PSV-1101

# UNIFIED VALVE LTD.

## PRV INSPECTION AND TEST REPORT

BRANCH: Red Deer **UVL ID#: 5317RD**

Work Order: 73423 Customer PO#: SO33345

Date: 7/28/2006 12:35:59 PM

Facility: STETTLER LSD: Customer: JIRO ENERFLEX SERVICE

A PSV Location:

Cust. Ref.: Cust Id: JOB # SC-1617-C1

Valve PO: SO33345

## VALVE DATA

Man.: Mercer Model: 91-52H11T82U1 Serial: 247478

Conn: Flanged Inlet: 2 Inch 300 Orifice: H Outlet: 3 inch 150

Set Pres: 300 PSI Back Press: 0 PSI Cold/Diff Set Press: 0 PSI Temp: Cap: 4474 SCFM

Lift Lever: ☐ Cap Assembly: Closed Trim: Standard Code Symbol: UV CRN#: OG8841.5C

## CUSTOMER INSTRUCTIONS

Instructions: Convert to AB Sour

RESET INFORMATION: *New Pressure:* *New Cold/Diff Set:* *New Capacity:*

Pretest Required? ☐ Reset Required? ☐

## CONDITION AS RECEIVED

Visual Condition: Fair Data Plate Condition: OK Date of last service: 04/06

Seal Condition: *Top:* Intact *Bottom:* Insignia: MVC

INDICATE FOULING *Inlet:* Carbon *Outlet:* Carbon Initial Insp. Signoff: Jeff Durbak

## PRETEST

Simmer: PSI Set Press: PSI Reseat: PSI Leakage: BPM Test gauge:

Tested by: Pretest comments:

## COMPONENTS INSPECTION

| ITEM | CLEAN | OILY | RUSTY | CARBON | OTHER | COMMENTS | OK / REPLACE | REPLACED? | REPAIRS PERFORMED |
|---|---|---|---|---|---|---|---|---|---|
| DISC: MIN= ACT= | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| NOZZLE: MIN= ACT= | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| CANTILEVER ASSY: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| COMP SCREW and LOCKNUT: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| SPRING and BUTTONS: NUMBER: 05-082 | ☐ | ☐ | ☐ | ☐ | ☐ | TRIM CHANGE | Replace | ☑ | 05-082 AL |
| SPINDLE / STEM: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| STEM RETAINER: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| DISC HOLDER: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| GUIDE / UPPER RING: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| LOWER RING: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| RING PIN(S): | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| BELLOWS: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| GASKETS / SEALS: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| CONNECTION ENDS: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| OTHER: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |

Comments: NEW PN 91-52H11T82U1S

Disassembly: Bill Fisher Inspection: Bill Fisher Reassembly: Bill Fisher

## FINAL TEST:

Test Medium: Air Simmer: 298 PSI Set Pressure: 300 PSI

Reseat: 255 PSI Leakage: 0BPM B.P. Test: 60 PSI Cold/Diff Set: PSI

ADJ. RING SETTING (NOTCHES): *Upper:* *Lower:* FIXED Test Gauge RD-11/1

Tested by: Bill Fisher

## FINAL INSPECTION:

SEAL: *Top:* ☑ *Bottom:* ☐ End Protectors Installed: ☑ Painted: ☐ Palletized: ☐ Ship Container: ☑ Flex Gaskets Supplied: ☐

Final Inspection: Jeff Durbak Customer Inspection INSPECTION ID#: 11056

Comments:

PSV-1501

UNIFIED VALVE LTD.

# PRV INSPECTION AND TEST REPORT

BRANCH: Red Deer **UVL ID#: 5317RD**

Work Order: 73423 Customer PO#: SO33345

Date: 7/28/2006 12:35:59 PM
Facility: STETTLER LSD:
Cust. Ref.:

Customer: JIRO ENERFLEX SERVICE
PSV Location:
Cust Id: JOB # SC-1617-C1
Valve PO: SO33345

## VALVE DATA

Man.: Mercer Model: 91-52H11T82U1 Serial: 247478
Conn: Flanged Inlet: 2 inch 300 Orifice: H Outlet: 3 inch 150
Set Pres: 300 PSI Back Press: 0 PSI Cold/Diff Set Press: 0 PSI Temp: Cap: 4474 SCFM
Lift Lever: ☐ Cap Assembly: Closed Trim: Standard Code Symbol: UV CRN#: OG8841.5C

## CUSTOMER INSTRUCTIONS

Instructions: Convert to AB Sour
Pretest Required? ☐ Reset Required? ☐
RESET INFORMATION: *New Pressure:* *New Cold/Diff Set:* *New Capacity:*

## CONDITION AS RECEIVED

Visual Condition: Fair Data Plate Condition: OK Date of last service: 04/06
Seal Condition: *Top:* Intact *Bottom:* Insignia: MVC
INDICATE FOULING *Inlet:* Carbon *Outlet:* Carbon Initial Insp. Signoff: Jeff Durbak

## PRETEST

Simmer: PSI Set Press: PSI Reseat: PSI Leakage: BPM Test gauge:
Tested by: Pretest comments:

## COMPONENTS INSPECTION

| ITEM | CLEAN | OILY | RUSTY | CARBON | OTHER | COMMENTS | OK / REPLACE | REPLACED? | REPAIRS PERFORMED |
|---|---|---|---|---|---|---|---|---|---|
| DISC: MIN= ACT= | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| NOZZLE: MIN= ACT= | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| C/ EVER ASSY: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| COMP SCREW and LOCKNUT: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| SPRING and BUTTONS: NUMBER: 05-082 | ☐ | ☐ | ☐ | ☐ | ☐ | TRIM CHANGE | Replace | ☑ | 05-082 AL |
| SPINDLE / STEM: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| STEM RETAINER: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| DISC HOLDER: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| GUIDE / UPPER RING: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| LOWER RING: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| RING PIN(S): | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| BELLOWS: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| GASKETS / SEALS: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| CONNECTION ENDS: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |
| OTHER: | ☐ | ☐ | ☐ | ☐ | ☐ | | | ☐ | |

Comments: NEW PN 91-52H11T82U1S

Disassembly: Bill Fisher Inspection: Bill Fisher Reassembly: Bill Fisher

## FINAL TEST:

Test Medium: Air Simmer: 298 PSI Set Pressure: 300 PSI
Reseat: 255 PSI Leakage: 0BPM B.P. Test: 60 PSI Cold/Diff Set: PSI
ADJ. RING SETTING (NOTCHES): *Upper:* *Lower:* FIXED Test Gauge RD-11/1
Tested by: Bill Fisher

## FINAL INSPECTION:

SEAL: *Top:* ☑ *Bottom:* ☐ End Protectors Installed: ☑ Painted: ☐ Palletized: ☐ Ship Container: ☑ Flex Gaskets Supplied: ☐
Final Inspection: Jeff Durbak Customer Inspection INSPECTION ID#: 11056
Comments:

PSV-1601

# MERCER VALVE CANADA

## TEST REPORT

BRANCH: Red Deer

**Serial #: 209324**

**Work Order:** 72978 **Customer PO#:** S31799

**Date:** 4/27/2006 **Customer:** Jiro Enerflex
**Facility:** STETTLER **LSD:** **PSV Location:**
**A#:** **Cust Id:** JOB# S400603
**Cust. Ref.:** **Valve PO:** S31799

## VALVE DATA

**Man.:** Mercer **Model:** 81-17151V09G11 **Serial:** 209324
**Conn:** Threaded **Inlet:** 1 inch MNPT **Orifice:** E **Outlet:** 1 inch FNPT
**Set Pres:** 100 PSI **Back Press:** PSI **Temp:** **Cold/Diff Set Press:** PSI **Cap:** 387 SCFM
**Lift Lever:** ☐ **Cap Assembly:** Closed **Trim:** Standard **Code Symbol:** UV **CRN#:** OG8841.5C

## CUSTOMER INSTRUCTIONS

**Valve Instruct.** Factory Set **Instructions:** Sold New Valve **Reset Required?** ☐
**RESET INFORMATION:** ***New Pressure:*** ***New Cold/Diff Set:*** ***New Capacity:***

## COMPONENTS INSPECTION

**Components Installed** **Components Removed**

**New Model #:** 81-17151V09G11 **Spring #:** 05-009 **New Inlet Size:**
**Trim:** Standard **Valve Medium:** Gas / Air **Temerature:**
**Disassembly:** **Inspection:** Karen Fegan **Reassembly:**

## FINAL TEST:

**Test Medium:** **Simmer:** **Set Pressure:**
**Reseat:** **Leakage:** BPM **B.P. Test:** **Cold/Diff Set:**
**Test Gauge:**
**Tested by:**

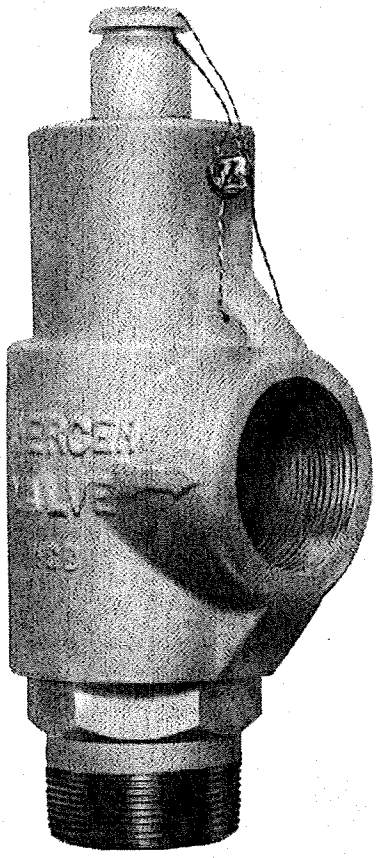
## FINAL INSPECTION:

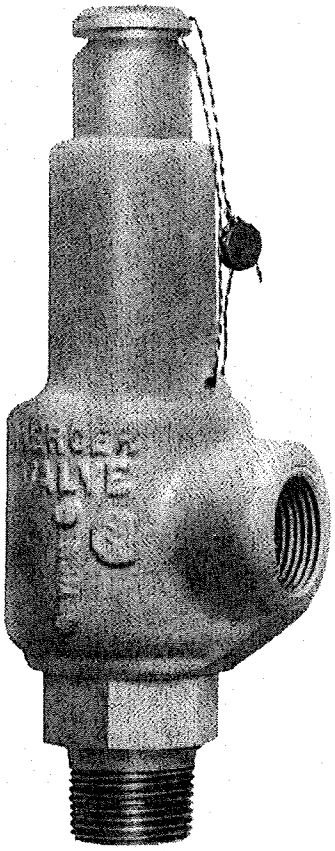
**SEAL Installed:** ☑ End Protectors Installed: ☑ Painted: ☐ Palletized: ☐ Ship Container: ☑ Flex Gaskets Supplied: ☐
**Final Inspection:** Karen Fegan **Customer Inspection** **INSPECTION ID#:** 4602

**Comments:**

RECEIVED 04.28.06

# MERCER 8100 SERIES
# SAFETY RELIEF VALVES





- Extended Seat Life
- Soft Seat Tightness
- Crisp "Pop" Action
- Full Nozzle Capacities
- Premium Construction Details
- ASME CODED FOR AIR, GAS, AND LIQUID


MERCER VALVE CO. INC.

