



**PRESSURE RELIEF VALVE: SHEAR PINS & RESETTING,
INSTALLATION, ROUTINE INSPECTION, AND ROUTINE MAINTENANCE**

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NOTE – Special attention should be paid to warnings and notes enclosed in a box, as is this explanatory note. The words DANGER and WARNING 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.



1. OVERVIEW

The Oteco Inc. Pressure Relief Valve (see sections 8 and 9) is designed to protect pump systems from overpressure. One or two shear pins chosen from several standard sizes are installed to set the relief pressure. After the valve operates to relieve an overpressure condition, it is necessary to remove pressure from the valve, manually reseal the piston, and install a new shear pin. For Model 26010 it is necessary to inject packing compound into the valve to obtain a seal. (see sections 8 (8) and 9 (6)).

DANGER – Do not attempt to inject packing compound into Model 26010 while the valve is under pressure. This will cause packing compound, parts of the packing gun and pressurized fluid to blow out of the valve resulting in bodily injury or death.

The discharge port is in the side of the valve body. The inlet port is at the base of the valve body or is a liner sub at the base of the valve body depending on the model of Pressure Relief Valve. A press-in bushing or screw-in bonnet is installed in the top of the valve body. The valve stem extends through the bushing or bonnet and down into the liner sub or liner bushing. A pressure-energized elastomeric piston is installed on the lower end of the valve stem on all models except Model 26010. The piston seals against the upper bore of the liner sub or liner bushing. (For Model 26010 (see sections 8 (8) and 9 (6)), the lower part of the stem seals against the upper bore of the liner sub with the aid of packing compound injected around the lower part of the stem.) One or two shear pins run through the holes in the upper end of the stem and through mating holes in the bushing or bonnet. The piston maintains a seal against the bore of the liner sub or liner bushing until fluid pressure below the piston is sufficient to cause shearing of the pin or pins, at which time the pressure forces the piston and stem upward, allowing flow from the inlet port to the discharge port.

Improper installation of the valve can result in bodily injury or death when the valve operates. Oteco, Inc. Engineering bulletin EB-001 provides guidelines for design of a safe and reliable installation. In particular, the discharge line must be of adequate pressure rating and must be routed to a location, which is safe with respect to both personnel and environment. Also inlet and discharged piping must be adequately anchored to resist the reaction forces produced by fluid flow and pressure.

Once installed, the pressure relief valve should receive periodic inspections for corrosion, which can prevent operation of the valve, and for leakage, which can erode the sealing surface. Design of the piping should anticipate periodic removal of the valve for inspection and should make provision for safe and routine inspection to detect leakage.



This engineering bulletin discusses shear pins and provides guidelines for installation, routine inspection, and routine maintenance of Oteco, Inc. pressure relief valves. Detail disassembly, inspection, and assembly procedures for these valves may be found in Oteco, Inc. Engineering bulletin EB-002.

2. SHEAR PINS

The pressure at which the valve operates is determined by the force required to shear a pin or pins installed through the bonnet or bushing and the valve stem in single or double shear configuration.

Warning – The Oteco, Inc. pressure valve is NOT designed for applications which demand precise setting of the relief pressure. The pressures indicated on the valve nameplate are nominal values. The actual pressure at which the valve operates may vary from the nominal pressure.

Early versions of valves of this design utilized common steel nails as shear pins. Although nails may have been satisfactory in years past, common nails currently on the market come from a wide range of sources, both domestic and foreign, and exhibit loose dimensional tolerances and a wide variation in material properties. Consequently, relief pressures obtained with nails are no longer sufficiently predictable. To ensure predictable and consistent relief pressures, shear pins of Oteco, Inc. manufacture are carefully controlled both in material properties and in dimension.

Shear pins manufactured by Oteco, Inc. are colored coded as follows:

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



The nominal relief pressures listed on the valve nameplate have been determined by testing in the Oteco, Inc. laboratory, and are valid when the specified genuine Oteco, Inc. shear pin is installed. The actual pressure at which the valve operates will vary, due to a number of factors. In the absence of pressure pulsation, relief pressures can be expected to fall within limits which are generally acceptable in the applications for which the valve is intended.

When exposed to excessive pressure pulsation, the valve may operate at a pressure significantly below nominal relief pressure, due to fatigue of the shear pin.

WARNING – Personnel must be alert to the possibility of unexpected operation of the pressure relief valve due to fatigue of the shear pin. Never place yourself in a position in which you may be exposed to bodily injury if the valve operates. Unless you have personally verified that the appropriate block valves or pump controls have been tagged and locked and that all pressure has been bled from the valve inlet port, you cannot safely assume that the valve cannot operate.

3. INSTALLATION PROCEDURE

WARNING – The Oteco, Inc. Pressure Relief Valve must be installed in accordance with Oteco, Inc. Engineering Bulletin EB-001. The bulletin provides guidelines for design of a safe and reliable installation and discusses potential personnel and environmental hazards posed by reaction forces and the discharge stream.

(1) Install the proper Oteco, Inc. shear pin(s).

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.

(2) Install the safety cover.

WARNING – The stem moves 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.



3.1 VALVES WITH THREADED INLET AND OUTLET CONNECTIONS (See section 8)

- (1) Inspect the threads on the inlet and discharge ports of the valve, to ensure they are clean and free from damage.

Threads on the inlet and discharge ports of Oteco, Inc. pressure relief valves are designed to mate with line pipe, which conforms to API specification 5B.

- (2) Inspect the mating threads on the inlet and discharge piping to ensure they are clean and free from damage and that they conform to API STD 5B.
- (3) Obtain a thread compound which meets the requirements of API bulletin BUL 5A2. Apply a uniform coating of the compound to both internal and external threads before making up a joint.
- (4) Make the valve inlet and outlet connections “power tight” before applying pressure to the valve. After application of pressure, ensure that the inlet and discharge connections are “tight joints” as defined in API specification 5B.

| |
|--|
| <p>DANGER – The inlet and discharge connections must be tight joints. Leakage through the threads will erode the valve body and the liner sub and can bring about separation of the valve from the inlet line, resulting in bodily injury or death.</p> |
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3.2 VALVES WITH HAMMER UNION INLET AND OUTLET CONNECTIONS (See section 9)

- (1) Inspect the hammer unions and the threads of the hammer unions on the inlet and outlet ports of the valve, to ensure they are clean and free from damage.

Hammer union connections on the inlet and outlet ports of Oteco, Inc. valves are manufactured to mate with FMC Weco® hammer unions.

Weco® is a registered trademark of FMC Technologies, Stephenville, Texas



- (2) Inspect the mating hammer unions on the inlet and discharge piping to ensure they are compatible with FMC Weco® hammer unions.

WARNING – The hammer union inlet and outlet connection of Oteco, Inc. valves are manufactured to mate with FMC Weco® hammer unions. Hammer unions made by other companies may not be compatible with hammer unions on Oteco, Inc. valves. Never make connections to mating hammer unions unless the mating unions are positively identified as being compatible with FMC Weco® hammer unions. Specific questions regarding compatibility of hammer unions of manufacture other than FMC Weco®, must be directed to the appropriate manufacturer. Use of mating hammer unions which are not compatibility with FMC Weco® hammer unions could result in leakage and/or failure under pressure resulting in equipment damage, bodily injury, or death.

- (3) Inspect the mating hammer unions and threads of the mating hammer unions on the inlet and discharge piping to ensure they are clean and free from free from damage.
- (4) Inspect the mating hammer unions on the inlet and discharge piping to ensure they are the same size, figure number, and pressure rating as the inlet and outlet hammer unions on the pressure relief valve.

Warning- Components of a hammer union assembly must be all the same size, figure number and pressure rating. Never connect Oteco, Inc. pressure relief valves to mating hammer unions that are not the same size, figure number and pressure rating as the respective hammer unions on the inlet and outlet ports of the pressure relief valve. Mismatched hammer union connections may fail under pressure, which can cause equipment damage, bodily injury or death.

- (5) Inspect the elastomer seal in the inlet and outlet hammer unions. If the hammer union seal is torn or shows signs of aging, it must be replaced.
- (6) Make the valve inlet and outlet hammer union connections completely before applying pressure to the valve.

Danger-The inlet and discharge connections must be tight joints. Leakage through the hammer unions will erode the connection and can bring about separation of the valve from the piping resulting in bodily injury or death.

THIS COMPLETES THE INSTALLATION PROCEDURE.

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4. ROUTINE INSPECTION

Periodic inspection of the pressure relief valve is necessary to ensure reliable operation. The aim of the inspection is to detect:

- (a) Internal corrosion, which can prevent operation of the valve.
- (b) Leakage, which can erode the sealing surface.
- (c) Erosion damage, caused by the flow of abrasive fluids.

Oteco, Inc. recommends an initial inspection interval of one week. Once a service history has been established for a particular installation, the inspection interval may be adjusted accordingly.

