adapters and Couplings
Medium Pressure to 22,500 psi (1,550 bar)
Accessories
High Pressure to 65,000 psi (4,500 bar)
Tools
Ultra High Pressure to 152,000 psi (10,500 bar)
Technical Information
Valve Actuators
Customized Solutions
Ball Valves to 21,000 psi (1,500 bar)

Index

1. Basic Information

Pipe systems play a central role in process technology and many other industrial areas. Most hydraulic systems designed for transporting fluids or gases work under complex operating conditions which is why the components and the screw connections needs to satisfy exacting requirements.

Information about the document

The document provides the specialist with an overview of the technical data and assembly options of the MAXIMATOR valves, fittings and tubing.

This documents looks at the respective functional principle of the components with all required application data. It also provides information about assembly, dismantling, maintenance and servicing.

The relevant accident prevention regulations and other generally accepted safety requirements must be complied with.

WARNING!

This combination of the symbol and signal word refers to possible hazardous situations that can lead to light, minor, major or even fatal injury if they are not avoided.

NOTE

This combination of the symbol and signal word refers to a possible hazardous situation that can lead to property and environmental damages if they are not avoided.

Tips and recommendations

This symbol highlights useful tips, recommendations and information for efficient and trouble-free operation.

2. High pressure fluid systems: operating conditions

The underlying conditions that need to be taken into account when designing fluid systems and selecting materials and components include the pressure levels, dynamic loads, high and low temperature, and the properties of the fluid.

High pressures of up to 10,500 bar and the dynamic loads, i.e. the alternating pressure exerted onto the components of a high pressure system, make exacting demands of the stainless steel that is used. These materials must have high strength and also be highly ductile. Another important criterion is the media-resistance of the materials. Therefore, austenitic stainless steel materials are usually used for tubing, fittings and valves.

It is recommended using autofrettage parts for applications that lie in the limit ranges of pressure resistance where dynamic loads are expected and therefore where the service life of the components must be optimised.

The process fluid also needs to be taken into account, because the components that transport light gases, such as hydrogen and helium, are much more difficult to seal than tubing carrying liquids, especially when they are pressurised.

Infobox Autofrettage:

Autofrettage (French.: Auto: self; frettage: creation of tensions) refers to a method for enhancing durability, in particular of pressure-cycle stressed components. Exerting a very high pressure (of up to 15,000 bar) into the part subject to internal pressure creates residual stress between the inner and the outer wall of the part that counters the premature failure due to fatigue breakage.

As a general rule: the higher the pressure range of a valve or fitting, the lower the probability of leaks for light gases. This principle also applies when selecting tubing because higher wall thicknesses for small pipe diameters provide better sealing surfaces.

Likewise, the choice of various components depends heavily on the fluid medium. Needle valves are much more suitable than ball valves for gases, and ball check valves are better for fluids and applications with high flow speeds. O-ring check valves are generally better suited for gases and applications with low differential pressures.

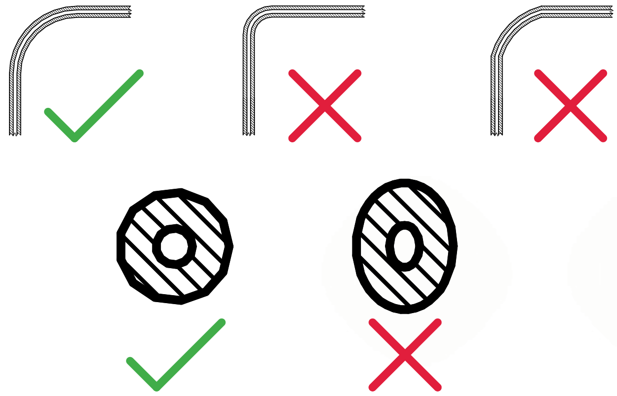
Products for Sour Gas Applications
Pipe Valves & Fittings to 15,200 psi (1,050 bar)
Adapters and Couplings
Medium Pressure to 22,500 psi (1,550 bar)
Accessories
High Pressure to 65,000 psi (4,500 bar)
Tools
Ultra High Pressure to 152,000 psi (10,500 bar)
Technical Information
Valve Actuators
Customized Solutions
Ball Valves to 21,000 psi (1,500 bar)

3. Handling of high pressure tubing

MAXIMATOR high pressure tubing are made of high-quality cold-worked stainless steels and are drawn without joints. They are used in all high pressure equipment, partially for extremely high pressures and for fluids and gases. Some aspects need to be taken into account when handling high pressure tubing:

- As the high pressure tubing are made of a cold-worked stainless steel they need to be protected against being heated to over 800°F (427°C) (see also Pressure vs. Temperature Chart for cold worked 316 SS on page 2 of this chapter). Heating above and beyond would weaken the material.
- For this reason, the high pressure tubing must not be welded or soldered.
- When bending tubing, the recommended minimum bending radii (see Attachment 13.4) need to be observed. A bending radius that is too small exerts excessive loads onto the tubing. Also, the cross-section of the high pressure tubing may not deform. No kinks may occur during the bending process. We recommend a bending tool with dies specific to the pipe diameter.
- Autofrettage tubing lose their better durability properties when shaped. Therefore, they may not be bent nor bent first before the autofrettage process.

The following figures show how to handle high-pressure tubing correctly:



4. Screw connections in fluid systems

All screw connections in fluid systems have the task of connecting components reliably without leaks. The systems primarily differ in the way they are sealed and the way they are connected to the pipe.

There are various screw connection systems available for modern hydraulic systems. In addition to pipe thread connections, cutting ring connections, clamping ring connections, flanged screw fittings or cone or threaded connections are used.

Selection criteria
Choosing a suitable screw connection system primarily depends on the pressure within the fluid system, however, the sealing method and its functional principle is also an important criterion: a differentiation is made between metallic and soft-seal systems.

Another aspect that needs to be taken into account, especially in the case of soft-sealing systems, is the property of the fluid. In addition, the temperature(s) of the fluid and the environment, flow parameters such as flow rate and fluid viscosity, space requirements and installation conditions, the tube bending procedure and various ambient influences also need to be considered.

In some cases, other requirements need to be considered when selecting the screw connection system depending on the application. The selection options are also extensively restricted by international standards, specifications defined by the operator or approval regulations. The following Table provides an overview of the screw connection systems often used in fluid systems and their applications:

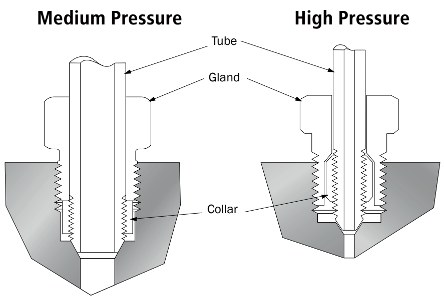
Screw connection system	Application	Typical rated pressures
Pipe thread screw connection	Hydraulic- and pneumatic applications, mobile hydraulics	approx. 1.050 bar
Compression fitting	Tool and Construction machines	approx. 700 bar
Cutting ring screw connection	Process engineering, Ship-building and offshore	approx. 1.000 bar
Flanged screw fitting	General and heavy engineering	approx. 500 bar
Coned and threaded screw connection	High Pressure Hydraulic and Pneumatic, Test equipment	approx. 10.500 bar

If fluid systems need to be designed for high pressures of more than 1.000 bar or if pressure peaks in these ranges need to be taken into account, the use of the cone and threaded screw connection is almost obligatory. The reason why these so-called high pressure screw connections are used for rated pressure levels of up to 10,500 bar is connected to the type of seal and the force required. High pressure screw connections primarily comprise three components:

- **Specially processed tubing end**
  A cone with an inclination of 58° and a left-handed thread (usually UNF) is cut onto the end of the tube.

- **Collar**
  The collar is screwed onto the left-handed thread and serves force transmission.

- **Gland**
  The gland serves to connect with the counter-piece into which a cone with an angle of 60° is cut. By screwing the pressure screw into the connection borehole with a defined torque, the tube/collar connection is pressed into the cone and mutually seal.



Structure of a high-pressure screw connection

» Assembly Instructions:

1. Insert the gland onto the tubing. Thread the left handed collar onto the tube until at least one or two threads are exposed from the tapered coned end.

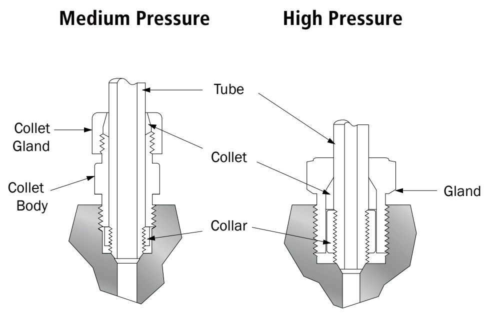
2. Apply a compatible lubricant to the gland threads and the back side of the collar where it comes in contact with the gland. Also lubricate the tapered cone portion of the tube. This will help protect the sealing surfaces from galling during the assembly process.

3. Insert the tubing into the connection and tighten the assembly hand tight. Then use a torque wrench to tighten the connection to the appropriate value in the table of attachement 13.1. It is good practice to use an additional wrench to preventthe opposite connection from turning.

This type of connection ensures that the sealing surface between the tube and the counterpiece is as small as possible (In this way, the sealing force is kept as low as possible). To ensure that the connection does not tear in the event of a leak, there is a relief borehole in the counterpiece to which the tube is connected.

If the cone and threaded connections are used in systems in which external forces (e.g. vibrations) impact on the fluid system, the resulting torsion forces can release high pressure screw connections. Therefore anti-vibration screw connections are particularly recommended for these types of applications. The tables of attachement 13.1 and 13.2 state the prescribed torques for the respective screw connection type.

The torsion forces generated as a result of system vibrations are only absorbed by the cone and the collar in standard high pressure screw connections. Anti-vibration screw connections also have an additional collet. The clamping surface acts onto the outer diameter of the high pressure tube. This means that the surface that absorbs the torsion forces is significantly increased thereby preventing the screw connection from becoming loose.



Structure of an anti-vibration screw connection

» Assembly Instructions:

1. The High Pressure Anti-Vibration Collet Gland Assembly can be installed using the same procedure as the standard coned and threaded connection (see above steps 1 to 3 but with torque values of 13.2). The high pressure collet grips the tube when the connection gland is tightened.

2. When using the Medium Pressure Anti-Vibration Collet Assembly, the procedure is the same as that of the standard coned and threaded connection (see above steps 1 through 3) with the additional step below.

3. Once the Collet Body has been tightened to the approriate torque value, use the torque wrench to tighten the Collet Gland to the appropriate value in the table of attachement 13.2. This will compress the Collet against the tube.

5. Valves: Structure, types, accessories (drives) and use

Due to the fact that high or low temperatures and fast heating or cooling speeds can impact on the sealing capability of the metal seals, the valve series should be selected after taking into account both the pressure resistance and also the static and dynamic temperature conditions. As a general rule: the smaller the sealing surface, the higher the temperature resistance. The following shows the types, design, the differences and the application ranges of these functional parts.

In the high pressure valve field a differentiation is made between needle valves and ball valves. Whilst needle valves are available for applications of up to 10,500 bar, ball valves are only designed for maximum 1.500 bar.

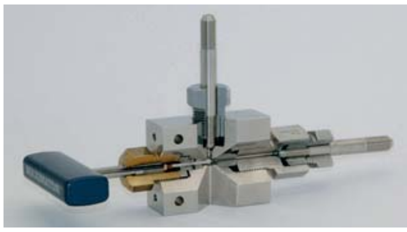


Figure 1

Figure 1 shows the structure of a needle valve. This valve is a 2-way angle valve with a replaceable valve seat. Also available are 2-way straight valves, 3-way valves with one or two pressure inlets and 3-way valves with 2-Stem for the pressure ranges Medium Pressure (1,550 bar) and High Pressure (4,500 bar).

The 2-way straight valves, 2-way angle valves and 3-way / 2-way pressure inlets are available for applications in the Ultra High Pressure (7,000 bar) range.