7211 Northwest 3rd Street • Oklahoma City, Oklahoma 73127

1(800) 833-6402 • FAX (405) 495-8728 • (405) 495-6533

Mobile (405) 550-1512 For 24 Hour Service

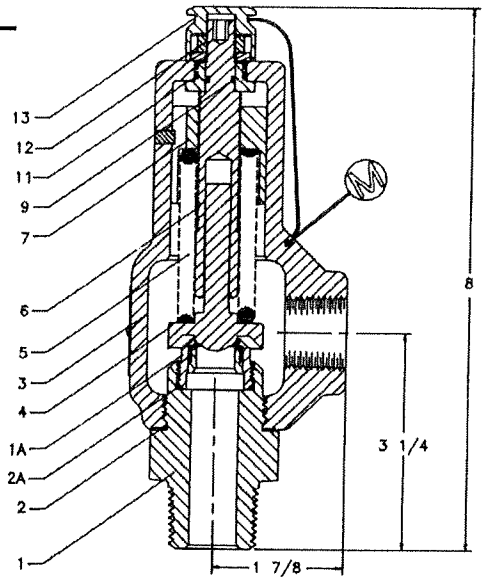
# MERCER

A.S.M.E. UV NB

# 8100 SERIES
## Safety Relief Valves

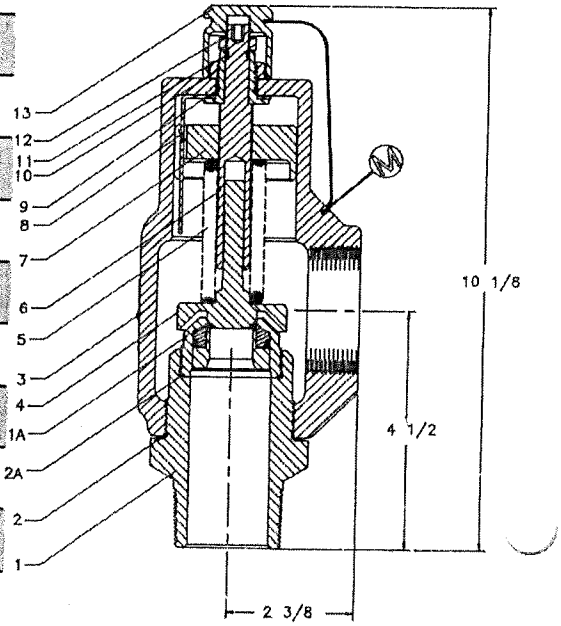
## SPECIFICATIONS

| BASIC VALVE SIZE | 1" NPT | 2" NPT |
|---|---|---|
| Inlet Valve Size | ¾" MNPT<br>1" MNPT | 1½" MNPT<br>2" MNPT |
| Outlet Size | 1" FNPT | 2" FNPT |
| Orifice Diameter | .520 in. | .775 in. |
| Orifice Area | .212 sq. in. | .472 sq. in. |
| Pressure Ranges | 15-2500 PSI | 15-2500 PSI |
| Temp. Ranges | | |
| Standard | -20° F to 400° F | |
| Extended | -40° F + 600° F | |
| ASME "slope" (90%) (Gas) | 3.10 | 7.21 |
| Flow Coefficient "K" (90%) (Gas) | .80 | .83 |
| ASME Flow Factor, CV (Liquid) | 5.15 | 12.77 |
| Weight | 4.5 lbs. | 10.0 lbs. |




## PARTS AND MATERIALS

| Item No. | Part Name | Standard Materials | Options |
|---|---|---|---|
| 1 | Inlet Base | Carbon Steel | Stainless Steel |
| 1A | Nozzle/Seat | Stainless Steel | — |
| 2 | Base Seal | Soft Steel | — |
| 2A | "O" Ring | Viton | — |
| 3 | Body | WCB Carbon Steel | Stainless Steel |
| 4 | Disk Sub Assembly | Stainless Steel | — |
| 5 | Spring | Stainless Steel | — |
| 6 | Adjustment Screw | Stainless Steel | — |
| 7 | Guide Bushing | Carbon Steel | Stainless Steel |
| 8 | Index Sub Assembly | Carbon Steel | — |
| 9 | "O" Ring | Buna N | Viton |
| 10 | Center Nut | Carbon Steel | — |
| 11 | "O" Ring (not shown) | Buna N | Viton |
| 12 | Lock Nut | Carbon Steel | — |
| 13 | CAP | Aluminum | — |



# MERCER

A.S.M.E. UV NB

# 8100 SERIES
## Safety Relief Valves

## INTRODUCTION

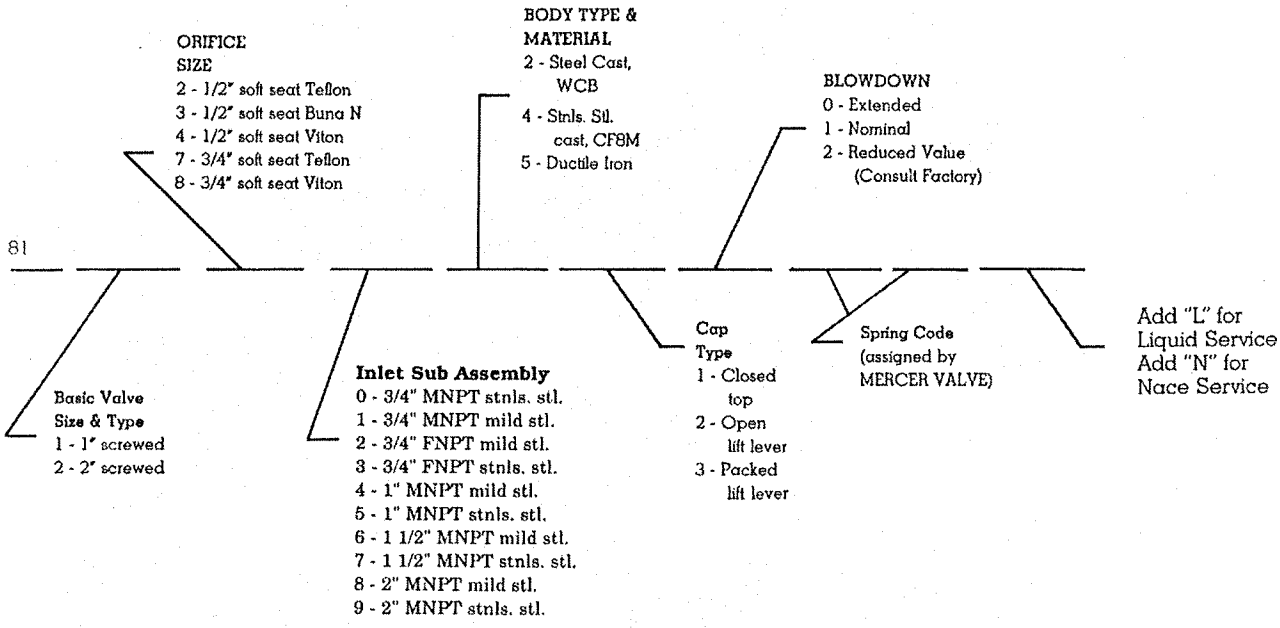
Mercer Valve 8100 Series Safety Relief Valves are the "State of the Art" in soft seat, high flow rate, pressure relieving devices. The field-proven soft seat is coupled with a new, unique disk type **PATENTED DESIGN**. Expected seat life is hundreds of "pops". Full length guiding of "low rate" set pressure springs insures accurate, repeatable relief action.

The Valve is well suited for all industrial air, gas, and liquid relief applications, including compressors, separators, refinery applications, transmission and gathering lines, gas production units, heater treaters, scrubbers, and other production processes.

All 8100 Series Valves are built in accordance with the requirements of the ASME Boiler and Pressure Vessel Code. Capacity ratings were established by testing performed at the National Board of Boiler and Pressure Vessel Inspectors, Columbus, Ohio.

## PRODUCT NUMBERING SYSTEM

A specific 8100 series valve is described by a 10 digit product numbering code as follows:




## ORDERING

To order a Safety Relief Valve, a 10 digit product number must be selected plus designation of a set pressure and any special features such as "Nace Trim".

- Basic valve size
- Orifice size
- Inlet sub assembly & material
- Body type and material
- Cap type
- Blowdown specification
- Set pressure
- Service temperature

# MERCER

UV A.S.M.E. NB

# 8100 SERIES
## Safety Relief Valves

### SAFETY RELIEF VALVE SIZING

Safety Relief Valves may be sized by formula or capacity chart, whichever the user prefers.

SIZING BY FORMULA: Appendix 11, Section VIII, Division I of the ASME Boiler and Pressure Vessel Code prescribes the formula for capacities of orifices. These basic formulas are:

WEIGHT FLOW $W_{lb/hr} = KACP\sqrt{\frac{M}{T}}$ (EQ 1)

VOLUME FLOW, Specified Conditions $\underset{SCFM}{Q} = \frac{KACP}{w \times 60}\sqrt{\frac{M}{T}}$ (EQ 2)

VOLUME FLOW (FLUID) $\underset{(GPM)}{Q} = "CV"\ K_v\sqrt{\frac{P-Pd}{S}}$ (EQ 3)

### WHERE

W=lb/hr weight flow of gas.

A=effective flow are in square inches. This factor is calculated from 90% of the instantaneous slope determined by capacity tests conducted at the National Board in accordance with UG 131, Section VIII of the Code.

P=(set pressure x 1.1 plus atmospheric pressure) psia. This is a 10% accumulation.

M=molecular weight

T=absolute temperature at inlet (°F + 460)

C=constant for gas or vapor which is a function of ratio of specific heats,

w=density of gas at exit conditions. This is usually specified at standard conditions of 60°F and 14.7 psia. lbs/cu.ft.

K=Flow coefficient

CV=ASME Flow Factor, Liquid

Pd=Pressure at discharge from valve, PSIA

S=Specific gravity of fluid

$K_v$=Viscosity correction factor

**Table Molecular Wt. and Values of C for Gases**

| Gas | Mol. Wt. | Cp/Cv | C | Gas | Mol. Wt. | Cp/Cv | C |
|---|---|---|---|---|---|---|---|
| Acetylene | 26 | 1.28 | 345 | Hydrochloric Acid | 36.5 | 1.40 | 356 |
| Air | 29 | 1.40 | 356 | Hydrogen | 2 | 1.40 | 356 |
| Ammonia | 17 | 1.33 | 351 | Hydrogen Sulphide | 34 | 1.32 | 348 |
| Argon | 40 | 1.66 | 377 | Iso-Butane | 58 | 1.11 | 328 |
| Benzene | 78 | 1.10 | 327 | Methane | 16 | 1.30 | 346 |
| Carbon Disulphide | 76 | 1.21 | 338 | Methyl-Alcohol | 32 | 1.20 | 337 |
| Carbon Dioxide | 44 | 1.28 | 345 | Methyl Chloride | 50.5 | 1.20 | 337 |
| Carbon Monoxide | 28 | 1.40 | 356 | N-Butane | 58 | 1.11 | 328 |
| Chlorine | 71 | 1.36 | 352 | Natural Gas (0.6) | 17.4 | 1.27 | 344 |
| Cyclohexane | 84 | 1.08 | 324 | Nitrogen | 28 | 1.40 | 356 |
| Ethane | 30 | 1.22 | 339 | Oxygen | 32 | 1.40 | 356 |
| Ethylene | 28 | 1.20 | 337 | Pentane | 72 | 1.09 | 325 |
| Freon 22 | 86 | 1.18 | 355 | Propane | 44 | 1.14 | 331 |
| Helium | 4 | 1.66 | 377 | Sulphur Dioxide | 64 | 1.26 | 342 |
| Hexane | 86 | 1.08 | 324 | | | | |

| SET PRESSURE | AIR CAPACITIES | | NATURAL GAS CAPACITIES | | WATER CAPACITIES | |
|---|---|---|---|---|---|---|
| | 81-14000000 1/2" Orifice | 81-28000000 3/4" Orifice | 81-14000000 1/2" Orifice | 81-28000000 3/4" Orifice | 81-12000000 1/2" Orifice | 81-27000000 3/4" Orifice |
| 15 (PSIG) | 101 (SCFM) | 236 (SCFM) | 120 (SCFM) | 280 (SCFM) | 22 (GPM) | 51 (GPM) |
| 20 | 117 | 272 | 142 | 329 | 25 | 61 |
| 25 | 132 | 308 | 163 | 379 | 27 | 67 |
| 30 | 148 | 344 | 184 | 428 | 30 | 73 |
| 50 | 216 | 503 | 269 | 626 | 38 | 95 |
| 75 | 301 | 701 | 375 | 872 | 47 | 116 |
| 100 | 387 | 899 | 481 | 1119 | 54 | 134 |
| 125 | 472 | 1097 | 587 | 1366 | 60 | 150 |
| 150 | 557 | 1296 | 693 | 1613 | 66 | 164 |
| 200 | 728 | 1692 | 906 | 2106 | 76 | 189 |
| 300 | 1069 | 2485 | 1330 | 3094 | 94 | 232 |
| 400 | 1410 | 3278 | 1755 | 4081 | 108 | 268 |
| 500 | 1751 | 4071 | 2197 | 5068 | 121 | 299 |
| 600 | 2092 | 4865 | 2604 | 6055 | 132 | 328 |
| 700 | 2433 | 5658 | 3028 | 7042 | 143 | 354 |
| 800 | 2774 | 6451 | 3452 | 8030 | 153 | 379 |
| 900 | 3115 | 7244 | 3877 | 9017 | 162 | 402 |
| 1000 | 3456 | 8037 | 4301 | 10004 | 171 | 424 |
| 1100 | 3797 | 8830 | 4726 | 10991 | 179 | 444 |
| 1250 | 4308 | 10020 | 5363 | 12472 | 191 | 474 |
| 1500 | 5161 | 12002 | 6424 | 14940 | 209 | 519 |
| 2000 | 6866 | 15968 | 8546 | 19876 | 242 | 599 |
| 2500 | 8571 | 19933 | 10668 | 24812 | 270 | 670 |

