

MIL-V-20065D(SHIPS)  
 8 June 1967  
 SUPERSEDING  
 MIL-V-20065C(SHIPS)  
 8 July 1959  
 (See 6.3)

## MILITARY SPECIFICATION

### VALVES, ANGLE, PRESSURE RELIEF, NAVAL SHIPBOARD, FOR STEAM SERVICE

#### 1. SCOPE

1.1 Scope. - This specification covers spring loaded pressure relief valves for steam service.

1.2 Classification. - Pressure relief valves shall be of the following types and compositions as specified (see 6.2):

Type I - Atmospheric outlet  
 Type II - Pressure tight outlet

##### Composition A:

Chromium - 2-1/4 percent  
 Molybdenum - 1 percent

##### Composition B:

Chromium - 1-1/4 percent  
 Molybdenum - 1/2 percent

Composition D: Carbon steel

#### 2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

##### SPECIFICATIONS

###### FEDERAL

QQ-N-288 - Nickel-Copper Alloy and Nickel-Copper-Silicon Alloy Castings.

###### MILITARY

MIL-S-901 - Shock Tests, H. I. (High-Impact); Shipboard Machinery, Equipment and Systems, Requirements for.

MIL-D-1000/2 - Drawings, Engineering and Associated Lists.

MIL-R-17131 - Rods, Welding, Surfacing.

MIL-S-23192 - Springs, Helical, Age-Hardenable Nickel-Chromium-Iron Alloy.

##### STANDARDS

###### MILITARY

MIL-STD-167 - Mechanical Vibrations of Shipboard Equipment.

MIL-STD-798 - Nondestructive Testing, Welding, Quality Control, Material Control and Identification and Hi-Shock Test Requirements for Piping System Components for Naval Shipboard Use.

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. - The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

FSC 4820

MIL-V-20065D(SHIPS)

**AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**

- A68 - Carbon-Steel Bars for Springs.
- A105 - Forged or Rolled Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
- A182 - Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings and Valves and Parts for High-Temperature Service.
- A193 - Alloy-Steel Bolting Materials for High Temperature Service.
- A194 - Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service.
- A216 - Carbon Steel Castings Suitable for Fusion Welding for High-Temperature Service.
- A217 - Alloy Steel Castings for Pressure Containing Parts Suitable for High-Temperature Service.
- A230 - Carbon-Steel Valve Spring Quality Wire.
- A231 - Chromium-Vanadium Alloy Steel Spring Wire.
- A232 - Chromium-Vanadium Alloy Steel Valve Spring Quality Wire.
- A276 - Hot-Rolled and Cold-Finished Stainless and Heat Resisting Steel Bars.
- A351 - Ferritic and Austenitic Steel Castings for High-Temperature Service.
- B164 - Nickel-Copper Alloy Rod and Bar.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103.)

**UNITED STATES OF AMERICA STANDARDS INSTITUTE (USAS)**

- B1.12 - Class 5 Interference-Fit Thread.
- B16.5 - Steel Pipe Flanges and Flanged Fittings.

(Application for copies should be addressed to the United States of America Standards Institute, 10 East 40th Street, New York, New York 10016.)

**THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)**  
Boiler and Pressure Vessel Code.

(Application for copies should be addressed to the American Society of Mechanical Engineers, 345 East 47th Street, New York, New York 10017.)

**NATIONAL BUREAU OF STANDARDS**

Handbook H28 - Screw-Thread Standards for Federal Services.

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.)

**OFFICIAL CLASSIFICATION COMMITTEE**

Uniform Freight Classification Ratings, Rules and Regulations.

(Application for copies should be addressed to the Official Classification Committee, 1 Park Avenue at 33rd Street, New York, New York 10016.)

**3. REQUIREMENTS**

**3.1 Definitions.** - The following definitions are applicable to this specification.

**3.1.1 Set pressure.** - The pressure at which the valve pops. Expressed in pounds per square inch gage (psig).

**3.1.2 Set pressure tolerance.** - The permissible plus or minus deviation from the specified set pressure. Expressed in pounds per square inch (psi) or as a percent of the set pressure.

