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# **PRESSURE RELIEF VALVE: DISASSEMBLY, INSPECTION, and ASSEMBLY**

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## 1. OVERVIEW

This engineering bulletin covers disassembly, inspection and assembly of OTECO, Inc. Pressure Relief Valves. Guidelines regarding routine inspection and routine maintenance of these valves may be found in OTECO, Inc. Engineering Bulletin EB-003.

NOTE - Special attention should be paid to warnings and notes enclosed in a box as is this explanatory note. The words DANGER, WARNING, CAUTION, & NOTE are used in accordance with the following definitions:

DANGER – In most instances, ignoring or violating this warning will definitely result in bodily injury or death.

WARNING – Ignoring or violating this warning can directly result in bodily injury or death, or can cause equipment malfunction which can result in bodily injury or death.

CAUTION – Ignoring or violating this warning can damage equipment.

NOTE – This is an explanation which may prove helpful.

## 2. DISASSEMBLY OF VALVES WITH LINER SUB AND PRESS-IN BUSHING (MODELS 30525 & 30550) (See drawings in Sections 10.1, 10.2, 10.3 and 10.4)

This procedure assumes the availability of a vise of sufficient capacity to grip the valve body (item 1).

CAUTION – When clamping the valve body in a vise, use care to avoid damage to the name plate (item 13), the threads on the liner sub (item 3) and the threads, which mount the safety cover (item 2).

### 2.1 ROUTINE DISASSEMBLY

#### PROCEDURE:

- (1.) Remove pressure from the valve inlet port.

DANGER – Tag and lock block valves or pump controls as necessary to ensure that pressure cannot accidentally be applied during maintenance of the valve.



- (2.) Disconnect the inlet and discharge lines from the valve. The threads at the valve inlet and discharge ports are right hand.
- (3.) Unscrew and remove the safety cover (item 2). The threads are right hand.
- (4.) Remove the shear pin(s) (item 12).
- (5.) Unseat the piston: Gripping the stem pin (item 11), pull the stem (item 5) outward by hand until the piston (item 6) is fully withdrawn from upper bore in the liner sub (item 3).
- (6.) Unscrew and remove the liner sub (item 3) from the valve body (item 1). The threads are right hand.
- (7.) Remove and discard the liner sub O-ring (item 4). A new O-ring should be used when reinstalling the liner sub.
- (8.) If the valve has hammer union inlet connection, remove the hammer union seal (item 20) from the liner sub hammer union connection.
- (9.) Back up the stem (item 5) with a bench or other support and use a hammer and punch to drive out the stem pin (item 11).

To reduce the possibility of bending the stem, it is recommended that a helper support the valve body so that the stem may be laid flat on the bench or support while driving out the pin. To prevent scarring of the stem, place a wooden block between the stem and the bench or support.

- (10.) Withdraw the stem assembly (items 5, 6, 7 & 8) from the valve.

**THIS COMPLETES THE DISASSEMBLY REQUIRED FOR ROUTINE INSPECTION AND ROUTINE MAINTENANCE. FURTHER DISASSEMBLY IS NECESSARY ONLY IF THE PISTON, THE BUSHING OR THE CUSHION RING MUST BE REPLACED.**

## 2.2 REMOVAL OF THE BUSHING AND CUSHION RING

**CAUTION** – To remove the cushion ring (item 10) without damaging the ring, it is necessary to press out the bushing (item 9). The bushing and cushion ring need not be removed unless one or both are obviously damaged.



**PROCEDURE:**

Using a press or puller, pull both the bushing (item 9) and the cushion ring (item 10) from the valve body.

A puller may be improvised using a length of all-thread of a diameter slightly less than that of the stem, two nuts, two flat washers, and a disk or plate with a hole for the all-thread and sufficiently large to span the inlet port of the valve.

**WARNING** – Do not attempt to drive out the bushing with a hammer. Hammering will deform the bushing. This will make field removal of the bushing impossible, and can cause malfunction of the valve.

**THIS COMPLETES DISASSEMBLY OF THE VALVE. FOR REPLACEMENT OF THE PISTON, SEE SECTION 6.**

**3. DISASSEMBLY OF VALVES WITH PRESS-IN BUSHINGS THAT DO NOT HAVE A LINER SUB (MODELS 20015 AND 20210) (See drawings in Sections 11.1 and 11.2)**

**3.1 ROUTINE DISASSEMBLY**

**PROCEDURE:**

- (1) Remove pressure from the valve inlet port.

**DANGER-** Tag and lock block valves or pump controls as necessary to ensure that pressure cannot accidentally be applied during maintenance of the valve.

- (2) Disconnect the inlet and discharge lines from the valve. The threads at the valve inlet and discharge ports are right-hand.
- (3) Unscrew and remove the safety cover (item 2). The threads are right-hand.
- (4) Remove the shear pin (item 12).
- (5) Unseat the piston: gripping the stem pin (item 11), pull the stem (item 5) outward by hand until the piston (item 6) is fully withdrawn from bore of the liner bushing (item 17).



- (6) Back up the stem (item 5) with a bench or other support and use a hammer and punch to drive out the stem pin (item 11).

To reduce the possibility of bending the stem, it is recommended that a helper support the valve body so that the stem may be laid flat on the bench or support while driving out the pin. To prevent scarring of the stem, place a wooden block between the stem and the bench or support.

- (7) Push the stem assembly (items 5, 6, 7 & 8) through the liner bushing and out the inlet end of the valve.

THIS COMPLETES THE DISASSEMBLY REQUIRED FOR ROUTINE INSPECTION AND ROUTINE MAINTENANCE. FURTHER DIASSEMBLY IS NECESSARY ONLY IF THE PISTON, THE BUSHING, OR THE CUSHION RING MUST BE REPLACED.

### 3.2 REMOVAL OF THE BUSHING AND CUSHION RING

**CAUTION** – To remove the cushion ring (item 10) without damaging the ring, it is necessary to press out the bushing (item 9). The bushing and cushion ring need not be removed unless one or both or obviously damaged.

#### PROCEDURE:

Using a press or puller, pull both the bushing (item 9) and the cushion ring (item 10) from the valve body.

A puller may be improvised using a length of all-thread of a diameter slightly less than that of the stem, two nuts, two flat washers and a disk or plate with a hole for the all-thread and sufficiently large to span the inlet port of the valve.

**WARNING** – Do not attempt to drive out the bushing with a hammer. Hammering will deform the bushing. This will make field removal of the bushing impossible, and can cause malfunction of the valve.

THIS COMPLETES DISASSEMBLY OF THE VALVE. FOR REPLACEMENT OF THE PISTON, SEE SECTION 6.

4. DISASSEMBLY OF VALVES WITH LINER SUB AND SCREW-IN BONNET (MODELS 20513, 21027, 21050 & 26010) (See drawings in Sections 12.1, 12.2, 12.3, 12.4, 12.5, 12.6, 12.7 and 12.8)



This procedure assumes the availability of a vise of sufficient capacity to grip the valve body (item 1).

**CAUTION** – When clamping the valve body in a vise, use care to avoid damage to the name plate (item 13), the threads on the liner sub (item 3) and the threads which mount the safety cover (item 2).

#### 4.1 ROUTINE DISASSEMBLY

##### PROCEDURE:

- (1) Remove pressure from the valve inlet port.

**DANGER** - Tag and lock block valves or pump controls as necessary to ensure that pressure cannot accidentally be applied during maintenance of the valve.

- (2) Disconnect the inlet and discharge lines from the valve. The threads at the valve inlet and discharge ports are right-hand.
- (3) Unscrew and remove the safety cover (item 2). The threads are right-hand.
- (4) Remove the shear pin(s) (item 12).
- (5) Unseat the piston: Gripping the stem pin (item 11), pull the stem (item 5) outward by hand until the piston (item 6) is fully withdrawn from upper bore in the liner sub (item 3).
- (6) Unscrew and remove the liner sub (item 3) from the valve body (item 1). The threads are right-hand.
- (7) Remove and discard the liner sub O-ring (item 4). A new O-ring should be use when reinstalling the liner sub
- (8) If the valve has a hammer union inlet connection, remove the hammer union seal (item 20) from the liner sub hammer union connection.
- (9) Unscrew the bonnet (item 9) from the valve body (item 1). The threads are right-hand.

Withdraw as a unit the assembly consisting of the bonnet (item 9), the cushion ring (item 10), and the stem assembly (items 5, 6, 7, 8 & 11).



THIS COMPLETES THE DISASSEMBLY REQUIRED FOR ROUTINE INSPECTION AND ROUTINE MAINTENANCE. DISASSEMBLY OF THE STEM/BONNET ASSEMBLY IS NECESSARY ONLY IF THE STEM, THE BONNET, OR THE CUSHION RING MUST BE REPLACED. FOR REPLACEMENT OF THE PISTON SEE SECTION 6.

#### 4.2 DISASSEMBLY OF THE STEM/BONNET ASSEMBLY

##### PROCEDURE:

- (1) Lay the stem (item 5) flat on a bench and use a hammer and a punch to drive out the stem pin (item 11). To prevent scarring of the stem, place a wooden block between the stem and the bench or support.
- (2) Withdraw the stem (item 5) from the bonnet (item 9).

CAUTION – The cushion ring (item 10) fits tightly in its recess in the bonnet. It may be impossible to remove the cushion ring from the bonnet without damaging the ring. Do not attempt to remove the cushion ring from the bonnet unless the ring must be replaced because of aging or damage.

THIS COMPLETES DISASSEMBLY OF THE STEM/BONNET ASSEMBLY. FOR REPLACEMENT OF THE PISTON, SEE SECTION 6.

#### 5. INSPECTION (ALL MODELS)

##### 5.1 THREADS

Inspect threads for obvious damage, such as galling and pulled threads. Valve bodies, liner subs, bonnets, safety covers or hammer union nuts with severe or extensive thread damaged must be replaced.

- (1) Inspect threads on the valve body (item 1):
  - (a) Internal threads which mate with the liner sub for valves that have a liner sub
  - (b) Threads which mate with the discharge piping
  - (c) Internal threads which mate with the bonnet for valves that have a screw-in bonnet
  - (d) External threads which mate with the safety cover.
  - (e) Internal threads which mate with the inlet piping (Models 20015 & 20210).



- (2) Inspect threads on the liner sub (item 3) (Models 30525, 30550, 20513, 21027, 21050, & 26010)
  - (a) External threads which mate with the valve body
  - (b) Threads which mate with the inlet piping.
- (3) Inspect external threads on the bonnet (item 9). (Models 25013, 21027, 21050 and 26010)
- (4) Inspect internal threads in the safety cover (item 2).