4.1 INTERNAL CORROSION

A valve may experience corrosion between the stainless steel stem and the carbon steel body, particularly if the valve is in salt-water service. Severe corrosion can prevent the valve from operating. The valve should be removed and disassembled in order to check for corrosion.

4.2 LEAKAGE

Leakage can erode the sealing surface. Leakage can easily go unnoticed if the valve discharge is piped back to a mud pit or reservoir without provision for leak detection.

DANGER – Never look directly into the discharge port of the pressure relief valve while pressure is applied to the valve inlet. Never place your hand into a high-velocity fluid stream or use your hand or body as a probe to detect leakage. High-velocity fluid streams such as those resulting from leakage can cause bodily injury or death. Use a mirror if visual inspection is necessary to detect leakage.

4.3 EROSION DAMAGE

When the valve operates repeatedly while in service with a highly-abrasive fluid, fluid can eventually erode the bore in the liner sub or liner bushing to the extent that a leak-tight seal can no longer be maintained.



5. ROUTINE MAINTENANCE

The following routine maintenance is adequate only if the valve is in service with a non-caking, non-corrosive fluid. If the valve is in service with a fluid which is corrosive or which carries suspended solids which may cake within the valve, routine maintenance should consist of disassembly of the valve, followed by through washing of the valve internals with high-pressure water. Disassembly and assembly procedures may be found in Oteco, Inc. Engineering Bulletin EB-002.

Oteco, Inc. recommends that, regardless of the routine inspection interval (see section 4), routine maintenance be performed on a weekly basis, as well as each time the valve operates to relieve an over pressure condition.

ROUTINE MAINTENANCE 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 be accidentally applied during maintenance of the valve.

Do not attempt to replace the shear pin while pressure is applied to the inlet port. The valve stem can move very rapidly in response to the pressure and can inflict bodily injury during the attempt to install the shear pin.

- (2) Remove the safety cover.

WARNING – The stem moves 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.

- (3) Remove the shear pin(s).

Discard any shear pin substitute (e.g. 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.

- (4) Oil the stem. Grip the stem pin and move the stem several times through its full stroke to distribute oil over the full length of the stem and to ensure that the stem travels freely and without binding.



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- (5) Seat the piston: Grip the stem pin and exert steady pressure on the stem until the piston seats into the liner sub or liner bushing.

WARNING – Do not hammer on the stem in an attempt to seat the piston. Hammering will deform the stem. This may 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 bushing or bonnet.

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.

- (7) Replace the shear pin(s).

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 system components and bodily injury or death.

- (8) Model 26010 does not have an elastomeric piston (See sections 8 (8) and 9 (6)). 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 1/2 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.

WARNING – The stem moves 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 MAINTENANCE PROCEDURE.

6. DIAGNOSTIC SUPPORT

Oteco, Inc. stands ready to provide engineering assistance with regard to the installation, use, and maintenance of Oteco, Inc. pressure relief valves, and to offer diagnostic assistance with regard to operation of the valves.

In the event that valve malfunction (such as accidental discharge or failure to discharge) has occurred or is suspected, it is important that both the valve and the shear pins or shear pin fragments be preserved for inspection.

7. REFERENCED DOCUMENTS

API bulletin BUL 5A2, "Bulletin on Thread Compounds", American Petroleum Institute, 1220 L Street Northwest, Washington, D. C., U.S.A., 20005

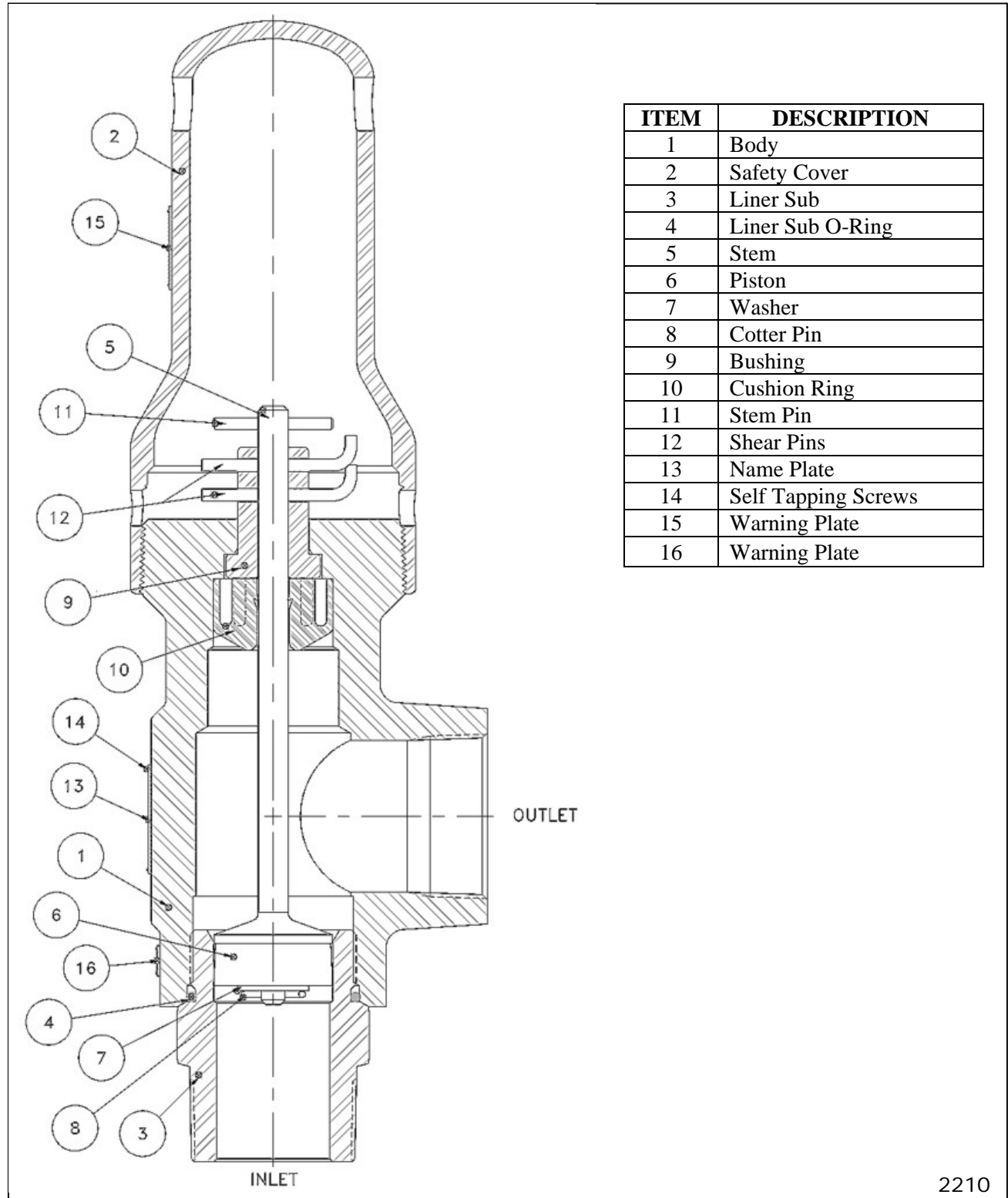
API Specification STD 5B, "Specification for Threading, Gaging, and Thread Inspection of Casing, Tubing, and Line Pipe Threads". American Petroleum Institute, 1220 L Street Northwest, Washington, D. C., U.S.A., 20005.

Oteco, Inc. Engineering Bulletin EB-001, "Safe Piping Design for Pressure Relief Valves: Reaction Forces and the Discharge Stream"

Oteco, Inc. Engineering Bulletin EB-002, "Pressure Relief Valve: Disassembly, Inspection, & Assembly"