**3.1.3 Set pressure range.** - The range over which the set pressure can be adjusted with the installed spring.

**3.1.4 Accumulation.** - The increase in pressure, above the set pressure, required to pass rated flow. Expressed in psi or as a percent of the set pressure.

MIL-V-20065D(SHIPS)

- 3.1.5 Accumulation pressure. - The set pressure plus the accumulation. Expressed in psig.
- 3.1.6 Blowdown. - The decrease in pressure, below the set pressure, required for the valve to re-seat. Expressed in psi or as a percent of the set pressure. The accumulation and blowdown establish the operating band of the relief valve at a particular setting.
- 3.1.7 Blowdown pressure. - The set pressure minus the blowdown. Expressed in psig.
- 3.2 Valve description. - This specification covers self-contained, single seated, spring loaded relief valves, where the inlet pressure is sensed under and directly operates the spring loaded disc.
- 3.3 Materials of construction. - Materials shall be as specified in table 1. All materials shall be selected to prevent galling, seizing, or excessive wear between parts. Clearances shall be such as to prevent interferences due to thermal expansion.

Table 1 - List of Materials

Name of Parts	Composition A	Composition B	Composition D
Body, bonnet, and yoke	ASTM A182 grade F22 ASTM A217 grade WC9	ASTM A182 grade F11 ASTM A217 grade WC6	ASTM A105 grade II ASTM A216 grade WCB ASTMA217 grade WC1, WC6 ASTM A351 grade CF3, CF31, CF8, CF8M
Disc and seat ring	Haynes 25 or Stellite (wrought Stellite 6B, cast Stellite 6 or an in- lay of Stellite not less than 3/32 inch thick. Where inlays are used, welding rod shall be in accordance with type MIL-RCrCo-A of MIL-R-17131 and base materials shall be one of the following: ASTM A351 grade CF3, CF3M, ASTM A276 types 302, 304, 316, 347).	Same as for Composition A	ASTM A276 types 302, 303, 304, 316, 431, 440 ASTM A351 grades CF3, CF3M, CF8, CF8M ASTM B164 QQ-N-288
Stem	CR 13	CR 13	CR 13
Springs	MIL-S-23192	MIL-S-23192	MIL-S23192 ASTM A231 ASTM A232 ASTM A230 ASTM A68
Body bolts and nuts	ASTM A193 grade B16 ASTM A194 grade 4	ASTM A193 grade B14 or B16 ASTM A194 grade 2H or 4	ASTM A193 grade B7 or B16 ASTM A194 grade 2H or 4

## MIL-V-20065D(SHIPS)

**3.4 Design and construction requirements. -**

**3.4.1 Pressure-temperature ratings.** - The design and pressure-temperature rating for valves of this specification shall be in accordance with USAS B16.5. Maximum temperature limitations shall be as follows:

Composition A - 1050 F  
Composition B - 1000 F  
Composition D - 775 F

The outlet and spring housing for type II valves shall be designed to withstand the higher of the following:

- (a) 150 percent of maximum system back pressure.
- (b) 150 pound USAS rating.

**3.4.2 End connections.** - Valve inlet and outlet connections shall be flanged in accordance with USAS B16.5.

**3.4.3 Body construction.** - The valve shall be designed and constructed so that the seat will not become distorted, relative to the disc, and valve operation is not adversely affected by internal pressure.

**3.4.4 Bonnet construction.** - The bonnet shall be flanged for attachment to the body. Sufficient bolting area shall be provided to maintain a leakproof joint over a three year period. Bearing surfaces of nuts and bolts and their respective mating surfaces on the valve, shall be finished machined.

**3.4.5 Seat rings.** - A seat ring shall be provided which is seal welded or silver brazed circumferentially to the body. When the seat ring is part of the inlet flange raised face, such as in full nozzle valves, no welding or brazing is required.