## 5.2 LINER SUB (Models 30525, 30550, 20513, 21027, 21050, & 26010)

Inspect the upper bore of the liner sub (item 3) for erosion damage. If the sealing surface is damaged, the liner sub must be replaced. For liner subs that have hammer union end connections, inspect the seat in the hammer union for dents, cuts and erosion damage. If the hammer union seat is damaged the liner sub must be replaced.

## 5.3 BODY (Models 20015 and 20210)

Inspect the liner bushing (item 17) for erosion damage. If the liner bushing is damaged, the body must be replaced. (The liner bushing cannot be replaced in the field. The replacement body from Oteco Inc. will have the liner bushing installed.)

## 5.4 BODY (Models 30525, 30550, 20513, 21027, 21050 and 26010 that have hammer union outlet connections)

Inspect the outlet hammer union seat for dents, cuts, corrosion and erosion damage. The body must be replaced if the hammer union end is damaged. Inspect the hammer union nut (item 21), retainer segments (item 22) and retainer ring (23) for damage. Replace the parts that are damaged.

## 5.5 ELASTOMERIC COMPONENTS

Elastomeric components of the pressure relief valve (the cushion ring, the piston, O-ring and the hammer union seal for valves that have hammer union connections) are subject to deterioration caused by aging. Aging is accelerated by a numbers of factors; the most typical of which is heat. The preferred temperature range for storage of elastomeric components is 40 deg F (5 deg C) to 80 deg F (25 deg C). Storage at low temperatures will not harm elastomeric components, but the components may become brittle and crack if flexed at low temperatures.



CAUTION – Elastomeric components of the pressure relief valve must not be flexed at temperatures below 40 deg F (5 deg C). Furthermore, elastomeric components stored at temperatures below 40 deg F must not be flexed until they have been warmed throughout to 85 deg F (30 deg C) even if they are being placed in service at temperatures less than 85 deg F.

Elastomeric components should be inspected for the following signs of aging:

- (a) Permanent deformation
- (b) Surface tackiness
- (c) Noticeable hardening or softening of the surface
- (d) Cracks

When inspecting for cracks, use a magnifying glass to view the surface as the component is flexed. Components exhibiting any of the above indications of aging should be considered unserviceable.

NOTE – When inspecting elastomers, the presence of a bloom (a delicate powdery coating) is unimportant. Bloom should not be interpreted as evidence of aging or damage.

- (1) Inspect the cushion ring (item 10). If the ring is abraded, torn, or shows signs of aging, the ring must be replaced.
- (2) Inspect the piston (item 6). In order to seal reliably, the elastomer of the piston must be free from visible defects or signs of aging.
- (3) If the valve has a liner sub, a new liner sub O-ring (item 4) should be installed each time the joint between the liner sub and the valve body is broken. Inspect the new O-ring before installing it. In order to seal reliably, an O-ring must show absolutely no visible defects or signs of aging.
- (4) If the valve has hammer union connections, inspect the hammer union seal (item 20). If the hammer union seal is torn or shows signs of aging, it must be replaced.

## 5.6 STEM

Inspect the stem (item 5) to ensure that it is not bent. Check for damage such as upsets and scoring, which can interfere with free travel of the stem through the bushing. Minor surface damage such as upsets and scoring may be smoothed with a file.



## 5.7 SHEAR PIN

Discard any shear pin substitute (eg. nails, hex wrenches, or other objects). Discard any shear pin of unknown origin. Discard any shear pin, which is deformed. i.e. Which shows the onset of shearing. The old shear pin may be reinstalled if it is known to be of OTECO, Inc. manufacture and if no deformation is visible.

**WARNING** – Use only genuine OTECO, Inc. shear pins. Substitution of nails, hex wrenches, or other objects can results in abnormally low or dangerously high relief pressures or prevent operation of the valve, with the risk of failure of other system components and bodily injury or death.

Shear pins manufactured by OTECO, Inc are color coded as follows:

<b>OTECO, Inc. Pin No.</b>	<b>Color Code</b>
60	ORANGE
50	BLACK
45	SILVER
40	GREEN
30	GREY
20	RED
16	BLUE
12	WHITE
8	PURPLE
6	YELLOW
4	PINK
3	BROWN

## 6. REPLACEMENT OF THE PISTON

The following procedure assumes that the valve has been disassembled, following the procedure in Section 2, Section 3 or Section 4, as applicable.

### PROCEDURE:

- (1) Remove and discard the cotter pin (item 8), which secures the piston (item 6) and washer (item 7) to the stem (item 5). Use a new cotter pin when reinstalling the piston and washer.
- (2) Remove the piston and the washer.
- (3) The piston for valve Models 30550, 20015, 20210, 20513, 21027 and 21050 consists of an elastomeric seal molded onto a backup ring, and is replaced as a unit. Do not attempt to



**WARNING** – The piston must be oriented on the stem correctly. Pistons that have a backup ring should be oriented so that the backup ring butts against the boss on the stem. The piston for the Model 30525 that does not have a backup ring should be oriented so that the flat end of the elastomeric piston butts against the boss on the stem. The valve can malfunction if the piston is installed upside down.

- (4) separate the seal and backup ring. The piston for Model 30525 is an elastomeric seal without a backup ring. Install the new piston by sliding it onto the lower end of the stem.
- (5) Slide the washer (item 7) onto the stem, outboard of the piston.
- (6) Install a new cotter pin (item 8) in the stem below the washer. Cotter pins should not be reused.

**THIS COMPLETES REPLACEMENT OF THE PISTON.**

## 7. ASSEMBLY OF VALVES WITH A LINER SUB AND PRESS-IN BUSHING (MODELS 30525 & 30550) (See drawings in Sections 10.1, 10.2, 10.3, and 10.4)

This procedure assumes the availability of a vise of sufficient capacity to grip the valve body (item 1).

**CAUTION** – When clamping the valve body in a vise, use care to avoid damage to the name plate (item 13), the threads on the liner sub (item 3) and the threads, which mount the safety cover (item 2).

### 7.1 INSTALLATION OF THE BUSHING AND CUSHION RING

#### PROCEDURE:

- (1) Using a press or puller, install the bushing (item 9) into its recess in the valve body (Item 1).

A puller may be improvised with a length of all-thread, two flat washers, two nuts, a sleeve (e.g. Pipe nipple) large enough to slip over the outside diameter of the bushing, and a disk or plate with hole for the all-thread and sufficiently large to span the diameter of the sleeve or nipple.

- (2) Using a press or puller, install the cushion ring (item 10) into its recess in the valve body (item 1). Cushion ring must be installed such that it is oriented correctly and firmly seated against the bushing (item 9).



**WARNING** – The cushion ring must be oriented in accordance with the following directives, in order to avoid the possibility of valve malfunction and/or cause damage to the valve.

The cushion rings for Models 30525 and 30550 have one end that is flat with small holes. The other end has a large bevel that extends from the outside diameter to almost the inside diameter. The cushion ring must be oriented so that the end with the large bevel faces the piston i.e. the beveled end of the cushion must face away from the bushing.

**WARNING-** The cushion ring (item 10) must be installed in the recess of the valve body (item 1) such that it is firmly seated in the recess and against the bushing (item 9). Operation of the valve with the cushion not seated correctly may cause the valve to malfunction and/or cause damage to the valve.

**THIS COMPLETES INSTALLATION OF THE BUSHING AND THE CUSHION RING.**

## 7.2 ROUTINE ASSEMBLY

### PROCEDURE:

- (1) Insert the stem assembly (items 5, 6, 7, & 8) into the valve body and through the cushion ring (item 10) and bushing (item 9).
- (2) Back up the stem (item 5) with a bench or other support and use a hammer to install the stem pin (item 11). Drive the pin through the stem until it is approximately centered.

To reduce the possibility of bending the stem, it is recommended that a helper support the valve body so that the stem may be laid flat on the bench or support while driving out the pin. To prevent scarring of the stem, place a wooden block between the stem and the bench or support.

- (3) Following the procedure below, install a new O-ring (item 4) on the liner sub (item 3).

**CAUTION** – Install a new O-ring each time the liner sub is reassembled to the valve body. O-rings are easily damaged during installation and removal. O-rings, which have previously been in service, may leak if reused.



#### PROCEDURE FOR INSTALLATION OF THE LINER SUB O-RING:

- (a) Carefully inspect the new O-ring for imperfections, permanent deformation, and for signs of aging. Do not install an O-ring, which shows any visible defect. The O-ring may be flexed to check for cracking, but it must not be stretched.
- (b) Apply a very light coat of O-ring lubricant to the O-ring, to the gland in the valve body and to the groove on the liner sub.
- (c) Wrap the threads on the liner sub with tape or paper in order to protect the O-ring from being cut by the threads.
- (d) Carefully slide the O-ring over the protective tape or paper and into place in the groove in the liner sub. Do not roll the ring into place.

#### THIS COMPLETES THE INSTALLATION OF THE LINER SUB O-RING.

- (4) Apply a light coat of anti-seize compound or thread compound to the threads in the valve body. Do not apply compound to the threads on the liner sub, since compound on the liner sub could be forced into the O-ring gland during assembly.

CAUTION – Thread compound can cause an O-ring to leak. Do not allow thread compound to enter the O-ring gland.

- (5) Screw the liner sub (item 3) into the valve body (item 1) until the tapered mating faces make contact, then torque the joint to approximately 100 ft-lb. Excessive tightness is not required nor will it improve the seal.
- (7) Seat piston: grip the stem pin (item 11) and exert steady pressure on the stem until the piston (item 6) seats in the upper bore of the liner sub (item 3).

WARNING – Do not hammer on the stem in an attempt to seat the piston. Hammering will deform the stem. This can cause malfunction of the valve.

- (8) Rotate the stem until the shear pin hole(s) in the stem is aligned with the corresponding hole(s) in the bushing (item 9).



WARNING – If the stem pin (item 11) is missing, it may be possible to seat the piston far enough into the liner sub to allow a shear pin to be inserted through the stem pin hole, rather than through the hole intended for the shear pin. This can cause malfunction of the valve. If the stem pin is missing and cannot be immediately be replaced, be certain that the stem pin hole is visible above the bushing.

- (9) Insert the proper shear pin(s) (item 12) through the stem (item 5) and bushing (item 9).