8 Assembly drawings of Pressure Relief valves with Threaded Inlet and Outlet connections
 8 (1) Model 30525

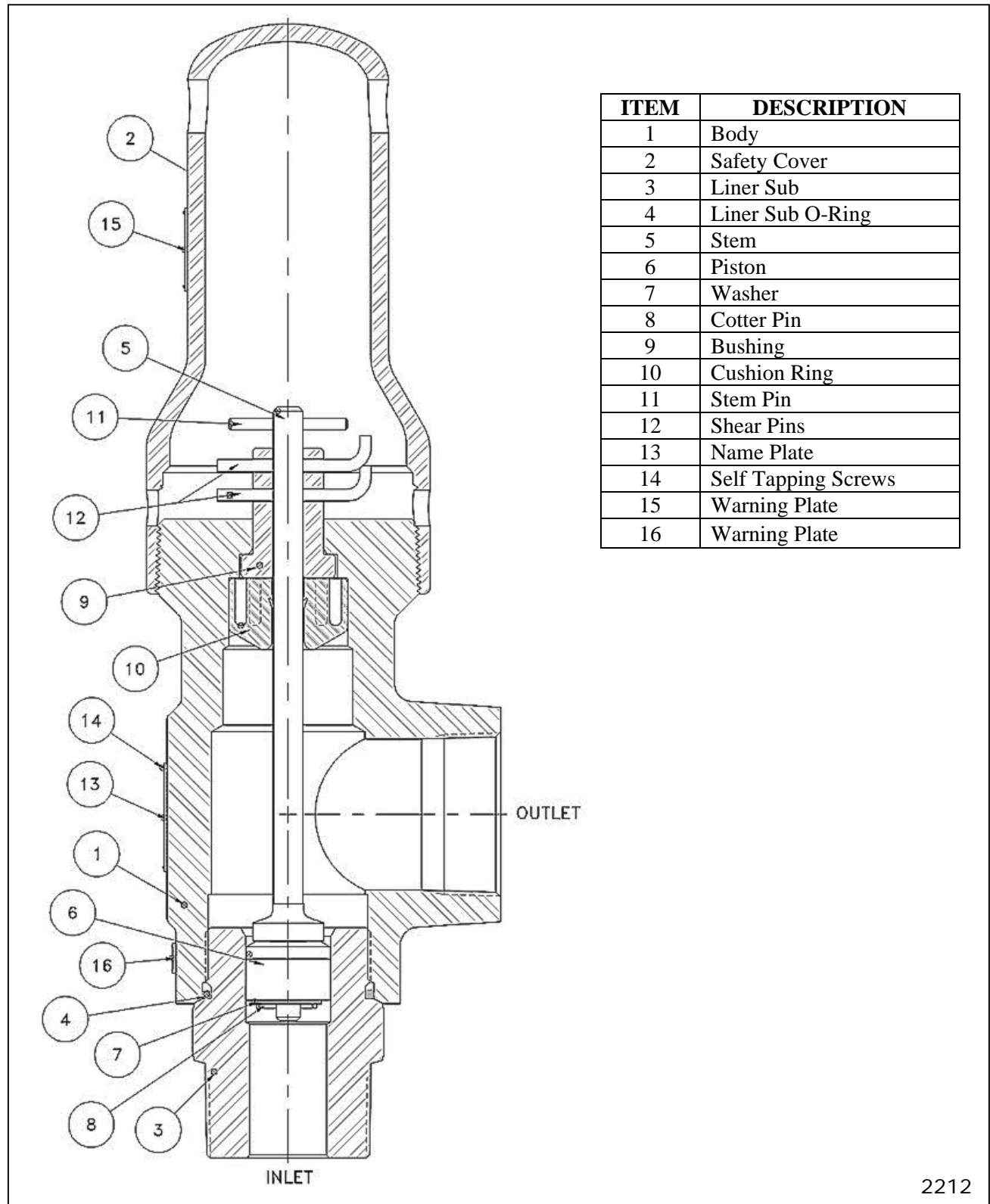


| ITEM | DESCRIPTION |
|------|---------------------|
| 1 | Body |
| 2 | Safety Cover |
| 3 | Liner Sub |
| 4 | Liner Sub O-Ring |
| 5 | Stem |
| 6 | Piston |
| 7 | Washer |
| 8 | Cotter Pin |
| 9 | Bushing |
| 10 | Cushion Ring |
| 11 | Stem Pin |
| 12 | Shear Pins |
| 13 | Name Plate |
| 14 | Self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

2210



8 (2) Model 30550

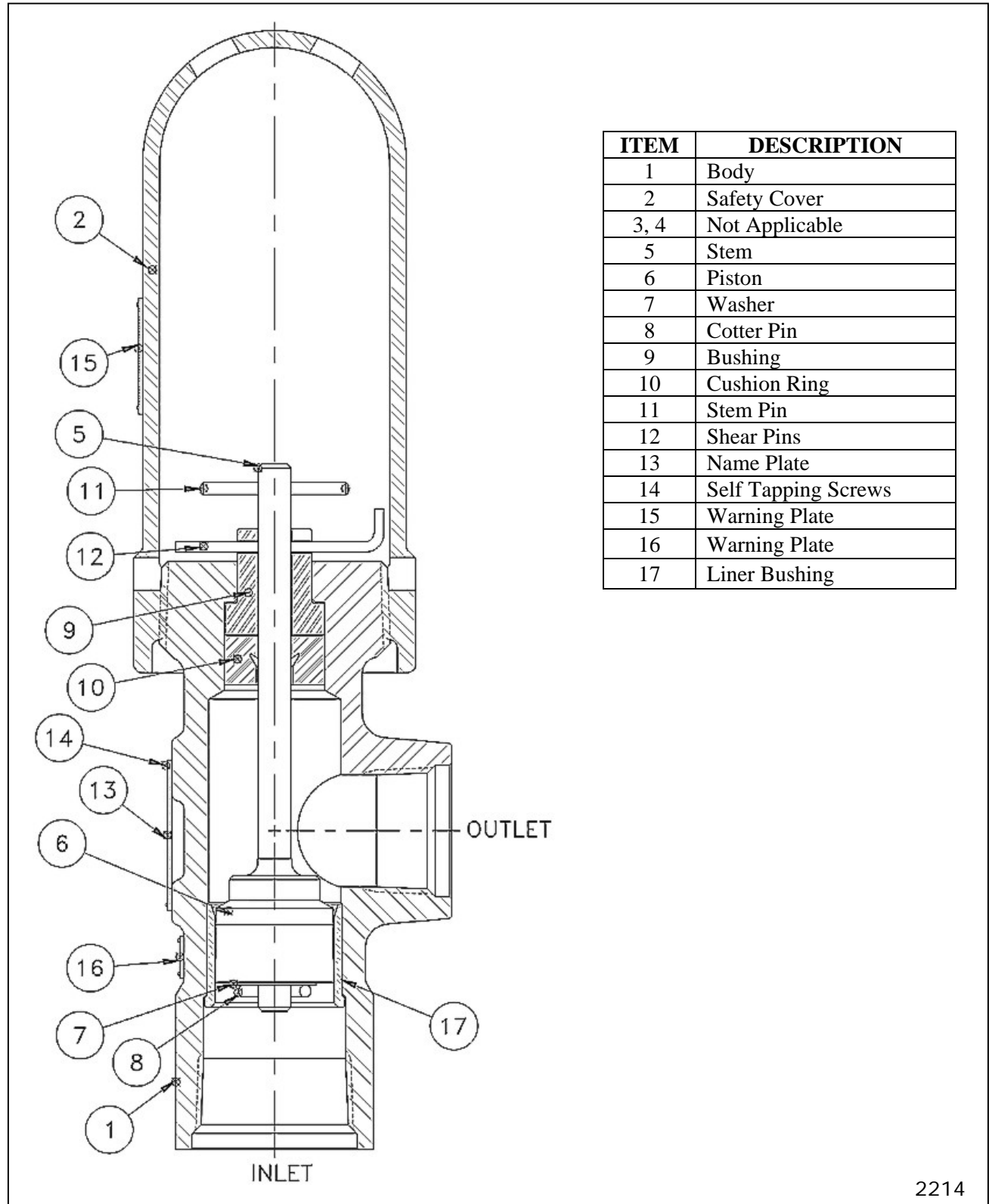


| ITEM | DESCRIPTION |
|------|---------------------|
| 1 | Body |
| 2 | Safety Cover |
| 3 | Liner Sub |
| 4 | Liner Sub O-Ring |
| 5 | Stem |
| 6 | Piston |
| 7 | Washer |
| 8 | Cotter Pin |
| 9 | Bushing |
| 10 | Cushion Ring |
| 11 | Stem Pin |
| 12 | Shear Pins |
| 13 | Name Plate |
| 14 | Self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