# MERCER VALVE COMPANY, INC.
# 81 SERIES SAFETY RELIEF VALVES

## INSTALLATION AND OPERATION INSTRUCTIONS

### INSTALLATION

The safety relief valve should always be installed on a tank or piping run in a vertical position with the outlet pointing in a horizontal direction. When screwing the valve into the inlet piping, always use a wrench on the inlet connection hex, never wrench on the relief valve body.

One of the most common causes of early failure of relief valves is dirt trapped on the valve seat. Welding slag and/or piping teflon tape are among the more common items that cause difficulty. It is recommended that all piping and tank systems be cleared prior to installation of the relief valve.

A relief valve mounted on a tank should be connected with the minimum amount of piping between the tank and the valve. Further, all piping used must be equal or larger than the inlet pipe size of the relief valve, never smaller. Any restriction of the inlet to a relief valve may cause unusual valve chatter or relief capacities below the design rating of the valve which could result in serious damage. Outlet piping from the relief valve should be less than four (4) feet in length and never of a pipe size smaller than the outlet pipe size of the relief valve. Long runs of small diameter pipe on the outlet size of a relief valve will create a serious hazard to life and property.

Extreme caution is required in the outlet piping if installed outdoors where the liquids, if present, could form an ice block in the piping of the relief valve body in below freezing weather. Discharge lines must be "weather capped" and provided with a drain hole to prevent any liquid collection in the relief valve body or outlet piping. If these precautions are not taken, serious damage and injury will result.

Additional, important installation factors are contained in paragraph UG-135, Section VIII of the ASME code.

### OPERATION

Best performance in process work is usually obtained by setting the relief valve to open at least 10% above the operating pressure where possible. A greater margin of 20-30% is desirable, however, this setting must not exceed the maximum working pressure of the vessel. All Mercer Safety Valves are checked for bubble-tight seat closures at 90% of set pressure.

In addition to checking the set pressure vs. the maximum allowable working pressure of the vessel, also check to insure that back pressure and temperature limitations of the process are consistent with valve ratings. Note that the Mercer 81 Series Valve with a viton seat is suitable for the temperature range of -20 to 250 F. Service outside of these ranges will require special materials. Further, carefully check the process, fluid input capacities to insure that the relief valve, relieving capacity is greater than the process capability.

DO NOT BREAK THE SEAL WIRE to do so invalidates the Manufacturer's warranty to repair or replace the valve. Should resetting be required in a field emergency situation, it should be performed by qualified personnel with calibrated instrumentation. Note that the ASME Section VIII Code prohibits resetting a relief valve more than 10% of the original setting up to 250 PSI set pressures and 5% above 250 PSI set pressures. Consult the factory for additional resetting information.

### LIMITED WARRANTY

Mercer Valve Warrants the goods delivered hereunder to be free from defects in material and workmanship, under normal use and service, for a period of one (1) year after date of shipment. Mercer's obligation under this warranty is limited to repair or replacement at Mercer's sole option, of any defective item. Mercer's liability under this warranty is conditioned upon Purchaser giving Mercer immediate written notice of any such defect. Mercer shall have the option of requiring the return of the defective item, transportation prepaid, to establish the claim. Any repair or replacement of defective goods or parts will occur at Mercer's plant in Oklahoma City, Oklahoma. Purchaser shall bear all freight costs incurred in transporting defective goods or parts to and from Mercer's plant. Mercer shall not be held liable for damages caused by delays in repair or replacement of any defective items. The provisions in the Mercer literature and specifications are descriptive only, unless expressly stated as warranties. EXCEPT FOR THE FOREGOING, MERCER EXPRESSLY DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Mercer's liability to the Purchaser, arising out of the supplying of the said goods or their use, whether based upon warranty, contract or negligence, shall not in any case exceed the cost of correcting defects in, or replacing, the equipment as herein provided. Upon the expiration of said one (1) year, all such liability shall terminate. Mercer shall not in any event be held liable for any special, indirect, or consequential damages. SUITABILITY OF THE MATERIAL AND PRODUCT FOR THE USE CONTEMPLATED BY THE BUYER IS THE SOLE RESPONSIBILITY OF THE BUYER.

MERCER VALVE CO., INC.
9609 N.W. 4th
Oklahoma City,OK 73127
405-495-6533

# MERCER

A.S.M.E. NB

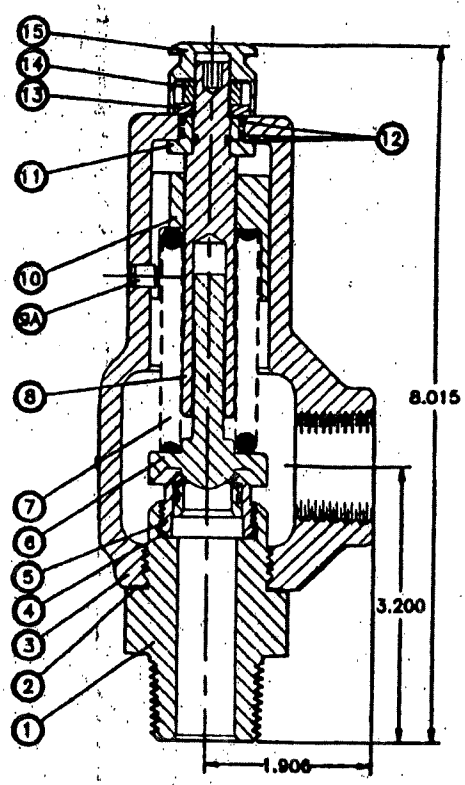
# 8100 SERIES
## Safety Relief Valves

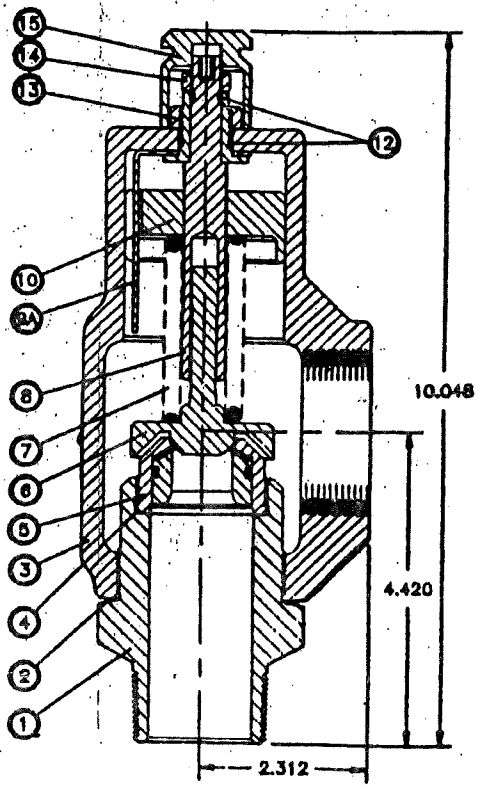
### SPECIFICATIONS

| BASIC VALVE SIZE | 1" NPT | 2" NPT |
|---|---|---|
| INLET VALVE SIZE | 3/4" FNPT | 1 1/2" MNPT |
| | 1" MNPT | 2" MNPT |
| OUTLET SIZE | 1" FNPT | 2" FNPT |
| ORIFICE DIAMETER | .520 in. | .775 in. |
| ORIFICE AREA | .212 sq. in. | .472 sq. in. |
| PRESSURE RANGES | 15-3000 PSI | 15-2500 PSI |
| TEMP. RANGES | | |
| STANDARD | -20F to 400F | |
| EXTENDED | -40F to 600F | |
| ASME "slope" (90%) (GAS) | 3.1 | 7.21 |
| FLOW COEFFICIENT "K" (90%) (GAS) | 0.8 | .83 |
| ASME FLOW FACTOR, Cv (LIQUID) | 5.15 | 12.77 |
| WEIGHT | 4.5 lbs. | 10.0 lbs. |

### PARTS AND MATERIALS

| ITEM NO. | PART NAME | STANDARD MATERIALS | OPTIONS |
|---|---|---|---|
| 1 | INLET BASE | CARBON STEEL | STNLS STL |
| 2 | BASE SEAL | SOFT STEEL | - |
| 3 | BODY | WCB CARBON STEEL | DUCTILE IRON<br>STNLS STL |
| 4 | "O" RING | VITON | EPDM<br>BUNA N |
| 5 | NOZZLE/ SEAT | STAINLESS STEEL | - |
| 6 | DISK SUB ASSEMBLY | STAINLESS STEEL | - |
| 7 | SPRING | STAINLESS STEEL | - |
| 8 | ADJUSTMENT SCREW | STAINLESS STEEL | - |
| 9A | BODY SIDE PIN | STAINLESS STEEL | - |
| 9B | INDEX SUB ASSEMBLY | CARBON STEEL | - |
| 10 | GUIDE BUSHING | CARBON STEEL | STNLS STL |
| 11 | CENTER BUSHING | CARBON STEEL | STNLS STL |
| 12 | "O" RING | BUNA N | EPDM<br>VITON |
| 13 | BUSHING WASHER | CARBON STEEL | STNLS STL |
| 14 | LOCK NUT | CARBON STEEL | - |
| 15 | CAP | ALUMINUM | - |



# MERCER VALVE CO., INC.
# 9100 SERIES FLANGED SAFETY RELIEF VALVES

## INSTALLATION AND OPERATION INSTRUCTIONS

### INSTALLATION

The safety relief valve should always be installed on a tank or piping run in a vertical position with the outlet pointing in a horizontal direction. When screwing the valve into the inlet piping, always use a wrench on the inlet connection hex, never wrench on the relief valve body.

One of the most common causes of early failure of relief valves is dirt trapped on the valve seat. Welding slag and/or piping teflon tape are among the more common items that cause difficulty. It is recommended that all piping and tank systems be cleaned prior to installation of the relief valve.

A relief valve mounted on a tank should be connected with the minimum amount of piping between the tank and the valve. Further, all piping used must be equal or later than the inlet pipe size of the relief valve, never smaller. Any restriction of the inlet to a relief valve may cause unusual valve charter or relief capacities below the design rating of the valve which could result in serious damage. Outlet piping from the relief valve should be less than four (4) feet in length and never of a pipe size smaller than the outlet pipe size of the relief valve. Long runs of small diameter pipe on the outlet size of a relief valve will create a serious hazard to life and property.