WARNING – Use only genuine OTECO, Inc. shear pins. Substitution of nails, hex wrenches, or other objects can result in abnormally low or dangerously high relief pressures or prevent operation of the valve, with the risk of failure of other system components and bodily injury or death.

- (10) Replace the safety cover (item 2).

WARNING – The stem is projected outward with great speed and force when the valve operates. Contact with the moving stem can result in bodily injury. To prevent accidental contact with the stem, the safety cover must be installed before pressure is applied to the valve and must remain installed at all times pressure is applied to the valve.

- (10) If the valve has hammer union connections, install the hammer union seal ring (item 20).

THIS COMPLETES THE ROUTINE ASSEMBLY.

## 8. ASSEMBLY OF VALVES WITH PRESS-IN BUSHING THAT DO NOT HAVE A LINER SUB (MODELS 20015 AND 20210) (See drawings in Sections 11.1 and 11.2)

This procedure assumes the availability of a vise of sufficient capacity to grip the valve body (item 1).

CAUTION – When clamping the valve body in a vise, use care to avoid damage to the name plate (item 13) and the threads, which mount the safety, cover (item 2).

### 8.1 INSTALLATION OF THE BUSHING AND CUSHION RING

#### PROCEDURE:

- (1.) Using a press or puller, install the bushing (item 9) into its recess in the valve body (item 1).
-



A puller may be improvised with a length of all-thread, two flat washers, two nuts, a sleeve (e.g. Pipe nipple) large enough to slip over the outside diameter of the bushing, and a disk or plate with hole for the all-thread and sufficiently large to span the diameter of the sleeve or nipple.

- (2.) Using a press or puller, install the cushion ring (item 10) into its recess in the valve body (item 1). Cushion ring must be installed such that it is oriented correctly and firmly seated against the bushing (item 9).

**WARNING** – The cushion ring must be oriented in accordance with the following directives, in order to avoid the possibility of valve malfunction and/or cause damage to the valve.

Cushion rings for Models 20015 and 20210 have a counterbore on the inside diameter (the end of the cushion with the larger inside diameter). The outside diameter on the same end as the counterbore is slightly larger than the opposite end. The end of the cushion with the counterbore and larger outside diameter must be oriented to face the piston. i.e. the enlarged end of the bore must face away from the bushing.

**WARNING-** The cushion ring (item 10) must be installed in the recess of the valve body (item 1) such that it is firmly seated in the recess and against the bushing (item 9). Operation of the valve with the cushion not seated correctly may cause the valve to malfunction and/or cause damage to the valve.

## THIS COMPLETES INSTALLATION OF THE BUSHING AND THE CUSHION RING

### 8.2 ROUTINE ASSEMBLY

#### PROCEDURE:

- (1) Insert the stem assembly (items 5, 6, 7, & 8) into the valve body and through the cushion ring (item 10) and bushing (item 9).
- (2) Back up the stem (item 5) with a bench or other support and use a hammer to install the stem pin (item 11). Drive the pin through the stem until it is approximately centered.

To reduce the possibility of bending the stem, it is recommended that a helper support the valve body so that the stem may be laid flat on the bench or support while driving out the pin. To prevent scarring of the stem, place a wooden block between the stem and the bench or support.



- (3) Seat the piston: Grip the stem pin (item 11) and exert steady pressure on the stem until the piston (item 6) seats in the upper bore of the liner bushing (item 17).

**WARNING** – Do not hammer on the stem in an attempt to seat the piston. Hammering will deform the stem. This can cause malfunction of the valve.

- (4) Rotate the stem until the shear pin hole in the stem is aligned with the corresponding hole in the bushing (item 9).

**WARNING** – If the stem pin (item 11) is missing, it may be possible to seat the piston far enough into the liner bushing to allow a shear pin to be inserted through the stem pin hole, rather than through the hole intended for the shear pin. This can cause malfunction of the valve. If the stem pin is missing and cannot be immediately be replaced, be certain that the stem pin hole is visible above the bushing.

- (5) Insert the proper shear pin (item 12) through the stem (item 5) and bushing (item 9).

**WARNING** – Use only genuine OTECO, Inc. shear pins. Substitution of nails, hex wrenches, or other objects can result in abnormally low or dangerously high relief pressures or prevent operation of the valve, with the risk of failure of other system components and bodily injury or death.

- (6) Replace the safety cover (item 2).

**WARNING** – The stem is projected outward with great speed and force when the valve operates. Contact with the moving stem can result in bodily injury. To prevent accidental contact with the stem, the safety cover must be installed before pressure is applied to the valve and must remain installed at all times pressure is applied to the valve.

**THIS COMPLETES THE ROUTINE ASSEMBLY.**

9. ASSEMBLY OF VALVES WITH A LINER SUB AND SCREW-IN BONNET (MODELS 20513, 21027, 21050, & 26010) (See drawings in Sections 12.1, 12.2, 12.3, 12.4, 12.5, 12.6, 12.7, and 12.8)

This procedure assumes the availability of a vise of sufficient capacity to grip the valve body (item 1).



**CAUTION** – When clamping the valve body in a vise, use care to avoid damage to the name plate (item 13), the threads on the liner sub (item 3) and the threads, which mount the safety cover (item 2).

## 9.1 ASSEMBLY OF THE STEM/BONNET ASSEMBLY

### PROCEDURE:

- (1) Using a vise, press or puller, install the cushion ring (item 10) into the bonnet (item 9). Cushion ring must be installed such that it is oriented correctly and firmly seated against the shoulder in the bonnet.

A puller may be improvised with a length of all-thread, two flat washers, two nuts, and a disk or plate with a hole for the all-thread and sufficiently large to span the diameter of the cushion ring.

**WARNING** – The cushion ring must be oriented in accordance with the following directives, in order to avoid the possibility of valve malfunction and/or cause damage to the valve.

The cushion rings for Models 20513, 21027, & 21050 have a counter bore in the inside diameter. The end of the cushion ring that has the counter bore (the end with the larger inside diameter) must be oriented so that the enlarged bore faces the piston i.e. the enlarged end of the bore must face away from the screwed-in bonnet.

The cushion ring for Model 26010 has a smaller outside diameter one end. The end of the cushion that has the smaller outside diameter must be oriented so that it faces the piston i.e. the smaller outside diameter end must face away from the screwed-in bonnet.

**WARNING-** The cushion ring (item 10) must be installed in the recess of the bonnet (item 9) such that it is firmly seated in the recess and against the shoulder in the bonnet. Operation of the valve with the cushion not seated correctly may cause the valve to malfunction and/or cause damage to the valve.

- (2) Insert the stem assembly (items 5, 6, 7, & 8) into the bonnet for Models 20513, 21027, 21050. Insert the stem (item 5) into the bonnet for Model 26010.
- (3) Lay the stem flat on a bench and use a hammer to install the stem pin (item 11). To prevent scarring of the stem, place a wooden block between the stem and the bench or support. Drive the pin through the stem until it is approximately centered.



THIS COMPLETES INSTALLATION OF THE STEM/BONNET ASSEMBLY. SEE SECTION 6 FOR REPLACEMENT OF THE PISTON.

## 9.2 ROUTINE ASSEMBLY

### PROCEDURE:

- (1) Install the stem/bonnet assembly (items 5, 6, 7, 8, 9, 10, & 11 for Models 20513, 21027, 21050), (items 5, 9, 10, & 11 for Model 26010) in the valve body. The threads are right hand. Tighten the bonnet to a torque of approximately 75 ft-lb.
- (2) Following the procedure below, install a new O-ring (item 4) on the liner sub (item 3).

CAUTION – Install a new O-ring each time the liner sub is reassembled to the valve body. O-rings are easily damaged during installation and removal. O-rings, which have previously been in service, may leak if reused.

### PROCEDURE FOR INSTALLATION OF THE LINER SUB O-RING:

- (a) Carefully inspect the O-ring for imperfections, permanent deformation, and for signs of aging. Do not install an O-ring which shows any visible defect. The O-ring may be flexed to check for cracking, but it must not be stretched.
- (b) Apply a very light coat of O-ring lubricant to the O-ring, to the gland in the valve body and to the groove on the liner sub.
- (c) Wrap the threads on the liner sub with tape or paper in order to protect the O-ring from being cut by the threads.
- (d) Carefully slide the O-ring over the protective tape or paper and into place in the groove in the liner sub. Do not roll the ring into place.

### THIS COMPLETES THE INSTALLATION OF THE LINER SUB O-RING

- (3) Apply a light coat of anti-seize compound or thread compound to the threads in the valve body. Do not apply compound to the threads on the liner sub, since compound on the liner sub could be forced into the O-ring gland during assembly.



**CAUTION** – Thread compound can cause an O-ring seal to leak. Do not allow thread compound to enter the O-ring gland.

- (4) Screw the liner sub (item 3) into the valve body (item 1) until the tapered mating faces make contact, then torque the joint to approximately 100 ft-lb. Excessive tightness is not required, nor will it improve the seal.
- (5) Seat the piston: grip the stem pin (item 11) and exert steady pressure on the stem until the piston (item 6) seats in the upper bore of the liner sub (item 3).

**WARNING** – Do not hammer on the stem in an attempt to seat the piston. Hammering will deform the stem. This can cause malfunction of the valve.

- (6) Rotate the stem until the shear pin hole(s) in the stem is aligned with the corresponding hole(s) in the bonnet.

**WARNING** – If the stem pin (item 11) is missing, it may be possible to seat the piston far enough into the liner sub to allow a shear pin to be inserted through the stem pin hole, rather than through the hole intended for the shear pin. This can cause malfunction of the valve. If the stem pin is missing and cannot be immediately replaced, be certain the stem pin hole is visible above the bushing.

- (7) Insert the proper shear pin(s) (item 12) through the stem (item 5) and bonnet (item 9).

**WARNING** – Use only genuine OTECO, Inc. shear pins. Substitution of nails, hex wrenches, or other objects can result in abnormally low or dangerously high relief pressures or prevent operation of the valve, with the risk of failure of other system components and bodily injury or death.

- (8) Model 26010 (See drawing in sections 12.7 and 12.8) does not have an elastomeric piston. This valve requires a packing compound to be pumped into the valve in order to obtain a seal between the lower stem and the liner sub. Remove the setscrew from the packing gun assembly (item 18). Insert a stick of packing compound (Item 19, use only Oteco, Inc. molding packing compound which contains TFE fluorocarbon particles with a synthetic binder, pt. no. 141627 , 3/8 diameter x 1 ½ long) into the packing gun. Reinstall the setscrew. Turn the setscrew forcing the packing compound into the valve. Repeat this procedure to install each stick of packing compound. Approximately 14 sticks of packing compound are required to obtain a seal.
- (9) Replace the safety cover (item 2).