**3.4.6 Stem and disc.** - The stem or stem and disc assembly shall be top guided. Guiding surfaces shall have the proper hardness, finish, concentricity, parallelism, clearance, length, and rigidity to prevent binding or seizing due to lateral thrust or thermal expansion, and to insure proper seating. These requirements shall be maintained with interchangeable parts.

**3.4.7 Springs.** - Springs shall be designed so that they will not be fully compressed or stressed beyond 2/3 of the yield strength of the spring material under any normal operation or adjustment of the valve. The working stress shall be such that relaxation shall not exceed 5 percent over a 1000 hour period at the operating temperature. When removed and compressed solid, the springs shall not exhibit a permanent set exceeding 0.010 inch per inch of free spring length, measured 10 minutes after release of the spring. Spring ends shall be squared and ground.

**3.4.8 Threads.** - All threads shall conform to Handbook H28. Provisions shall be incorporated to prevent the accidental loosening of all threaded parts. Unless otherwise specified in the contract or order, bolting shall be class 2 fit. When tap-end studs are used, the tap end shall have an interference fit in accordance with USAS B1.12. Pipe threads shall not be used.

**3.4.9 Interchangeability.** - All parts having the same manufacturer's part number shall be directly interchangeable with each other with respect to installation and performance and should not require selection, fitting, or machining of any kind. Where machining is required after installation of a seat ring or guide in order to maintain critical concentricity or alignment dimensions, detailed instructions must be provided with each spare part.

**3.4.10 Hand lifting device.** - Valves shall be designed so that they may be operated by hand for testing purposes with an inlet pressure of 75 percent of the set pressure. The necessary lever or tool shall be furnished as part of each valve.

**3.4.11 Stuffing boxes.** - A stuffing box on the valve stem shall not be permitted. A stuffing box on the shaft of a hand lifting device, which will have no effect on the relief valve setting, shall be required on type II valves.

MIL-V-20065D(SHIPS)

**3.4.12 Gagging device.** - Where required for system test purposes, a gagging device shall be specified to be supplied with the valve (see 6.2). Valves shall be capable of being gagged without alteration of the set point. The gagging screw shall be provided with a knurled or wing nut type head to discourage the use of wrenches when gagging the valve. The gagging device shall be designed to minimize the possibility of overlooking its removal after test and shall include a tag or other warning to this effect.

**3.4.13 Accessibility.** - Valves shall be accessible for adjustment and repair without requiring removal from the line.

**3.4.14 Valve adjustment.** - Means shall be provided for adjusting the setting with the valve under pressure. The adjusting screw shall have right hand threads so that clockwise rotation increases the set pressure. The adjusting device shall be provided with a locknut and cap, or other suitable means, to prevent accidental change of adjustment.

**3.4.15 Type I valve requirements.** - Type I valves shall have exposed springs. The clearance between the stem and the bonnet shall be sufficiently close to minimize the escape of steam between the stem and bonnet while the valve is relieving.

**3.4.16 Type II valve requirements.** - Type II valves shall be pressure-tight on the outlet side. The pressure-temperature rating for the valve outlet shall be in accordance with 3.4.1.

### **3.5 Performance requirements.** -

**3.5.1 Range of adjustment.** - For set pressures up to 250 psig, the set pressure shall be adjustable over a range of plus or minus 10 percent and for set pressures over 250 psig, the set pressure shall be adjustable over a range of plus or minus 5 percent, without requiring replacement of any internal parts.

**3.5.2 Operation.** - Where properly installed in accordance with limitations specified by the valve manufacturer, relief valves shall operate over entire flow range without chatter. Valve lift shall be sufficient to prevent wire drawing. Valves shall open with a clear sharp pop at the pressure for which they are set. Valve closure shall be clean and sharp when the inlet pressure is reduced to the blowdown pressure, after the valve has passed full rated flow or any intermediate flow.

**3.5.3 Set pressure tolerance.** - The set pressure tolerance, plus or minus, shall not exceed 2 psi or 2 percent of the set pressure, whichever is greater.

**3.5.4 Accumulation.** - Valves shall be sized to pass the capacity specified (see 6.2) without permitting the inlet pressure to exceed the accumulation limit specified in figure 1.