Extreme caution is required in the outlet piping if installed outdoors where the liquids, if present, could form an ice block in the piping of the relief valve body in below freezing weather. Discharge lines must be "weather capped" and provided with a drain hole to prevent any liquid collection in the relief valve body or outlet piping. If these precautions are not taken, serious damage and injury will result.

Additional, important installation factors are contained in paragraph UG-135, Section VIII of the ASME Code.

### OPERATION

Best performance in process work is usually obtained by setting the safety relief valve to open at least 10% above the operating pressure where possible. A greater margin of 20-30% is desirable, however, this setting must not exceed the maximum working pressure of the vessel. All Mercer Safety Relief Valves are checked for bubble-tight seat closures at 90% of set pressure.

In addition to checking the set pressure vs. the maximum allowable working pressure of the vessel, also check to insure that back pressure and temperature limitations of the process are consistent with valve ratings. Note that the Mercer 91 Series Valve with a viton seat is suitable for the temperature range of –20° to +400°F. Service outside of these ranges will require special materials. Further, carefully check the process, fluid input capacities to insure that the relief valve, relieving capacity is greater than the process capability.

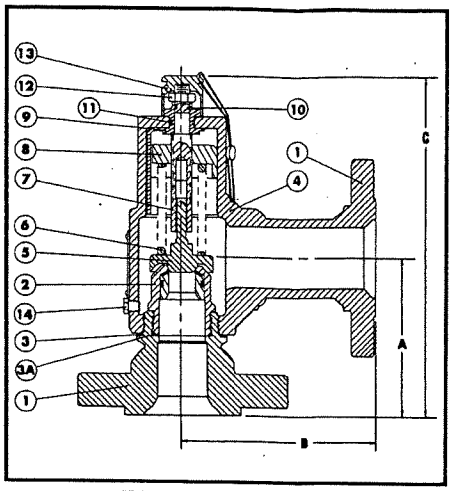
DO NOT BREAK THE SEAL WIRE, to do so invalidates the Manufacturer's warranty to repair or replace the valve. Should resetting be required in a field emergency situation, it should be preformed by qualified personnel with calibrated instrumentation. Note that the ASME Section VIII Code prohibits resetting a relief valve more than = 10% of the original setting up to 250 PSI set pressures and = 5% above 250 PSI set pressures. Consult the factory for additional resetting information.

### WARRANTY

Mercer warrants the goods delivered hereunder to be free from defects in material and workmanship, under normal use and service, for a period of one year after date of shipment. Mercer's obligation under this warranty is limited to repair or replacement, at Mercer's sole option, of any defective item. Mercer's liability under this warranty is conditioned upon Purchaser giving Mercer immediate written notice of any such defect. Mercer shall have the option of requiring the return of the defective part, transportation prepaid, to establish the claim. Any repair or replacement of defective goods or parts will occur at Mercer's plant in Oklahoma City, Oklahoma and Purchaser shall bear all freight costs incurred in transporting defective goods or parts to and from Mercer's plant. Mercer shall not be held liable for damages caused by delays in repair or replacement of any defective items. The provisions in the Mercer literature and specifications are descriptive only, unless expressly stated as warranties. EXCEPT FOR THE FOREGOING, MERCER EXPRESSLY DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. MERCER'S liability to the Purchaser, arising out of the supplying of the said goods or their use, weather based upon warranty contract or negligence, shall not in any case exceed the cost of correcting defects in, or replacing, the equipment as herein provided and upon the expiration of said one year such liability shall terminate. Mercer shall not in any event be held liable for any special, indirect or consequential damages.

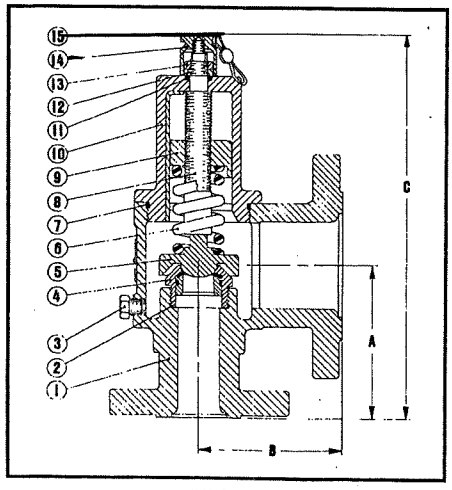
MERCER VALVE CO., INC
9609 N.W. 4th
Oklahoma City, OK 73127
405-495-6533

# MERCER 9100 SERIES
# FLANGED SAFETY RELIEF VALVES



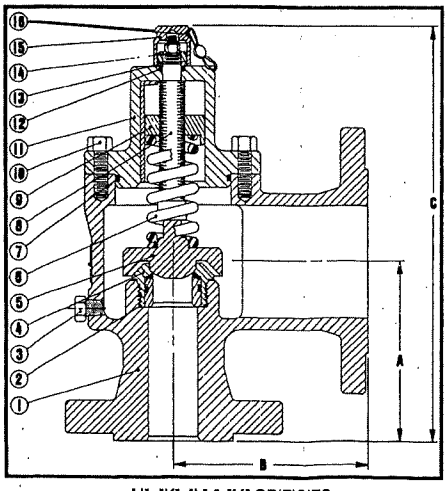

"D", "E", "F", and "G" Orifices

| "D", "E", "F", & "G" ORIFICES | | | |
|---|---|---|---|
| ITEM NUMBER | PART NAME | STANDARD MATERIALS | OPTIONS |
| 1 | Inlet, Outlet Flanges | SA105 Forged Steel | Stainless Steel |
| 2 | Nozzle/Seat | 316 Stainless Steel/Viton | 17-4 Stainless Steel/Teflon |
| 3 | Base Seal | Soft Steel | ------ |
| 3A | O'Ring | Viton | Buna N |
| 4 | Body | SA 216 GR WCB Carbon Steel | Stainless Steel |
| 5 | Disk Sub Assembly | 316 Stainless Steel | 17-4 Stainless Steel |
| 6 | Spring | 17-7 Stainless Steel | Inconel X-750 |
| 7 | Adjustment Screw | 300 Series Stainless Steel | ------ |
| 8 | Guide Bushing | 300 Series Stainless Steel | ------ |
| 9 | Index Sub Assembly | Nickel Plated Carbon Steel | ------ |
| 10 | "O" Ring | Buna N | Viton |
| 11 | "O" Ring | Buna N | Viton |
| 12 | Lock Nut | Carbon Steel | ------ |
| 13 | Cap | Aluminum Anodized | Carbon Steel |
| 14 | Drain Plug | Carbon Steel | Stainless Steel |




"H" Orifice

| "H" ORIFICES | | | |
|---|---|---|---|
| ITEM NUMBER | PART NAME | STANDARD MATERIALS | OPTIONS |
| 1 | Body | SA 216 GR WCB Carbon Steel | CF8M Stnls. Steel |
| 2 | "O" Ring | Viton | ------ |
| 3 | Drain Plug | Carbon Steel | Stainless Steel |
| 4 | Nozzle/Seat Sub Assembly | 316 Stainless Steel/Viton | 17-4 Stainless Steel/Teflon |
| 5 | Disk Sub Assembly | 316 Stainless Steel | 17-4 Stainless Steel |
| 6 | Spring | 17-7 Stainless Steel | Inconel X-750 |
| 7 | "O" Ring | Buna N | ------ |
| 8 | Adjustment Screw | 300 Series Stainless Steel | ------ |
| 9 | Adjustment Bushing | 300 Series Stainless Steel | ------ |
| 10 | Bonnet | Carbon Steel | Stainless Steel |
| 11 | "O" Ring | Buna N | ------ |
| 12 | Stem Washer | 300 Series Stainless Steel | ------ |
| 13 | Lock Nut | Carbon Steel Rust Proofed | ------ |
| 14 | Cap | Aluminum Anodized | Carbon Steel Rust Proofed |
| 15 | Lock Wire | Stainless Steel | ------ |



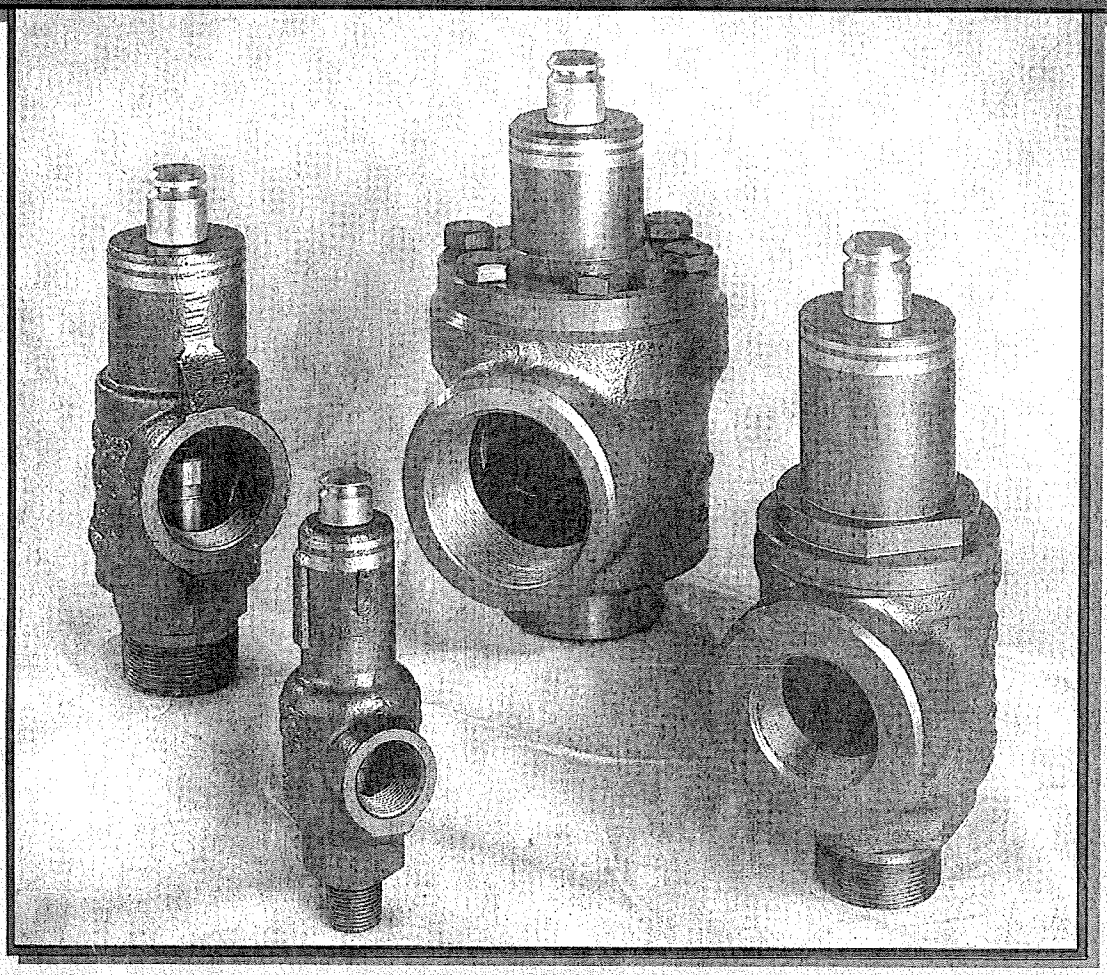

"J", "K", "L" & "M" ORIFICIES

| "J", "K", "L" & "M" ORIFICIES | | | |
|---|---|---|---|
| ITEM NUMBER | PART NAME | STANDARD MATERIALS | OPTIONS |
| 1 | Body | SA 216 GR WCB Carbon Steel | CF8M Stnls. Steel |
| 2 | "O" Ring | Viton | ------ |
| 3 | Drain Plug | Carbon Steel | Stainless Steel |
| 4 | Nozzle/Seat Sub Assembly | 316 Stainless Steel/Viton | 17-4 Stainless Steel/Teflon |
| 5 | Disk Sub Assembly | 316 Stainless Steel | 17-4 Stainless Steel |
| 6 | Spring | 17-7 Stnls. Stl. | Inconel X-750 |
| 7 | "O" Ring | Buna N | Viton |
| 8 | Adjustment Screw | 300 Series Stainless Steel | ------ |
| 9 | Adjustment Bushing | 300 Series Stainless Steel | ------ |
| 10 | Bolt | Carbon Steel | Stainless Steel |
| 11 | Bonnet | Carbon Steel | Stainless Steel |
| 12 | "O" Ring | Buna N | Viton |
| 13 | Stem Washer | 300 Series Stainless Steel | ------ |
| 14 | Lock Nut | Carbon Steel Rust Proofed | ------ |
| 15 | Cap | Aluminum Anodized | Carbon Steel Rust Proofed |
| 16 | Lock Wire | Stainless Steel | ------ |

