

**KUNKLE SAFETY AND RELIEF PRODUCTS**

MODELS 91, 218 AND 228

Cast Iron Liquid Relief Valves

Model 228


**Model descriptions**

**Model 91:** Bronze trim, with pressure-tight cap. Suitable for maximum back pressure of 60 psig<sup>1</sup>. Variation "03" for field adjustability.

**Model 218:** Bronze trim, UL and FM approved for fire pump installations. Special design offers minimum set pressure of 60 psig<sup>1</sup>. Easily adjustable with handwheel to 200 psig (175 psig with optional 125# inlet flange).

**Model 228:** Bronze trim, with pressure-tight cap. UL and FM approved for fire pump installations. Suitable for maximum back pressure of 60 psig<sup>1</sup>. Supplied with handwheel.

**Features**

- Bolted bonnet permits easy inspection and servicing without removal from system.
- Quality cast iron body and bonnet, insert and disc are available in either bronze or Stainless Steel (SS) and lapped for optimum performance.
- Springs are steel with plating for corrosion protection.
- High lift, wing-guided disc offers high relieving capacity. Pivot between disc and spring corrects misalignment and compensates for spring side thrust.
- Each Kunkle valve is tested and inspected for pressure setting and leakage.

**Technical data**
**Pressure and Temperature Limits<sup>2</sup>**
**Model 91:**

5 to 400 psig;  
-20° to 406°F

**Models 218, 228:**

60 to 200 psig;  
-20° to 406°F

Furnished standard with ANSI rated B16.1 - 250# inlet flange and ANSI rated B16.1 - 125# outlet flange.

**Notes:**

1. Back pressure increases set pressure on a one to one basis, and reduces capacity. Back pressure in excess of 10% of set pressure is not recommended.

**Applications**

- Fire Pump Service, UL1478 listed and FM approved. (models 218, 228)
- Overpressure relief and protection of pumps, tanks, lines and hydraulic systems.
- Pressure regulation.

**Options**

- SS trim. (insert and disc) (variation 02)
- Female x Female NPT connections. (1 1/2" to 4" sizes)

- Inlet and outlet flanges per ANSI B16.1 - 125#. Limited to 175 psig maximum set pressure.
- Epoxy-coated internal body and bonnet for corrosive environments. Temperature limit 125°F [52°C].