WARNING – The stem is projected outward with great speed and force when the valve operates. Contact with the moving stem can result in bodily injury. To prevent accidental contact with the stem, the safety cover must be installed before pressure is applied to the valve and must remain installed at all times pressure is applied to the valve.

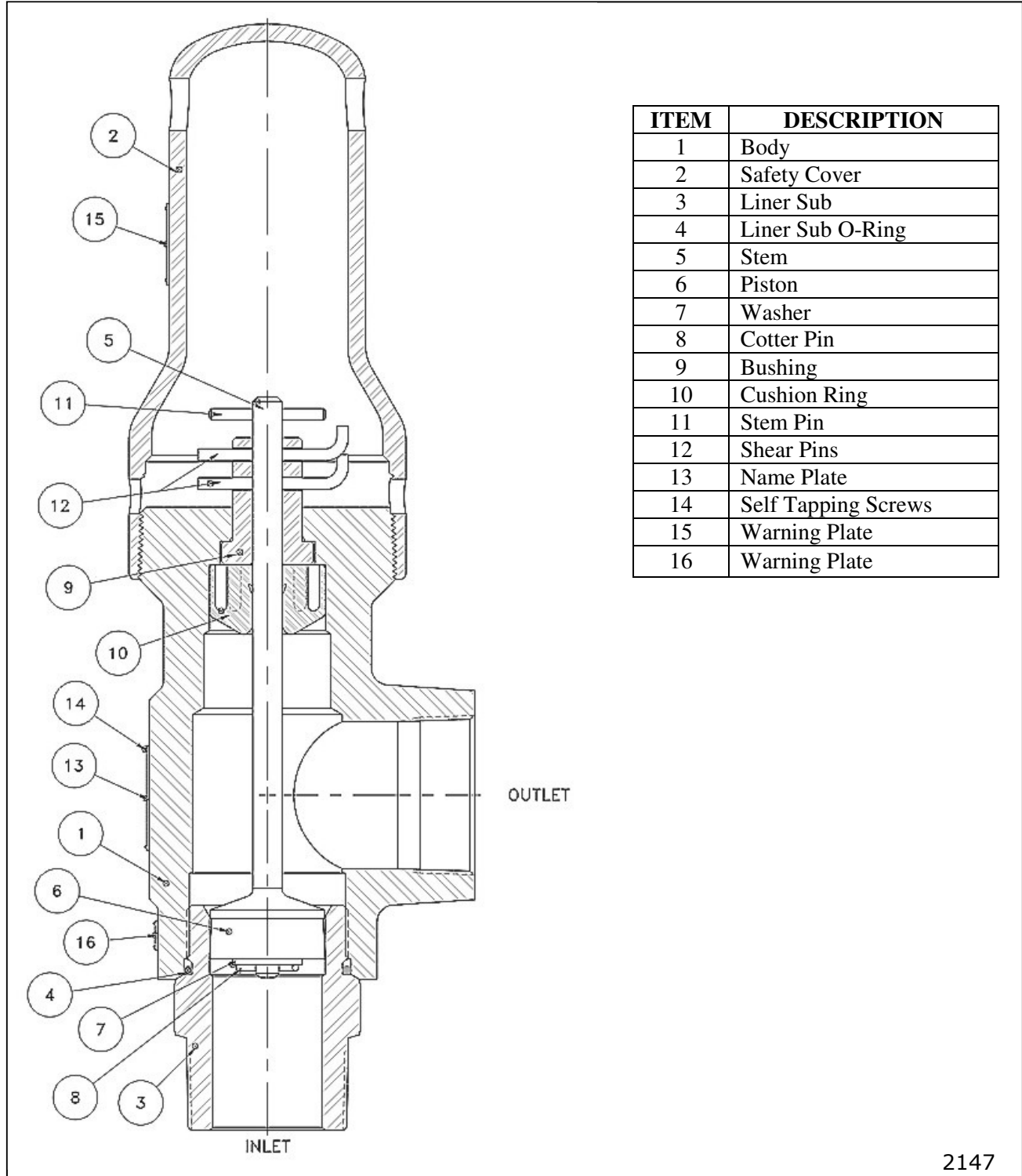
(10) If the valve has hammer union connections, install the hammer union seal ring (item 20).

**THIS COMPLETES THE ROUTINE ASSEMBLY**



Assembly drawings of valves with Liner Sub and Press-In Bushing

10.1 Model 30525 with threaded Inlet and Outlet connections

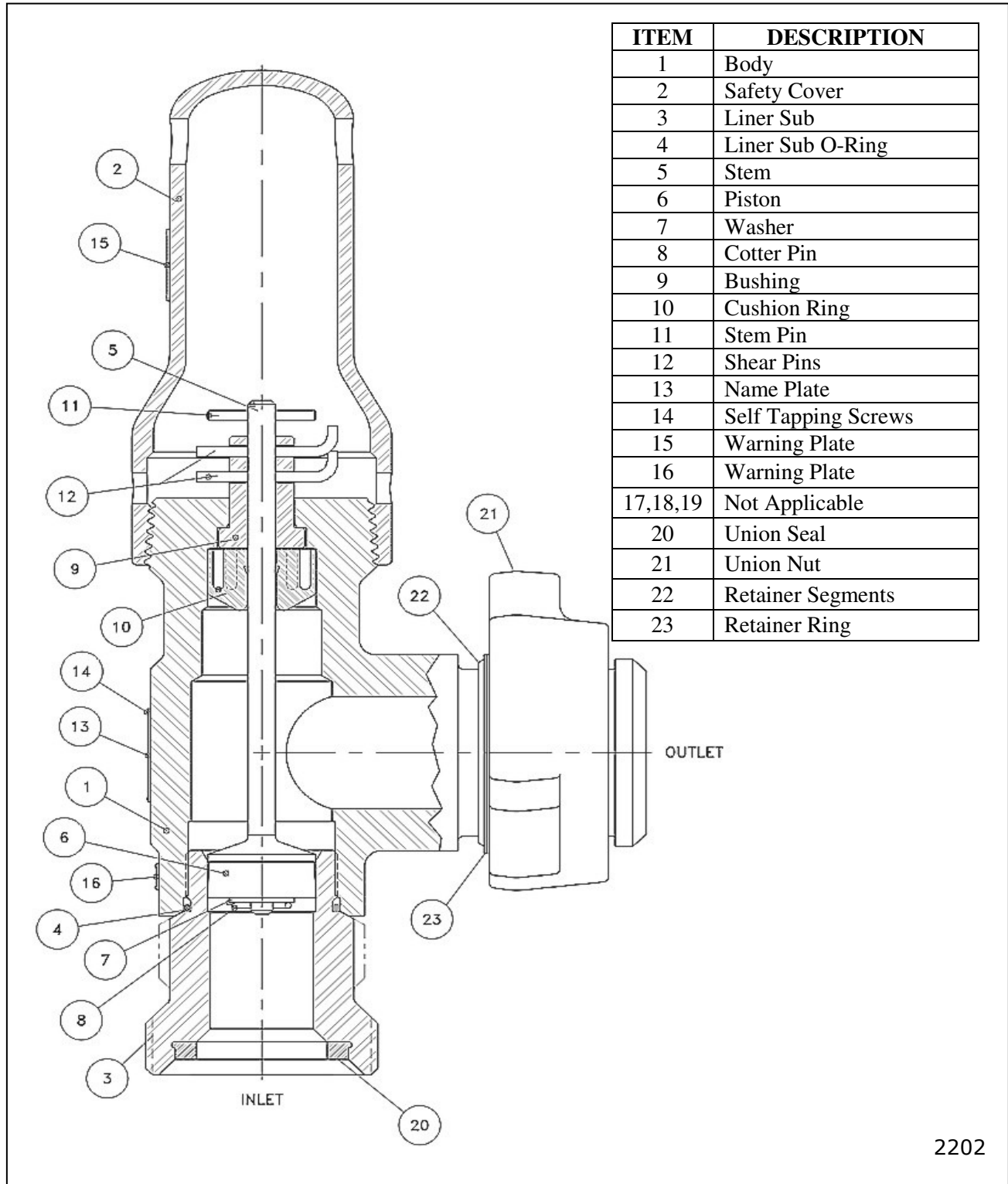


ITEM	DESCRIPTION
1	Body
2	Safety Cover
3	Liner Sub
4	Liner Sub O-Ring
5	Stem
6	Piston
7	Washer
8	Cotter Pin
9	Bushing
10	Cushion Ring
11	Stem Pin
12	Shear Pins
13	Name Plate
14	Self Tapping Screws
15	Warning Plate
16	Warning Plate