UV A.S.M.E. NB

# MERCER 9100 SERIES

# THREADED SAFETY RELIEF VALVES



- EXTENDED SEAT LIFE • SOFT SEAT TIGHTNESS
- CRISP "POP" ACTION • FULL NOZZLE CAPACITIES
- PREMIUM CONSTRUCTION DETAILS
- **ASME CODED FOR AIR, GAS AND LIQUID** •


## MERCER VALVE CO. INC.

7211 NORTHWEST 3RD STREET, OKLAHOMA CITY, OK 73127
1-800-833-6402 (405) 495-6533 FAX (405) 495-8728
MOBILE (405) 550-1512 OR (405) 830-1191 FOR 24 HOUR SERVICE

# MERCER 9100 SERIES
# THREADED SAFETY RELIEF VALVES

UV A.S.M.E. NB

## INTRODUCTION

Mercer Valve 9100 Series Threaded Safety Relief Valves are the "State of the Art" in soft seat, high flow rate, pressure relieving devices. The field-proven soft seat is coupled with a new, unique disk type **PATENTED DESIGN.** Expected seat life is hundreds of "pops". Full length guiding of "low rate" set pressure springs insures accurate, repeatable relief action. Standard, low blow downs are consistant with efficient relieving of over pressure without expensive loss of process gas.

The valve is well suited for all industrial air, gas, or liquid relief applications, including compressors, separators, heater treaters, scrubbers, dehydrator, free water knockouts, thermal relief, gas production units, transmission and gathering lines, meter runs, gas plants, chemical plants, refineries and other industrial applications.

All 9100 Series Threaded Valves are built in accordance with the requirements of the ASME Boiler and Pressure Vessel Code. Capacity ratings were established by testing performed at the National Board of Boiler and Pressure Vessel Inspectors, Columbus, Ohio.

# SPECIFICATIONS

| API Orifice Letter | C | D | E | F | G | H | J | K |
|---|---|---|---|---|---|---|---|---|
| Orifice Diameter (In.) | .281 | .394 | .520 | .655 | .775 | 1.050 | 1.350 | 1.625 |
| Orifice Area (Sq. In.) | .062 | .122 | .212 | .337 | .472 | .865 | 1.430 | 2.074 |
| *Inlet Size Offered | ½", ¾", 1" | ½", ¾", 1" | ¾", 1" | 1", 1½" | 1½", 2 | 1½", 2 | 2, 2½", 3" | 3" |
| Pressure Ranges (PSIG) | 15-10,000 | 15-6500 | 15-3500 | 15-2500 | 15-2500 | 15-2000 | 15-1800 | 15-1500 |
| **TEMP. RANGES** | | | | | | | | |
| Standard (°F) -20° F to +450° F | | | | | | | | |
| Extended (°F)-180° F to +600°F (Consult Factory for material specifications) | | | | | | | | |
| ASME Gas "Slope" (90%) | .93 | 1.83 | 3.18 | 5.06 | 7.08 | 12.98 | 21.51 | 31.12 |
| Flow Coefficiant "K" (90%) Gas | .818 | .818 | .818 | .818 | .818 | .818 | .818 | .818 |
| Flow Coefficiant "K" (90%) Fluid | .707 | .707 | .707 | .707 | .707 | .707 | .707 | .707 |
| Weight (Lbs.) | **Consult Factory** | | | | | | | |

*NOTE: FOR INLET AND OUTLET SIZE COMBINATIONS SEE SELECTION CHART.

| BODY BACK PRESSURE LIMITS | | |
|---|---|---|
| OUTLET SIZE | ORIFICE SIZE | MAXIMUM PRESSURE (PSI) |
| 1" | C, D, E | 2000 |
| 1½", 2 | D, E, F, G | 1500 |
| 2", 2½" | H | 1000 |
| 3" | J | 1000 |
| 3" | K | 1000 |

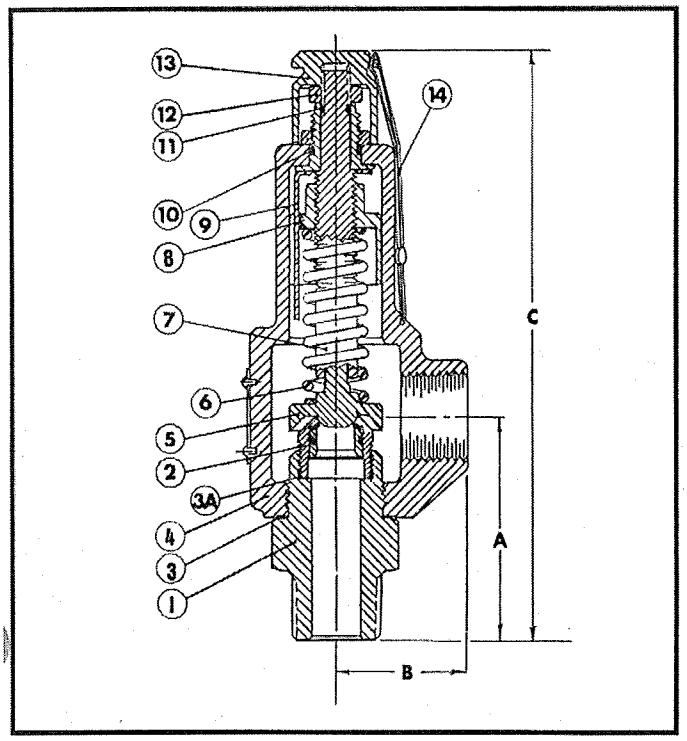
| SEAT DATA (For seat material consult factory) | | | | | |
|---|---|---|---|---|---|
| SEAT MATERIAL | DUROMETER | TEMPERATURE °F | | PRESSURE PSIG | |
| | | Maximum | Minimum | Maximum | Minimum |
| *BUNA-N | 90 | 250 | -65 | 2000 | 15 |
| VITON | 90 | 275 | -65 | 3000 | 15 |
| TEFLON | N/A | 450 | -420 | 4500 | 15 |
| PEEK | N/A | 525 | 0 | 10,000 | 15 |
| *KALREZ | 90 | 525 | 0 | 3000 | 15 |
| *NEOPRENE | 90 | 300 | -65 | 3000 | 15 |
| *EPDM | 90 | 325 | -65 | 3000 | 15 |

*SPECIAL ORDER, CONSULT FACTORY

# MERCER 9100 SERIES

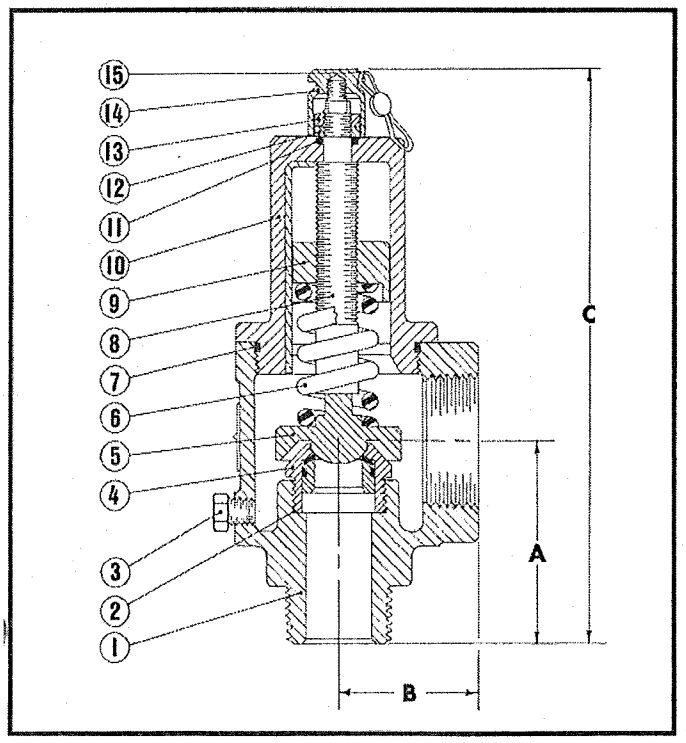
# THREADED SAFETY RELIEF VALVES

## BILL OF MATERIALS




"C", "D", "E", "F", and "G" Orifices

| "C", "D", "E", "F", & "G" ORIFICES | | | |
|---|---|---|---|
| ITEM NUMBER | PART NAME | STANDARD MATERIALS | OPTIONS |
| 1 | Inlet Base | SA 216 GR WCB Carbon Steel | Stainless Steel |
| 2 | Nozzle/Seat | 316 Stainless Steel/Viton | 17-4 Stainless Steel/Teflon |
| 3 | Base Seal | Soft Steel | ------ |
| 3A | O'Ring | Viton | Buna N |
| 4 | Body | SA 216 GR WCB Carbon Steel | Stainless Steel |
| 5 | Disk Sub Assembly | 316 Stainless Steel | 17-4 Stainless Steel |
| 6 | Spring | 17-7 Stainless Steel | Inconel X-750 |
| 7 | Adjustment Screw | 300 Series Stainless Steel | ------ |
| 8 | Guide Bushing | 300 Series Stainless Steel | ------ |
| 9 | Index Sub Assembly | Nickel Plated Carbon Steel | ------ |
| 10 | "O" Ring | Buna N | Viton |
| 11 | "O" Ring | Buna N | Viton |
| 12 | Lock Nut | Carbon Steel | ------ |
| 13 | Cap | Aluminum Anodized | Carbon Steel |
| 14 | Lock Wire | Stainless Steel | ------ |



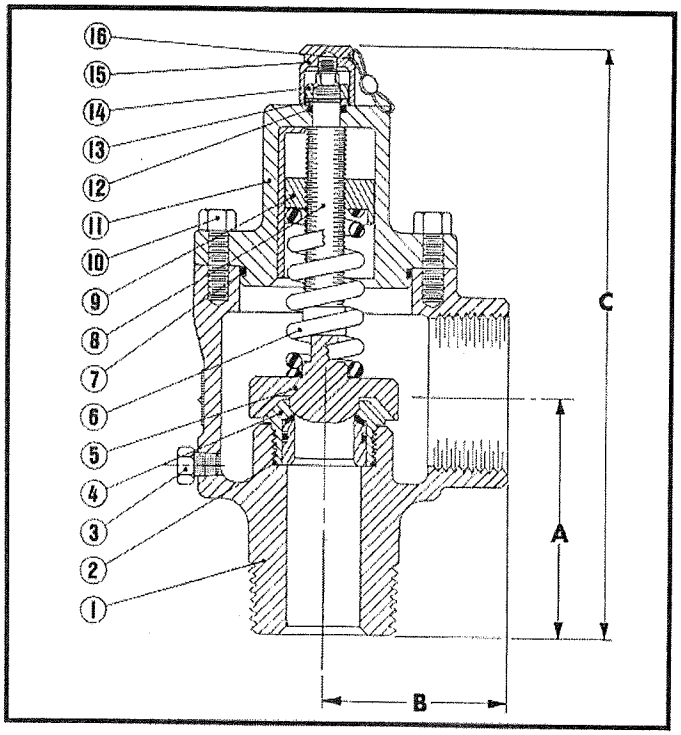

"H" Orifice

| "H" ORIFICES | | | |
|---|---|---|---|
| ITEM NUMBER | PART NAME | STANDARD MATERIALS | OPTIONS |
| 1 | Body | SA 216 GR WCB Carbon Steel | CF8M Stnls. Steel |
| 2 | "O" Ring | Viton | ------ |
| 3 | Drain Plug | Carbon Steel | ------ |
| 4 | Nozzle/Seat Sub Assembly | 316 Stainless Steel/Viton | 17-4 Stainless Steel/Teflon |
| 5 | Disk Sub Assembly | 316 Stainless Steel | 17-4 Stainless Steel |
| 6 | Spring | 17-7 Stainless Steel | Inconel X-750 |
| 7 | "O" Ring | Buna N | ------ |
| 8 | Adjustment Screw | 300 Series Stainless Steel | ------ |
| 9 | Adjustment Bushing | 300 Series Stainless Steel | ------ |
| 10 | Bonnet | Carbon Steel | ------ |
| 11 | "O" Ring | Buna N | ------ |
| 12 | Stem Washer | 300 Series Stainless Steel | ------ |
| 13 | Lock Nut | Carbon Steel Rust Proofed | ------ |
| 14 | Cap | Aluminum Anodized | Carbon Steel Rust Proofed |
| 15 | Lock Wire | Stainless Steel | ------ |