2212



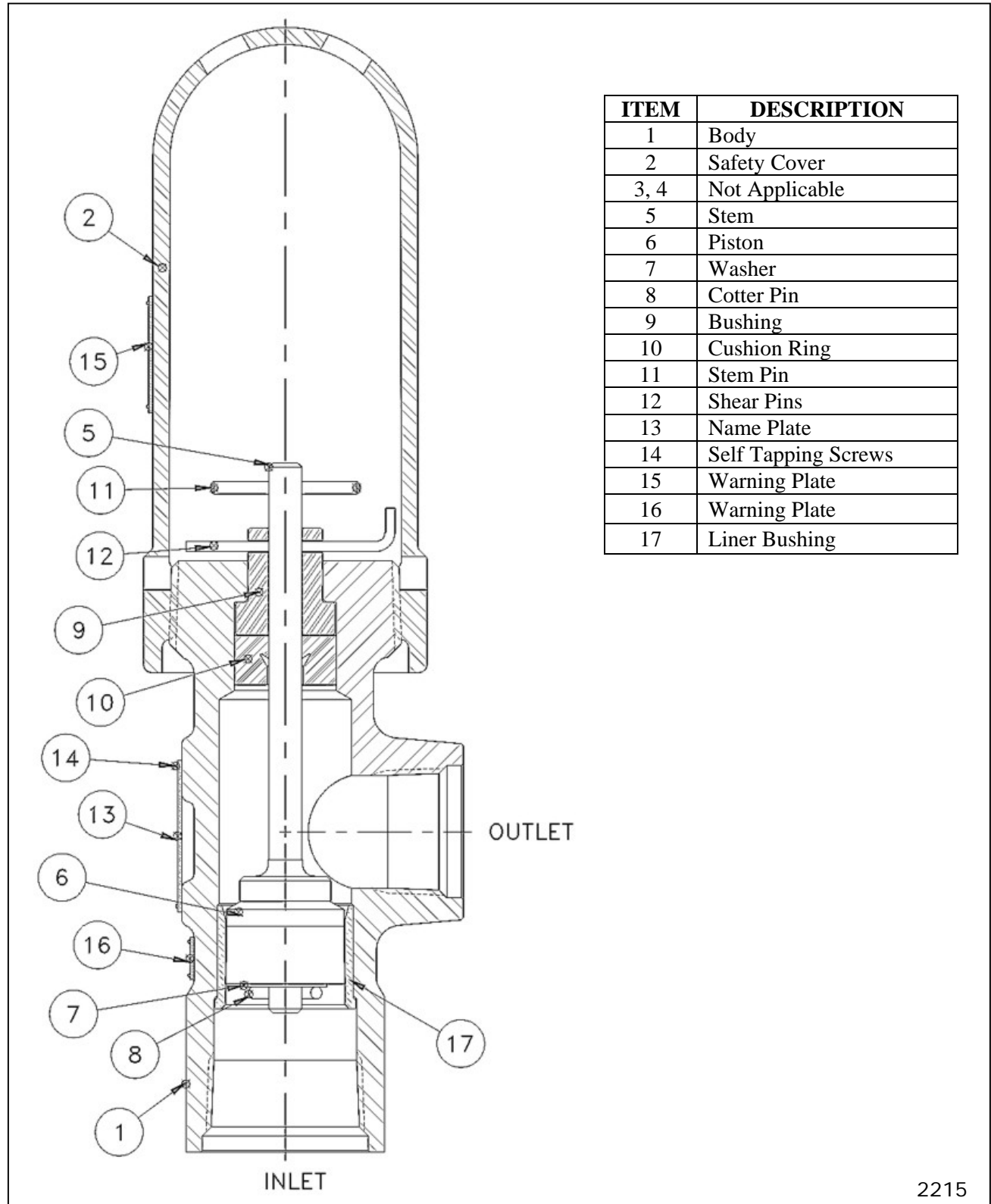
8 (3) Model 20015



| 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 |



8 (4) Model 20210

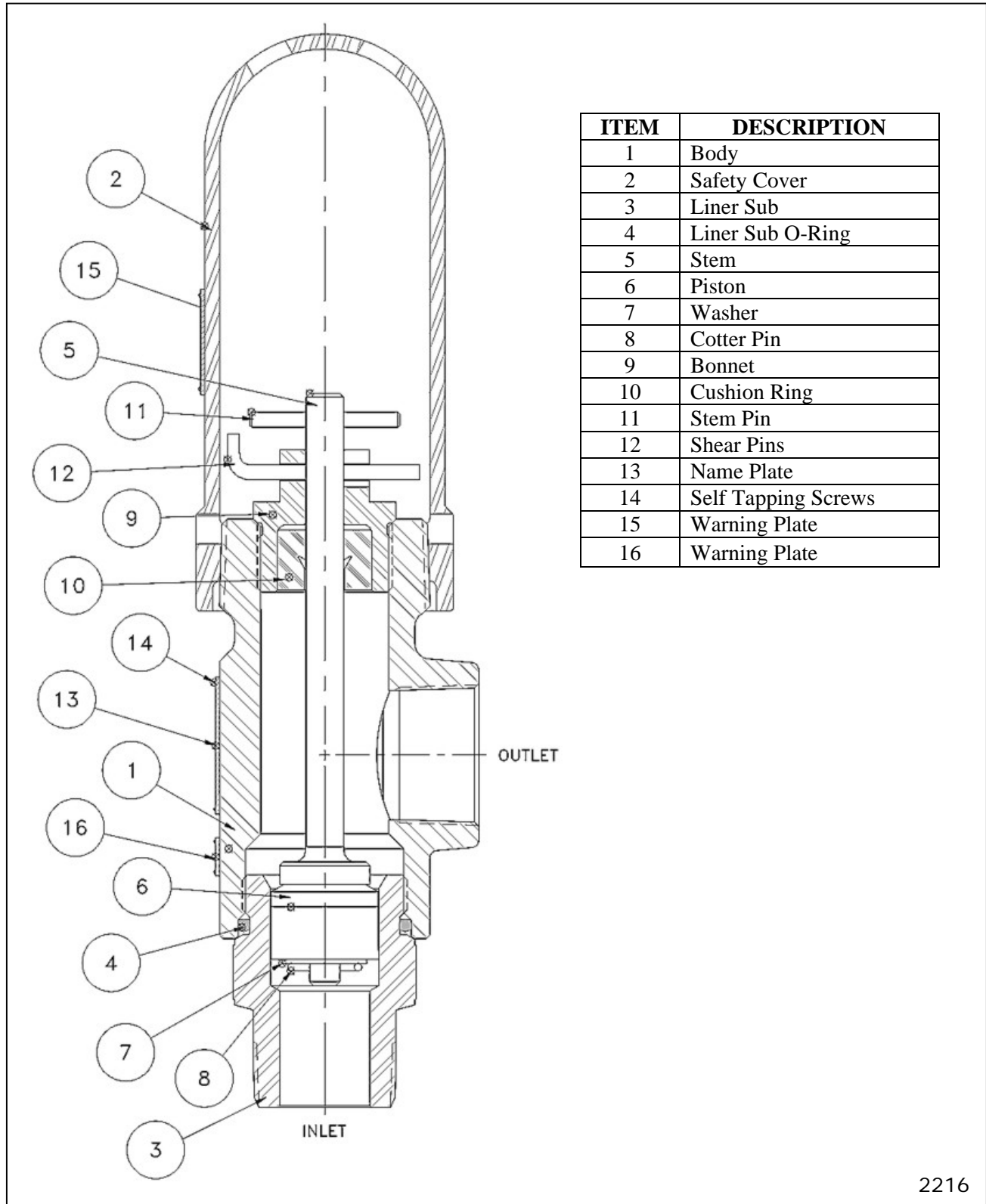


| ITEM | DESCRIPTION |
|------|---------------------|
| 1 | Body |
| 2 | Safety Cover |
| 3, 4 | Not Applicable |
| 5 | Stem |
| 6 | Piston |
| 7 | Washer |
| 8 | Cotter Pin |
| 9 | Bushing |
| 10 | Cushion Ring |
| 11 | Stem Pin |
| 12 | Shear Pins |
| 13 | Name Plate |
| 14 | Self Tapping Screws |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