Figure 2 shows all components of the example valve 65V4H081. It is a straight valve. Depending on the specified pressure range, adjustments can be made regarding the seal packing. (For more information, see chapter 5.2)

When choosing for the application, it is not only the options that relate to the extreme temperature conditions that are important but in particular the shape of the valve spindle. Here, a differentiation is made between three different spindles (see table below):

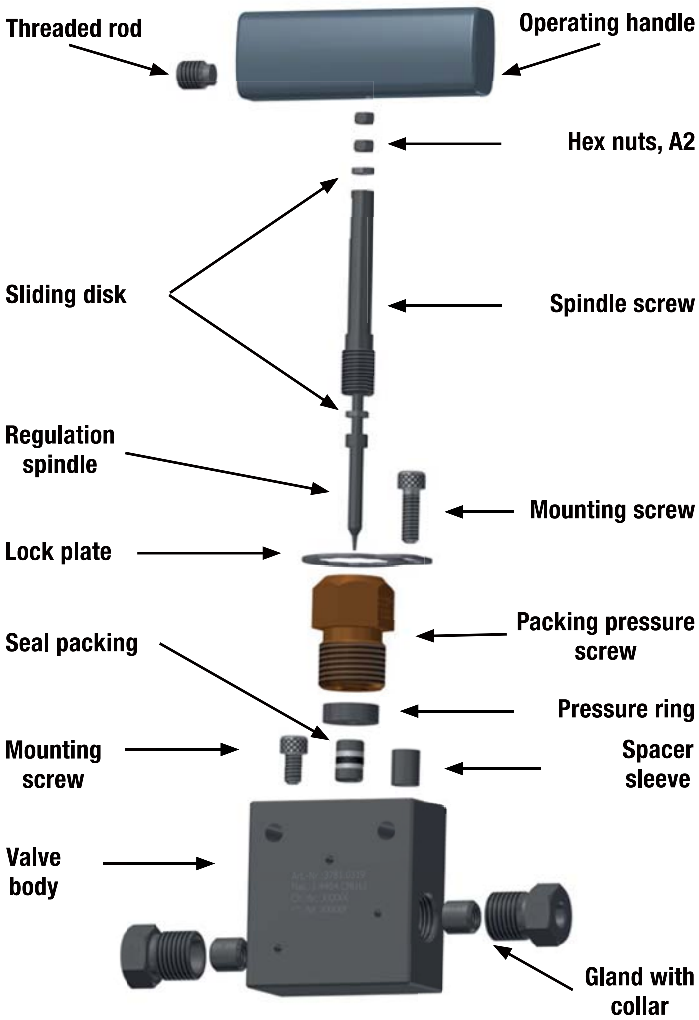


Figure 2

Important design features of the needle valves are the non-rotating stem and the metal-on-metal seal. The non-rotating stem effectively reduces the wear on the tip of the stem and the seat because the rotational movement when activating the valve is not transferred to the stem in a positive-lock manner. The metal-on-metal seal ensures high protection against corrosion and high durability.

Stem Type	Description	Use
V-stem	On/Off stem	Shutoff valve
Regulation stem	Conical stem tip	Throttle valve/shutoff valve
Micrometer stem	Fine dosage valve also with micrometer scale	Dosing of small reproducible flow rates

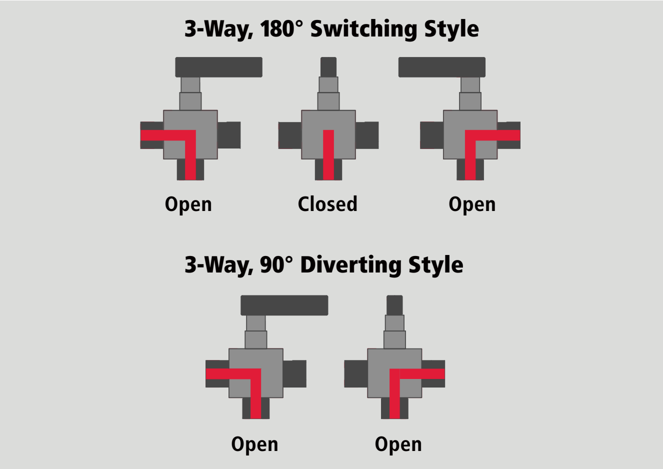


Figure 3

Ball valves are available as 2-way and 3-way model and are designed for closing/opening applications. The 3-way model is also available as a 90° switch and also 180° switch version (middle setting closed) (see also Fig.3). Compared to 2-part stem, ball valves with trunnion mounted, single-part valve stems prevent shear fracture and also reduce the impact of lateral forces.

Compared to the needle valves, ball valves have the advantage of faster actuation. Also, it is visible from outside at all times whether the valve is closed or open. A disadvantage is the sealing functionality. The use of ball valves for e.g. light gases is therefore not recommended.

There are pneumatic valve drives for automatic actuation of the manual valves. Depending on the application, drives of the type ‚Normal closed' or ‚Normal open' are used for needle valves. There are pneumatic and also electrical drives available for the ball valves.

pneumatic actuator (normal open)

pneumatic actuator (normal closed)

electrical actuator

Needle Valves | **Ball Valves**

5.1 Repair of seal and valve stems

If you detect leaks in ball valves, they will need to be repaired by trained specialists. Independent repairs are not advisable due to the construction situation. If the manual valve starts to leak, follow the defined steps to seal the valve again correctly.

NOTE

! The minimum and maximum allowed temperature ranges of the suitable seals, screw connections or materials are stated in the Temperature Table on page 2 of this chapter.

Check seals and adjust if necessary

1. Depressurise the valve and remove it from the fluid system.
2. Ensure that the valve stem is in the fully open position.
3. Release the lock plate of the packing pressure screw
4. Attach the valve securely and tighten the packing pressure screw to the value stated in the product catalogue using a torque wrench. If you do not have a torque wrench, tighten the packing pressure screw by turning 1/16 of a turn.
5. Exert maximum pressure onto the valve to check the valve for leaks.
6. If there are still leaks on the valve seat or the packing, completely relieve the valve and repeat steps 4 and 5. If the seal still does not seal correctly after a few further attempts, the stem or possibly the seal need to be replaced. (See the paragraph below)
7. If the system is tight again, install the packing pressure screw and locking plate as specified.

Replace the seals or the valve stem

1. Repeat the upper steps 1-3 again.
2. Attach the valve securely and loosen or remove the packing pressure screw. The seal is automatically removed if the stem tip has a diameter larger than the seal parts. This applies to stems of the series 1/2“ upwards. The seals need to be removed separately in the case of smaller valves.
3. MAXIMATOR manual valves are available with various stem models: single-part rotating/non-rotating; two-part stem [optionally with replaceable seat]. When replacing single-part non-rotating stems steps 4 to 7, two-part non-rotating spindles steps 8 to 9 and for rotating stems step 10.

Single-part non-rotating stems:

4. In the case of valves less than 1/2“, the seal packing that comprises a collar, sealing ring and support ring must be removed. Replace the seal packing and insert into the valve body. If the stems does not need to be replaced, also screw the packing pressure screw into the body of the valve and tighten it to the torque stated in the document.

5. Remove the handle from the stem by releasing the threaded pin with an Allen key. Then unscrew the stem from the packing pressure screw. Now remove the two hex nuts and the sliding disk on the upper part of the stem. Dismantle the existing part into its three components. To do this, pull the stem screw and the second sliding disk from the stem. In the case of valves with a larger stem tip, the pressure ring and seal also need to be removed. (see also Fig. 4)

6. Clean the sliding disks and all surfaces that come into contact with the sliding disks with a clean cloth. Use a non-hardening lubricant and lightly coat the surface of the slide ring and the threads of the stem screw.

7. In the case of stems with large stem tips, place the lower sliding disk, the seal and the sealing rings into the stem. The following applies to all other valves: start with the lower sliding disk and place this onto the stem before you connect these two parts with the stem screw.
   Now place the second sliding disk onto the stem screw. Then screw the first hex nut against the upper sliding disk and thread the stem completely into the packing pressure screw. Insert the packing pressure screw into the body of the valve and tighten to the torque stated in the document. Open the valve completely. Turn back one turn to achieve a little clearance.
   Now tighten the hex nut by hand and turn about 1/8-turn further with a wrench. In the next step, the second hex nut is inserted and also tightened by hand. Now hold the upper hex nut tight and release the lower hex nut from the sliding disk. Lock the lower hex nut with a 1/16-turn against the upper hex nut. Finally, place the hand piece onto the stem and connect both with each other by turning the threaded pin into the designated surface of the stem screw. (Caution! Do not turn too far).
   To achieve a non-rotating stem, the clearance between the stem screw and the shaft must be retained. The handle should have a maximum free travel of 10°. If the clearance is too large, the handle will need to be removed again and the upper hex nut loosened. Tighten the lower hex nut against the sliding disk. Attach the upper hex nut in compliance with the instructions above and check the system for clearance.
   If the defined free travel is satisfied, you can attach the handle again as described above. In a final step, the locking plate must be mounted.

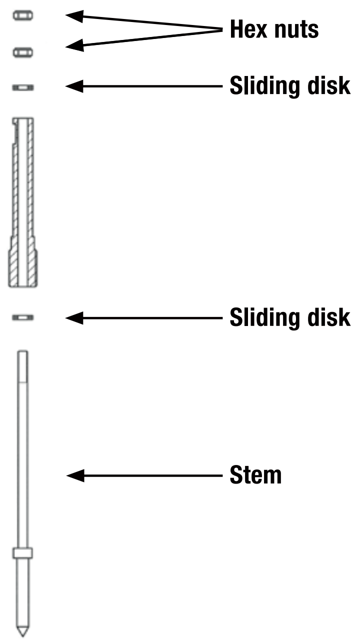


Figure 4

Two-part non-rotating stems:

8. In the case of valves with high or low temperature modifications, the sealing rings and the seal can be replaced. If a smaller stem is used, the casing and the support ring need to be removed from the old stem and attached to the new stem. Then place the lower sliding disk, the seal and the sealing washer onto the smaller stem. Then join the smaller stem to the larger one.
9. Use a non-hardening lubricant with a high percentage of solid lubricant (recommen-dation: pastes such as OKS 245) for the threads of the stem screw. Then screw the stem screw completely to the packing pressure screws or the valve seat so that the stem is in an open position. Whilst the casing is firmly clamped in a vice, tighten the packing pressure screw with the torque stated in the document (see chapter 7) and then tighten the lock nut. Use silicone grease or a similar lubricant for the sealing sur-faces of the support rings. Also coat the threads with a non-hardening lubricant with a high percentage of solid lubricant (recommendation: pastes such as OKS 245) before screwing the casing into the body of the valve. Please note the torques stated in the document (see attachement 13.3) and then secure the casing with the lock plate.

Rotating stem:

10. Remove the handle from the stem and release the stem from the packing pressure screw. Use a non-hardening lubricant with a high percentage of solid lubricant (recommendation: pastes such as OKS 245) for the threads of the new stem and screw these completely into the packing pressure screw. Align the threaded pin with the stem so that it engages on the flat surface of the stem and then screw the handle tight. Together with the inserted lower sliding disk, the seal and the sealing washer in the body of the valve, the packing pressure screw can be tightened to the torque stated in the document (see attachement 13.3). Finally, mount the locking plate.

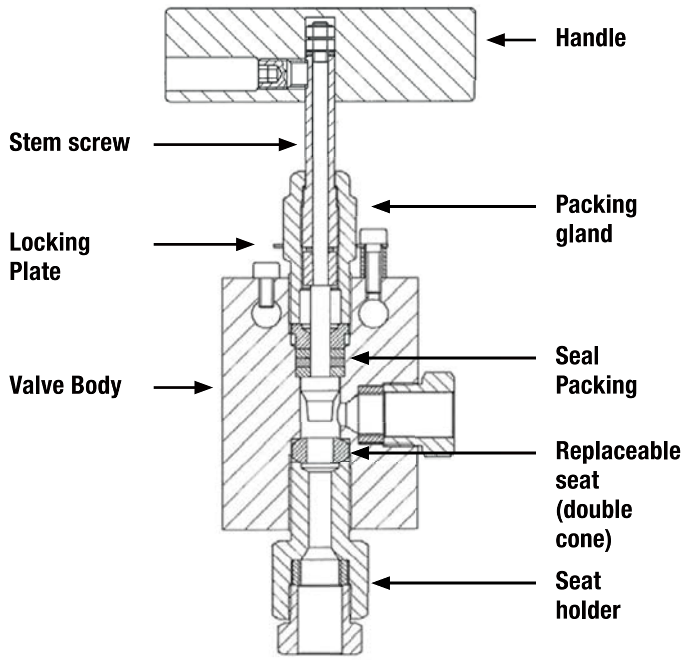


Figure 5

Replacement of the valve seat

1. Depressurise the valve and remove it from the fluid system. Ensure that the valve stem is in the fully open position.
2. Remove the seat holder whilst the valve body is firmly clamped into place.
3. Remove the old seat and replace if necessary.
4. Use silicone paste or a similar lubricant for all sealing surfaces of the seat. Use a non-hardening lubricant with a high percentage of solid lubricant (recommendation: pastes such as OKS 245) for the threads of the seat holder.
5. Replace the seat and the seat holder. Ensure that the seat is placed flush on the body of the valve. Tighten the seat holder with the torque stated in the document (see attachement 13.3).

5.2 Seal: Structure and composition of the standard packing

The sealing material used are generally PTFE and carbon sealing washers with a metallic or plastic back up. However, the packing can be adapted in a number of ways depending on the purpose of the valves. The item numbers of the packing are stated in the technical drawings or can be requested from MAXIMATOR GmbH.

Figure 6: Sealing washer (middle) and back up washers (example 21V9M packing)

Figure 6 shows the components of a packing of the valve series 21V9M. The middle ring (black) is a sealing washer. These all look the same for all packing and are made of PTFE and carbon. Only the dimensions of the sealing washers vary depending on the valve series. On the outside you can see both back up washer variants. On the right (shiny) is a metallic back up washer (material 1.4404 [316L]) and on the left (white) a plastic ring (material PEEK).

Depending on requirements, the compositions of the back up washers may vary for different valve series.

During assembly ensure that the sealing washer is always located between the pressure ring and at least one back up washer. The sealing washer can therefore never form the last part of the packing. (Exception 22V…-SOG & 36V series)

In some cases the sealing washer is surrounded by two back up washer. (See also Fig.7 & Fig.8)

Figure 7: Spindle with packing single (example 21V4M /21V6M)

Figure 8: Spindle with packing together (example 21V4M /21V6M)

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NOTE

! The back up washer that make up the closure of the seal packing, i.e. those closet to the stem tip, must always be mounted with the chamfered side facing the stem tip.