2. For other pressure and temperature limits, consult ANSI B16 cast iron flange standards.

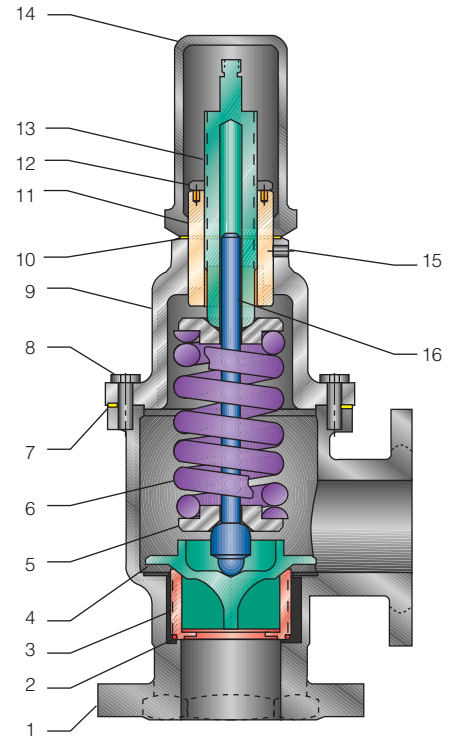
**Parts and Materials**

**Model 91<sup>3, 6</sup> - Non-code, Liquid Relief Valve**

| No. | Part Name                       | Materials                                   |
|-----|---------------------------------|---|
| 1   | Body                            | Iron, A126 Class A or B                     |
| 2   | O-ring                          | BUNA-N                                      |
| 3   | Insert                          | 1   |
| 4   | Disc                            | 1   |
| 5   | Spring Step                     | 2   |
| 6   | Spring                          | Steel, Aluminum Coated                      |
| 7   | Bonnet Gasket                   | Fiber and Nitrile, Klinger C-4400 or C-4401 |
| 8   | Hex Head Cap Screw <sup>3</sup> | Steel, SAE Gr. 5                            |
| 9   | Bonnet                          | Iron, A126 Class A or B                     |
| 10  | Cap Gasket <sup>5</sup>         | Fiber and Nitrile, Klinger C-4400 or C-4401 |
| 11  | Compression Screw Bushing       | Iron, A536 80-55-06                         |
| 12  | Jam Nut                         | 4   |
| 13  | Compression Screw               | 4   |
| 14  | Cap <sup>5</sup>                | Iron, A126 Class A or B                     |
| 15  | Socket Set Screw                | Steel, Commercial                           |
| 16  | Stem                            | 2   |

**Items Not Shown**

|                                |                          |
|--------------------------------|--------------------------|
| Handwheel <sup>5</sup>         | Iron, A126 Class A or B  |
| Handwheel Jam Nut <sup>5</sup> | Steel Plated, Commercial |



**Model 91**

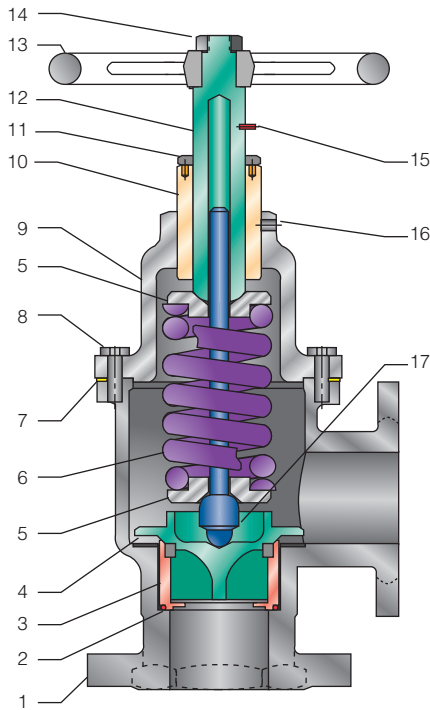
**Notes:**

1. Disc (item 4) and insert (item 3) material Bronze, B-584 Alloy 84400 or B62, also available in SS, A743 Gr. CF-8, as a package option.
2. Material CS with anti-corrosion coating, commercial Gr. or Brass, B16.
3. 6 bolts required for 3" and 4" sizes, and 8 bolts required for 6" size.
4. Material Brass, B16 or Bronze, B584 casting.
5. Handwheel option available, delete cap (item 14) and gasket (item 10).
6. Inlet and outlet flanges per ANSI B16.1 250#, inlet flange standard and 125# inlet flange optional. Outlet flange 125#.