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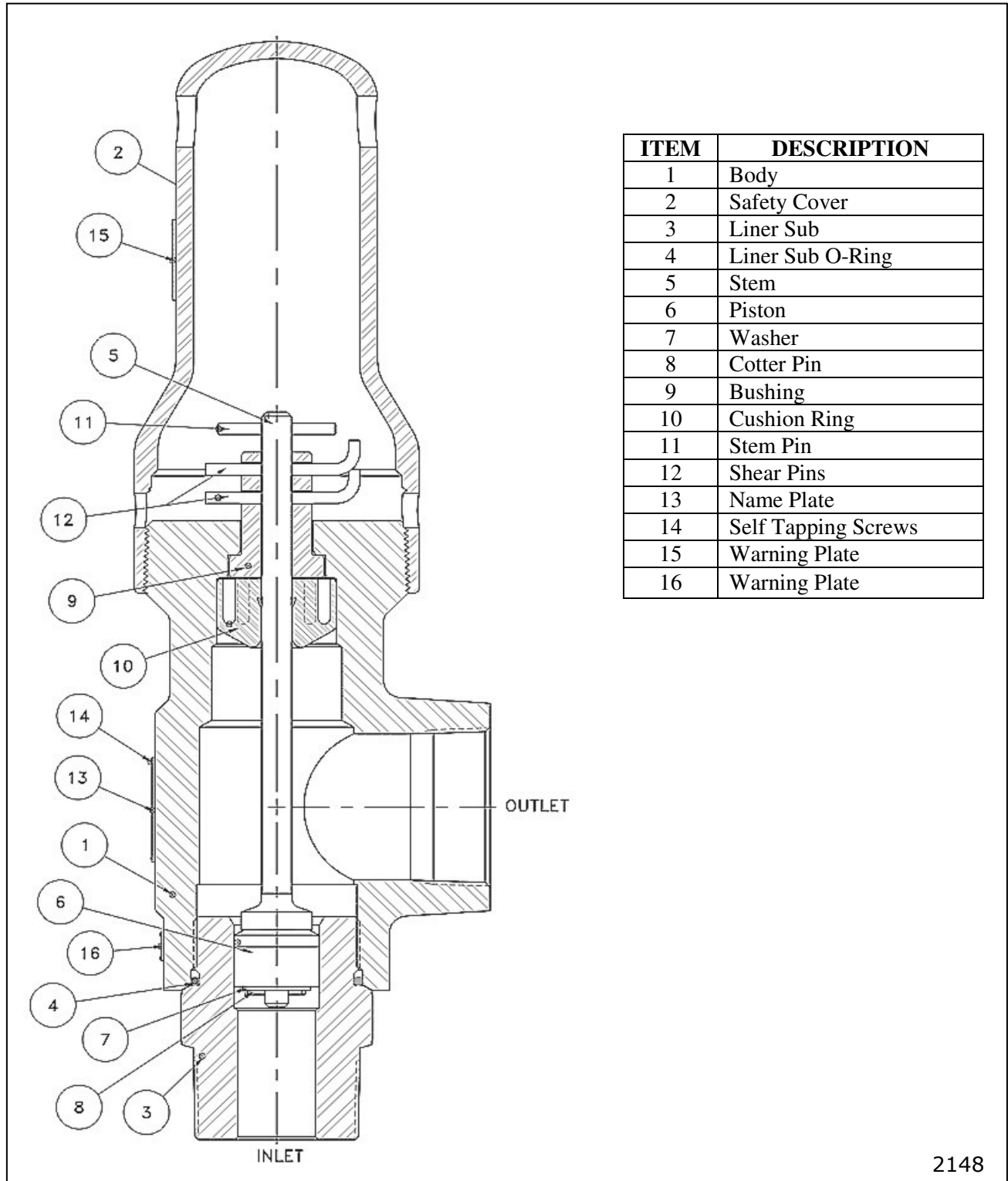