{UV} A.S.M.E. [NB]

# MERCER 9100 SERIES

# THREADED SAFETY RELIEF VALVES



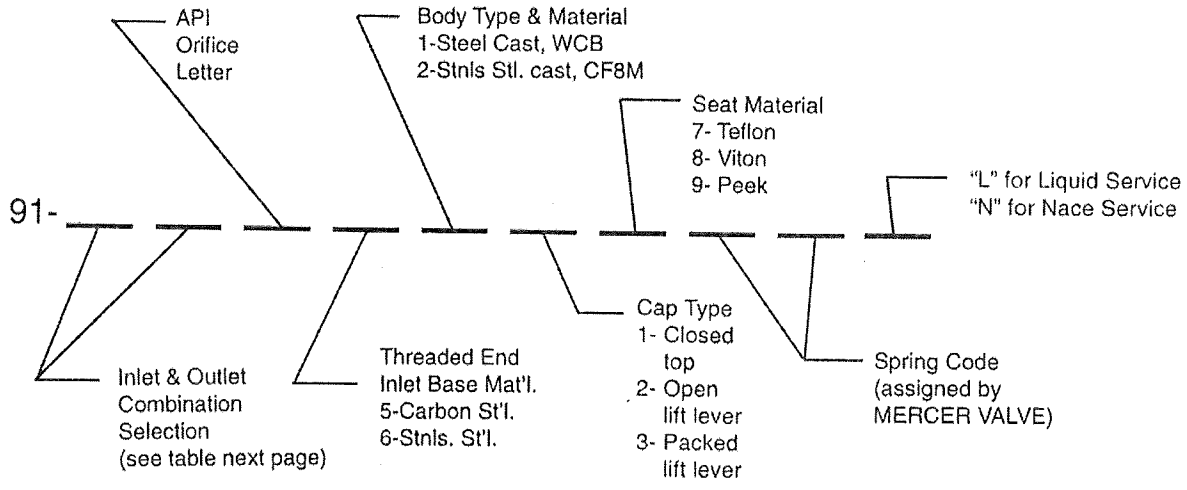

"J", and "K" Orifices

| "J" & "K" ORIFICES | | | |
|---|---|---|---|
| ITEM NUMBER | PART NAME | STANDARD MATERIALS | OPTIONS |
| 1 | Body | SA 216 GR WCB Carbon Steel | CF8M Stnls. Steel |
| 2 | "O" Ring | Viton | ------ |
| 3 | Drain Plug | Carbon Steel | ------ |
| 4 | Nozzle/Seat Sub Assembly | 316 Stainless Steel/Viton | 17-4 Stainless Steel/Teflon |
| 5 | Disk Sub Assembly | 316 Stainless Steel | 17-4 Stainless Steel |
| 6 | Spring | 17-7 Stnls. Stl. | Inconel X-750 |
| 7 | "O" Ring | Buna N | Viton |
| 8 | Adjustment Screw | 300 Series Stainless Steel | ------ |
| 9 | Adjustment Bushing | 300 Series Stainless Steel | ------ |
| 10 | Bolt | Carbon Steel | ------ |
| 11 | Bonnet | Carbon Steel | |
| 12 | "O" Ring | Buna N | Viton |
| 13 | Stem Washer | 300 Series Stainless Steel | ------ |
| 14 | Lock Nut | Carbon Steel Rust Proofed | ------ |
| 15 | Cap | Aluminum Anodized | Carbon Steel Rust Proofed |
| 16 | Lock Wire | Stainless Steel | ------ |

# PRODUCT NUMBERING SYSTEM

## VALVE PRODUCT NUMBERING SYSTEM

A specific 91 Series Valve is described by a 11 digit product numbering code as follows:

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# MERCER 9100 SERIES

# THREADED SAFETY RELIEF VALVES

## SELECTION TABLE

| VALVE SIZE INLET BY ORIFICE BY OUTLET | BODY MATERIAL | INLET BASE MATERIAL | CENTER TO FACE DIMENSIONS (IN.) INLET X OUTLET X HT. "A" X "B" X "C" MAX. (Refer to Bill of Material Drawings) | MERCER GENERAL PART NUMBER* |
|---|---|---|---|---|
| ½" FNPT-C-1" FNPT | WCB CARBON STL | WCB CARBON STL | 2 5/8 x 1 7/8 x 7 1/4 | 91-05C511000 (7) |
| ½" MNPT-C-1" FNPT | WCB CARBON STL | WCB CARBON STL | 3 1/4 x 1 7/8 x 8 1/8 | 91-06C511000 (7) |
| ¾" MNPT-C-1" FNPT | WCB CARBON STL | WCB CARBON STL | 3 1/4 x 1 7/8 x 8 1/8 | 91-12C511000 (7) |
| 1" MNPT-C-1" FNPT | WCB CARBON STL | WCB CARBON STL | 3 1/4 x 1 7/8 x 8 1/8 | 91-17C511000 (7) |
| ½" FNPT-D-1" FNPT | WCB CARBON STL | WCB CARBON STL | 2 5/8 x 1 7/8 x 7 1/4 | 91-05D511000 (I) (7) |
| ½" MNPT-D-1" FNPT | WCB CARBON STL | WCB CARBON STL | 3 1/4 x 1 7/8 x 8 1/8 | 91-06D511000 (I) (7) |
| ¾" MNPT-D-1" FNPT | WCB CARBON STL | WCB CARBON STL | 3 1/4 x 1 7/8 x 8 1/8 | 91-12D511000 (I) (7) |
| ¾" MNPT-D-1" FNPT | WCB CARBON STL | 316 STNLS STL | 3 1/4 x 1 7/8 x 8 1/8 | 91-12D611000 (7) |
| ¾" MNPT-D-1" FNPT | CF8M STNLS STL | 316 STNLS STL | 3 1/4 x 1 7/8 x 8 1/8 | 91-12D621000 (7) |
| 1" MNPT-D-1" FNPT | WCB CARBON STL | WCB CARBON STL | 3 1/4 x 1 7/8 x 8 1/8 | 91-17D511000 (I) (7) |
| 1" MNPT-D-1" FNPT | WCB CARBON STL | 316 STNLS STL | 3 1/4 x 1 7/8 x 8 1/8 | 91-17D611000 (7) |
| 1" MNPT-D-1" FNPT | CF8M STNLS STL | 316 STNLS STL | 3 1/4 x 1 7/8 x 8 1/8 | 91-17D621000 (7) |
| 1" FNPT-D-2" FNPT | WCB CARBON STL | 316 STNLS STL | 4 x 2 3/8 x 9 5/8 | 91-27D611000 |
| 1" FNPT-D-2" FNPT | CF8M STNLS STL | 316 STNLS STL | 4 x 2 3/8 x 9 5/8 | 91-27D621000 |
| 1" MNPT-D-2" FNPT | WCB CARBON STL | 316 STNLS STL | 4 x 2 3/8 x 9 5/8 | 91-28D611000 |
| 1" MNPT-D-2" FNPT | CF8M STNLS STL | 316 STNLS STL | 4 x 2 3/8 x 9 5/8 | 91-28D621000 |
| ¾" FNPT-E-1" FNPT | WCB CARBON STL | WCB CARBON STL | 2 5/8 x 1 7/8 x 7 3/4 | 91-11E511000 |
| ¾" FNPT-E-1" FNPT | WCB CARBON STL | 316 STNLS STL | 2 5/8 x 1 7/8 x 7 3/4 | 91-11E611000 |
| ¾" FNPT-E-1" FNPT | CF8M STNLS STL | 316 STNLS STL | 2 5/8 x 1 7/8 x 7 3/4 | 91-11E621000 |
| ¾" MNPT-E-1" FNPT | WCB CARBON STL | WCB CARBON STL | 3 1/4 x 1 7/8 x 8 5/8 | 91-12E511000 |
| ¾" MNPT-E-1" FNPT | WCB CARBON STL | 316 STNLS STL | 3 1/4 x 1 7/8 x 8 5/8 | 91-12E611000 |
| ¾" MNPT-E-1" FNPT | CF8M STNLS STL | 316 STNLS STL | 3 1/4 x 1 7/8 x 8 5/8 | 91-12E621000 |
| 1" FNPT-E-1" FNPT | WCB CARBON STL | WCB CARBON STL | 3 x 1 7/8 x 8 3/8 | 91-16E511000 |
| 1" FNPT-E-1" FNPT | WCB CARBON STL | 316 STNLS STL | 3 x 1 7/8 x 8 3/8 | 91-16E611000 |
| 1" FNPT-E-1" FNPT | CF8M STNLS STL | 316 STNLS STL | 3 x 1 7/8 x 8 3/8 | 91-16E621000 |
| 1" MNPT-E-1" FNPT | WCB CARBON STL | WCB CARBON STL | 3 1/4 x 1 7/8 x 8 5/8 | 91-17E511000 |
| 1" MNPT-E-1" FNPT | WCB CARBON STL | 316 STNLS STL | 3 1/4 x 1 7/8 x 8 5/8 | 91-17E611000 |
| 1" MNPT-E-1" FNPT | CF8M STNLS STL | 316 STNLS STL | 3 1/4 x 1 7/8 x 8 5/8 | 91-17E621000 |
| 1" FNPT-E-1 1/2" FNPT | WCB CARBON STL | 316 STNLS STL | 4 x 2 5/8 x 9 5/8 | 91-22E611000 |
| 1" FNPT-E-1 1/2" FNPT | CF8M STNLS STL | 316 STNLS STL | 4 x 2 5/8 x 9 5/8 | 91-22E621000 |
| 1" MNPT-E-1 1/2" FNPT | WCB CARBON STL | 316 STNLS STL | 4 x 2 5/8 x 9 5/8 | 91-23E611000 |
| 1" MNPT-E-1 1/2" FNPT | CF8M STNLS STL | 316 STNLS STL | 4 x 2 5/8 x 9 5/8 | 91-23E621000 |
| 1" FNPT-E-2" FNPT | WCB CARBON STL | 316 STNLS STL | 4 x 2 3/8 x 9 5/8 | 91-27E611000 |
| 1" FNPT-E-2" FNPT | CF8M STNLS STL | 316 STNLS STL | 4 x 2 3/8 x 9 5/8 | 91-27E621000 |
| 1" MNPT-E-2" FNPT | WCB CARBON STL | 316 STNLS STL | 4 x 2 3/8 x 9 5/8 | 91-28E611000 |
| 1" MNPT-E-2" FNPT | CF8M STNLS STL | 316 STNLS STL | 4 x 2 3/8 x 9 5/8 | 91-28E621000 |
| 1" FNPT-F-1 1/2" FNPT | WCB CARBON STL | 316 STNLS STL | 4 x 2 5/8 x 9 5/8 | 91-22F611000 |
| 1" FNPT-F-1 1/2" FNPT | CF8M STNLS STL | 316 STNLS STL | 4 x 2 5/8 x 9 5/8 | 91-22F621000 |
| 1" MNPT-F-1 1/2" FNPT | WCB CARBON STL | 316 STNLS STL | 4 x 2 5/8 x 9 5/8 | 91-23F611000 |
| 1" MNPT-F-1 1/2" FNPT | CF8M STNLS STL | 316 STNLS STL | 4 x 2 5/8 x 9 5/8 | 91-23F621000 |
| 1 1/2" FNPT-F-2" FNPT | WCB CARBON STL | 316 STNLS STL | 4 3/4 x 2 3/8 x 10 3/8 | 91-33F611000 |
| 1 1/2" FNPT-F-2" FNPT | CF8M STNLS STL | 316 STNLS STL | 4 3/4 x 2 3/8 x 10 3/8 | 91-33F621000 |
| 1 1/2" MNPT-F-2" FNPT | WCB CARBON STL | 316 STNLS STL | 4 1/2 x 2 3/8 x 10 1/8 | 91-34F611000 |
| 1 1/2" MNPT-F-2" FNPT | CF8M STNLS STL | 316 STNLS STL | 4 1/2 x 2 3/8 x 10 1/8 | 91-34F621000 |
| 1 1/2" FNPT-G-2" FNPT | WCB CARBON STL | WCB CARBON STL | 4 3/4 x 2 3/8 x 10 3/8 | 91-33G511000 |
| 1 1/2" FNPT-G-2" FNPT | WCB CARBON STL | 316 STNLS STL | 4 3/4 x 2 3/8 x 10 3/8 | 91-33G611000 |
| 1 1/2" FNPT-G-2" FNPT | CF8M STNLS STL | 316 STNLS STL | 4 3/4 x 2 3/8 x 10 3/8 | 91-33G621000 |
| 1 1/2" MNPT-G-2" FNPT | WCB CARBON STL | WCB CARBON STL | 4 1/2 x 2 3/8 x 10 1/8 | 91-34G511000 |
| 1 1/2" MNPT-G-2" FNPT | WCB CARBON STL | 316 STNLS STL | 4 1/2 x 2 3/8 x 10 1/8 | 91-34G611000 |
| 1 1/2" MNPT-G-2" FNPT | CF8M STNLS STL | 316 STNLS STL | 4 1/2 x 2 3/8 x 10 1/8 | 91-34G621000 |
| 2" FNPT-G-2" FNPT | WCB CARBON STL | WCB CARBON STL | 4 3/4 x 2 3/8 x 10 3/8 | 91-42G511000 |
| 2" FNPT-G-2" FNPT | WCB CARBON STL | 316 STNLS STL | 4 3/4 x 2 3/8 x 10 3/8 | 91-42G611000 |
| 2" FNPT-G-2" FNPT | CF8M STNLS STL | 316 STNLS STL | 4 3/4 x 2 3/8 x 10 3/8 | 91-42G621000 |
| 2" MNPT-G-2" FNPT | WCB CARBON STL | WCB CARBON STL | 4 1/2 x 2 3/8 x 10 1/8 | 91-43G511000 |
| 2" MNPT-G-2" FNPT | WCB CARBON STL | 316 STNLS STL | 4 1/2 x 2 3/8 x 10 1/8 | 91-43G611000 |
| 2" MNPT-G-2" FNPT | CF8M STNLS STL | 316 STNLS STL | 4 1/2 x 2 3/8 x 10 1/8 | 91-43G621000 |
| 1 1/2" FNPT-H-2" FNPT | WCB CARBON STL | WCB CARBON STL | 3 x 3 x 10 3/4 | 91-33H511000 (6) |
| 1 1/2" FNPT-H-2" FNPT | CF8M STNLS STL | 316 STNLS STL | 3 x 3 x 10 3/4 | 91-33H621000 (6) |
| 1 1/2" MNPT-H-2" FNPT | WCB CARBON STL | WCB CARBON STL | 4 1/4 x 3 x 12 | 91-34H511000 (6) |
| 1 1/2" MNPT-H-2" FNPT | CF8M STNLS STL | 316 STNLS STL | 4 1/4 x 3 x 12 | 91-34H621000 (6) |
| 2" FNPT-H-2" FNPT | WCB CARBON STL | WCB CARBON STL | 3 x 3 x 10 3/4 | 91-42H511000 (6) |
| 2" FNPT-H-2" FNPT | CF8M STNLS STL | 316 STNLS STL | 3 x 3 x 10 3/4 | 91-42H621000 (6) |
| 2" MNPT-H-2" FNPT | WCB CARBON STL | WCB CARBON STL | 4 1/4 x 3 x 12 | 91-43H511000 (6) |
| 2" MNPT-H-2" FNPT | CF8M STNLS STL | 316 STNLS STL | 4 1/4 x 3 x 12 | 91-43H621000 (6) |