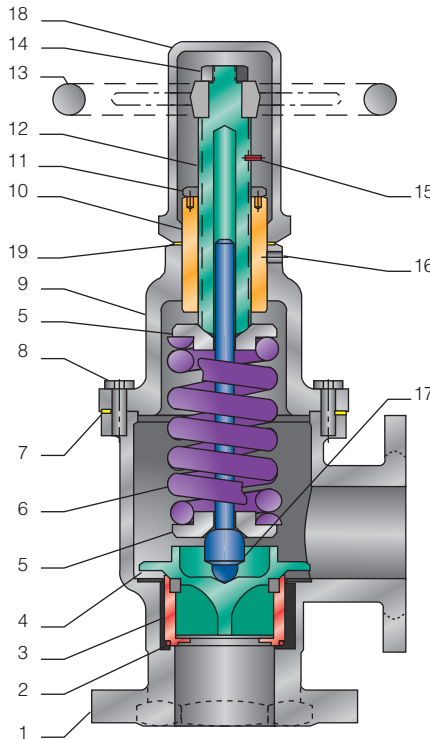
# KUNKLE SAFETY AND RELIEF PRODUCTS

MODELS 91, 218 AND 228

## Parts and Materials



**Model 218**



**Model 228**

### Models 218 and 228 - Non-code

| No. | Part Name                                     | Materials                                   |
|-----|---|---|
| 1   | Body <sup>1</sup>                             | Iron, A126 Class A or B                     |
| 2   | O-ring  | BUNA-N                                      |
| 3   | Insert  | 2   |
| 4   | Disc  | 2   |
| 5   | Spring Step                                   | 3   |
| 6   | Spring  | Steel, Aluminum Coated                      |
| 7   | Bonnet Gasket                                 | Fiber and Nitrile, Klinger C-4400 or C-4401 |
| 8   | Hex Head Cap Screw <sup>4</sup>               | Steel, SAE Gr. <sup>5</sup>                 |
| 9   | Bonnet  | Iron, A126 Class A or B                     |
| 10  | Compression Screw Bushing                     | Brass, B16                                  |
| 11  | Jam Nut                                       | Brass, B16                                  |
| 12  | Compression Screw                             | 5   |
| 13  | Handwheel                                     | Iron, A126 Class A or B                     |
| 14  | Handwheel Locknut                             | Steel Plated, Commercial Gr.                |
| 15  | Spring Pin                                    | Steel, Commercial Gr.                       |
| 16  | Socket Set Screw                              | Steel, Commercial Gr.                       |
| 17  | Stem  | 3   |
|     | Compression Screw Locknut Wrench <sup>6</sup> | Steel, A366                                 |
|     | Installation Instruction <sup>6</sup>         | Paper, Commercial Gr.                       |

### Model 228 Only

|    |                         |                                 |
|----|-------------------------|---------------------------------|
| 18 | Cap <sup>7</sup>        | Iron, A126 Class A or B         |
| 19 | Cap Gasket <sup>7</sup> | Gasket, Klinger Silicone C-4400 |

#### Notes:

- Inlet and outlet flanges per ANSI B16.1 250#, inlet flange standard and 125# inlet flange optional. Outlet flange 125#.
- Disc (item 4) and insert (item 3) material Bronze, B-584 Alloy 84400 or B62, also available in SS, A743 Gr. CF-8, as a package option.
- Material CS with anti-corrosion coating, commercial Gr., Brass, B16 or SS, A582 TY 416.
- 6 bolts required for 3" and 4" sizes, and 8 bolts required for 6" size.
- Material Brass, B16 or Bronze, B584 casting (Model 218 only), B584 Alloy 84400 (Model 228 only).
- Not shown on assembly.
- Cap (item 18), Gasket (item 19) and Locknut (item 11) factory installed. Handwheel (item 13) shipped unassembled (Models 218 and 228).