10.2 Model 30525 with Hammer Union Inlet and Outlet connections



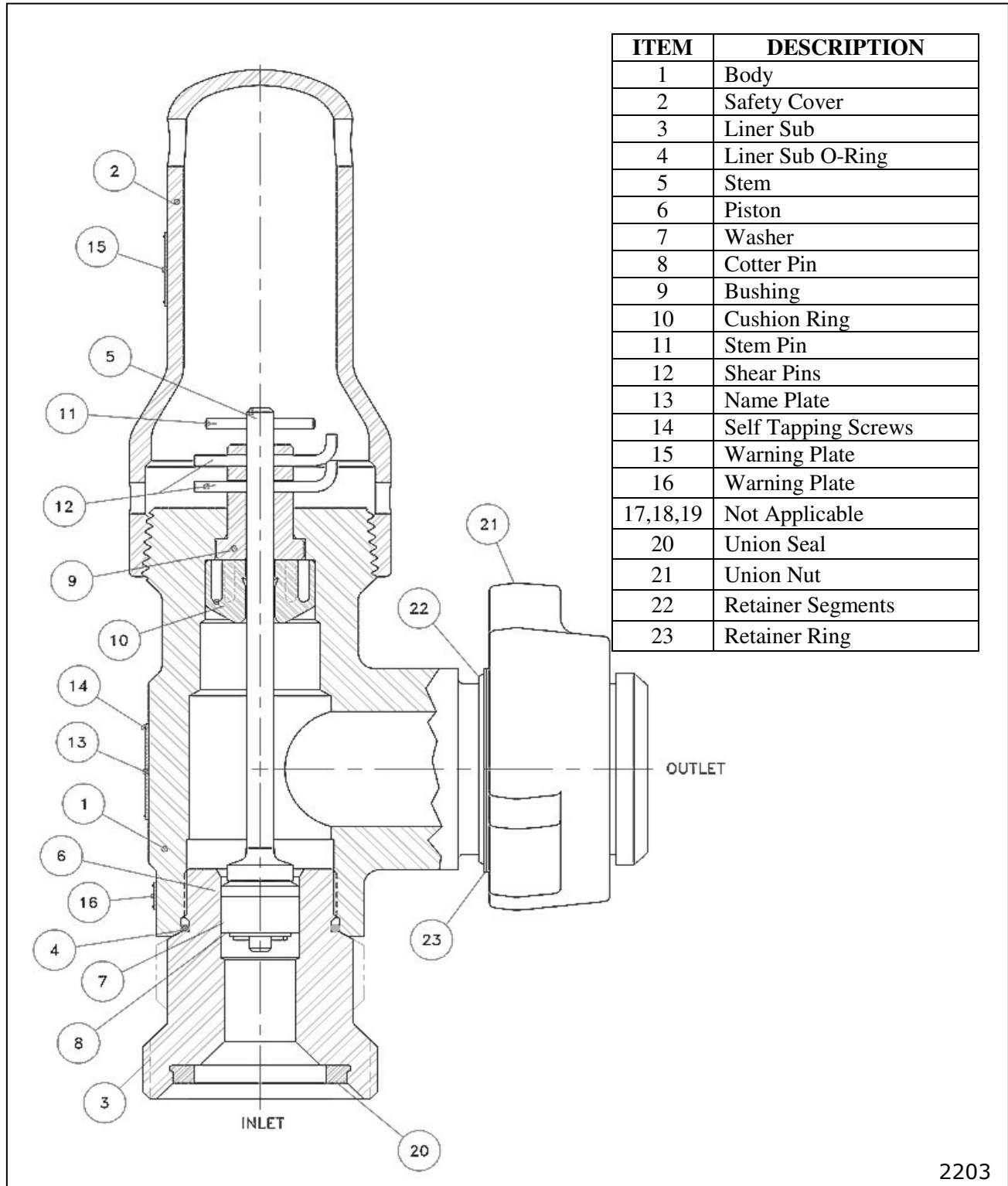


10.3 Model 30550 with Threaded Inlet and Outlet connections



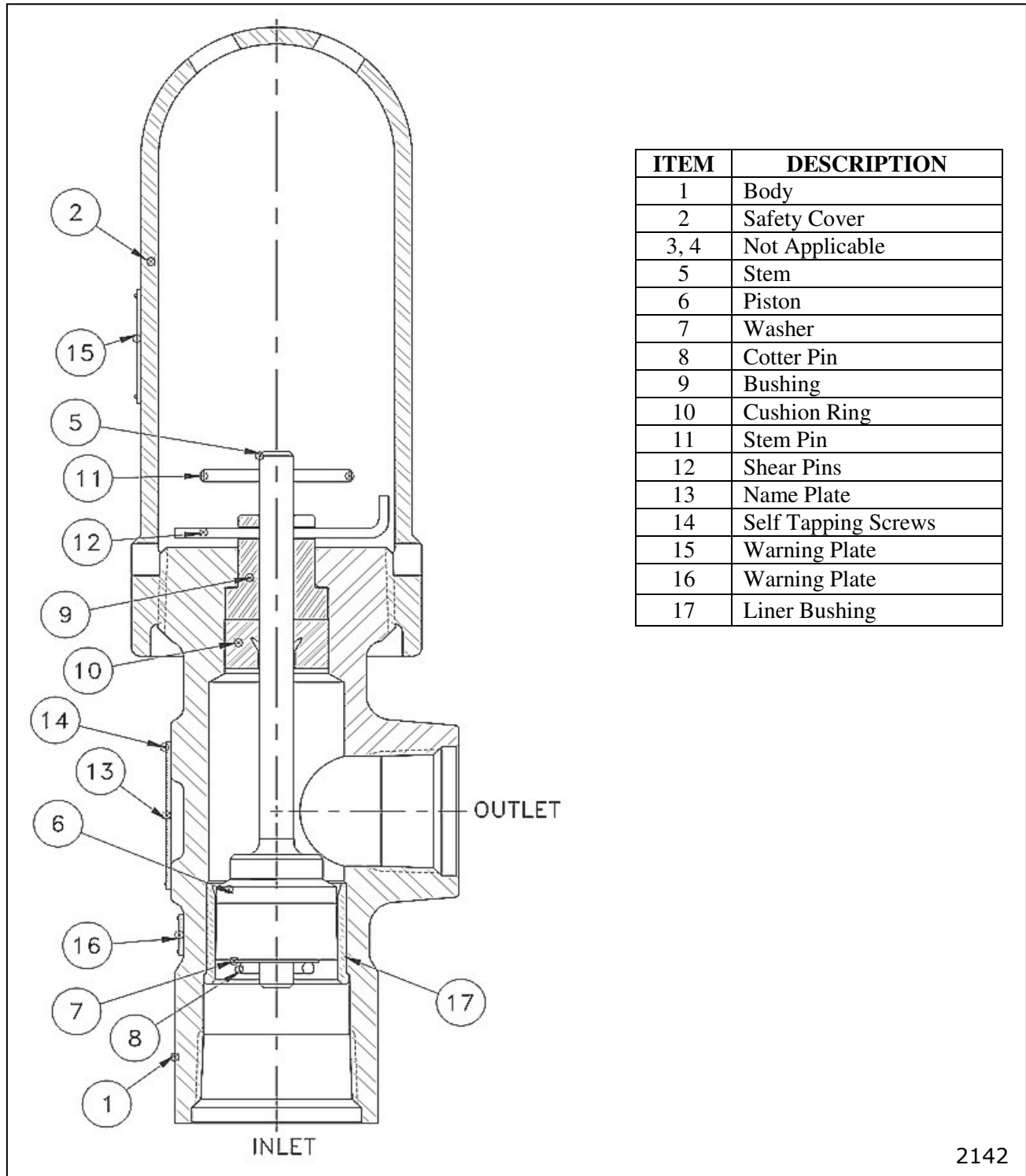


10.4 Model 30550 with Hammer Union Inlet and Outlet connections



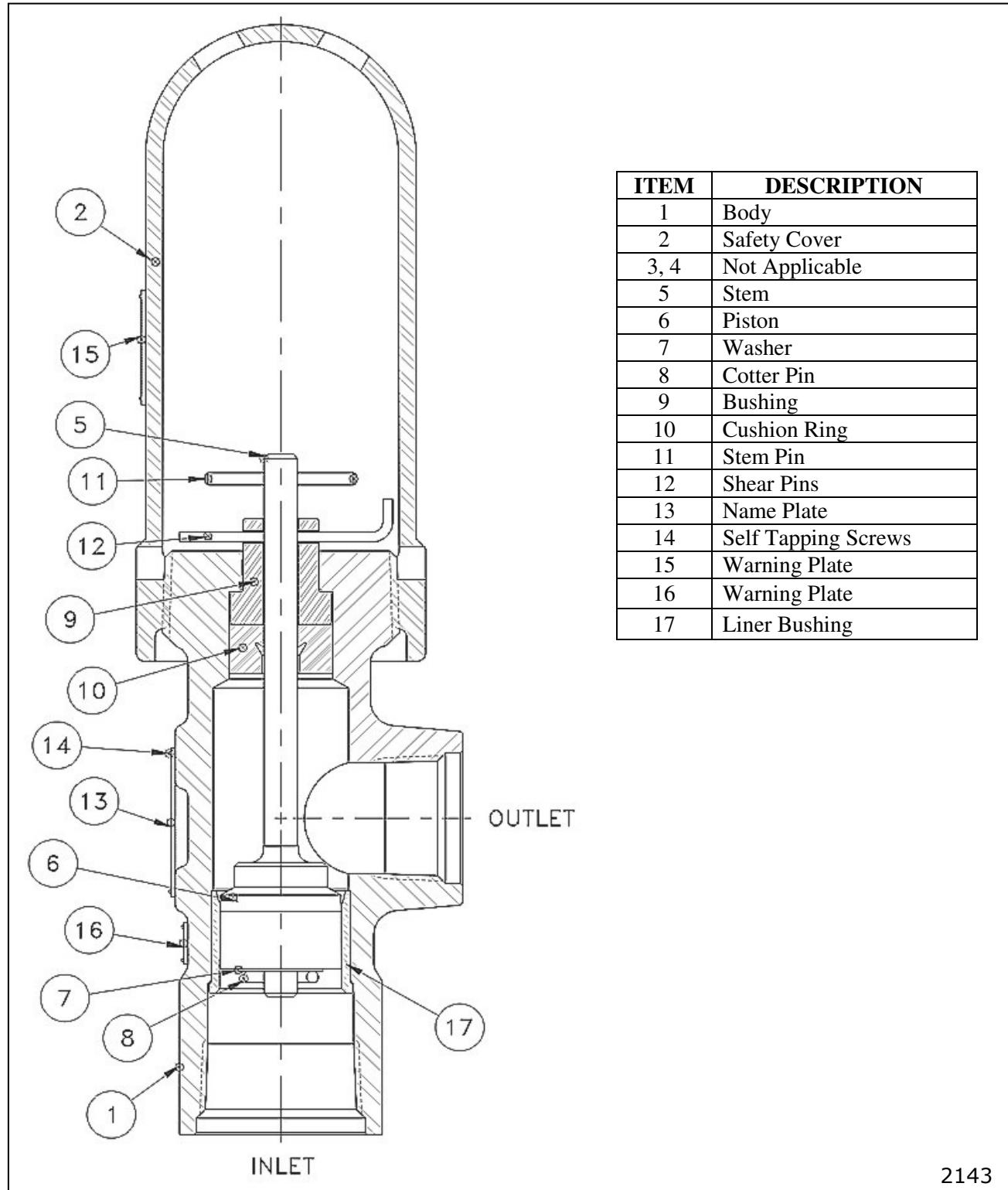


11 Assembly drawings of valves with Press-In Bushing that do not have a Liner Sub  
 11.1 Model 20015 with Threaded Inlet and Outlet Connection