One special case involves packing of the valve series with borehole diameters of 3/4“ (12M) and 1“ (16M). In this case, two sealing washer are used and all parts are delivered as ‚serrated‘. The design is shown in figures 9 to 11.

Figure 10: Structure parts packing 12M/16M

Figure 9: Components packing 12M/16M

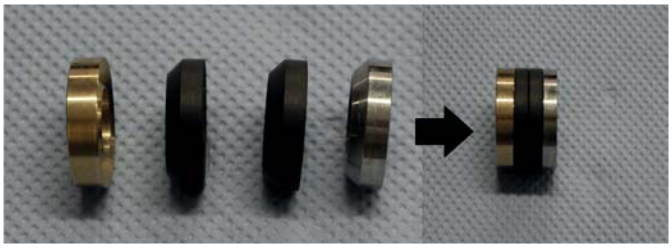


Figure 11: Assembly sequence packing 12M/16M

6. Functional principle and technical data

	Needle Valves	Ball Valves
Method of functioning / Use	Pressure-sealed shutting off of liquids and gases	
Type of load	Valves are designed for static loads. Life expectancy of the valves is reduced under dynamic load conditions.	
Media temperature	-50°C up to +230°C (-60°F up to +450°F) Max. pressure drops with rising temperature. (see P/T diagram)	-20°C up to +150°C (-4°F up to +302°F) Max. pressure drops with rising temperature. (see P/T diagram)

	Air actuated Y.NO, Y.NC - Valves	Air actuated valves
Method of functioning / Use	Designed or pressure-sealed shutting off of fluids and gases. The valves are operated through pneumatic cylinders. 3/2-way pneumatic valves are recommended as drive units.	
Type of load	Valves are designed for use under static loads. Use under dynamic loads will reduce the valves' life expectancy.	
HP media	Only media included in our media resistance list may be employed.	
Drive media	Valve selection may only be performed with compressed air or an inert gas until a pressure of 10 bar.	
Media temperature	For the Actuator: -30°C up to +95°C (-22°F up to +203°F)	For the Actuator: -30°C up to +80°C (-22°F up to +176°F) -50°C up to +150°C (-58°F up to +302°F) for the HP-sealing Max. pressure decreases with rising temperature.
Max. air drive pressure	See table for the corresponding valve type	
Material of air actuator	anodized aluminum	
Air connection	1/8 NPT female	

	Check Valves	Disc-, Cup-Type-, Angel-Filter, Filterinlets
Method of functioning / Use	Used to shut off flow in one direction and for pressure-sealed conveyance of liquids and gases	Filters collect solid matter particles from passed through fluids and gases. The maximum filter differential pressure is 10 bar. The characteristic filter curves indicate maximum throughput rates. Please, not that the differential pressure rises with increasing soling. Hence, replace filter cartridges in good time.
Type of load	Designed for static loads. Life expectancy of the valves is reduced under dynamic load conditions.	
Media temperature	O-ring non-return valve: FKM O-ring: -20°C up to +200°C (-4°F up to +392°F) NBR O-ring: -50°C up to +100°C (-58°F up to +212°F) Ball-type non-return valve: -200°C up to +350°C (-330°F up to +662°F) Caution: Selection of the O-ring depends on the media to be used! Max. pressure drops with rising temperature. (see P/T diagram)	-252°C up to +350°C (-423°F up to +662°F) Max. pressure drops with rising temperature. (see P/T diagram)

	Fittings, Adapter	High Pressure Connections
Method of functioning / Use	Pressure-sealed conveyance of liquids and gases	Pressure-sealed connection of HP components, plugs for pressure-sealed closing of HP connections.
Type of load	Designed for static loads. Life expectancy of the reducing pieces is reduced under dynamic load conditions.	
Media temperature	-252°C up to +650°C (-423°F up to +1200°F) Max. pressure drops with rising temperature. (see P/T diagram)	-20°C up to +150°C (-4°F up to +302°F) Max. pressure drops with rising temperature. (see P/T diagram)

	Rupture disks
Method of functioning / Use	The MAXIMATOR rupture disks are only designed for use in MAXIMATOR safety head assamblies with the collar safety heads 3771.1092 or 3781.1092.
Orifice	¼“ (6.35mm)
Rupture range	See type plate
Temperature	-73°C to +350°C (-100°F to +660°F) - bursting pressure in relation to 20°C
Type	flat to 600 bar or hat-shape from 600 bar

7. Installation

7.1 Needle valves & ball valves

Valve (for front panel installation):

1. Release threaded pin, pull operating handle from the stem.
2. Dismantle cylinder screw and lock plate.
3. The manual valve can now be attached in a front plate using the cylinder screw. The installation position can be selected freely (if necessary a longer cylinder screw may be required for thicker front plates).
4. Insert operating handle onto the stem screw again and tighten using the threaded pin with max. 8 Nm for 1/4“, 3/8“ and 9/16“ 4500bar (thread M8); 12 Nm for 9/16“ 1550 bar, 5/16“, 3/4“ and 1“ (thread M10).

NOTE

! Securing the manual valve on the two designated attachment boreholes is always recommended (except for front panel installation), because otherwise the screw connections could become loose when the valve is actuated.

Assembly of high pressure tubes:

1. Slide the glans over the HP tube.
2. Screw on the collar up to the end of the thread and turn back by one turn (left-handed thread). It should be noted that 1-2 threads should be left exposed between the sealing cone and the collar.
3. Screw the gland into the body connection drill hole and tighten with the specified torque according to the below table.

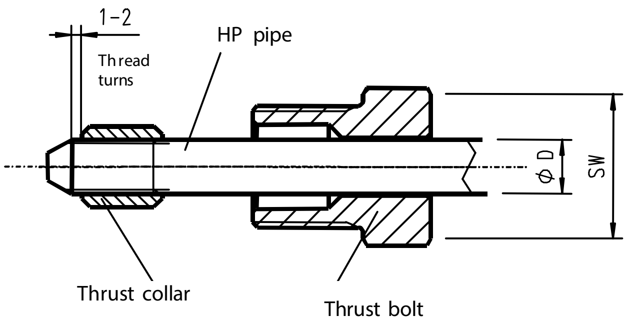
NOTE

! If possible (and if the medium allows it), use a suitable lubricant (e.g. copper paste) for all threads and sealing cones!

Tightening torque for pressure screws:

Pressure connec-tion	Tube connection dimensions	O.D. Tube	Gland Wrench size (WS)	Torque value
bar	Inches	mm	Inches (mm)	Nm
1550	1/4	6.35	1/2 (12.7)	28
	3/8	9.53	5/8 (15.9)	41
	9/16	14.30	15/16 (23.8)	75
	3/4	19.05	1-3/6 (30.2)	122
	1	25.40	1-3/8 (34.9)	204
2500 / 4500	1/4	6.35	5/8 (15.9)	34
	3/8	9.53	13/16 (20.6)	68
	9/16	14.30	1-3/16 (30.2)	150
7000	1/4	6.35	5/8 (15.9)	34
	3/8	9.53	13/16 (20.6)	68
	9/16	14.30	1-3/16 (30.2)	150
10500	5/16	7.94	3/4 (19.05)	95

(The torques may vary slightly for various lubricants.)



7.2 Pneumatically controlled Y.NO and Y.NC valves

The side boreholes (Ø 7 mm) in the yoke are intended for assembly of the valves.

NOTE

! Securing the manual valve on the two designated attachment boreholes is always recommended (except for front panel instal-lation), because otherwise the screw connections could become loose when the valve is actuated.

7.3 Disk, cup type and angle filters

During assembly, check the direction of flow. The angle filter should be installed so that the filter element can be replaced from below.

7.4 Fittings

Bulkhead fitting:

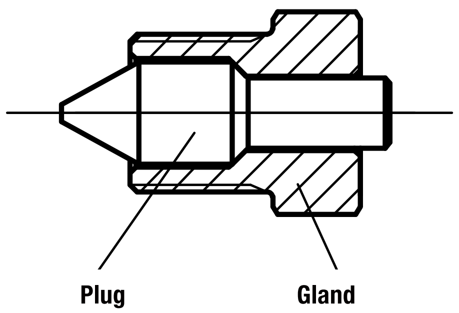
1. Release the hex nut from the screw connection.
2. Push the screw connection through the borehole (borehole diameter as stated in table below).
3. The re-tighten the hex nuts.

Type	Bore-hole diameter Inches (mm)
21BF4M	0.81 (20.6)
21BF6M	0.94 (23.9)
21BF9M	1.12 (28.5)
21BF12M	1.37 (34.8)
21BF16M	1.68 (42.6)
43BF16H	1.68 (42.6)
65BF4H	0.94 (23.9)
65BF6H	1.12 (28.5)
65BF9H	1.43 (36.3)
101BF4U	0.94 (23.9)
101BF6U	1.12 (28.5)
101BF9U	1.43 (36.3)
152BF5U	1.43 (36.3)

7.5 High-pressure screw connections

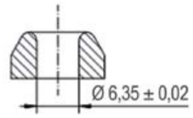
Plugs:

1. Push the plug into the gland.
2. Screw gland into the body connection and tighten with torque stated in the table: Tightening torque for pressure screws.



7.6 Rupture disks

Check the rupture pressure prior to rupture disk installation. To this end, the rupture pressure as indicated on the rupture disk must be compared to the value stated on the type plate. Sealing surfaces shall be inspected prior to assembly, if you wish to replace a rupture disk or want to place it in a used safety head assembly. Only intact surfaces en-sure proper function of components. Defective parts must be replaced. Also check the internal diameter of the hold-down ring. The borehole must lie within a tolerance range of 6.35 mm ± 0.02 mm. In case of deviation, replace the pressure piece.



NOTE

! A deformed hold-down ring results in rupture pressure modifications. Depending on rupture disk design (flat or hat-shaped) the rupture disk shall be assembled in front of or behind the hold-down ring.

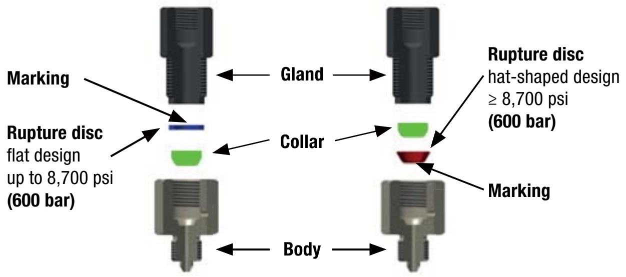


Figure 12: Rupture disk forms

The tightening torque for the hold-down nut based on a thread treated with lubricant paste is indicated on the rupture disk type label. Figure 12 shows the two rupture disk forms. This is a flat or hat-shaped rupture disk that can be used depending on the pressure requirements.

NOTE

! An unsuitable tightening torque results in leakages and modifi-cations of rupture pressure. If possible (and if operating conditions allow), use a suitable lubricant (e.g. copper paste) for all threads and sealing cones.

8. Deinstallation

Dismantling takes place in the reverse order of assembly.

NOTE

! Ensure that the system is depressurized before dismantling.

9. Maintenance

MAXIMATOR valves, fittings and tubing are generally maintenance-free.

Exceptions are the MAXIMATOR filters. The filter elements need to be replaced when soiled. A suitable interval for the regular exchange of the filter elements must be defined by the operator.

10. Maintenance and repair

Only qualified personnel may carry out repairs.

10.1 Needle valves, ball valves & pneumatic valves

Only qualified personnel may carry out repairs.

WARNING!

The NC valves have a tension spring and this must be released before opening the air drive. The spring may only be relieved and tighten when the valve is actuated (open position).

Fault	Possible cause	Remedy
Valve won't close	Stem and/or seat or ball seal faulty	Replace the stem. Replace the seat or body or ball seal
Medium escapes from the relief borehole at the Pressure connections	Incorrect assembly of the pressure connection	Check assembly.
	Cone surface damaged.	Rework the cone surface with the deburring tool or rework the pipe.
Medium escapes from the relief borehole during packing	Initial pressure on the packing seal is too low.	Packing gland must be adjusted to the respective torque value.
	Packing and/or stem damaged.	Exchange the damaged components.

All parts of the valves can be purchased as spare parts from MAXIMATOR GmbH. You will find the order numbers on the drawing included with each valve. Due to the fact that more than one seal or component is generally worn, we have created spare part kits. The compo-sition of the spare parts kits should be taken from the drawings where the corresponding order numbers can also be found.

When ordering spare parts, please state the order code and valve type that are printed on the valve body. We can also carry out repairs in our factory. Our qualified service technicians are available to help you.

Torque for packing gland:

Valve Type	Connection	Torque value
bar	Inches	Nm
1550	1/4	41
	3/8	41
	9/16	82
	3/4	150
	1	200
2500	1/4	61
	3/8	61
	9/16	61
4500	1/4	48
	3/8	48
	9/16	48
7000	5/16	82

10.2 Non Return valve

All parts of the non return valves can be purchased as spare parts from MAXIMATOR GmbH. When ordering spare parts, please state the order code and valve type that are printed on the return valve body. We can also carry out repairs in our factory. Our qualified service technicians are available to help you.