# KUNKLE SAFETY AND RELIEF PRODUCTS

MODELS 91, 218 AND 228

## Specifications

### Model 91<sup>1</sup>

| Model Number | Valve Size (in) | Connections<br>ANSI Standard |             | Valve Dimensions              |                               |                                | Min/Max Approx.<br>Set Pressure (psig) Weight (lb) |     |
|--------------|-----------------|------------------------------|-------------|-------------------------------|-------------------------------|--------------------------------|--|-----|
|              |                 | Inlet                        | Outlet      | A                             | in B                          | C                              |  |     |
| 091A-G       | 1 1/2 x 1 1/2   | Female NPT                   | Female NPT  | 4 <sup>3</sup> / <sub>4</sub> | 4 1/4                         | 11 <sup>7</sup> / <sub>8</sub> | 5/400  | 27  |
| 091H-G       | 1 1/2 x 1 1/2   | 125# Flange                  | 125# Flange | 4 <sup>3</sup> / <sub>4</sub> | 4 1/4                         | 11 1/4                         | 5/175  | 36  |
| 091K-G       | 1 1/2 x 1 1/2   | 250# Flange                  | 125# Flange | 5                             | 4 <sup>3</sup> / <sub>4</sub> | 11 1/4                         | 5/400  | 36  |
| 091A-H       | 2 x 2           | Female NPT                   | Female NPT  | 4 1/8                         | 4 1/8                         | 12 <sup>3</sup> / <sub>4</sub> | 5/400  | 35  |
| 091H-H       | 2 x 2           | 125# Flange                  | 125# Flange | 4 <sup>3</sup> / <sub>4</sub> | 4 <sup>5</sup> / <sub>8</sub> | 12 <sup>3</sup> / <sub>4</sub> | 5/175  | 47  |
| 091K-H       | 2 x 2           | 250# Flange                  | 125# Flange | 5                             | 4 <sup>5</sup> / <sub>8</sub> | 12 <sup>3</sup> / <sub>4</sub> | 5/400  | 47  |
| 091A-J       | 2 1/2 x 2 1/2   | Female NPT                   | Female NPT  | 4 1/2                         | 4 1/2                         | 14 1/4                         | 5/400  | 48  |
| 091H-J       | 2 1/2 x 2 1/2   | 125# Flange                  | 125# Flange | 5 1/4                         | 4 <sup>3</sup> / <sub>4</sub> | 14 1/4                         | 5/175  | 65  |
| 091K-J       | 2 1/2 x 2 1/2   | 250# Flange                  | 125# Flange | 5 1/4                         | 4 <sup>3</sup> / <sub>4</sub> | 14 1/4                         | 5/400  | 65  |
| 091A-K       | 3 x 3           | Female NPT                   | Female NPT  | 5 <sup>7</sup> / <sub>8</sub> | 5 <sup>7</sup> / <sub>8</sub> | 21                             | 5/400  | 81  |
| 091H-K       | 3 x 3           | 125# Flange                  | 125# Flange | 5 <sup>7</sup> / <sub>8</sub> | 5 <sup>7</sup> / <sub>8</sub> | 21 <sup>3</sup> / <sub>4</sub> | 5/175  | 98  |
| 091K-K       | 3 x 3           | 250# Flange                  | 125# Flange | 6 1/4                         | 5 <sup>7</sup> / <sub>8</sub> | 21 <sup>3</sup> / <sub>4</sub> | 5/400  | 98  |
| 091A-M       | 4 x 4           | Female NPT                   | Female NPT  | 6 <sup>5</sup> / <sub>8</sub> | 6 1/2                         | 26                             | 5/400  | 132 |
| 091H-M       | 4 x 4           | 125# Flange                  | 125# Flange | 6 <sup>5</sup> / <sub>8</sub> | 6 1/2                         | 26                             | 5/175  | 170 |
| 091K-M       | 4 x 4           | 250# Flange                  | 125# Flange | 6 <sup>5</sup> / <sub>8</sub> | 6 1/2                         | 26                             | 5/400  | 170 |
| 091H-P       | 6 x 6           | 125# Flange                  | 125# Flange | 9 <sup>3</sup> / <sub>8</sub> | 8 1/2                         | 31                             | 5/175  | 340 |
| 091K-P       | 6 x 6           | 250# Flange                  | 125# Flange | 9 <sup>3</sup> / <sub>8</sub> | 8 1/2                         | 31                             | 5/300  | 340 |