11.2 Model 20210 with Threaded Inlet and Outlet Connections



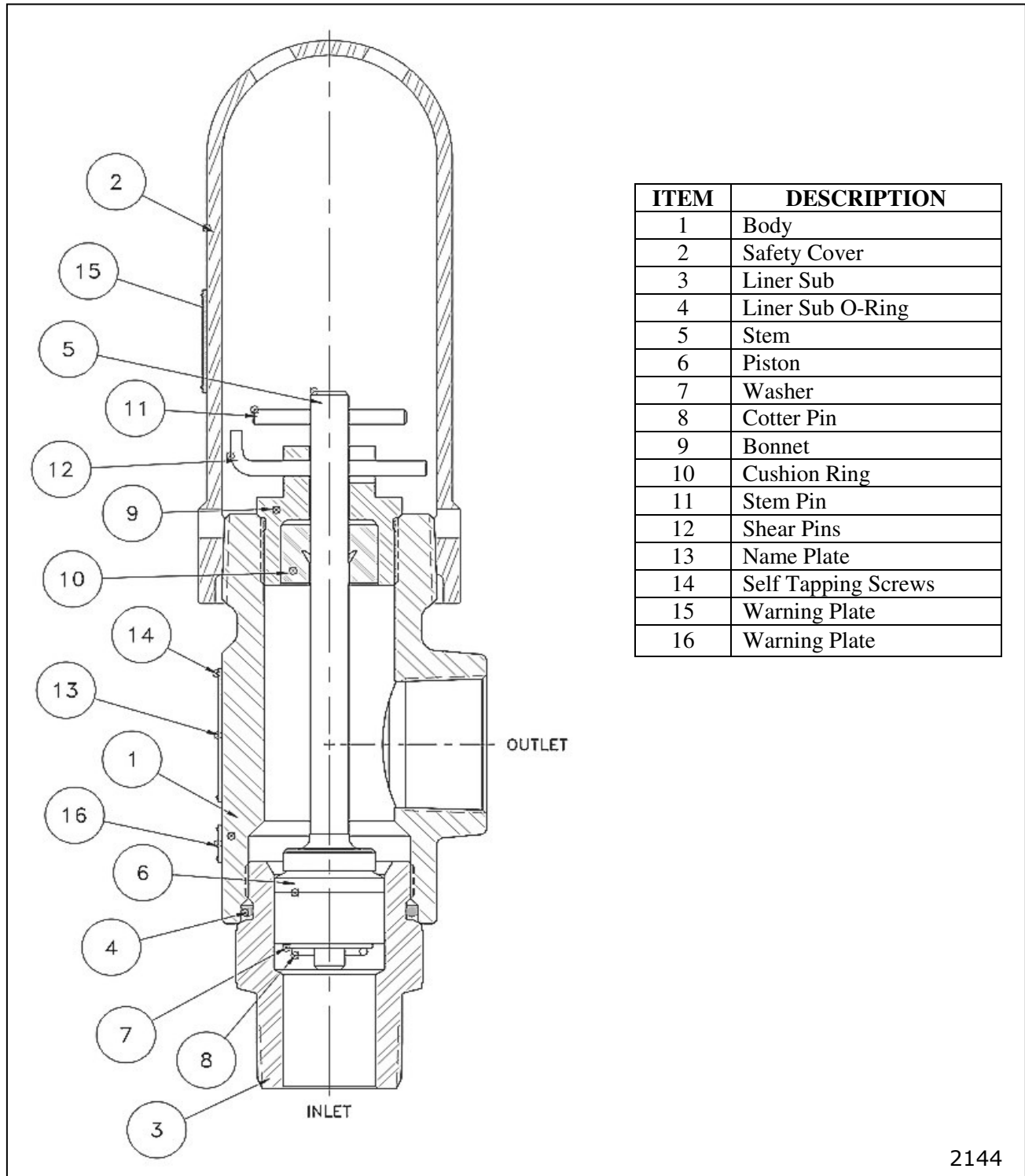
ITEM	DESCRIPTION
1	Body
2	Safety Cover
3, 4	Not Applicable
5	Stem
6	Piston
7	Washer
8	Cotter Pin
9	Bushing
10	Cushion Ring
11	Stem Pin
12	Shear Pins
13	Name Plate
14	Self Tapping Screws
15	Warning Plate
16	Warning Plate
17	Liner Bushing

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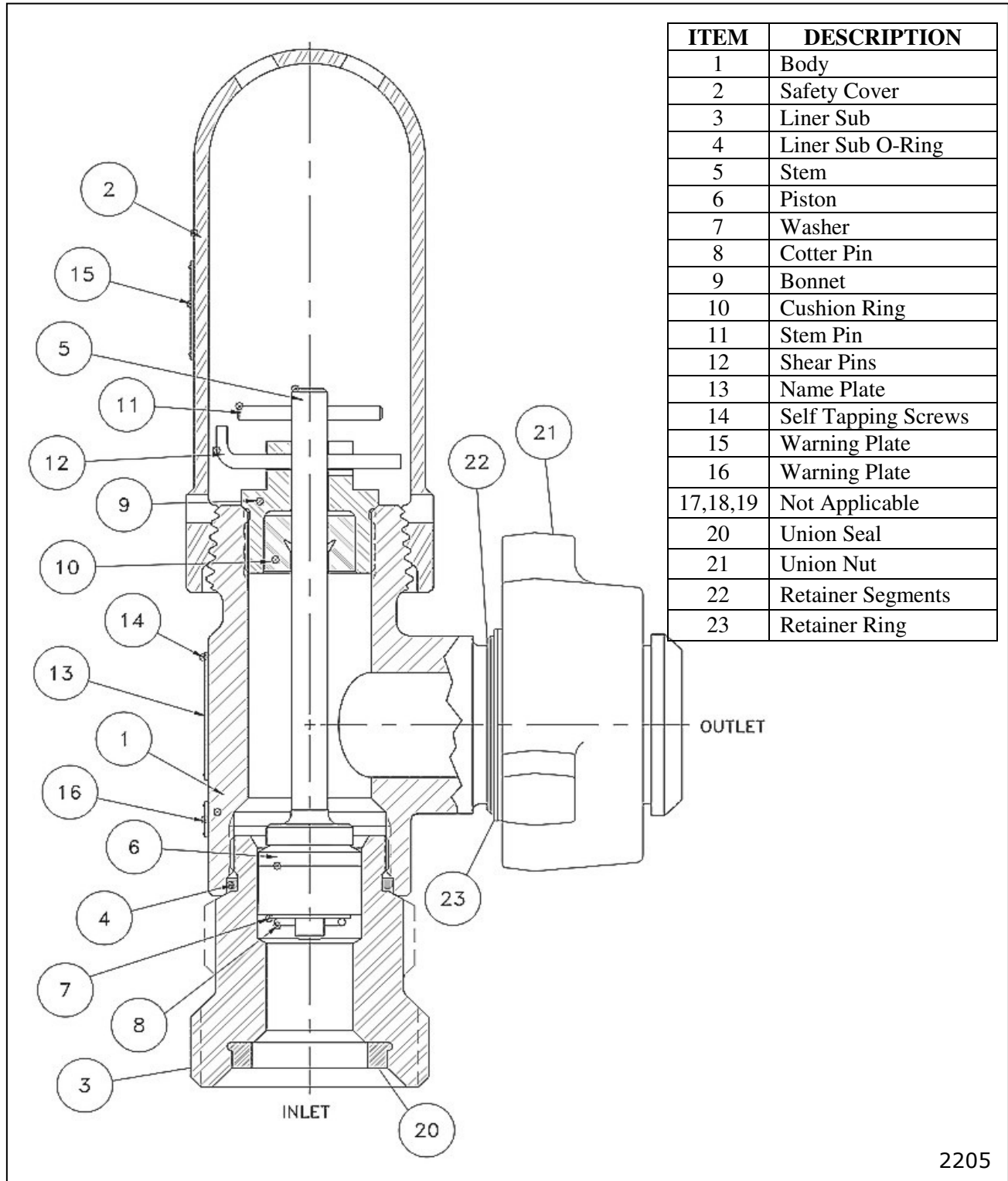
12 Assembly drawings of valves with Liner Sub and Screw-In Bonnet