Fault	Possible cause	Remedy
The media leaks at the release drill hole for pressure connections.	Incorrect assembly of the pressure connection	Check assembly.
	Cone surface damaged.	Rework the cone surface with the deburring tool
Medium flows in shut-off direction	Seal / seat faulty	Replace seal / seat

10.3 Disc Line Filters

Before removing the filter elements, the filter must be dismantled as described below.

Removal of the filter element:

1. Release gland and removes with the plugs.
2. Press all filter elements with a plastic mandrel out of the

body of the filter.

3. Push the filter body over the caulking anvil. Direction of flow toward the caulking anvil.
4. Place the finer filter elements into the body of the filter first, and then caulk with the Maximator caulking mandrel and several hammer strikes.
5. Use a lamp to check if the filter leaks. If a gap of light is visible, the filter element needs to be compressed more strongly.
6. Place the distance washer into the filter body.
7. Insert the coarser filter washer and caulk.
8. Replace the plugs and pressure screws again. [200 Nm at 9/16" 1550 and 4500 bar; 150 Nm at 1/4" and 3/8" 4500 bar]

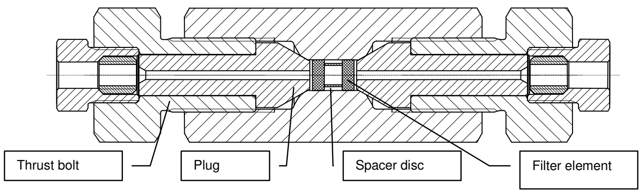


Figure 13: Structure of a disc filter

Fault	Possible cause	Remedy
Medium escapes from the relief borehole at the Pressure connections	Incorrect assembly of the pressure connection.	Check assembly.
	Cone surface damaged.	Rework the cone surface with the deburring tool

All parts of the disk filter can be purchased as spare parts from MAXIMATOR GmbH. When ordering spare parts, please state the order code and filter type that are printed on the filter body.

We can also carry out repairs in our factory. Our qualified service technicians are available to help you.

10.4 Cup-Type Line Filters

Before removing the filter elements, the filter must be dismantled as described below.

Removal of the filter element:

1. Loosen gland and remove with the filter seat.
2. Pull old filter element from the filter seat
3. Insert a clean filter element and knock lightly into the filter seat with a plastic hammer.
4. Re-insert the filter seat and screw-in the gland. [200 Nm at 9/16" 1550 and 4500 bar; 150 Nm at 1/4" and 3/8" 4500 bar ; 100 Nm at 1/4" and 3/8" 1550 bar]

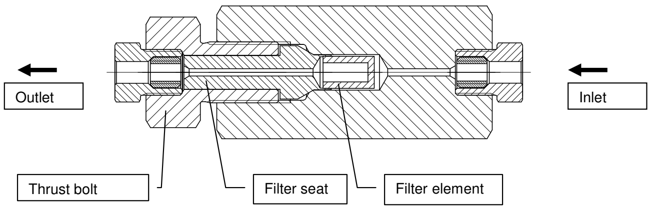


Figure 14: Structure of a cup/type filter

Fault	Possible cause	Remedy
Medium escapes from the relief borehole at the Pressure connections	Incorrect assembly of the pressure connection.	Check assembly.
	Cone surface damaged.	Rework the cone surface with the deburring tool

All parts of the cup-type filter can be purchased as spare parts from MAXIMATOR GmbH. When ordering spare parts, please state the order code and filter type that are printed on the filter body.

We can also carry out repairs in our factory. Our qualified service technicians are available to help you.

10.5 Angle filter

Remove the filter element without dismantling the entire filter from the pressure system (angle filter):

1. System must be depressurized.
2. Loosen gland and remove with the plug.
3. Loosen the old filter element carefully with a small screwdriver and remove.
4. Insert a clean filter element and knock lightly into the filter seat with a soft mandrel (plastic).
5. Re-insert the plug and screw on the gland with 150 Nm.

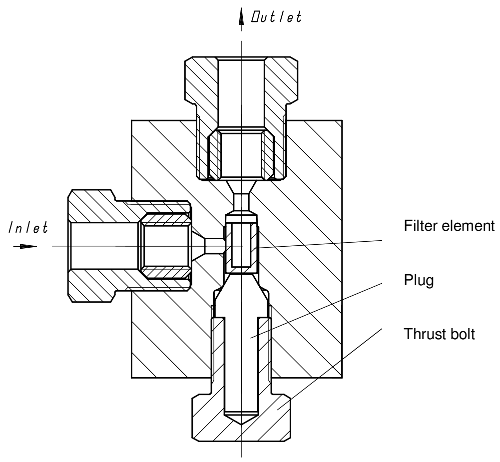


Figure 15: Structure of a angle filter

Fault	Possible cause	Remedy
The media leaks at the release drill hole for pressure connections.	Incorrect assembly of the pressure connection	Check assembly.
	Cone surface damaged.	Rework the cone surface with the deburring tool

All parts of the disk filter can be purchased as spare parts from MAXIMATOR GmbH. When ordering spare parts, please state the serial number, order code and filter type that are printed on the filter body.

We can also carry out repairs in our factory. Our qualified service technicians are available to help you.

10.6 Fittings & adapters & high-pressure screw connections

Fault	Possible cause	Remedy
The media leaks at the release drill hole for pressure connections.	Incorrect assembly of the pressure connection	Check assembly.
	Cone surface damaged.	Rework the cone surface with the deburring tool

All parts of the fittings can be purchased as spare parts from MAXIMATOR GmbH. You will find the order numbers on the drawing included with each fitting. Due to the fact that more than one seal or component is generally worn, we have created spare part kits. The compo-sition of the spare parts kits should be taken from the drawings where the corresponding order numbers can also be found.

11. Coning and Threading Tools

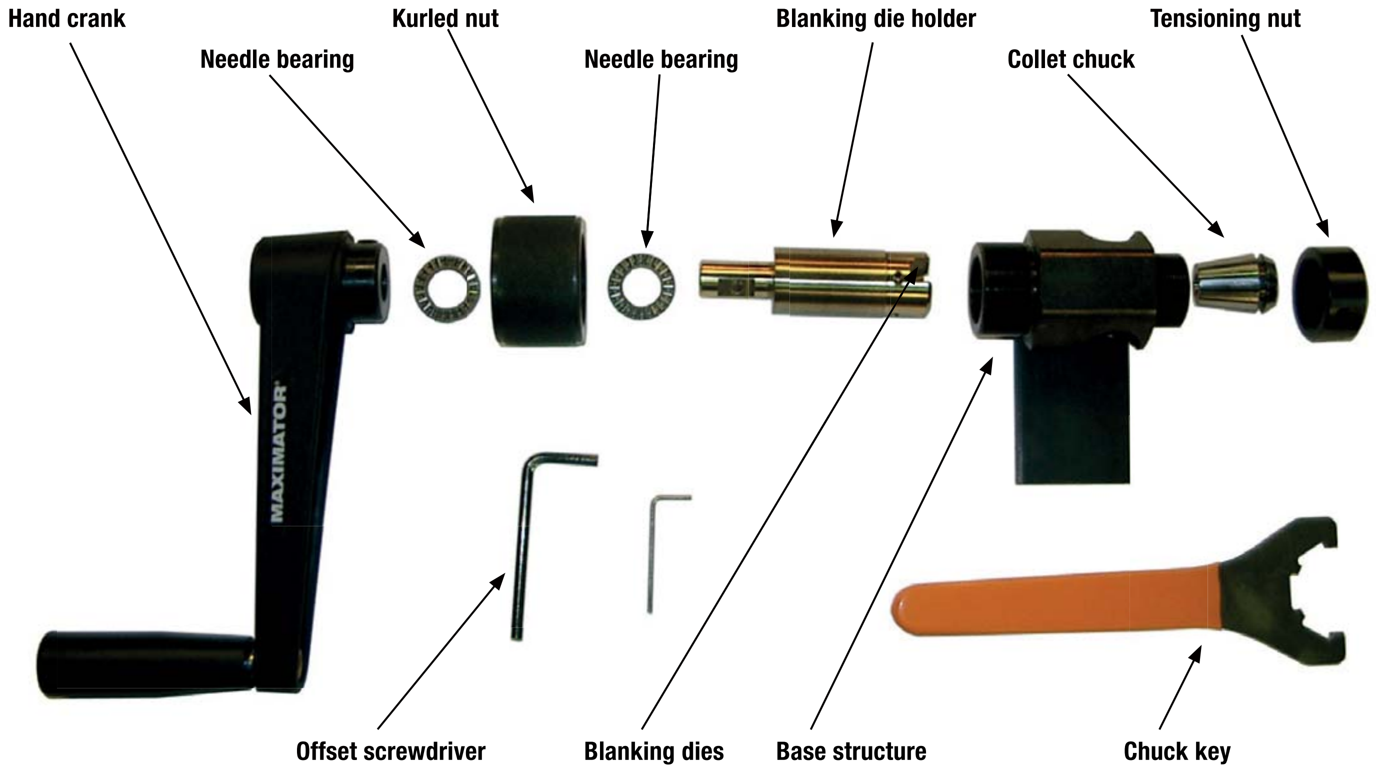
Functional principle / use:

The MAXIMATOR coning and threading tools must only be used for the finishing of high-pressure tubing.

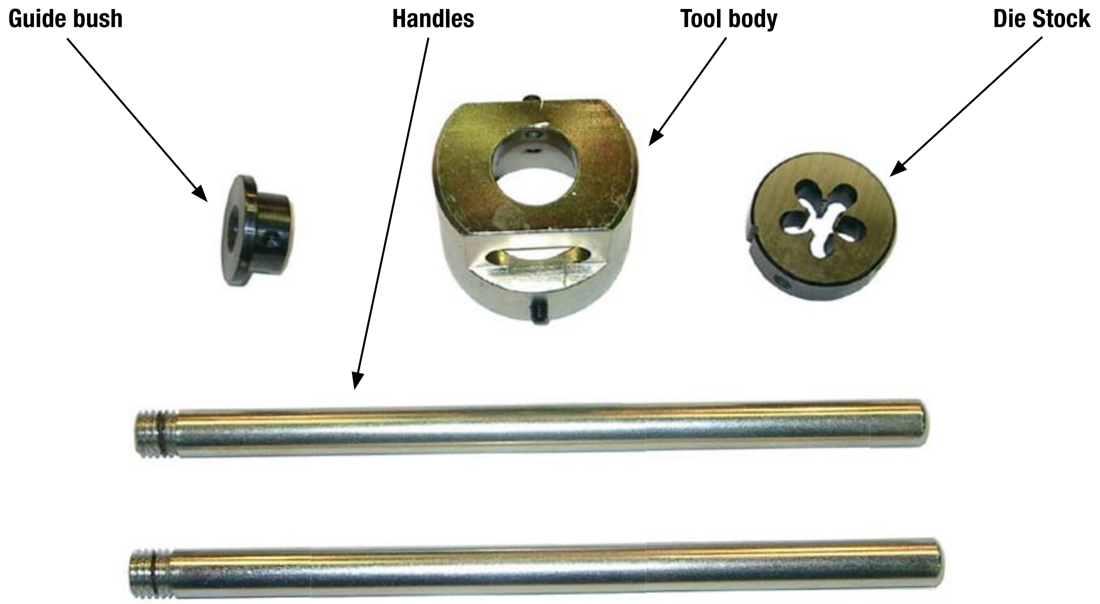
Most parts of the coning tool are identical for the various high-pressure con-nections. Only different collets and cutting plates need to be used.

The threading tools for the 1550 bar 4500 bar and 7000 bar series are identical. Only the guide bushes and dies need to be re-placed for the various tubing diameters.

11.1 Component parts and configuration of the coning tool



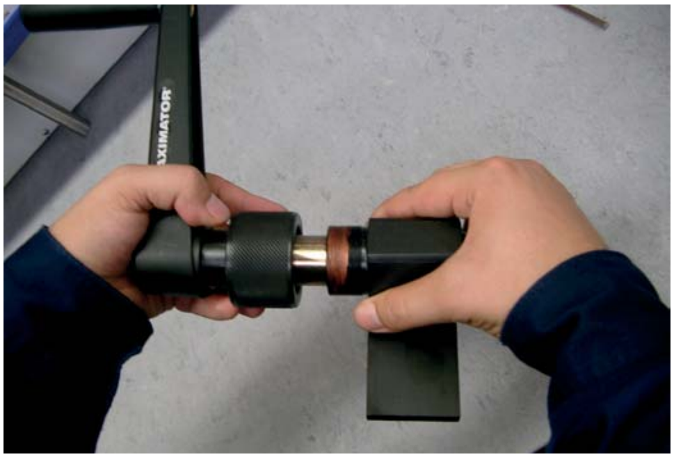
11.2 Single parts and structure of the thread cutting tool



11.3 Preparation of the coning tool

Disassembly

Remove the knurled nut by unscrewing from the base structure.