**3.5.5 Blowdown.** - Valves shall operate satisfactory with a blowdown setting not exceeding that permitted by figure 1.

**3.5.6 Seat tightness.** - With an inlet pressure equal to the minimum allowable blowdown pressure, there shall be no visible evidence of steam leakage when the outlet is viewed against a dark background.

**3.5.7 Installation limitations.** - Unless otherwise specified (see 6.2), valve operation shall not be adversely affected by an inlet pressure loss up to 25 percent of the relief valve blowdown, a discharge pressure buildup up to 10 percent of the set pressure or both. Where the installation will subject the valve to greater piping restrictions, this information must be included in the ordering data.

**3.6 Mechanical shock and vibration.** - Valves shall be designed to meet the mechanical shock requirements of MIL-S-901 and vibration requirements of MIL-STD-167. Requirements for shock and vibration testing shall be as specified (see 6.2).

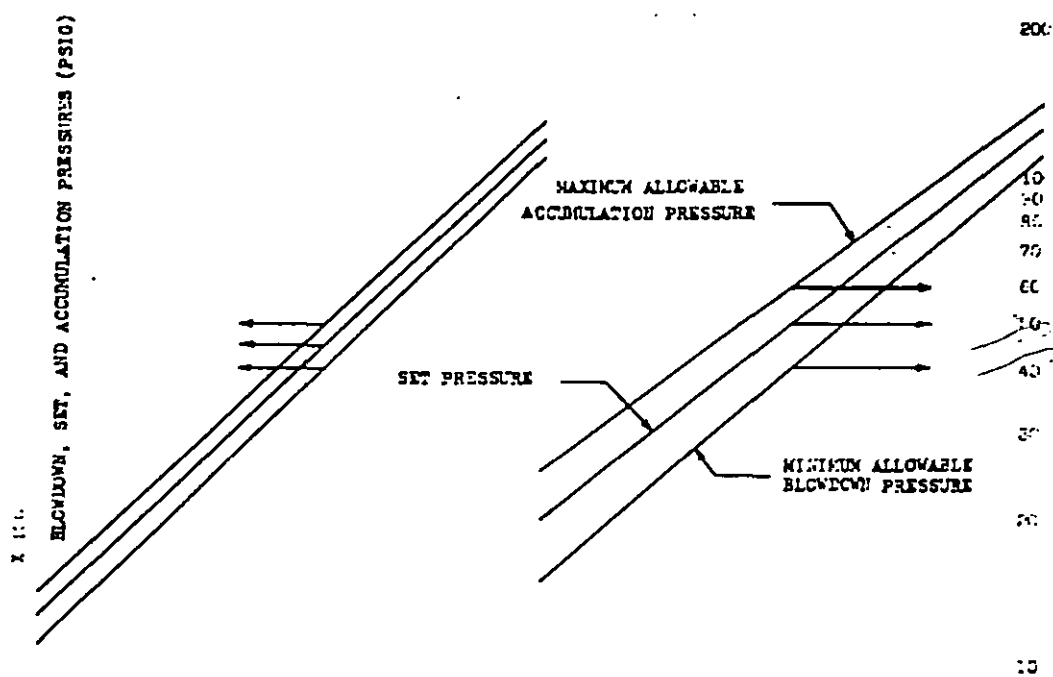
### **3.7 Marking.** -

**3.7.1 Body markings.** - The manufacturer's name or trademark and the body material composition shall be cast or forged integral with the valve body. The size and USAS pressure rating (inlet and outlet) shall be cast or forged integral with the valve body or stamped on the O. D. of the flanges.