12.1 Model 20513 with threaded Inlet and Outlet connections



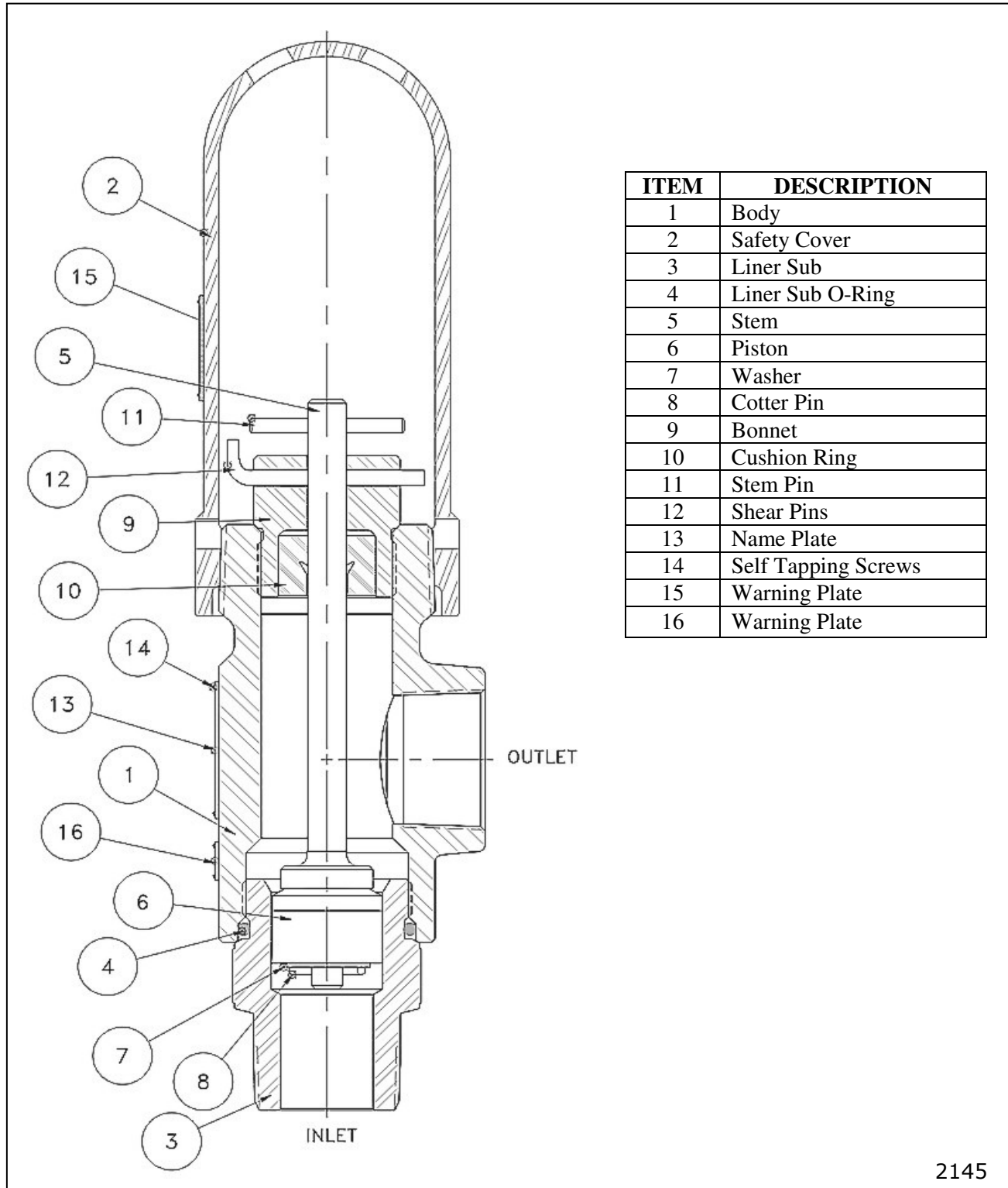


12.2 Model 20513 with Hammer Union Inlet and Outlet connections



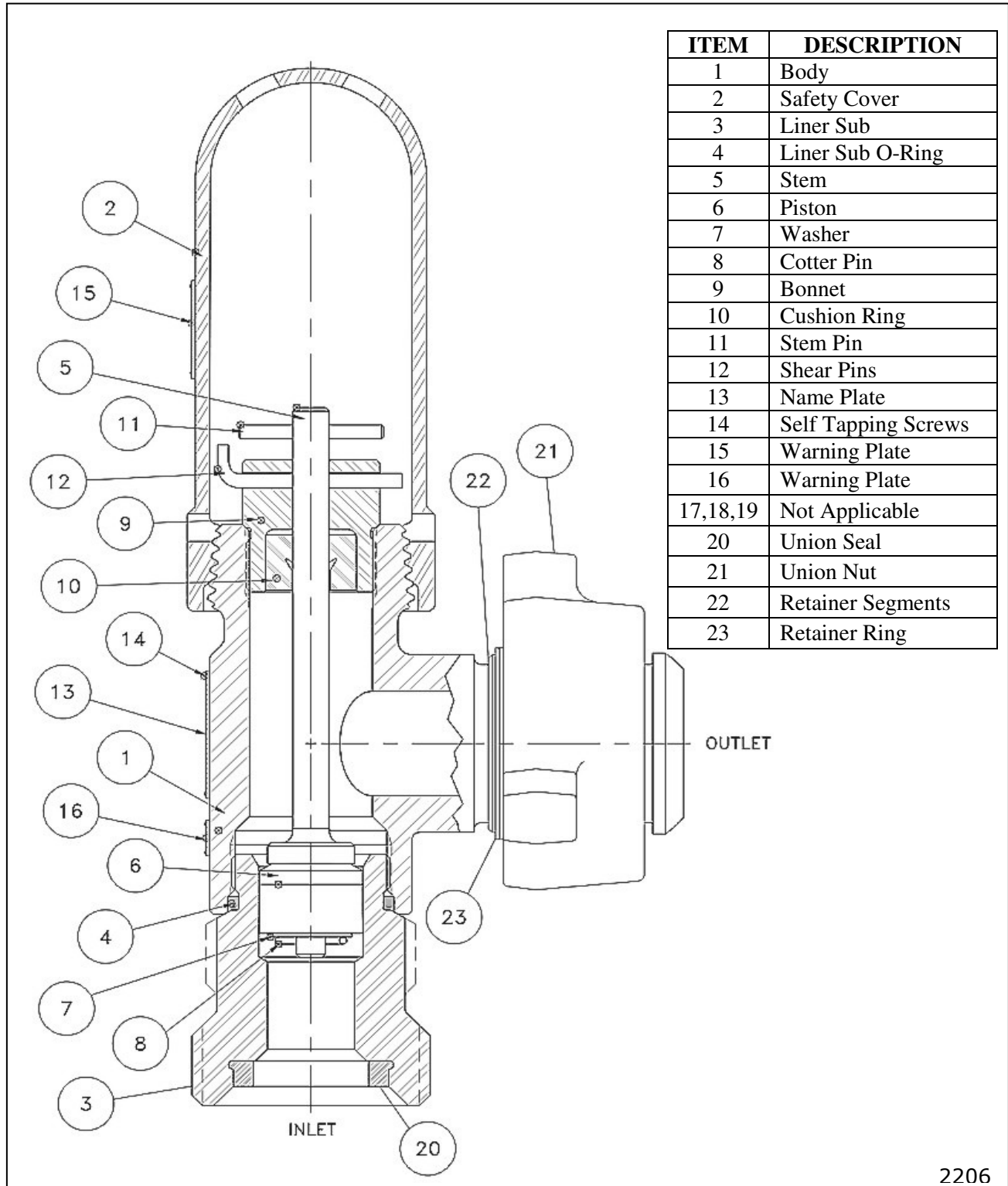


12.3 Model 21027 with Threaded Inlet and Outlet connections



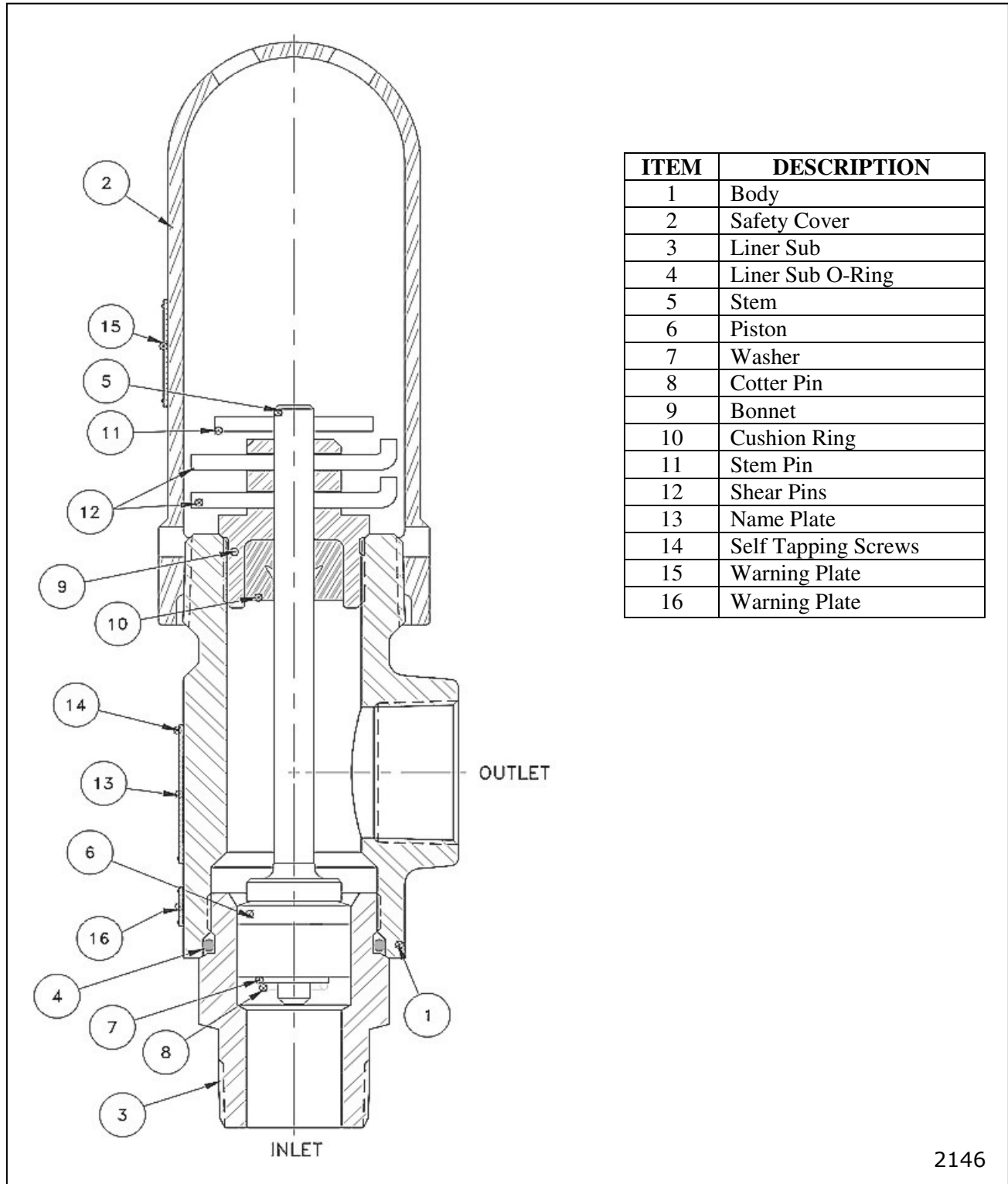


12.4 Model 21027 with Hammer Union Inlet and Outlet connections



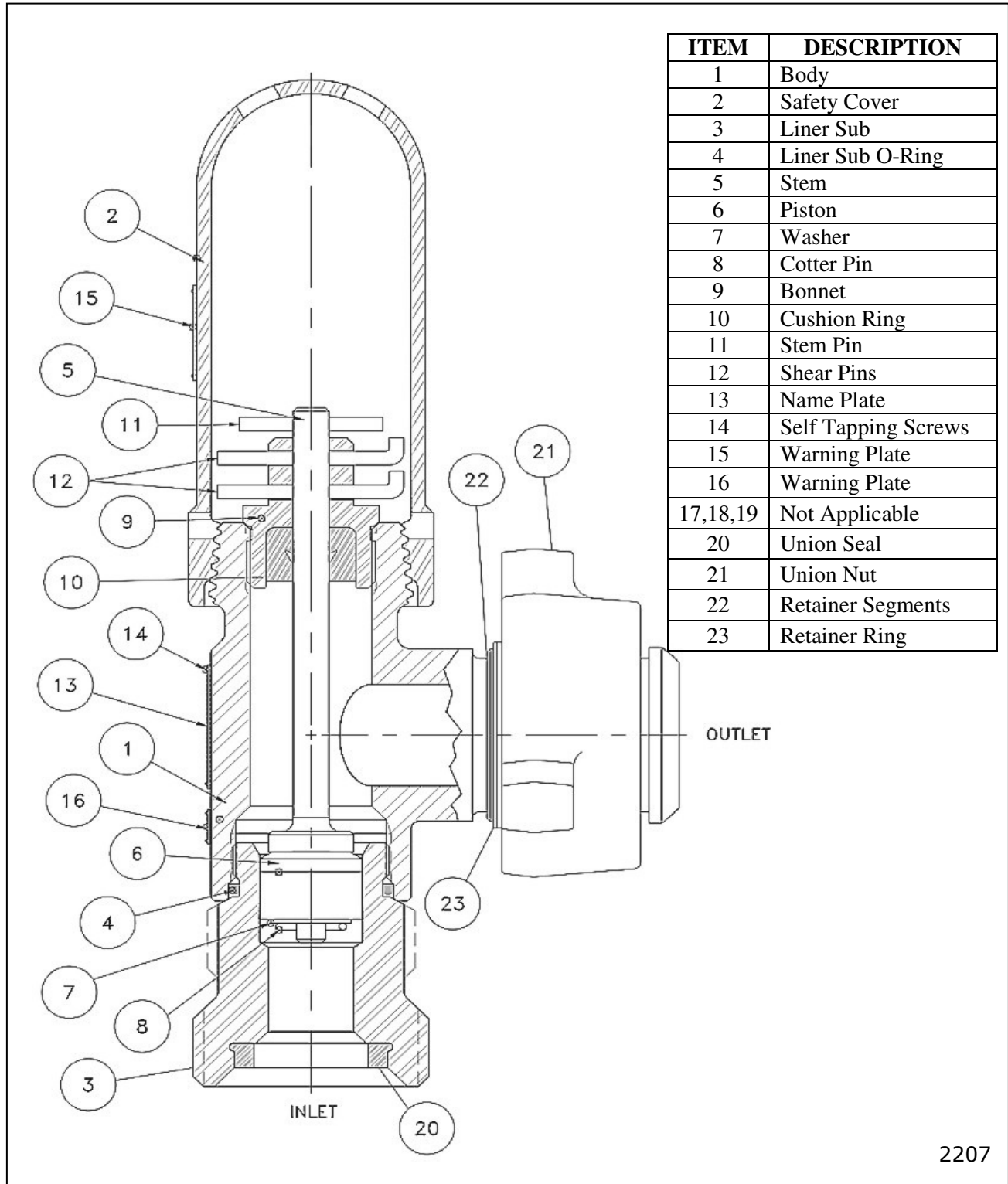


12.5 Model 21050 with Threaded Inlet and Outlet connections





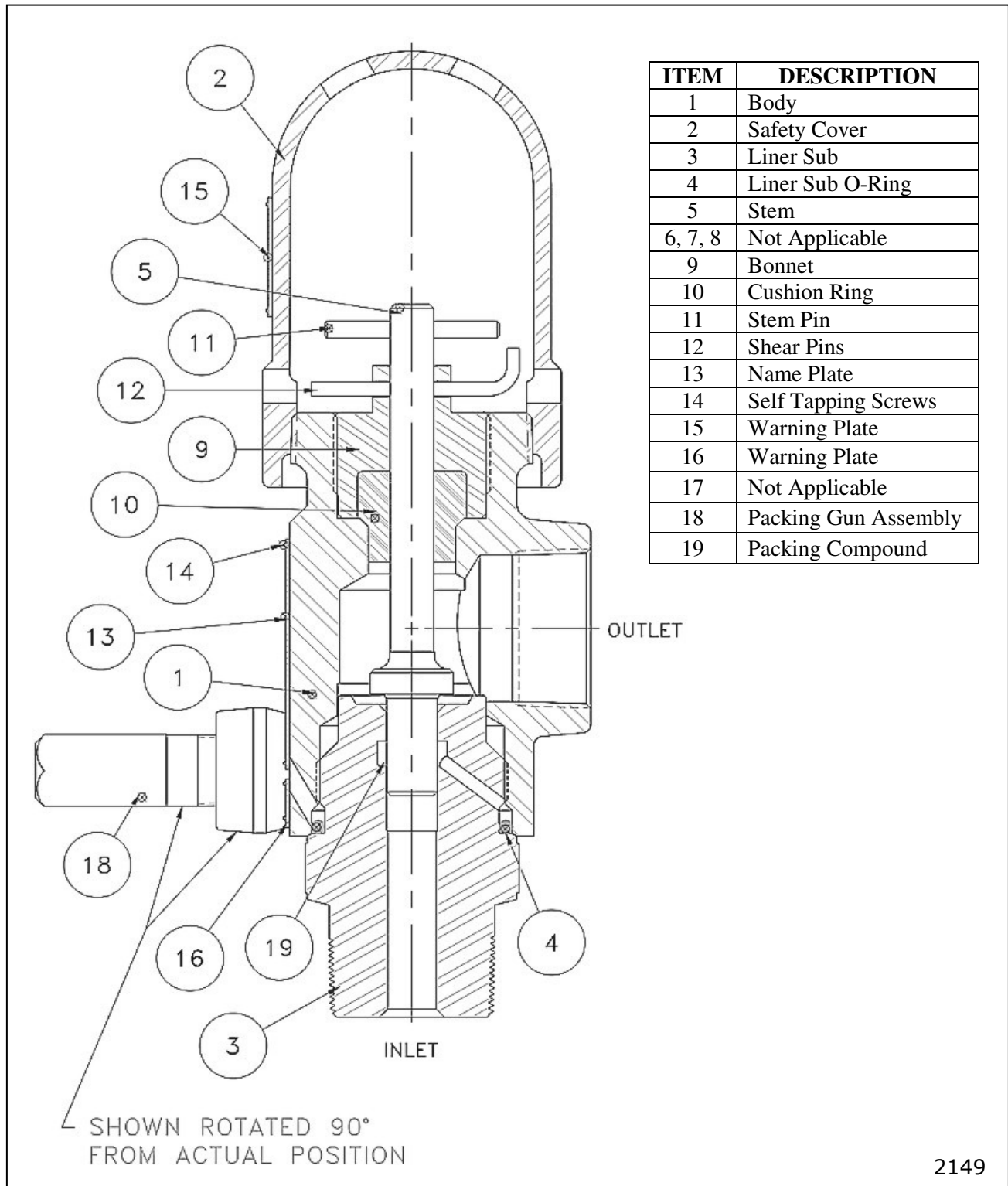
12.6 Model 21050 with Hammer Union Inlet and Outlet connections



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12.7 Model 26010 with Threaded Inlet and Outlet connections





12.8 Model 26010 with Hammer Union Inlet and Outlet connections