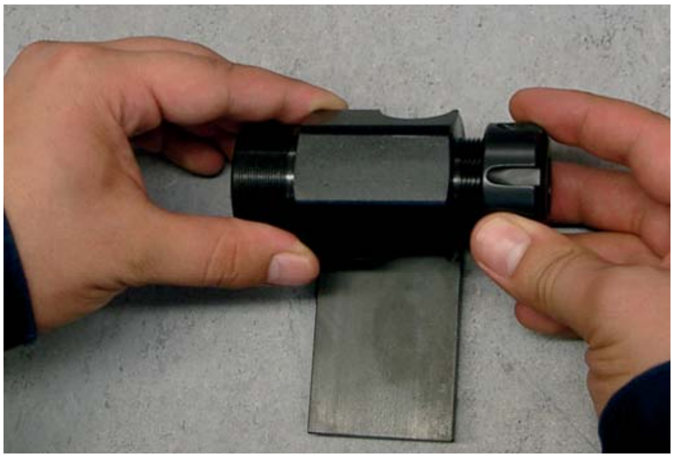


Use the supplied hexagonal offset screwdriver to loosen the headless set screw that keeps the crank handle in its position.

Remove crank handle, knurled nut and needle bearing by pulling from the blanking die holder.

Loosen the 4 headless set screws in the blanking die holder to disassemble the blanking dies. Then remove the blanking from the blanking die holder.

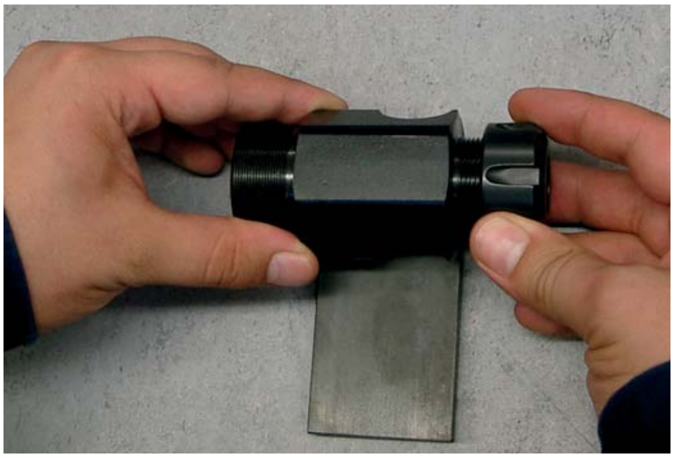
Unscrew the tensioning nut from the base structure. Then push the collet chuck out of the tensioning nut.



Assembly

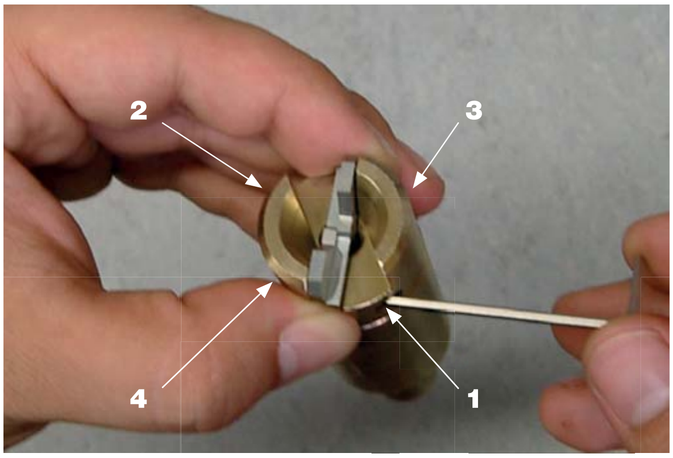
Push the collet chuck into the tensioning nut.

Slightly grease tensioning nut and collet chuck and screw them onto the base structure.



Insert the blanking dies into the blanking die holder as shown in the illustration. Make sure that the labelled order code is always on the outside.

Use the hexagonal offset screwdriver to slightly tighten the headless set screws to align the blanking dies. Make sure to first tighten the headless set screws lo-cated opposite the cutting edges (see se-quence in the illustration). Thus, the blanking dies with cutting edges fit closely to the blanking die holder. Otherwise the processed taper surface may be uneven.



Lubricate the needle bearings with roller bearing grease.

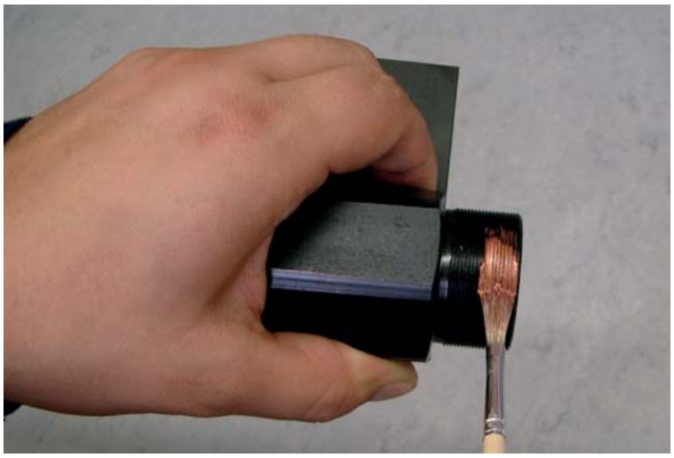
Stick the components onto the blanking die holder in the following sequence: Needle bearing -> Knurled nut -> Needle bearing -> Crank handle

Align the crank handle and blanking die holder in such a manner that the head-less set screw of the crank handle pushes onto the key area at the shaft of the blanking die holder.

Press the components together by hand and tighten the headless set screw.

Avoid any tangible longitudinal play between crank handle, needle bearings, knurled nut and blanking die holder. A clearance between the components may result in an uneven taper surface.

Lubricate the threads of knurled nut and base structures (We recommend use of solid lubricant. such as copper paste).



Lubricate the running surface of the blanking die holder.

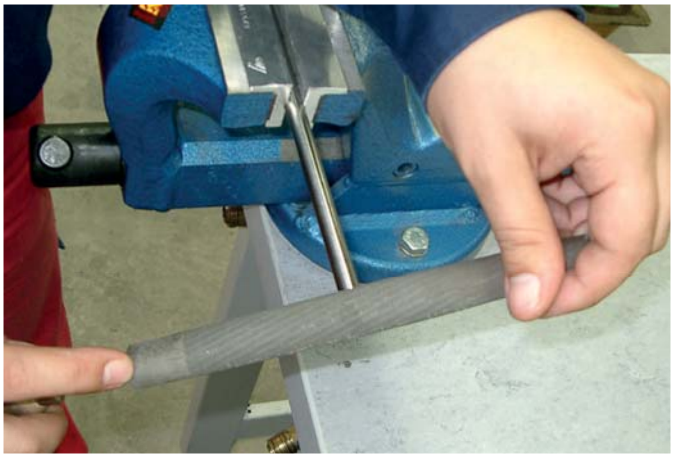
Insert the blanking die holder into the base structure and screw the knurled nut on with a few rotations. Now the coning tool is ready for use.

11.4 Cutting pipework to length

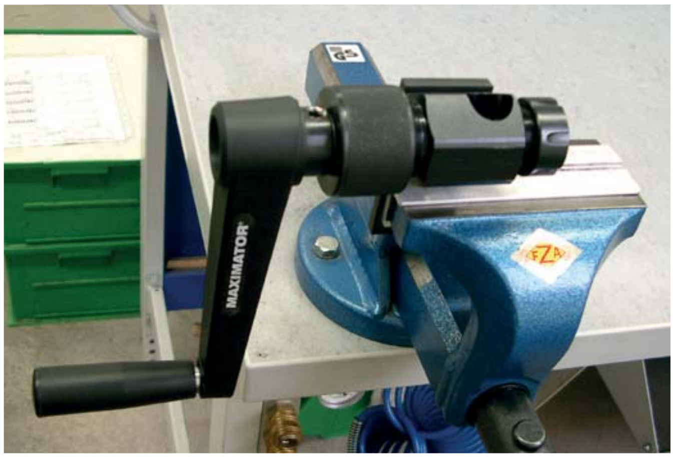
The pipe length is the result of the clear distance of the components to be connected plus the allowance for each connection as shown in Table 2.

For processing the face sides, add another 0.5 mm for each end.
Pipe length = Distance + 2 x allowance + 2 x 0.5 mm

Cut the pipe to the desired length and deburr on the outside so that it can be inserted into the collet chuck of the ta-pering tool.



11.5 Cut the cone



Clamp the coning tool on the fixing plate in a vice or similar.

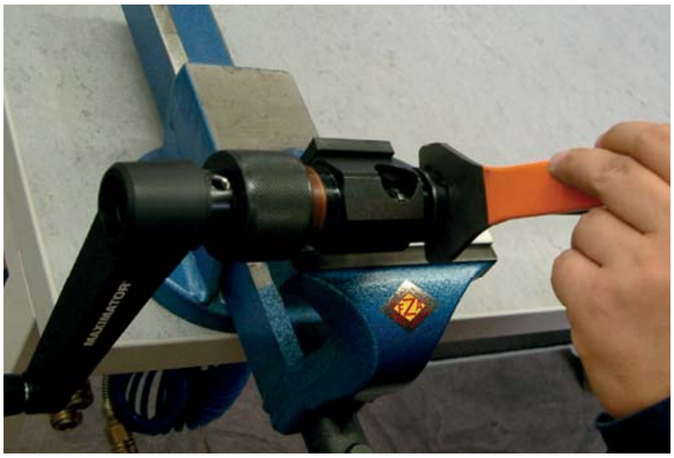
Assembly instructions and technical data

» Valves | Fittings | Tubing

Turn out the knurled screw until only approx. 2 – 3 thread turns are gripping. This corresponds to a distance of 20 mm between knurled nut and the step of the base structures.

Insert the pipe into the collet chuck. Push forward till to the cheek and pull backward for approx.1 mm

Tighten the tensioning nut with the chuck key. Make sure that all 4 springs of the chuck keys are gripping the tensioning nut slots.

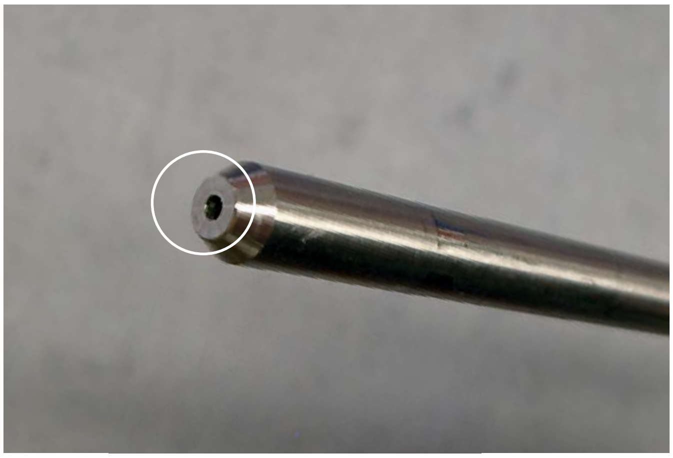


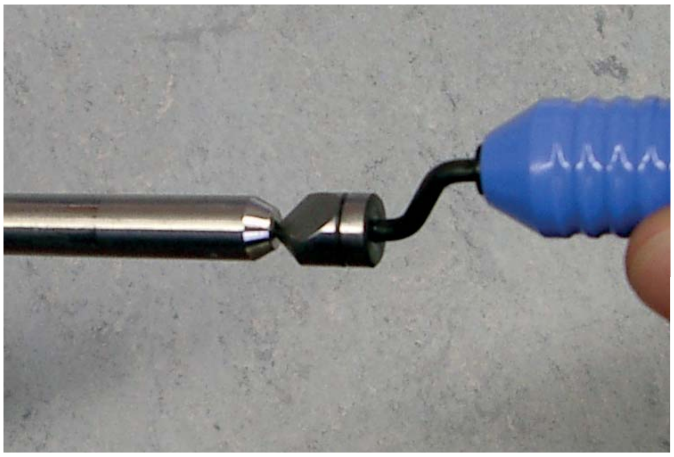
Apply cutting oil onto the blanking dies and pipe end through the side opening in the base structure. Repeat several times during the cutting operation.

Turn the crank handle in clockwise di-rection and simultaneously provide a slow advance with the knurled nut. Advancing without simultaneous „cranking“ can destroy the blanking dies. To ensure that the taper is completely cut the rotations of the knurled nut can be counted or the advance measured. The number of required rotations corresponds to the necessary advance in mm and can be gathered from the Table: Assembly instructions cone processing (see point 11.8). When ending the cutting operation and in order to obtain a smooth surface turn the crank handle evenly and continuously and reduce the advance speed with the knurled nut. Then stop the advance and continuously perform 3-4 rotations of the crank without moving the knurled nut. Slowly turn back the knurled nut. Thus, an in-dentation of the blanking on the taper is avoided.

Use the chuck key to loosen the tensioning nut and the tube can be re-moved from the coning tool.

The finished pipe can be recognised by the completely machined face side of the pipe. The taper surface must be free from any damage, such as indentations or scratches. If this is not the case, the pipe can simply be re-cut.

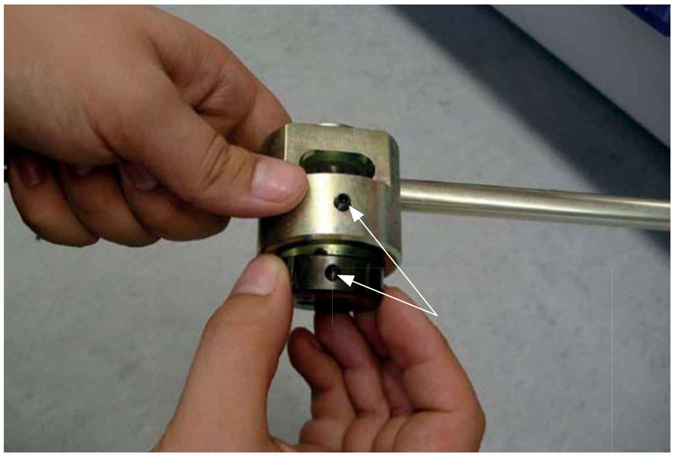




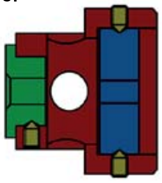
The only work left to do now is debur-ring of the internal diameter of the finished pipe. Carefully remove all chips that are generated by taper cutting edges and deburring (inside and out-side).