2215



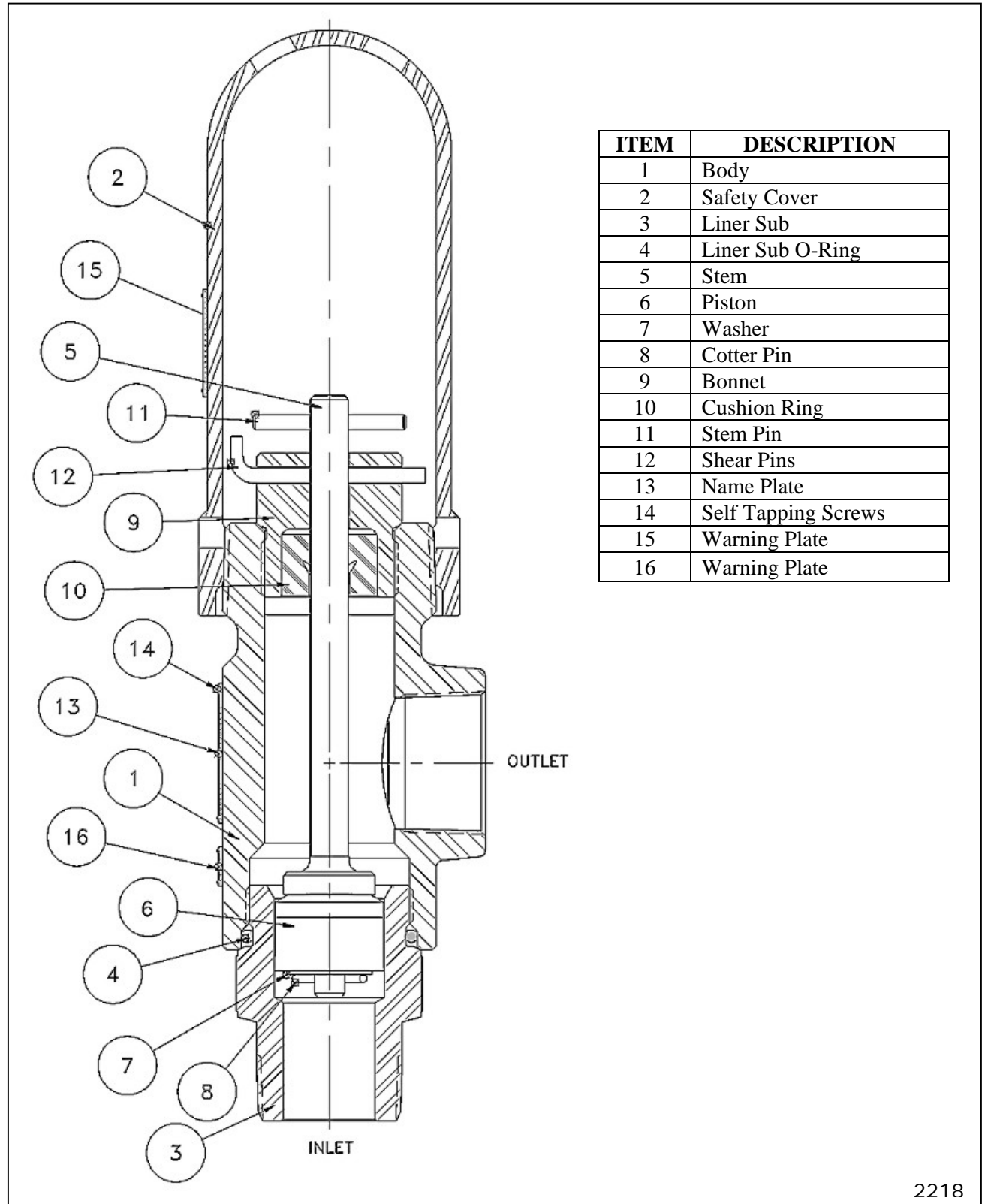
8 (5) Model 20513



2216

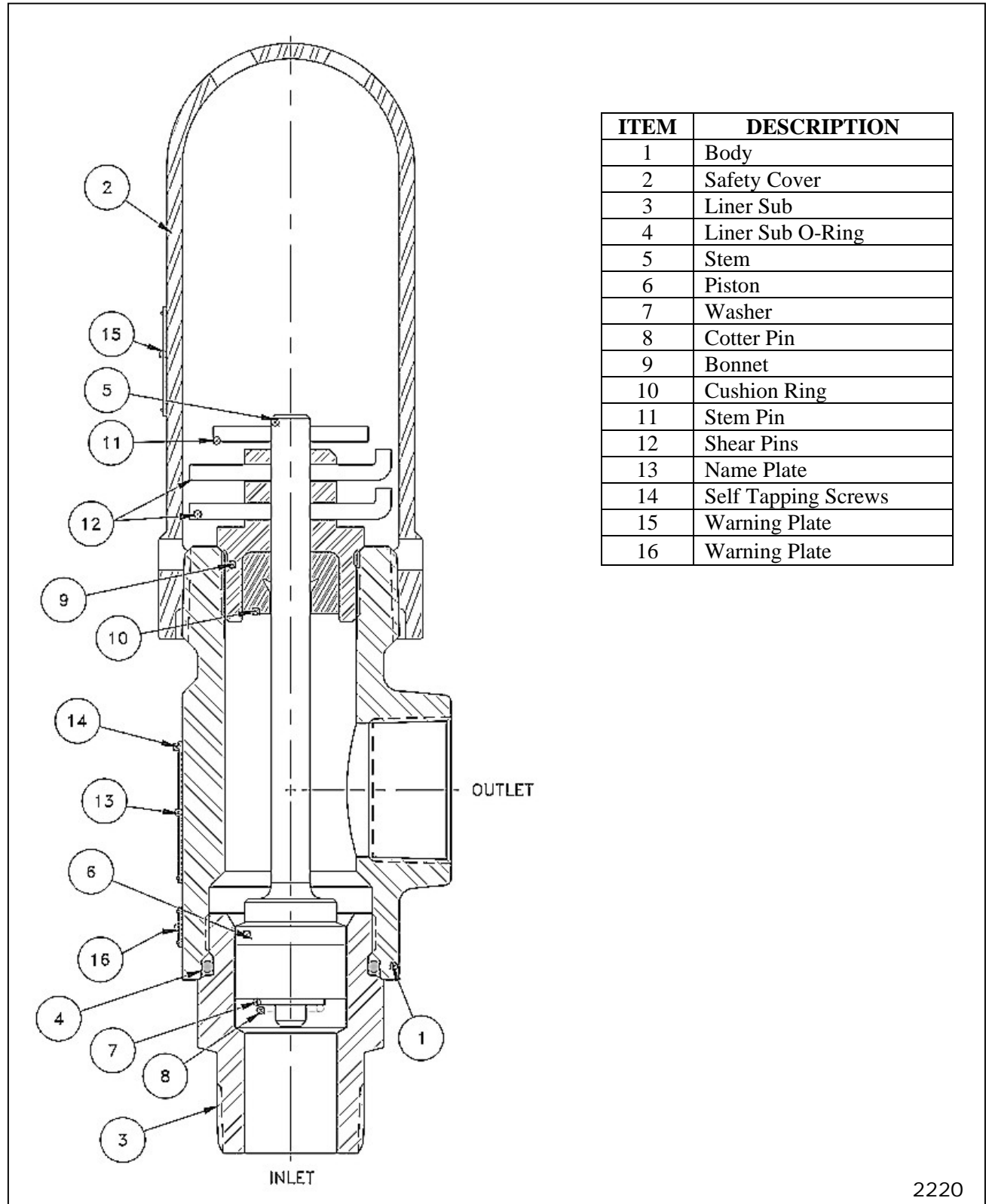


8 (6) Model 21027



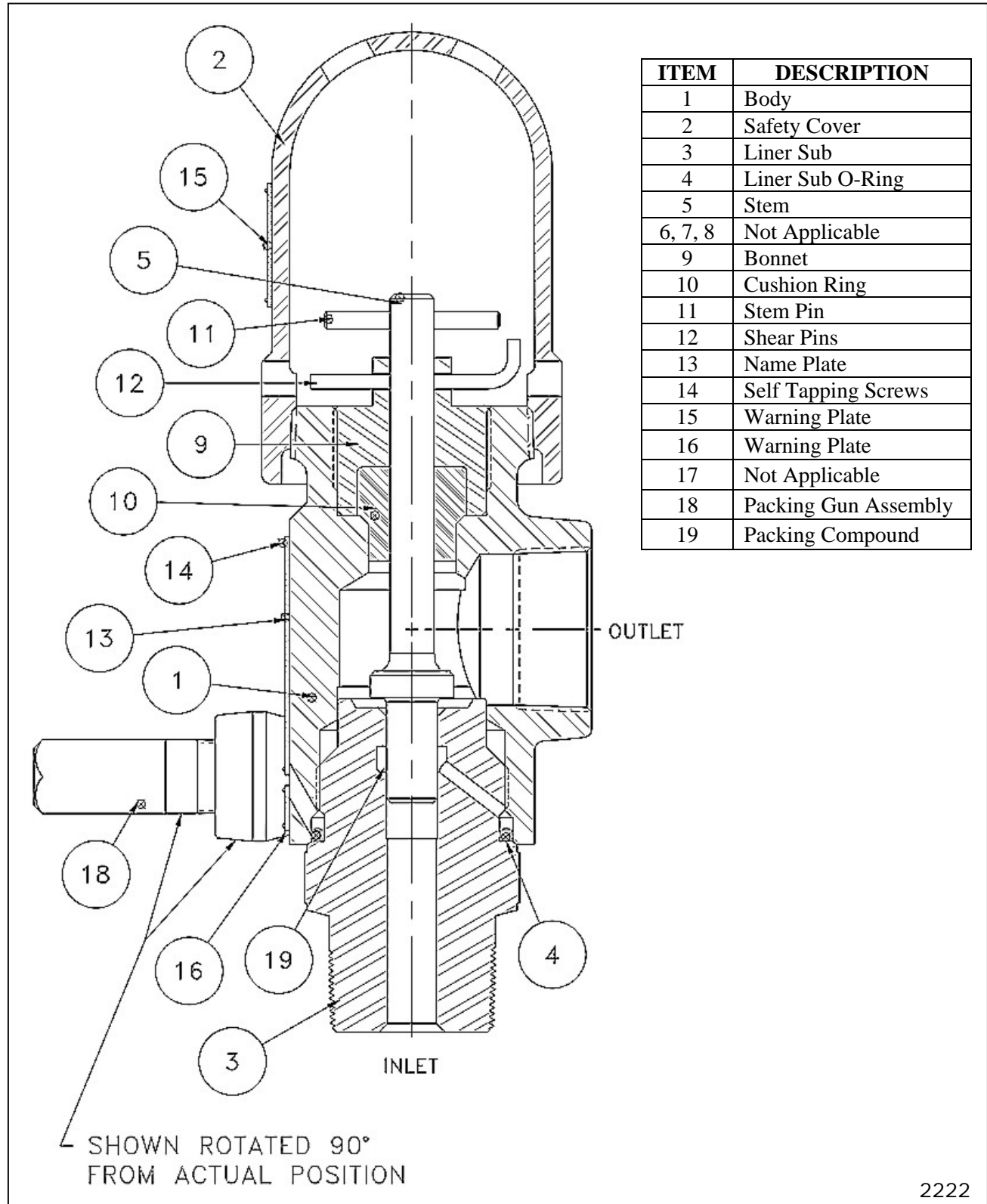


8 (7) Model 21050





8 (8) Model 26010

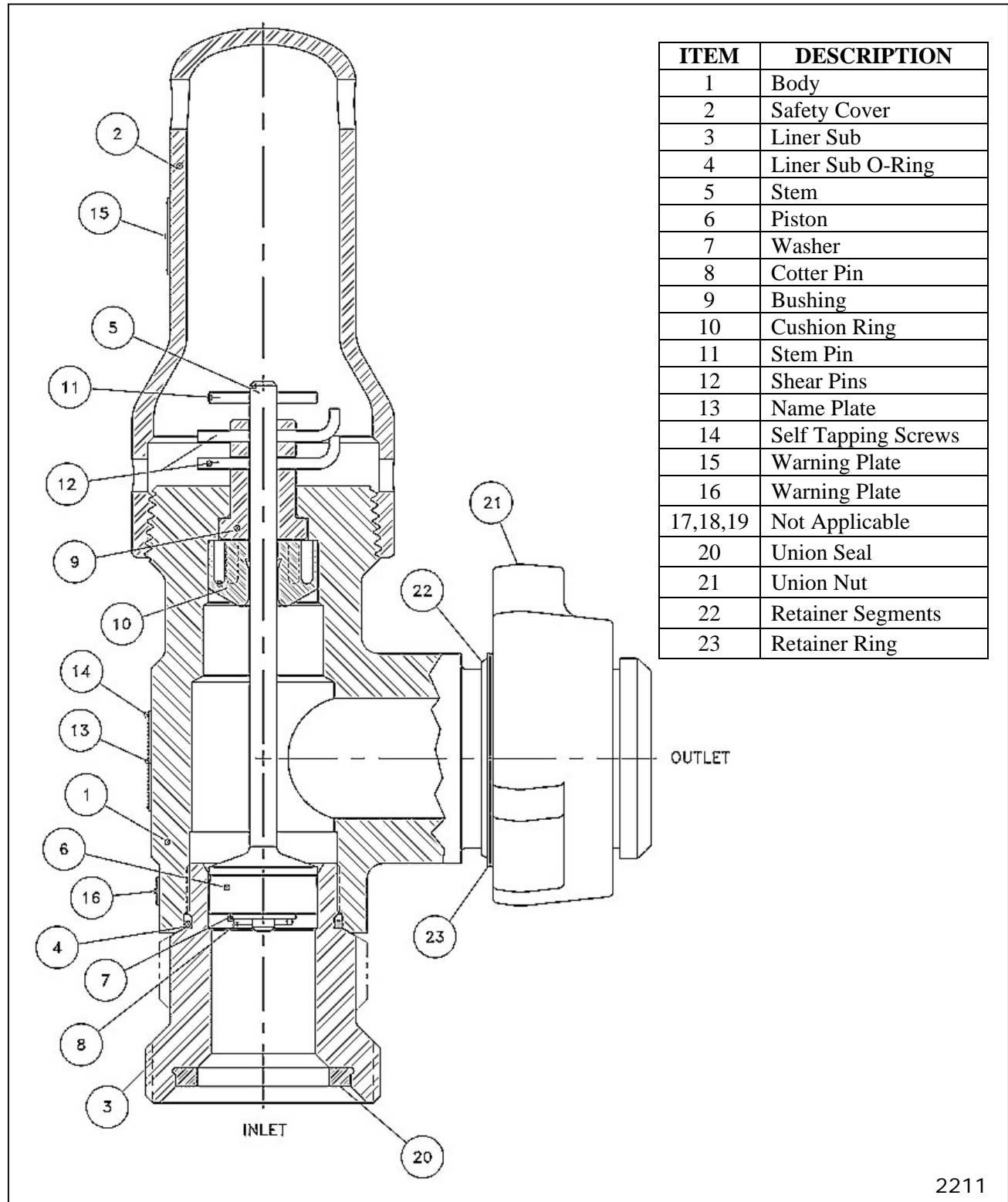


| ITEM | DESCRIPTION |
|---------|----------------------|
| 1 | Body |
| 2 | Safety Cover |
| 3 | Liner Sub |
| 4 | Liner Sub O-Ring |
| 5 | Stem |