MIL-V-20065D(SHIPS)

X 10/0

FIGURE 1  
RELIEF VALVE CHARACTERISTICS



MIL-V-20065D(SHIPS)

**3.7.2 Identification plates.** - Each valve shall have an identification plate permanently attached to an exposed position on the valve that will not be covered by insulation. The identification plate shall be made of a corrosion-resistant material and shall contain the following information or a space therefor:

- (a) Manufacturer's name or trademark.
- (b) Rated capacity at the applicable setting and accumulation.
- (c) Body material composition.
- (d) Service (temperature).
- (e) Set pressure (psig), blowdown pressure (psig), and accumulation pressure (psig).
- (f) Range of set pressure adjustment available with installed spring.
- (g) Installation limitations of valve (maximum permissible inlet pressure loss and maximum permissible backpressure buildup for which valve is designed).
- (h) Manufacturer's model or part number and drawing number.
- (i) Space for 9 digit CID number.

### **3.8 Drawings.** -

**3.8.1 Preliminary drawings.** - Preliminary drawings which are sufficient to permit evaluation of the design and approval of materials, shall be submitted with bids to the procuring activity. These drawings shall show the following:

- (a) A sectional assembly of the valve and details of the seat, and disc and stem assembly.
- (b) Finishes of all guiding and seating surfaces.
- (c) Bill of materials listing specification, grade, condition, and any other data required to fully identify the properties of the materials proposed.
- (d) Installation dimensions, end connection detail, and clearance dimensions required for disassembly.
- (e) Performance characteristics, estimated weight, and any limitations on installation.
- (f) Note any previous shock, vibration, or first unit test approval.

**3.8.2 Master drawings.** - Master drawings shall be submitted to the procuring activity for approval within 60 days after date of contract. The drawings shall be in accordance with type II of MIL-D-1000/2 except for extent of detail. Only the information required on the preliminary drawings need be furnished.

## **4. QUALITY ASSURANCE PROVISIONS**

**4.1 Responsibility for inspection.** - Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

**4.2 First unit examination and tests.** - The first valve of the same size, design, pressure rating, setting, and capacity, furnished under a contract or order shall undergo first unit examination and tests as outlined in table II. A complete agenda of the test procedures, based on table II, shall be submitted to the procuring activity for approval prior to testing. All subsequent valves of the same size, design, pressure rating, setting and capacity furnished under that contract or order shall undergo the quality conformance examination and tests specified in 4.3.

MIL-V-20065D(SHIPS)

Table II - First unit examination and test outline

Test	Test conditions	Purpose of test	Acceptance criteria
Visual examination	-----	To verify conformance to the requirements of this specification.	Complete conformance.
Proof test	Valves gagged shut and water at 1.5 times the set pressure applied to the inlet.  For type II valves, water at pressure defined by 3.4.1 applied to outlet.	To test strength and soundness of pressure containing envelope.	No external leakage, permanent deformation, or structural failure.
Set pressure, blowdown, and seat tightness test.	Steam inlet pressure increased until valve lifts. Inlet pressure reduced until valve reseats. Check for leakage over a 10 minute period with an inlet pressure equal to the minimum blowdown pressure permitted by figure 1.	To determine set point and blowdown setting of valve. To test for seat tightness at the minimum allowable blowdown pressure.	Blowdown - see 3.5.5. Seat tightness - see 3.5.6 No damage to seating surfaces. No instability.
Accumulation test (see note 3)	Steam inlet pressure increased until valve passes rated flow.	To verify relief valve capacity. To check for instability over operational range of valve. To check extent of leakage past the stem on type I valves.	Valve to pass rated flow without exceeding accumulation permitted by figure I. No instability.
Material chemical and physical test	As specified in the applicable material specifications.	To verify conformance of materials used to their applicable material specifications.	As specified in the applicable material specifications.
Nondestructive tests	Radiography-as defined by section 4 of MIL-STD-798.	To verify quality of pressure containing castings.	As defined by table II of MIL-STD-798.
	Magnetic particle-as defined by section 5 of MIL-STD-798	To check for surface defects on pressure containing forgings and castings.	As defined by table III of MIL-STD-798.
	Dye penetrant-as defined by section 6 of MIL-STD-798.	To inspect stellite surfaces.	As defined by table IV of MIL-STD-798.
Set pressure repeatability and endurance test (see note 4)	Using steam, cycle valve 50 times. After each 10 cycles check for leakage.	To verify that set pressure repeatability is within allowable limits. To verify ability of valve to withstand repetitive cycling.	Set pressure repeatability - see 3.5.3 Seat tightness - see 3.5.6 No damage to seating surface caused by cycling impact. (see note 5) No instability.