11.6 Preparation of the threading tool

Screw the handles into the tool body.

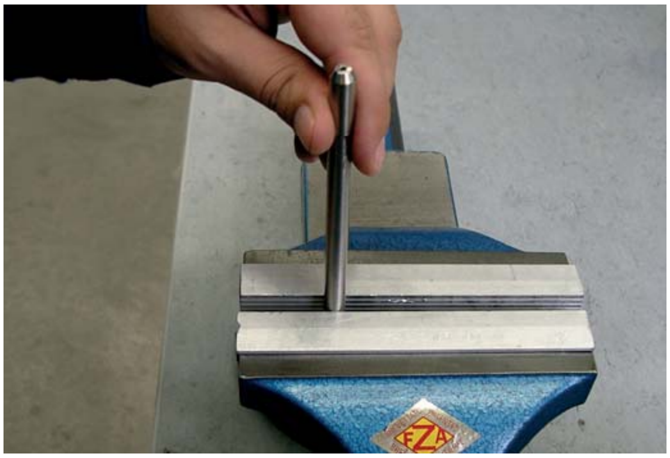


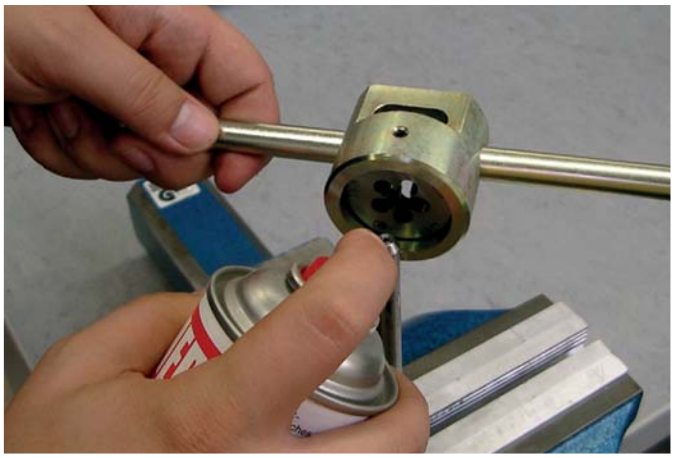
Insert the die stock and guide bush into the tool body and secure with headless set screws. Align the components in such a manner that the headless set screws grip into the recesses.



11.7 Threading

Clamp the high-pressure tube with the finished cones. We recommend protective jaws made of aluminium.



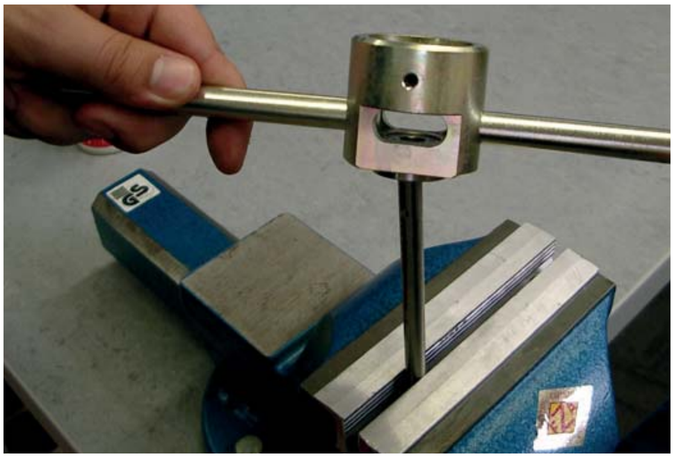


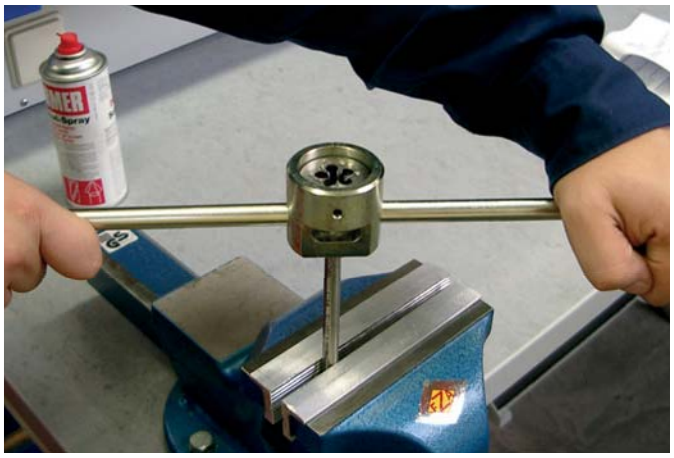
Wet the pipe and the die with cutting oil.

Assembly instructions and technical data

» Valves | Fittings | Tubing

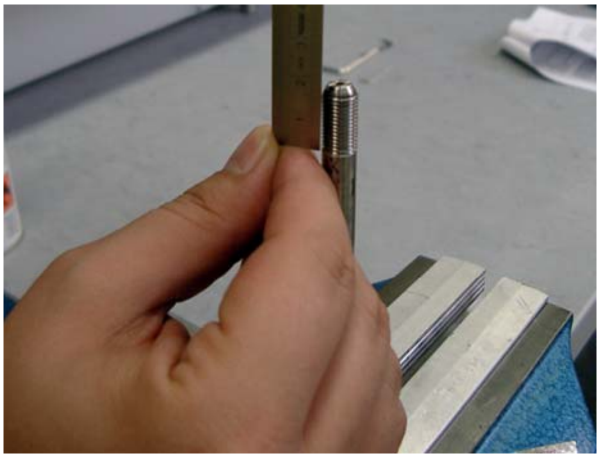
Place the threading tool with guide bush on top of the tube.





Slightly press down the tool and start the threading operation (in counter-clockwise direction). Rotate the tool briefly in clockwise direction during the threading process in order to break the chip and apply more cutting oil.

See Table 7 (Point 11.8) for the length of the thread. Chips created when cut-ting the thread must be removed carefully (inside and outside).



11.8 Technical parameters

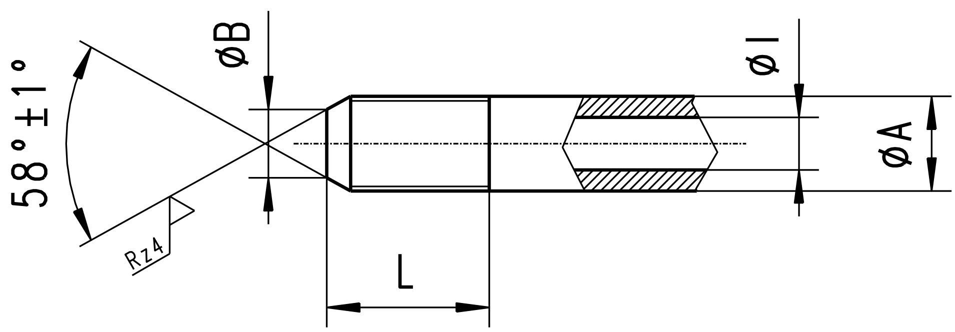
Connection	Ø A (mm)	Ø I (mm)	Ø B (mm)	L (mm)	UNF left-handed thread
4M	6.35	2.77	3.6	9	1/4-28-LH
4H	6.35	2.11	3.2	14	1/4-28-LH
4U	6.35	1.59	3.2	14	1/4-28-LH
6M	9.53	5.16	6.4	11	3/8-24-LH
6H/6U	9.53	3.18	5.6	19	3/8-24-LH
6U	9.53	1.59	5.6	19	3/8-24-LH
9M	14.29	7.93	10.3	13	9/16-18-LH
9H/9U	14.29	4.78	7.1	24	9/16-18-LH
5U	7.94	1.57	3.2	17	5/16-24-LH
12M	19.05	11.13	14.27	15.88	3/4-16-LH
16M	25.4	14.27	18.26	19.84	1-14-LH

Table: Pipe end dimensions

Connection	Tube dimensions		Advance (mm)	Allowance
	Ø A (mm)	Ø I (mm)	Rotations**	(mm)*
4M	6.35	2.77	3	14
4H/4U	6.35	2.11	4	13
6M	9.53	5.16	4	18
6H/6U	9.53	3.18	5	18
9M	14.29	7.93	7	21
9H/9U	14.29	4.78	9	22
5U	7.94	1.58	5	32

*Allowance for inserting the tube into the connecting part.
**Number of turns required for cutting the cone.

Table: Assembly instructions cone processing



12. Disposal

MAXIMATOR valves, fittings and tubing must be disposed of according to the national regulations at the end of their service life.

Assembly instructions and technical data

» Valves | Fittings | Tubing

13 Attachment

13.1 Torque Values

Tubing Size O.D. x I.D. in. (mm)	Tubing Pressure psi (bar) @ R.T.	Connection Type	Tube Gland Hex Size in. (mm)	Required Torque ft-lbs. (Nm)
1/4 x .109 **(6.35 x 2.77)**	22,500 **(1,550)**	4M	1/2 **(12.7)**	20 **(28)**
3/8 x .203 **(9.53 x 5.17)**	22,500 **(1,550)**	6M	5/8 **(15.9)**	30 **(41)**
9/16 x .312 **(14.29 x 7.93)**	22,500 **(1,550)**	9M	15/16 **(23.8)**	55 **(75)**
9/16 x .359 **(14.29 x 9.13)**	15,200 **(1,050)**	9M	15/16 **(23.8)**	55 **(75)**
3/4 x .438 **(19.05 x 11.12)**	22,500 **(1,550)**	12M	1-3/16 **(30.2)**	90 **(122)**
3/4 x .516 **(19.05 x 13.1)**	15,200 **(1,050)**	12M	1-3/16 **(30.2)**	90 **(122)**
1 x .562 **(25.4 x 14.27)**	22,500 **(1,550)**	16M	1-3/8 **(34.9)**	150 **(204)**
1 x .688 **(25.4 x 17.47)**	15,200 **(1,050)**	16M	1-3/8 **(34.9)**	150 **(204)**
1/4 x .083 **(6.35 x 2.11)**	65,000 **(4,500)**	4H	5/8 **(15.9)**	25 **(34)**
3/8 x .125 **(9.53 x 3.17)**	65,000 **(4,500)**	6H	13/16 **(20.6)**	50 **(68)**
9/16 x .188 **(14.29 x 4.77)**	65,000 **(4,500)**	9H	1-3/16 **(30.2)**	110 **(150)**
1 x .438 **(25.4 x 11.13)**	43,000 **(2,965)**	16M	1-3/8 **(34.9)**	150 **(204)**
1/4 x .063 **(6.35 x 1.59)**	101,000 **(7,000)**	4U	5/8 **(15.9)**	25 **(34)**
3/8 x .125 **(9.53 x 3.17)**	101,000 **(7,000)**	6U	13/16 **(20.6)**	50 **(68)**
9/16 x .188 **(14.29 x 4.77)**	101,000 **(7,000)**	9U	1-3/16 **(30.2)**	110 **(150)**
5/16 x .062 **(7.94 x 1.58)**	152,000 **(10,500)**	5U	3/4 **(19.05)**	70 **(95)**

All dimensions are for references only and are subject to change.

13.2 Anti-Vibration Torque Values

Tubing Size O.D. x I.D. in. (mm)	Tubing Pressure psi (bar) @ R.T.	Connection Type	Tube Gland Hex Size in. (mm)	Required Torque ft-lbs. (Nm)
1/4 x .109 **(6.35 x 2.77)**	22,500 **(1,550)**	4M	5/8 **(15.9)**	15 **(21)**
3/8 x .203 **(9.53 x 5.17)**	22,500 **(1,550)**	6M	13/16 **(20.6)**	20 **(28)**
9/16 x .312 **(14.29 x 7.93)**	22,500 **(1,550)**	9M	15/16 **(23.8)**	35 **(48)**
9/16 x .359 **(14.29 x 9.13)**	15,200 **(1,050)**	9M	15/16 **(23.8)**	35 **(48)**
3/4 x .438 **(19.05 x 11.12)**	22,500 **(1,550)**	12M	5/4 **(31.8)**	60 **(82)**
3/4 x .516 **(19.05 x 13.1)**	15,200 **(1,050)**	12M	5/4 **(31.8)**	60 **(82)**
1 x .562 **(25.4 x 14.27)**	22,500 **(1,550)**	16M	1 1/4 **(38.1)**	100 **(136)**
1 x .688 **(25.4 x 17.47)**	15,200 **(1,050)**	16M	1 1/4 **(38.1)**	100 **(136)**
1/4 x .083 **(6.35 x 2.11)**	65,000 **(4,500)**	4H	5/8 **(15.9)**	20 **(28)**
3/8 x .125 **(9.53 x 3.17)**	65,000 **(4,500)**	6H	13/16 **(20.6)**	30 **(41)**
9/16 x .188 **(14.29 x 4.77)**	65,000 **(4,500)**	9H	1-3/16 **(30.2)**	60 **(82)**
1 x .438 **(25.4 x 11.13)**	43,000 **(2,965)**	16M	1 1/4 **(38.1)**	100 **(136)**

All dimensions are for references only and are subject to change.