| 6, 7, 8 | Not Applicable |
| 9 | Bonnet |
| 10 | Cushion Ring |
| 11 | Stem Pin |
| 12 | Shear Pins |
| 13 | Name Plate |
| 14 | Self Tapping Screws |
| 15 | Warning Plate |
| 16 | Warning Plate |
| 17 | Not Applicable |
| 18 | Packing Gun Assembly |
| 19 | Packing Compound |



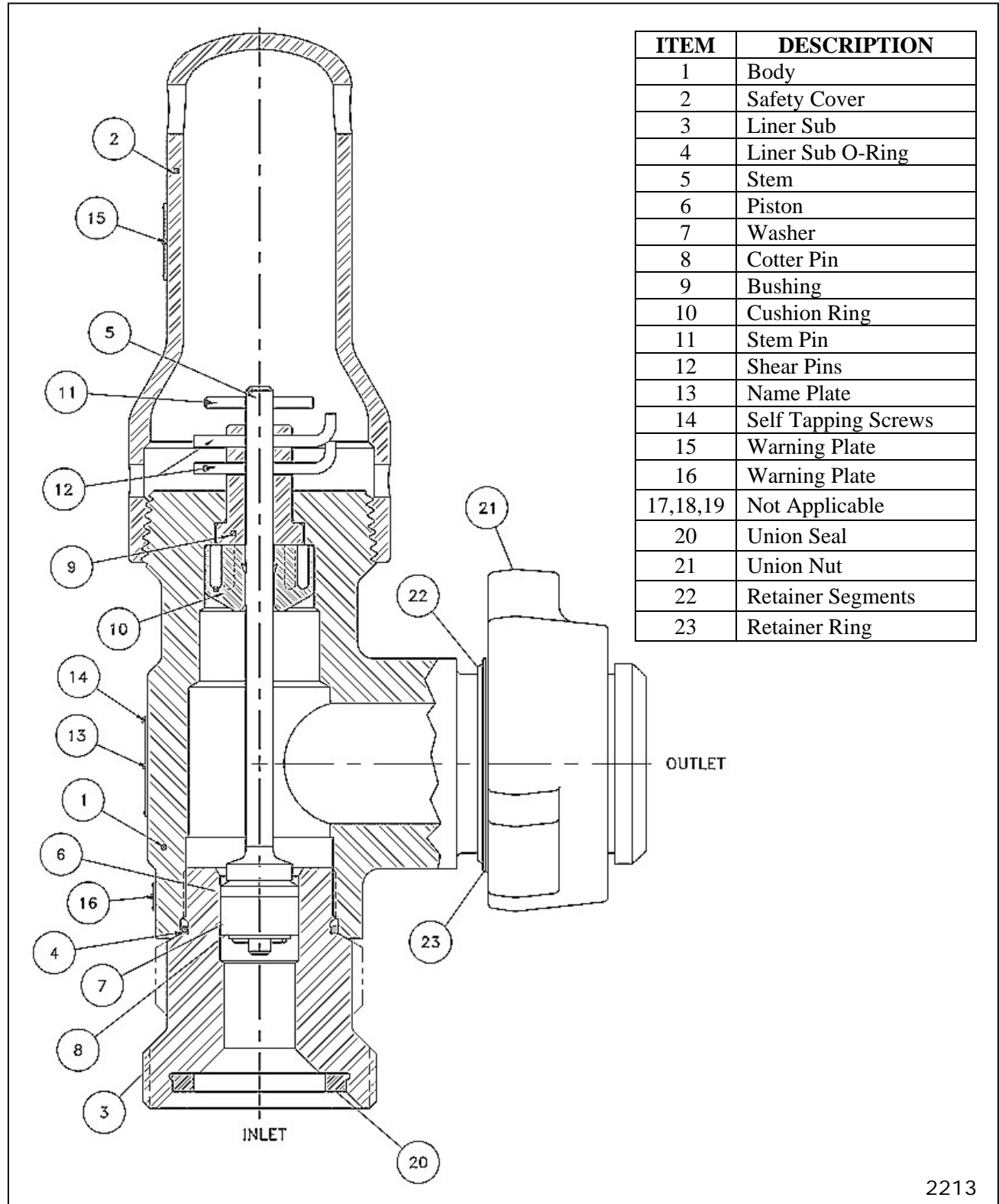
9 Assembly drawings of Pressure Relief Valves w/Hammer Union Inlet and Outlet connections