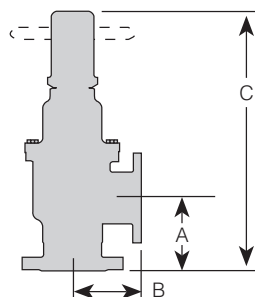
### Models 218 and 228<sup>1</sup>

| Model Number        | Valve Size | Connections<br>ANSI Standard |             | Valve Dimensions              |                               |                                |                                | Min/Max Set Pressure (psig) | Approx. Weight (lb) |
|---------------------|------------|------------------------------|-------------|-------------------------------|-------------------------------|--------------------------------|--------------------------------|-----------------------------|---------------------|
|                     |            | Inlet                        | Outlet      | A                             | in B                          | C (218)                        | C (228)                        |                             |                     |
| 2*8A-K <sup>2</sup> | 3 x 3      | Female NPT                   | Female NPT  | 6 1/8                         | 5 <sup>7</sup> / <sub>8</sub> | 20 <sup>5</sup> / <sub>8</sub> | 21 <sup>5</sup> / <sub>8</sub> | 60/200                      | 85                  |
| 2*8H-K <sup>2</sup> | 3 x 3      | 125# Flange                  | 125# Flange | 6 1/8                         | 5 <sup>7</sup> / <sub>8</sub> | 20 <sup>5</sup> / <sub>8</sub> | 21 <sup>5</sup> / <sub>8</sub> | 60/175                      | 110                 |
| 2*8K-K <sup>2</sup> | 3 x 3      | 250# Flange                  | 125# Flange | 6 1/8                         | 5 <sup>7</sup> / <sub>8</sub> | 20 <sup>5</sup> / <sub>8</sub> | 21 <sup>5</sup> / <sub>8</sub> | 60/200                      | 110                 |
| 2*8A-M <sup>2</sup> | 4 x 4      | Female NPT                   | Female NPT  | 6 <sup>5</sup> / <sub>8</sub> | 6 1/2                         | 25                             | 26                             | 60/200                      | 143                 |
| 2*8H-M <sup>2</sup> | 4 x 4      | 125# Flange                  | 125# Flange | 6 <sup>5</sup> / <sub>8</sub> | 6 1/2                         | 25                             | 26                             | 60/175                      | 185                 |
| 2*8K-M <sup>2</sup> | 4 x 4      | 250# Flange                  | 125# Flange | 6 <sup>5</sup> / <sub>8</sub> | 6 1/2                         | 25                             | 26                             | 60/200                      | 185                 |
| 2*8H-P <sup>2</sup> | 6 x 6      | 125# Flange                  | 125# Flange | 9 <sup>3</sup> / <sub>8</sub> | 8 1/2                         | 30                             | 31                             | 60/175                      | 350                 |
| 2*8K-P <sup>2</sup> | 6 x 6      | 250# Flange                  | 125# Flange | 9 <sup>3</sup> / <sub>8</sub> | 8 1/2                         | 30                             | 31                             | 60/200                      | 350                 |

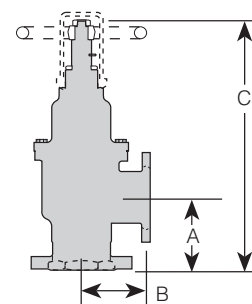
Dimensions are for reference only.

#### Notes:

1. Temperature limits -20°F to 406°F.
2. Replace asterisk with desired model number. Data applicable to models 218, 228.



Model 91



Models 218, 228

# KUNKLE SAFETY AND RELIEF PRODUCTS

MODELS 91, 218 AND 228

## Capacities

### Liquid Overpressure Factors

To determine capacities at other than 25% overpressure/accumulation, multiply capacity shown by:

10% Acc. = 0.6

15% Acc. = 0.8

20% Acc. = 0.9

### Models 218, 228 Capacities

| UL/FM Size, in | Certified Capacities <sup>1</sup> GPM |
|----------------|---------------------------------------|
| 3 x 3          | 500                                   |
| 4 x 4          | 1000                                  |
| 6 x 6          | 2000                                  |