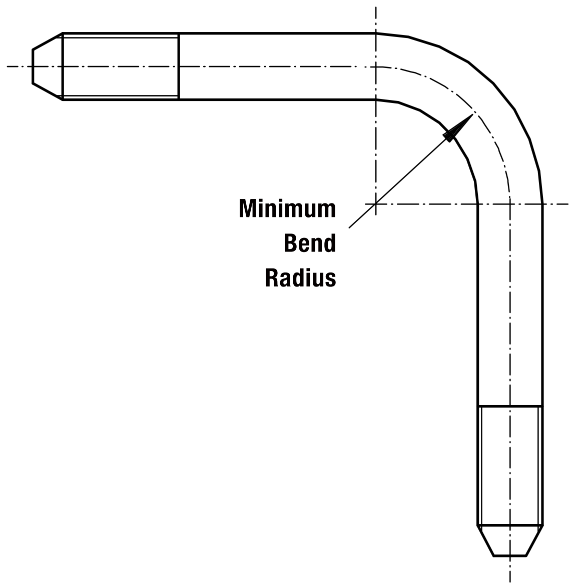
13.3 Needle Valve Torque Values

Valve Series	Tubing Size in. (mm)	Packing Gland Hex in. (mm) Size	Packing Gland Torque ft.-lbs. (Nm)	Running Torque in.-lbs. (Nm)	Seating Torque in.-lbs. (Nm)
Pipe 15,200 psig @RT 15V	1/4 **(6.35)**	5/8 **(15.9)**	30 **(41)**	40 **(4.5)**	55 **(6.2)**
	3/8 **(9.53)**	5/8 **(15.9)**	30 **(41)**	40 **(4.5)**	55 **(6.2)**
	9/16 **(14.29)**	13/16 **(20.6)**	60 **(82)**	46 **(6.8)**	90 **(10.2)**
Medium Pressure 22,500 psig @ RT 21V	3/4 **(19.05)**	15/16 **(23.8)**	3/4 turn	300 **(33.9)**	360 **(40.7)**
	1 **(25.4)**	1-3/8 **(34.9)**	3/4 turn	360 **(40.7)**	600 **(67.8)**
High Pressure 36,000 psig @ RT 36V	1/4 **(6.35)**				
	3/8 **(9.53)**	13/16 **(20.6)**	45 **(61)**	50 **(5.6)**	60 **(6.8)**
	9/16 **(14.29)**				
High Pressure 43,000 psig @ RT 43V	1 **(25.4)**	1-3/8 **(34.9)**	3/4 turn	360 **(40.7)**	600 **(67.8)**
High Pressure 65,000 psig @ RT 65V	1/4 **(6.35)**				
	3/8 **(9.53)**	13/16 **(20.6)**	35 **(48)**	65 **(7.3)**	75 **(8.5)**
	9/16 **(14.29)**				
Ultra High Pressure 101,000 psig @ RT 101V	1/4 **(6.35)**				
	3/8 **(9.53)**	13/16 **(20.6)**	40 **(55)**	65 **(7.3)**	75 **(8.5)**
	9/16 **(14.29)**				
	5/16 **(7.94)**	15/16 **(23.8)**	60 **(82)**	100 **(11.3)**	120 **(13.6)**

All dimensions are for references only and are subject to change.

13.4 Recommended Bend Radius for 316SS Tubing

Tubing Size O.D. x I.D. in. (mm)	Tubing Pressure psi (bar) @ R.T.	Recommended Minimum Bend Radius in. (mm)
1/4 x .109 **(6.35 x 2.77)**	22,500 **(1,550)**	1.25 **(31.8)**
3/8 x .203 **(9.53 x 5.17)**	22,500 **(1,550)**	1.75 **(44.5)**
9/16 x .312 **(14.29 x 7.93)**	22,500 **(1,550)**	2.63 **(66.8)**
9/16 x .359 **(14.29 x 9.13)**	15,200 **(1,050)**	2.63 **(66.8)**
3/4 x .438 **(19.05 x 11.12)**	22,500 **(1,550)**	3.50 **(88.9)**
3/4 x .516 **(19.05 x 13.1)**	15,200 **(1,050)**	3.50 **(88.9)**
1 x .562 **(25.4 x 14.27)**	22,500 **(1,550)**	4.63 **(117.6)**
1 x .688 **(25.4 x 17.47)**	15,200 **(1,050)**	4.63 **(117.6)**
1/4 x .083 **(6.35 x 2.11)**	65,000 **(4,500)**	1.25 **(31.8)**
3/8 x .125 **(9.53 x 3.17)**	65,000 **(4,500)**	1.75 **(44.5)**
9/16 x .188 **(14.29 x 4.77)**	65,000 **(4,500)**	2.63 **(66.8)**
1 x .438 **(25.4 x 11.13)**	43,000 **(2,965)**	4.63 **(117.6)**
5/16 x .062 **(7.94 x 1.58)**	152,000 **(10,500)**	6.00 **(152.4)**

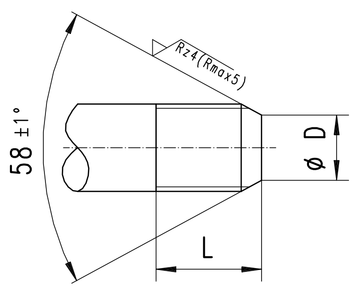


All dimensions are for references only and are subject to change.

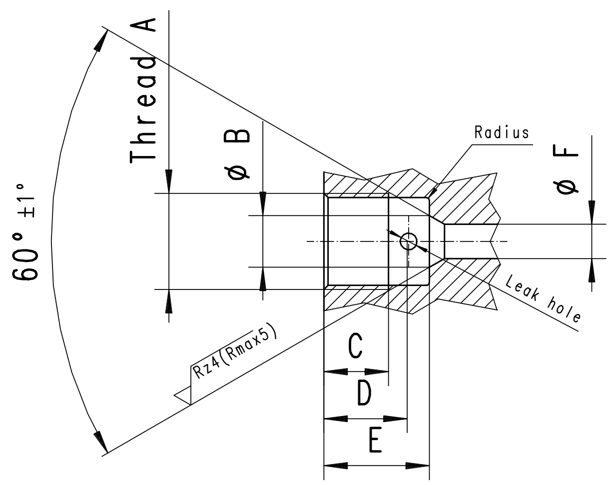
All technical and dimensional information subject to change. All general Terms and Conditions of sale, including limitations of our liability, apply to all products and services sold.

13.5 Tube Connection Details

Male Connection



Female Connection



Tubing Size O.D. x I.D in. (mm)	Tubing Pressure psi (bar) @ R.T	Dimension in. (mm) D	Dimension in. (mm) L	Left Hand Thread**	Male Conn. Type	Female Conn. Type	Dimension in. (mm) A**	B (±0.1)	C	D	E	F*	Tubing Engagement Allowance
Medium Pressure													
1/4 x .109 **(6.35 x 2.77)**	22,500 **(1,550)**	0.141 **(3.6)**	0.344 **(8.7)**	1/4-28	4M	4M	7/16-20	0.19 **(4.7)**	0.28 **(7)**	0.37 **(9.5)**	0.51 **(13)**	0.109 **(2.7)**	0.55 **(14)**
3/8 x .203 **(9.53 x 5.17)**	22,500 **(1,550)**	0.250 **(6.4)**	0.438 **(11.1)**	3/8-24	6M	6M	9/16-18	0.31 **(7.7)**	0.38 **(9.6)**	0.50 **(12.7)**	0.62 **(15.7)**	0.203 **(5.1)**	0.69 **(17.5)**
9/16 x .312 **(14.29 x 7.93)**	22,500 **(1,550)**	0.406 **(10.3)**	0.500 **(12.7)**	9/16-18	9M	9M	13/16-16	0.50 **(12.7)**	0.44 **(11.2)**	0.59 **(15.1)**	0.75 **(19.1)**	0.312 **(7.8)**	0.84 **(21.3)**
9/16 x .359 **(14.29 x 9.13)**	15,200 **(1,050)**	0.438 **(11.1)**	0.500 **(12.7)**	9/16-18								0.359 **(9.1)**	0.83 **(21.1)**
3/4 x .438 **(19.05 x 11.12)**	22,500 **(1,550)**	0.562 **(14.3)**	0.625 **(15.9)**	3/4-16	12M	12M	3/4-14NPS	0.62 **(15.7)**	0.50 **(12.7)**	0.72 **(18.3)**	0.94 **(23.9)**	0.438 **(11.1)**	1.00 **(25.4)**
3/4 x .516 **(19.05 x 13.1)**	15,200 **(1,050)**	0.578 **(14.7)**	0.625 **(15.9)**	3/4-16								0.516 **(13.1)**	0.99 **(25.1)**
1 x .562 **(25.4 x 14.27)**	22,500 **(1,550)**	0.719 **(18.3)**	0.781 **(19.8)**	1-14	16M	16M	1-3/8-12	0.88 **(22.4)**	0.81 **(20.6)**	1.06 **(27)**	1.31 **(33.3)**	0.562 **(14.3)**	1.44 **(36.6)**
1 x .688 **(25.4 x 17.47)**	15,200 **(1,050)**	0.812 **(20.6)**	0.781 **(19.8)**	1-14								0.688 **(17.5)**	1.38 **(35.1)**

* Port diameters may vary depending on specific valve or fitting component type. See actual component catalog page for orifice sizes and pressure ratings.
** Unified National Fine thread, Class 2.

Tubing Size O.D. x I.D in. (mm)	Tubing Pressure psi (bar) @ R.T	Dimension in. (mm)			Male Conn. Type	Female Conn. Type	Dimension in. (mm)						
		D	L	Left Hand Thread**			A**	B (±0.1)	C	D	E	F*	Tubing Engagement Allowance
High Pressure													
1/4 x .083 **(6.35 x 2.11)**	65,000 **(4,500)**	0.125 **(3.2)**	0.562 **(14.3)**	1/4-28	4H	4H	9/16-18	0.17 **(4.2)**	0.39 **(10)**	0.39 **(10)**	0.45 **(11.5)**	0.094 **(2.3)**	0.50 **(12.7)**
3/8 x .125 **(9.53 x 3.17)**	65,000 **(4,500)**	0.219 **(5.6)**	0.750 **(19.1)**	3/8-24	6H	6H	3/4-16	0.26 **(6.5)**	0.53 **(13.5)**	0.53 **(13.5)**	0.63 **(16)**	0.125 **(3.2)**	0.69 **(17.5)**
9/16 x .188 **(14.29 x 4.77)**	65,000 **(4,500)**	0.281 **(7.1)**	0.938 **(23.8)**	9/16-18	9H	9H	1-1/8-12	0.38 **(9.7)**	0.62 **(15.7)**	0.62 **(15.7)**	0.75 **(19.1)**	0.188 **(4.8)**	0.84 **(21.3))**
1 x .438 **(25.4 x 11.13)**	43,000 **(2,965)**	0.563 **(14.3)**	1.083 **(27.5)**	1-14	16M	16M	1-3/8-12	0.88 **(22.4)**	0.81 **(20.6)**	1.06 **(27)**	1.31 **(33.3)**	0.438 **(11.1)**	1.59 **(40.3)**
Ultra High Pressure													
1/4 x .063 **(6.35 x 1.59)**	101,000 **(7,000)**	0.125 **(3.2)**	0.562 **(14.3)**	1/4-28	4U	4U	9/16-18	0.17 **(4.2)**	0.39 **(10)**	0.39 **(10)**	0.45 **(11.5)**	0.094 **(2.3)**	0.50 **(12.7)**
3/8 x .125 **(9.53 x 3.17)**	101,000 **(7,000)**	0.219 **(5.6)**	0.750 **(19.1)**	3/8-24	6U	6U	3/4-16	0.26 **(6.5)**	0.53 **(13.5)**	0.53 **(13.5)**	0.63 **(16)**	0.118 **(3)**	0.69 **(17.5)**
9/16 x .188 **(14.29 x 4.77)**	101,000 **(7,000)**	0.281 **(7.1)**	0.938 **(23.8)**	9/16-18	9U	9U	1-1/8-12	0.38 **(9.7)**	0.62 **(15.7)**	0.62 **(15.7)**	0.75 **(19.1)**	0.188 **(4.8)**	0.84 **(21.3)**
5/16 x 0.62 **(7.95 x 1.58)**	152,000 **(10,500)**	0.125 **(3.2)**	0.687 **(17.4)**	5/16-24	5U	5U	5/8-18	0.25 **(6.2)**	0.63 **(16)**	0.93 **(23.5)**	1.06 **(27)**	0.09 **(2.3)**	1.25 **(31.75)**

* Port diameters may vary depending on specific valve or fitting component type. See actual component catalog page for orifice sizes and pressure ratings.

** Unified National Fine thread, Class 2.

14. Flow Calculations - Example of a high-pressure fluid system design

When designing high-pressure fluid systems, the most important variables are the flow (flow rate), flow speed and pressure loss.