9 (1) Model 30525





9 (2) Model 30550

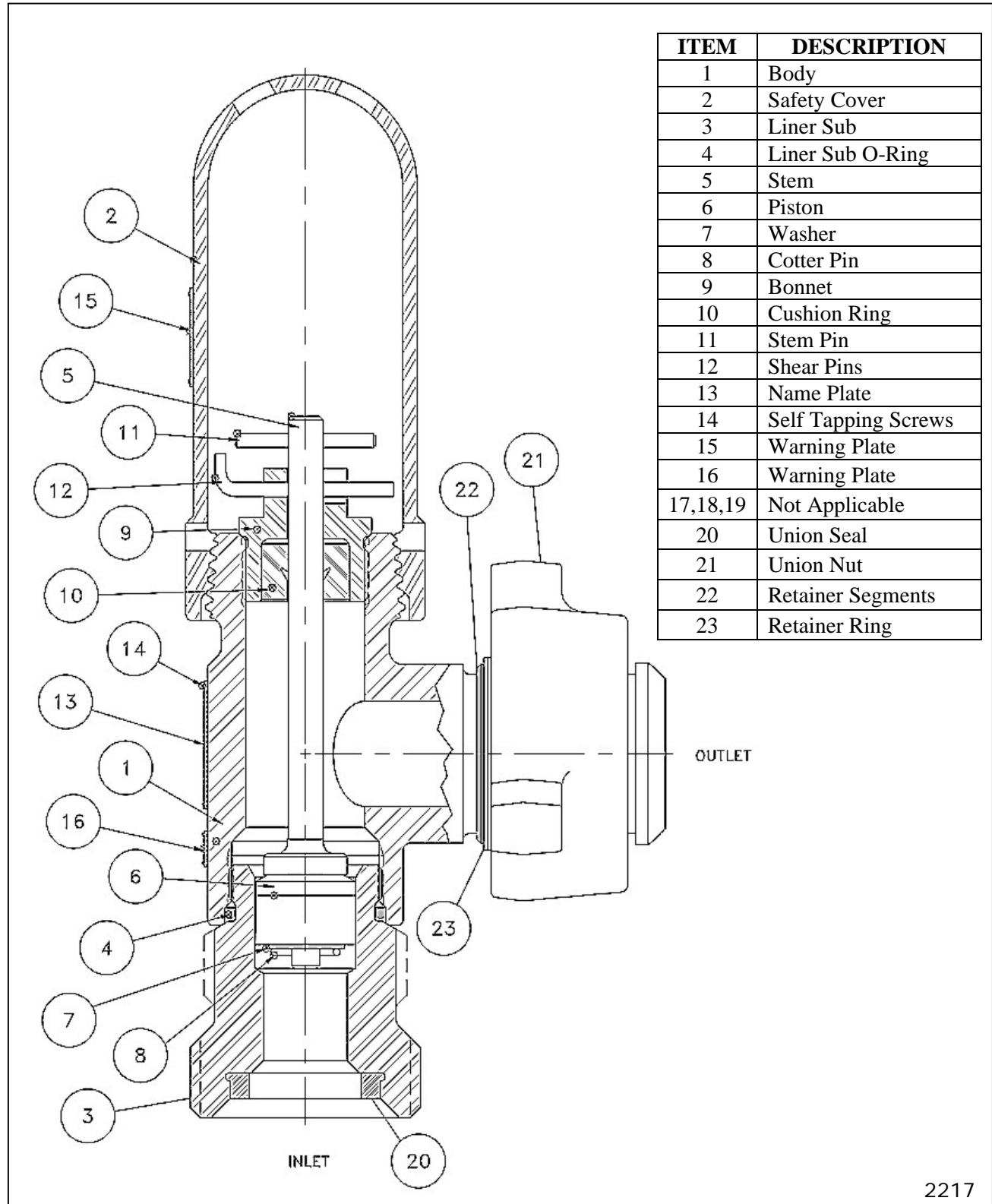


| ITEM | DESCRIPTION |
|----------|---------------------|
| 1 | Body |
| 2 | Safety Cover |
| 3 | Liner Sub |
| 4 | Liner Sub O-Ring |
| 5 | Stem |
| 6 | Piston |
| 7 | Washer |
| 8 | Cotter Pin |
| 9 | Bushing |
| 10 | Cushion Ring |
| 11 | Stem Pin |
| 12 | Shear Pins |
| 13 | Name Plate |
| 14 | Self Tapping Screws |
| 15 | Warning Plate |
| 16 | Warning Plate |
| 17,18,19 | Not Applicable |
| 20 | Union Seal |
| 21 | Union Nut |
| 22 | Retainer Segments |
| 23 | Retainer Ring |

2213



9 (3) Model 20513

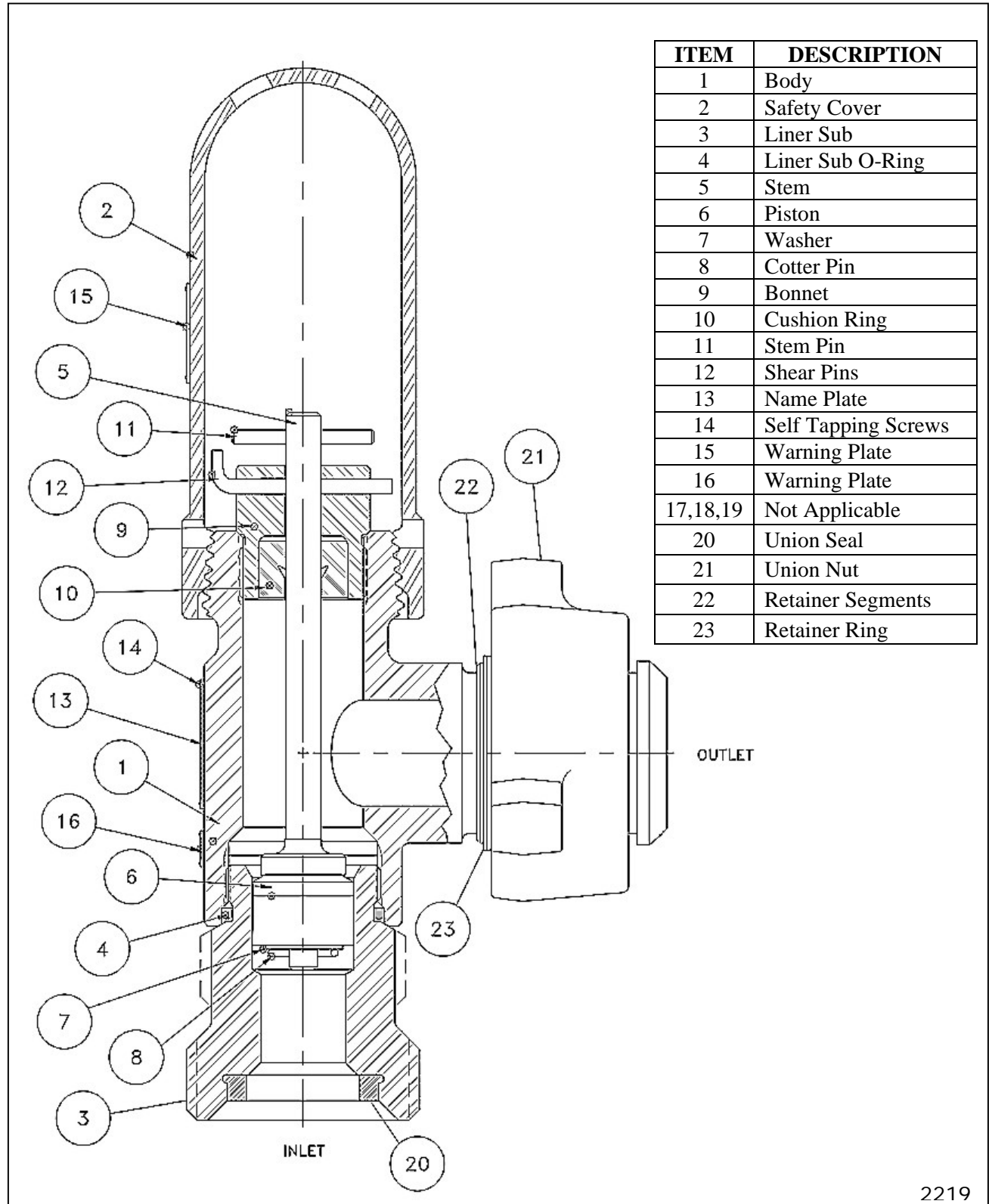


| ITEM | DESCRIPTION |
|----------|---------------------|
| 1 | Body |
| 2 | Safety Cover |
| 3 | Liner Sub |
| 4 | Liner Sub O-Ring |
| 5 | Stem |
| 6 | Piston |
| 7 | Washer |
| 8 | Cotter Pin |
| 9 | Bonnet |
| 10 | Cushion Ring |
| 11 | Stem Pin |
| 12 | Shear Pins |
| 13 | Name Plate |
| 14 | Self Tapping Screws |
| 15 | Warning Plate |
| 16 | Warning Plate |
| 17,18,19 | Not Applicable |
| 20 | Union Seal |
| 21 | Union Nut |
| 22 | Retainer Segments |
| 23 | Retainer Ring |