# MERCER 9100 SERIES

# THREADED SAFETY RELIEF VALVES

| VALVE SIZE INLET BY ORIFICE BY OUTLET | BODY MATERIAL | INLET BASE MATERIAL | CENTER TO FACE DIMENSIONS (IN.) INLET X OUTLET X HT. "A" X "B" X "C" MAX. (Refer to Bill of Material Drawings) | MERCER GENERAL PART NUMBER* |
|---|---|---|---|---|
| 2" FNPT-H-2 1/2" FNPT | WCB CARBON STL | WCB CARBON STL | 3 x 3 x 10 3/4 | 91-46H511000 |
| 2" FNPT-H-2 1/2" FNPT | CF8M STNLS STL | 316 STNLS STL | 3 x 3 x 10 3/4 | 91-46H621000 |
| 2" MNPT-H-2 1/2" FNPT | WCB CARBON STL | WCB CARBON STL | 4 1/4 x 3 x 12 | 91-47H511000 |
| 2" MNPT-H-2 1/2" FNPT | CF8M STNLS STL | 316 STNLS STL | 4 1/4 x 3 x 12 | 91-47H621000 |
| 2" FNPT-J-3" FNPT | WCB CARBON STL | WCB CARBON STL | 3 3/8 x 4 1/4 x 11 3/8 | 91-51J511000 (2) |
| 2" FNPT-J-3" FNPT | WCB CARBON STL | WCB CARBON STL | 3 3/8 x 4 1/4 x 15 | 91-51J511000 (8) |
| 2" FNPT-J-3" FNPT | CF8M STNLS STL | 316 STNLS STL | 3 3/8 x 4 1/4 x 11 3/8 | 91-51J621000 (2) |
| 2" FNPT-J-3" FNPT | CF8M STNLS STL | 316 STNLS STL | 3 3/8 x 4 1/4 x 15 | 91-51J621000 (8) |
| 2" MNPT-J-3" FNPT | WCB CARBON STL | WCB CARBON STL | 5 1/2 x 4 1/4 x 13 1/2 | 91-52J511000 (2) |
| 2" MNPT-J-3" FNPT | WCB CARBON STL | WCB CARBON STL | 5 1/2 x 4 1/4 x 17 1/8 | 91-52J511000 (8) |
| 2" MNPT-J-3" FNPT | CF8M STNLS STL | 316 STNLS STL | 5 1/2 x 4 1/4 x 13 1/2 | 91-52J621000 (2) |
| 2" MNPT-J-3" FNPT | CF8M STNLS STL | 316 STNLS STL | 5 1/2 x 4 1/4 x 17 1/8 | 91-52J621000 (8) |
| 3" MNPT-J-3" FNPT | WCB CARBON STL | WCB CARBON STL | 5 1/2 x 4 1/4 x 13 1/2 | 91-61J511000 (2) |
| 3" MNPT-J-3" FNPT | WCB CARBON STL | WCB CARBON STL | 5 1/2 x 4 1/4 x 17 1/8 | 91-61J511000 (8) |
| 3" MNPT-J-3" FNPT | CF8M STNLS STL | 316 STNLS STL | 5 1/2 x 4 1/4 x 13 1/2 | 91-61J621000 (2) |
| 3" MNPT-J-3" FNPT | CF8M STNLS STL | 316 STNLS STL | 5 1/2 x 4 1/4 x 17 1/8 | 91-61J621000 (8) |
| 3" MNPT-K-3" FNPT | WCB CARBON STL | WCB CARBON STL | 5 1/2 x 4 1/4 x 13 1/2 | 91-61K511000 (3) |
| 3" MNPT-K-3" FNPT | WCB CARBON STL | WCB CARBON STL | 5 1/2 x 4 1/4 x 17 1/8 | 91-61K511000 (9) |
| 3" MNPT-K-3" FNPT | CF8M STNLS STL | CF8M STNLS STL | 5 1/2 x 4 1/4 x 13 1/2 | 91-61K621000 (3) |
| 3" MNPT-K-3" FNPT | CF8M STNLS STL | CF8M STNLS STL | 5 1/2 x 4 1/4 x 17 1/8 | 91-61K621000 (9) |

NOTES: (1) *See Product Numbering System for other options and part numbers. (2) Max. Set Pressure 450 PSI. (3) Max. Set Pressure 285 PSI. (4) On "H" Orifices at Set Pressures 850 PSI or more, "C" Dimension are 14 3/4" max. (5) Consult factory for other size options. (6) 850 PSI and above must be a 2 1/2" or 3"outlet. (7) "C" & "D" up to 2999 PSI. (8) 801 PSI & above, consult factory (9) Max. set pressure 750 PSI.

# SIZING

Safety Relief Valves may be sized by formula or capacity chart, whichever the use prefers.

SIZING BY FORMULA: Appendix II, Section VIII, Division I of the ASME Boiler and Pressure Vessel Code prescribes the formula for capacities of orifices. These basic formulas are:

WEIGHT FLOW (Gas), $W_{lb/hr} = KACP\sqrt{\frac{M}{ZT}}$

VOLUME FLOW (Gas), Specified Conditions $Q\ (SCFM) = KACP\ wX60\sqrt{\frac{M}{ZT}}$

VOLUME FLOW (Fluid), $Q\ (GPM) = 38KA\ K_v\sqrt{\frac{P-Pd}{S}}$

WHERE:

| | | |
|---|---|---|
| K | = | flow coefficient for gas = 0.818, (@ 90%) |
| K | = | flow coefficient for fluid = 0.707, (@ 90%) |
| W | = | lb/hr weight flow of gass |
| A | = | actual flow area spuare inches. |
| P | = | (set pressure x 1.1) plus atmospheric pressure, psia or set pressure plus 3 psi plus atmospheric pressure, whichever is greater |
| Pd | = | pressure at discharge from valve, psia |
| M | = | molecular weight |
| T | = | absolute temperature at inlet (°F + 460) |
| C | = | constant for gas or vapor which is a function of ration of specific heats, $C_p/C_v$ |
| w | = | density of gas at exit conditions. This is usually specified at standard conditions of 60°F and 14.7 psia. lbs./cu.ft. $w_{air}$=0.07640, $w_{natural\ gas}$=0.04588 |
| S | = | Specific gravity of fluid |
| Kv | = | Viscosity correction factor |
| Z | = | Compressibility factor corresponding to P and T. |