The flow Q is usually determined from the requirements of the application. The flow speed v plays a controlling function in the design and protects the overall system from impermissible statuses.

If the flow speeds are too high in high-pressure pipe systems, this can lead to premature wear of components (in particular the sealing surfaces). Therefore, the limit value for flow speeds when dimensioning pipe systems with gaseous fluids is 10-15 m/s and for fluids 5-7 m/s.

When designing the pressure generator it is important that the pressure loss Δp is taken into account along the entire pipe system. This therefore guarantees that the pipe equipment has no further impact on the respective requirements of the application.

The following is an example design. The application makes the following requirements of the system:

Flow	Q = 0,5 m³/h
Pressure range	p = 1,000 bar
Fluid	Water
Pressure loss	Δp = 2 bar
Density of fluid	ρ = 1 kg/dm³ (at T= 20°C)

The valve design work starts with the dimensioning process. The flow coefficient has proven an important dimensioning ratio. The flow coefficient K_V defines, for all valves, the water flow in m³/h at room temperature of an open valve and simultaneous pressure loss of Δp= 1 bar.

The C_V value is usually used in the USA. (US gallons/min at Δp= 1psi)
The following conversion formula is used: **$K_V = 0.86 * C_V$**

The following formula is used to calculate the minimum K_V value of the example application:

$$K_V = Q * \sqrt{\frac{1\ bar}{\Delta p} * \frac{\rho}{1000\ kg/m^3}}$$

As the medium used is water, the last term under the root is omitted. Therefore:

$$K_V = Q * \sqrt{\frac{1\ bar}{\Delta p}}$$

$$K_V = 0{,}5\ m^3/h * \sqrt{\frac{1\ bar}{2\ bar}} = 0{,}35\ m^3/h$$

Conversion of K_V in C_V:

$$C_V = \frac{K_V}{0{,}86} = 0{,}4\ m^3/h$$

The selected valve should therefore not undercut a K_V value of 0.35 m³/h. Please note here that most stated flow coefficients K_V refer to straight-way valves. The flow coefficients for angled valves may be increased by up to 50%.

In this case, a 3/8“ valve of the Medium Pressure Series offers a K_V value of 0.64 (C_V = 0.75). The matching valve is **21V6M071**.

Usually the pipe size (inner diameter) is also specified together with the valve dimensions based on the flow coefficient. However, we recommend checking this paying special attention to the flow speed.

The following formula is used to determine the minimum require inner pipe diameter ID:

$$ID = \sqrt{\frac{Q}{3600 * v} * \frac{4}{\pi}}$$

$$ID = \sqrt{\frac{0{,}5\ m^3/h}{3600 * 7\ m/s} * \frac{4}{\pi}} = 5{,}03\ mm$$

According to the calculation for the example application, a pipe with an inner diameter of at least 5.03 mm must be selected.

The 3/8“ high-pressure pipe and its inner diameter of 5.17 mm satisfies the requirements and therefore confirms the dimensions of the valve.

15 Conversation Tables

Temperature Equivalents

Celisius [°C]	Kelvin [K]	Fahrenheit [°F]	Rankine [°R]
0	273	32	492
-273	0	-460	0
-18	255	0	460

Linear Equivalents

meter [m]	centimeter [cm]	millimeter [mm]	foot [ft]	inch [in]
1	100	1000	3.28083	39.37
0.01	1	10	0.03281	0.3937
0.001	0.1	1	0.003281	0.03937
0.3048	30.48	304.8	1	12
0.0254	2.54	25.4	0.0833	1

Pressure Equivalents

Pascal [Pa]	MPascal [MPa]	Bar [bar]	[psi]	kg/cm²
1	$1x10^{-6}$	$1x10^{-5}$	$1.4504x10^{-4}$	$1.0197x10^{-5}$
$1x10^{-6}$	1	10	145.04	10.1971
100000	0.1	1	14.504	1.01971
6894.757	$6.8948x10^{-3}$	0.06895	1	0.07031
98066.5	0.098067	0.98067	14.223	1

Volume Equivalents

meter³ [m³]	liter [l]	foot³ [ft³]	inch³ [in³]	gallon*
1	1000	35.31	61023	264.2
$1x10^{-3}$	1	0.3531	61.023	0.2642
$28.317x10^{-3}$	28.317	1	1728	7.4822
$1.638x10^{-5}$	0.1639	$5.787x10^{-4}$	1	$43.29x10^{-4}$
$3.785x10^{-3}$	3.785	0.1337	231	1

* U.S. Gallons: U.S. gallon = 0.833 British Imperial gallon; British Imperial gallon = 1.201 U.S. gallon

Density Equivalents

kg/m³	g/cm³	pound/ft³	pound/in³	pound/gallon*
1	0.001	0.062427	$3.613x10^{-5}$	0.008345
1000	1	62.427	0.03613	8.3454
16.018	0.016018	1	$5.787x10^{-4}$	0.13368
27679.9	27.6799	1728	1	231
119.826	0.11983	7.4805	$4.33x10^{-3}$	1

All technical and dimensional information subject to change. All general Terms and Conditions of sale, including limitations of our liability, apply to all products and services sold.

Fluid Flow Equivalents

m^3/h	m^3/min	l/h	l/min	gallon*/h	gallon*/min
1	0.01667	1000	16.667	264.172	4.4029
60	1	60000	1000	15850.3	264.17
0.001	$1.667x10^{-5}$	1	0.01667	0.26417	$4.4029x10^{-3}$
0.06	0.001	60	1	15.85	0.26417
$3.7854x10^{-3}$	$6.309x10^{-5}$	3.7854	0.06309	1	0.01667
0.2271	$3.7854x10^{-3}$	227.1247	3.7854	60	1

Area Equivalents

m^2	cm^2	mm^2	ft^2	in^2
1	$1x10^{4}$	$1x10^{6}$	10.7639	1550
$1x10^{-4}$	1	100	$1.0764x10^{-3}$	0.155
$1x10^{-6}$	0.01	1	$1.0764x10^{-5}$	$1.55x10^{-3}$
0.0929	929.03	92903.04	1	144
$6.4516x10^{-4}$	6.4516	645.1625	$6.944x10^{-3}$	1

Velocity Equivalents

km/h	m/min	m/s	fpm	fps
1	16.667	0.2778	54.6807	0.9113
0.06	1	0.01667	3.2808	0.05468
3.6	60	1	196.85	3.2808
$1.829x10^{-2}$	0.3048	0.00508	1	0.01667
1.09728	18.288	0.3048	60	1

CERTIFICATE

TIC TÜV International Certification TÜV CERT

for the management system according to ISO 9001:2008

The proof of the conforming application with the regulation was furnished and in accordance with certification procedure it is certified for the company

MAXIMATOR®
Maximum Pressure.

MAXIMATOR GmbH

Lange Straße 6
99734 Nordhausen / Germany

Scope

Design, manufacturing and sale of high pressure technics, hydraulics, pneumatics and test technology

Certificate Registration No.: TIC 15 100 4011

Valid until: 2018-09-15
Valid from: 2015-12-10

Audit Report No.: 3330 20WJ Q0

Initial certification: 1994

This certification was conducted in accordance with the TIC auditing and certification procedures and is subject to regular surveillance audits.

TÜV Thüringen e.V.
Certification body for systems and personnel

TÜV THÜRINGEN

Jena, 2015-12-10

IAF

DAkkS Deutsche Akkreditierungsstelle D-ZM-16006-05-01

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MAXIMATOR®
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EU-Konformitätserklärung
Hiermit erklären wir, dass die Bauart von Ventilen der Baureihen
(10-, 15-, 21-, 22-, 30-, 36-, 43-, 65-, 101-)(-V-, -DBBNV-, -B2-, B3S, B3D-),
Fittingen der Baureihen
(10-, 15-, 21-, 22-, 30-, 36-, 43-, 65-, 101-, 152-)(-A-, -BF-, -F-, -L-, -M-, -SH-, -T-, -TC-, -UF-, -X-),
Filter der Baureihen
(10-, 15-, 21-, 22-, 30-, 36-, 43-, 65-, 101-)((-CF-, -DF-, -AF-) und
Rückschlagventilen der Baureihen
(10-, 15-, 21-, 22-, 30-, 36-, 43-, 65-, 101-)(-BC-, -OC-)
in der gelieferten Ausführung folgenden einschlägigen Bestimmungen entspricht:
EG-Richtlinie Druckgeräte 2014/68/EU
Angewendete harmonisierte Normen und technische Spezifikationen:
AD 2000
Angewendete Konformitätsbewertungsverfahren:
Modul A

Anschrift Hersteller: MAXIMATOR GmbH, Lange Straße 6, 99734 Nordhausen / Deutschland

EC Declaration of Conformity
Herewith, we declare that the type and design of valves type
(10-, 15-, 21-, 22-, 30-, 36-, 43-, 65-, 101-)(-V-, -DBBNV-, -B2-, B3S, B3D-),
fittings type
(10-, 15-, 21-, 22-, 30-, 36-, 43-, 65-, 101-, 152-)(-A-, -BF-, -F-, -L-, -M-, -SH-, -T-, -TC-, -UF-, -X-),
filters type
(10-, 15-, 21-, 22-, 30-, 36-, 43-, 65-, 101-)((-CF-, -DF-, -AF-) and
and check valves type
(10-, 15-, 21-, 22-, 30-, 36-, 43-, 65-, 101-)(-BC-, -OC-)
as supplied are in conformity with the following relevant regulations:
EC Pressure Equipment Directive 2014/68/EU
Harmonised standards and technical specifications applied:
AD 2000
Conformity assessment procedures applied:
Modul A

Name and address of manufacturer: MAXIMATOR GmbH, Lange Straße 6, 99734 Nordhausen / Germany

Déclaration de conformité CE
Nous certifions que le modèle de type de valves
(10-, 15-, 21-, 22-, 30-, 36-, 43-, 65-, 101-)(-V-, -DBBNV-, -B2-, B3S, B3D-),
Type de garnitures
(10-, 15-, 21-, 22-, 30-, 36-, 43-, 65-, 101-, 152-)(-A-, -BF-, -F-, -L-, -M-, -SH-, -T-, -TC-, -UF-, -X-),
Type de Filtres
(10-, 15-, 21-, 22-, 30-, 36-, 43-, 65-, 101-)((-CF-, -DF-, -AF-)
et type clapet de non retour
(10-, 15-, 21-, 22-, 30-, 36-, 43-, 65-, 101-)(-BC-, -OC-)
est conforme, à sa livraison, aux spécifications applicables suivantes:
Directive CE d'équipment sous pression 2014/68/UE
Normes harmonisées appliquées et préscriptions
techniques:
AD 2000
Procédures d'évaluation de la conformité appliquées:
Modul A

Adresse du fabricant : MAXIMATOR GmbH, Lange Straße 6, 99734 Nordhausen / Allemagne

Nordhausen, den 19.07.2016 (Nordhausen, 19.07.2016) [Nordhausen, le 19.07.2016]

....
Steffen Roloff (Technischer Leiter) (Technical Director) [Directeur technique]

MAXIMATOR GmbH, Lange Straße 6, 99734 Nordhausen, Telefon +49 (0) 3631 9533–0, Telefax +49 (0) 3631 9533–5010, www.maximator.de, info@maximator.de

MAXIMATOR®
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Statement on
ATEX Directive 2014/34/EC

The scope of the directive 2014/34/EC also includes non-electrical equipment and components to be used in potentially explosive atmospheres which have their own source of ignition.

Maximator manufactured items:

Manual valves with stainless steel handle 15-, 21-, 22-, 30-, 36-, 65-, 101- series,

Fittings of 10-, 15-, 21-, 30-, 36-, 65-, 101-, 152- series,

Filters of 15-, 21-, 30-, 65- series,

Check valves of 15-, 21-, 30-, 65-, 101- series,

Tubing of 15-, 21-, 30-, 36-, 65-, 101- series

Providing it is used as intended none of the items have its own potential source of ignition.

Therefore they do not fall in the scope of the directive 2014/34/EC and can be used in all explosion zones without declaration of conformity.

Nordhausen, 20.04.2016

i.V. Hanke
....
Peter Hanke (Technical Director)

MAXIMATOR GmbH, Lange Straße 6, 99734 Nordhausen, Telefon +49 (0) 3631 9533 – 0, Telefax +49 (0) 3631 9533 – 5010, www.maximator.de, info@maximator.de

Technical Information
» Achilles JQS

Achilles JQS
empowered by Achilles

Joint Qualification System

for suppliers to the Oil Industry in Norway and Denmark

Certificate of Qualification

Awarded to

MAXIMATOR GMBH

Company Reg.no: HRB 506347

Achilles Id. 60411

Achilles Information Centre hereby confirms that MAXIMATOR GMBH is qualified in the Achilles Joint Qualification System for suppliers to the Oil Industry in Norway and Denmark. The qualification concerns the product and service categories listed in the appendix.

Atle Gijertsen
Achilles Information Centre
Sector Manager, Oil & Gas

Anja Thorsdalen
Achilles Information Centre
Operation Manager

Issued Date:
19-Feb-2016

Expiry Date:
29-Oct-2016

The participating Oil Companies and Main Contractors may use Achilles JQS as the basis for preparation of bidder lists directly or together with additional qualification criteria established by the individual Company. Other qualification stages may be added by the individual Company if more information is found necessary to complete the preparation of bidder lists