MIL-V-20065D(SHIPS)

## Notes on table II

1. The test setup shall impose an inlet pressure loss and outlet pressure buildup equal to the maximums specified in 3.5.7 (25 percent of the blowdown and 10 percent of set pressure). Where greater losses are specified in the ordering data (see 6.2) they shall be imposed instead.
2. The performance requirements listed in table II are based on figure 1. If other parameters are specified in the ordering data (see 6.2) they shall be used instead.
3. Accumulation test may be waived providing that capacity data, obtained and certified in accordance with section VIII of the ASME Boiler and Pressure Vessel Code, is available.
4. This test may be waived providing certified test data is available showing that the same basic design and size has previously passed these tests.
5. Any damage caused by foreign particle entrapment on the seating surfaces shall be repaired prior to acceptance of the valve.

4.3 Quality conformance examination and tests. - Each valve shall be subjected to quality conformance examination and tests. These shall consist of the visual examination, proof, set pressure, blowdown and seat tightness, chemical and physical, and nondestructive tests, outlined in table II. Any discrepancies or failures shall be corrected prior to acceptance.

4.4 Inspection of preparation for delivery. - The packaging, packing, and marking shall be inspected for compliance with section 5 of this document.

## 5. PREPARATION FOR DELIVERY

5.1 Domestic shipment and early equipment installation and for storage of onboard repair parts. -5.1.1 Valves. -

5.1.1.1 Preservation and packaging. - Preservation and packaging which may be the supplier's commercial practice, shall be sufficient to afford adequate protection against corrosion, deterioration and physical damage during shipment from the supply source to the using activity and until early installation.

5.1.1.2 Packing. - Packing shall be accomplished in a manner which will insure acceptance by common carrier at the lowest rate and will afford protection against physical or mechanical damage during direct shipment from the supply source to the using activity for early installation. The shipping containers or method of packing shall conform to the Uniform Freight Classification Ratings, Rules and Regulations or other carrier regulations as applicable to the mode of transportation and may conform to the suppliers commercial practice.

5.1.1.3 Marking. - Shipment marking information shall be provided on interior packages and exterior shipping containers in accordance with the contractor's commercial practice. The information shall include nomenclature, Federal stock number or manufacturer's part number, contract or order number, contractor's name and destination.

5.2 Domestic shipment and storage or overseas shipment requirements. - The requirements and levels of preservation, packaging, packing and marking for shipment shall be specified by the procuring activity (see 6.2).

## 6. NOTES

6.1 Intended use. - Pressure relief valves covered by this specification are intended for line steam overpressure protection onboard ship.

6.2 Ordering data. - Procurement documents shall specify the following:

- (a) Title, number, and date of this specification.
- (b) Type and composition required (see 1.2).

MIL-V-20065D(SHIPS)

- (c) ASA pressure rating required (see 3.4.1).
- (d) If a gagging device is required to be supplied with valve (see 3.4.12).
- (e) Set pressure required.
- (f) Capacity required (see 3.5.4).
- (g) Maximum inlet pressure and temperature.
- (h) Data on the inlet and outlet piping restrictions which will be imposed on the valve (see 3.5.7).
- (i) Performance requirements (set pressure tolerance, accumulation, blowdown, etc.) if other than specified in 3.5.
- (j) When shock and vibration tests are required (see 3.6).
- (k) Preservation, packaging, and packing required if other than specified (see 5.2).

6.3 CHANGES FROM PREVIOUS ISSUE. THE EXTENT OF CHANGES (DELETIONS, ADDITIONS, ETC.) PRECLUDE THE ANNOTATION OF THE INDIVIDUAL CHANGES FROM THE PREVIOUS ISSUE OF THIS DOCUMENT.

Preparing activity:  
Navy - SH  
(Project 4820-0119)