## Table Molecular Weight and Values of C for Gases

| Gas | Mol. Wt. | Cp/Cv | C | Gas | Mol. Wt. | Cp/Cv | C |
|---|---|---|---|---|---|---|---|
| Acetylene | 26 | 1.28 | 345 | Hydrochloric Acid | 36.5 | 1.40 | 356 |
| Air | 29 | 1.40 | 356 | Hydrogen | 2 | 1.40 | 356 |
| Ammonia | 17 | 1.33 | 351 | Hydrogen Sulphide | 34 | 1.32 | 348 |
| Argon | 40 | 1.66 | 377 | Iso-butane | 58 | 1.11 | 328 |
| Benzene | 78 | 1.10 | 327 | Methane | 16 | 1.30 | 346 |
| Carbon Disulphide | 76 | 1.21 | 338 | Methyl-Alcohol | 32 | 1.20 | 337 |
| Carbon Dioxide | 44 | 1.28 | 345 | Methylchloride | 50.5 | 1.20 | 337 |
| Carbon Monoxide | 28 | 1.40 | 356 | N-Butane | 58 | 1.11 | 328 |
| Chlorine | 71 | 1.36 | 352 | Natural Gas (0.6) | 17.4 | 1.27 | 344 |
| Cyclohexane | 84 | 1.08 | 324 | Nitrogen | 28 | 1.40 | 356 |
| Ethane | 30 | 1.22 | 339 | Oxygen | 32 | 1.40 | 356 |
| Ethylene | 28 | 1.20 | 337 | Pentane | 72 | 1.09 | 325 |
| Freon 22 | 86 | 1.18 | 355 | Propane | 44 | 1.14 | 331 |
| Helium | 04 | 1.66 | 377 | Sulphur Dioxide | 64 | 1.26 | 342 |
| Hexane | 86 | 1.08 | 324 | | | | |

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# MERCER 9100 SERIES

# THREADED SAFETY RELIEF VALVES

## AIR — 10% OVERPRESSURE

NOZZLE CAPACITIES-CU. FT. PER MIN. — ASME PRESSURE VESSEL CODE (UV) 90% RATING

| SET | C | D | E | F | G | H | J | K |
|---|---|---|---|---|---|---|---|---|
| 15 | 30 | 60 | 104 | 165 | 232 | 424 | 702 | 1018 |
| 20 | 35 | 69 | 120 | 191 | 267 | 489 | 809 | 1173 |
| 25 | 40 | 78 | 136 | 216 | 302 | 554 | 916 | 1329 |
| 30 | 44 | 87 | 152 | 241 | 338 | 619 | 1024 | 1484 |
| 50 | 65 | 128 | 222 | 352 | 494 | 905 | 1496 | 2169 |
| 100 | 116 | 228 | 397 | 631 | 883 | 1619 | 2676 | 3881 |
| 150 | 167 | 329 | 572 | 909 | 1273 | 2332 | 3856 | 5592 |
| 200 | 218 | 430 | 747 | 1187 | 1662 | 3046 | 5036 | 7304 |
| 250 | 270 | 530 | 921 | 1465 | 2052 | 3760 | 6216 | 9016 |
| 300 | 321 | 631 | 1097 | 1743 | 2441 | 4474 | 7396 | 10727 |
| 400 | 423 | 832 | 1446 | 2299 | 3220 | 5902 | 9757 | 14151 |
| 500 | 525 | 1034 | 1796 | 2856 | 3999 | 7329 | 12117 | 17574 |
| 700 | 730 | 1436 | 2496 | 3968 | 5558 | 10185 | 16837 | 24420 |
| 900 | 935 | 1839 | 3196 | 5080 | 7116 | 13040 | 21558 | 31267 |
| 1000 | 1037 | 2041 | 3546 | 5637 | 7895 | 14468 | 23918 | 34690 |
| 1500 | 1549 | 3047 | 5296 | 8418 | 11790 | 21607 | 35720 | 51806 |
| 1800 | 1856 | 3652 | 6345 | 10087 | 14127 | 25890 | 42801 | |
| 2000 | 2060 | 4054 | 7045 | 11199 | 15685 | 28746 | | |
| 2500 | 2572 | 5061 | 8795 | 13980 | | | | |
| 3000 | 3084 | 6068 | | | | | | |
| 4500 | 4619 | 9088 | | | | | | |
| 5000 | 5130 | 10095 | | | | | | |
| 5500 | 5642 | 11102 | | | | | | |
| 6000 | 6153 | 12109 | | | | | | |

## WATER — 10% OVERPRESSURE

NOZZLE CAPACITIES-U.S. GALLONS PER MINUTE — ASME PRESSURE VESSEL CODE (UV) 90% RATING

| SET | C | D | E | F | G | H | J | K |
|---|---|---|---|---|---|---|---|---|
| 15 | 7 | 14 | 24 | 38 | 54 | 99 | 163 | 237 |
| 20 | 8 | 16 | 27 | 43 | 61 | 112 | 184 | 267 |
| 25 | 9 | 17 | 30 | 48 | 67 | 123 | 203 | 295 |
| 30 | 10 | 19 | 33 | 52 | 73 | 134 | 221 | 320 |
| 50 | 12 | 24 | 42 | 67 | 94 | 172 | 285 | 413 |
| 100 | 17 | 34 | 60 | 95 | 133 | 244 | 403 | 585 |
| 150 | 21 | 42 | 73 | 116 | 163 | 299 | 494 | 716 |
| 200 | 25 | 49 | 85 | 134 | 188 | 345 | 570 | 827 |
| 250 | 28 | 54 | 94 | 150 | 210 | 386 | 637 | 924 |
| 300 | 30 | 60 | 104 | 165 | 230 | 422 | 698 | 1013 |
| 400 | 35 | 69 | 120 | 190 | 266 | 488 | 806 | 1169 |
| 500 | 39 | 77 | 134 | 212 | 298 | 545 | 901 | 1307 |
| 700 | 46 | 91 | 158 | 251 | 352 | 645 | 1067 | 1547 |
| 900 | 52 | 103 | 179 | 285 | 399 | 732 | 1209 | 1754 |
| 1000 | 55 | 109 | 189 | 300 | 421 | 771 | 1275 | 1849 |
| 1500 | 68 | 133 | 231 | 368 | 515 | 944 | 1561 | 2265 |
| 1800 | 74 | 146 | 254 | 403 | 565 | 1035 | 1710 | |
| 2000 | 78 | 154 | 267 | 425 | 595 | 1091 | | |
| 2500 | 87 | 172 | 299 | 475 | | | | |
| 3000 | 96 | 188 | | | | | | |
| 4500 | 117 | 231 | | | | | | |
| 5000 | 124 | 243 | | | | | | |
| 5500 | 130 | 255 | | | | | | |
| 6000 | 135 | 266 | | | | | | |

To determine capacity at 25% overpressure, multiply the capacity at 10% overpressure by 1.066.
Capacities in gallons per minute of water.

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# GAS — 10% OVERPRESSURE

## NOZZLE CAPACITIES-CU. FT. PER MIN.

NATURAL GAS SPECIFIC GRAVITY OF .6 @ 60° F
ASME PRESSURE VESSEL CODE (UV) 90% RATING

| SET | C | D | E | F | G | H | J | K |
|---|---|---|---|---|---|---|---|---|
| 15 | 38 | 75 | 130 | 206 | 289 | 529 | 874 | 1268 |
| 20 | 43 | 86 | 149 | 238 | 333 | 610 | 1008 | 1462 |
| 25 | 49 | 97 | 169 | 269 | 377 | 691 | 1142 | 1656 |
| 30 | 55 | 109 | 189 | 301 | 421 | 772 | 1275 | 1850 |
| 50 | 83 | 159 | 276 | 439 | 615 | 1127 | 1864 | 2703 |
| 100 | 146 | 284 | 494 | 786 | 1101 | 2017 | 3334 | 4836 |
| 150 | 208 | 410 | 712 | 1132 | 1586 | 2907 | 4805 | 6969 |
| 200 | 271 | 535 | 930 | 1479 | 2071 | 3796 | 6276 | 9102 |
| 250 | 336 | 661 | 1148 | 1826 | 2557 | 4686 | 7746 | 11235 |
| 300 | 396 | 786 | 1366 | 2172 | 3042 | 5575 | 9217 | 13368 |
| 400 | 528 | 1037 | 1802 | 2865 | 4013 | 7354 | 12158 | 17634 |
| 500 | 653 | 1288 | 2239 | 3558 | 4984 | 9134 | 15100 | 21900 |
| 700 | 910 | 1790 | 3111 | 4945 | 6926 | 12692 | 20982 | 30431 |
| 900 | 1167 | 2292 | 3983 | 6331 | 8867 | 16250 | 26865 | 38963 |
| 1000 | 1292 | 2543 | 4419 | 7024 | 9838 | 18030 | 29806 | 43229 |
| 1500 | 1931 | 3798 | 6599 | 10490 | 14692 | 26925 | 44513 | 64559 |
| 1800 | 2315 | 4550 | 7907 | 12569 | 17605 | 32263 | 48523 | |
| 2000 | 2569 | 5052 | 8779 | 13956 | 19546 | 35821 | | |
| 2500 | 3208 | 6307 | 10960 | 17422 | | | | |
| 3000 | 3840 | 7562 | | | | | | |
| 4500 | 5757 | 11326 | | | | | | |
| 5000 | 6396 | 12583 | | | | | | |
| 5500 | 7035 | 13833 | | | | | | |
| 6000 | 7667 | 15090 | | | | | | |

# GAS — 10% OVERPRESSURE

## NOZZLE CAPACITIES-MILLION CU. FT. PER DAY

NATURAL GAS SPECIFIC GRAVITY OF .6 @ 60° F
ASME PRESSURE VESSEL CODE (UV) 90% RATING

| SET | C | D | E | F | G | H | J | K |
|---|---|---|---|---|---|---|---|---|
| 15 | .055 | .11 | .19 | .30 | .42 | .76 | 1.26 | 1.83 |
| 20 | .062 | .12 | .21 | .34 | .48 | .88 | 1.45 | 2.11 |
| 25 | .071 | .14 | .24 | .39 | .54 | 1.00 | 1.64 | 2.38 |
| 30 | .079 | .16 | .27 | .43 | .61 | 1.11 | 1.84 | 2.66 |
| 50 | .12 | .23 | .40 | .63 | .89 | 1.62 | 2.68 | 3.89 |
| 100 | .21 | .41 | .71 | 1.13 | 1.59 | 2.90 | 4.80 | 6.96 |
| 150 | .30 | .59 | 1.03 | 1.63 | 2.28 | 4.19 | 6.92 | 10.04 |
| 200 | .39 | .77 | 1.34 | 2.13 | 2.98 | 5.47 | 9.04 | 13.11 |
| 250 | .48 | .95 | 1.65 | 2.63 | 3.68 | 6.75 | 11.15 | 16.18 |
| 300 | .57 | 1.13 | 1.97 | 3.13 | 4.38 | 8.03 | 13.27 | 19.25 |
| 400 | .76 | 1.49 | 2.59 | 4.13 | 5.78 | 10.59 | 17.51 | 25.39 |
| 500 | .94 | 1.85 | 3.22 | 5.12 | 7.18 | 13.15 | 21.74 | 31.54 |
| 700 | 1.31 | 2.58 | 4.48 | 7.12 | 9.97 | 18.28 | 30.21 | 43.82 |
| 900 | 1.68 | 3.30 | 5.74 | 9.12 | 12.77 | 23.40 | 38.69 | 56.11 |
| 1000 | 1.86 | 3.66 | 6.36 | 10.11 | 14.17 | 25.96 | 42.92 | 62.25 |
| 1500 | 2.78 | 5.47 | 9.50 | 15.11 | 21.16 | 38.77 | 64.10 | 92.97 |
| 1800 | 3.33 | 6.55 | 11.39 | 18.10 | 25.35 | 46.46 | 69.87 | |
| 2000 | 3.70 | 7.27 | 12.64 | 20.10 | 28.15 | 51.58 | | |
| 2500 | 4.62 | 9.08 | 15.78 | 25.09 | | | | |
| 3000 | 5.53 | 10.89 | | | | | | |
| 4500 | 8.29 | 16.31 | | | | | | |
| 5000 | 9.21 | 18.12 | | | | | | |
| 5500 | 10.13 | 19.92 | | | | | | |
| 6000 | 11.04 | 21.73 | | | | | | |

UV A.S.M.E. NB


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REVISED 4-3-98 SUPERCEEDS 5-30-97