2217

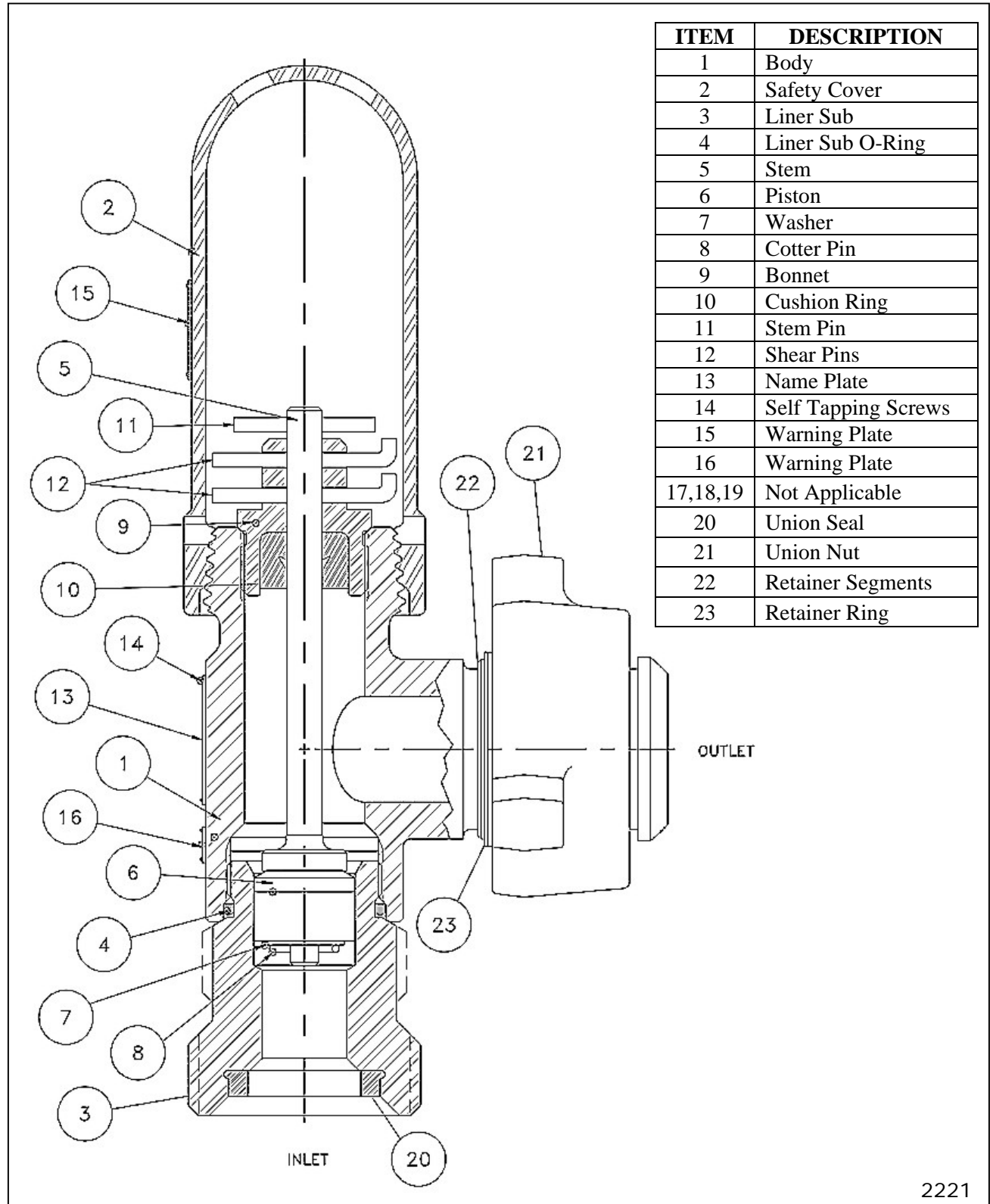


9 (4) Model 21027



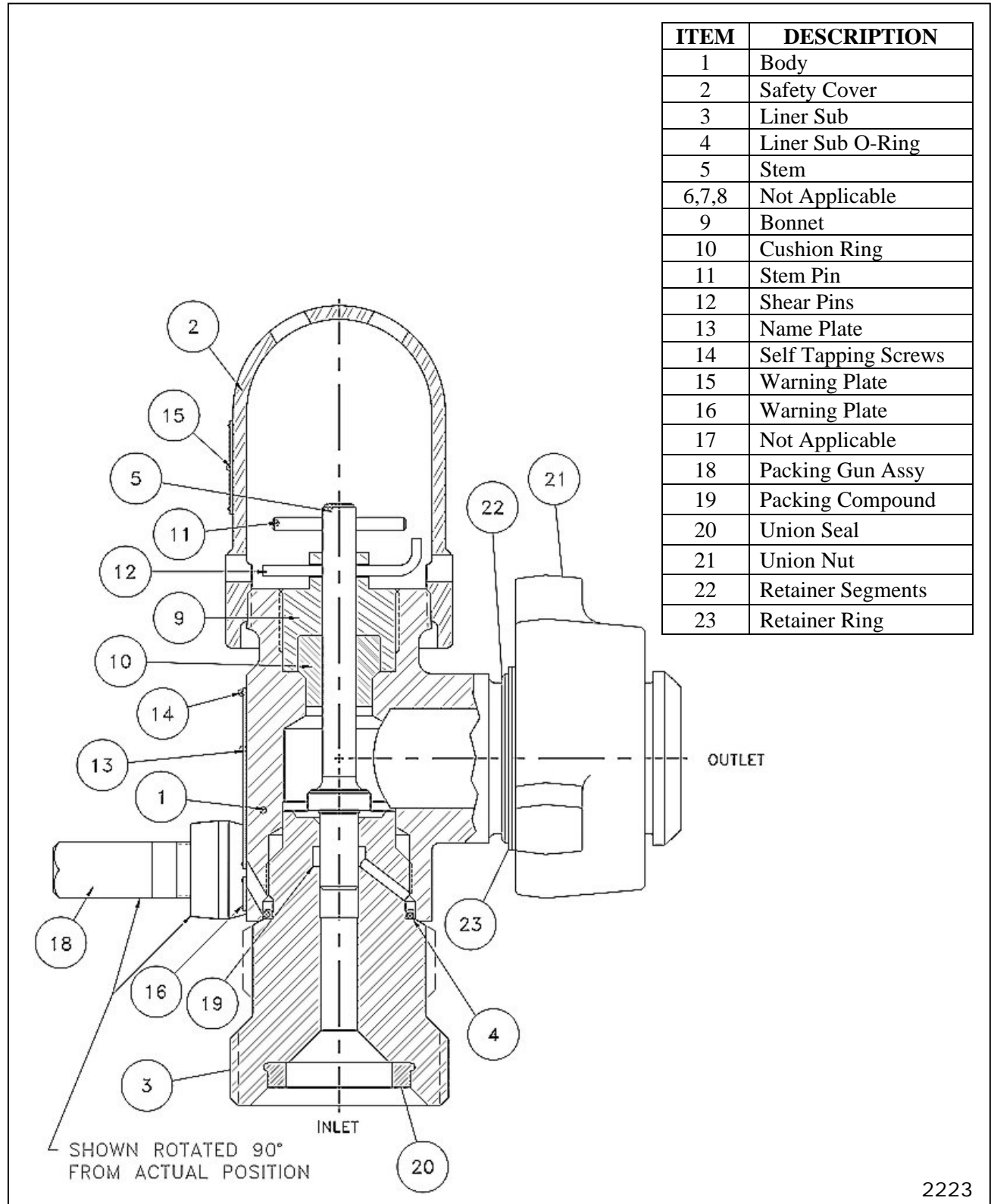


9 (5) Model 21050





9 (6) Model 26010



| ITEM | DESCRIPTION |
|-------|---------------------|
| 1 | Body |
| 2 | Safety Cover |
| 3 | Liner Sub |
| 4 | Liner Sub O-Ring |
| 5 | Stem |
| 6,7,8 | Not Applicable |
| 9 | Bonnet |
| 10 | Cushion Ring |
| 11 | Stem Pin |
| 12 | Shear Pins |
| 13 | Name Plate |
| 14 | Self Tapping Screws |
| 15 | Warning Plate |
| 16 | Warning Plate |
| 17 | Not Applicable |
| 18 | Packing Gun Assy |
| 19 | Packing Compound |
| 20 | Union Seal |
| 21 | Union Nut |
| 22 | Retainer Segments |
| 23 | Retainer Ring |

2223