#### Note:

1. Rated at 100 psig set pressure and 25% accumulation 125 psig.

### Non-code Liquid - 25% Accumulation (GPM) – Model 91 Only

| Set Pressure (psig) | Inlet Size |     |        |      |      |      |
|---------------------|------------|-----|--------|------|------|------|
|                     | 1 1/2"     | 2"  | 2 1/2" | 3"   | 4"   | 6"   |
| 5                   | 31         | 56  | 87     | 125  | 224  | 447  |
| 10                  | 44         | 79  | 123    | 177  | 316  | 632  |
| 20                  | 63         | 111 | 174    | 250  | 447  | 894  |
| 30                  | 77         | 136 | 213    | 307  | 548  | 1095 |
| 40                  | 88         | 157 | 246    | 354  | 633  | 1265 |
| 50                  | 99         | 176 | 275    | 396  | 707  | 1414 |
| 60                  | 108        | 193 | 301    | 434  | 775  | 1549 |
| 70                  | 117        | 208 | 325    | 468  | 837  | 1673 |
| 80                  | 125        | 223 | 348    | 501  | 895  | 1789 |
| 90                  | 133        | 236 | 369    | 531  | 949  | 1897 |
| 100                 | 140        | 249 | 389    | 560  | 1000 | 2000 |
| 110                 | 147        | 261 | 408    | 587  | 1049 | 2097 |
| 120                 | 153        | 273 | 426    | 613  | 1096 | 2191 |
| 130                 | 159        | 284 | 443    | 638  | 1140 | 2280 |
| 140                 | 165        | 295 | 460    | 663  | 1183 | 2366 |
| 150                 | 171        | 305 | 476    | 686  | 1225 | 2449 |
| 160                 | 177        | 315 | 492    | 708  | 1265 | 2530 |
| 170                 | 182        | 325 | 507    | 730  | 1304 | 2607 |
| 180                 | 188        | 334 | 522    | 751  | 1342 | 2683 |
| 190                 | 193        | 343 | 536    | 772  | 1379 | 2757 |
| 200                 | 198        | 352 | 550    | 792  | 1414 | 2828 |
| 210                 | 203        | 361 | 563    | 811  | 1449 | 2898 |
| 220                 | 207        | 369 | 577    | 831  | 1483 | 2966 |
| 230                 | 212        | 378 | 590    | 849  | 1517 | 3033 |
| 240                 | 217        | 386 | 602    | 867  | 1549 | 3098 |
| 250                 | 221        | 394 | 615    | 885  | 1581 | 3162 |
| 260                 | 225        | 401 | 627    | 903  | 1613 | 3225 |
| 270                 | 230        | 409 | 639    | 920  | 1643 | 3286 |
| 280                 | 234        | 417 | 650    | 937  | 1673 | 3346 |
| 290                 | 238        | 424 | 662    | 954  | 1703 | 3406 |
| 300                 | 242        | 431 | 673    | 970  | 1732 | 3464 |
| 310                 | 246        | 438 | 684    | 986  | 1761 | —    |
| 320                 | 250        | 445 | 695    | 1002 | 1789 | —    |
| 330                 | 254        | 452 | 706    | 1017 | 1817 | —    |
| 340                 | 258        | 459 | 717    | 1033 | 1844 | —    |
| 350                 | 261        | 466 | 727    | 1048 | 1871 | —    |
| 360                 | 265        | 472 | 738    | 1062 | 1898 | —    |
| 370                 | 269        | 479 | 748    | 1077 | 1924 | —    |
| 380                 | 272        | 485 | 758    | 1092 | 1950 | —    |
| 390                 | 276        | 492 | 768    | 1106 | 1975 | —    |
| 400                 | 280        | 498 | 777    | 1120 | 2000 | —    |

# KUNKLE SAFETY AND RELIEF PRODUCTS

MODELS 91, 218 AND 228

## Model Number/Order Guide

### Model Number Position

|   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|

### Example

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 9 | 1 | K | — | M | 0 | 1 | A | M | S | 0 | 4 | 0 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

### Model

091  
218  
228

### Connection Type

A - Female x Female NPT  
H - 125# Flange x 125# Flange  
K - 250# Flange x 125# Flange

### Inlet Size

G - 1 1/2"  
H - 2"  
J - 2 1/2"  
K - 3"  
M - 4"  
P - 6"

### Variation

01 - Catalog standard  
02 - SS seat and disc  
03 - Model 91 w/handwheel (K, M and P inlet only)  
03 - SST Seat, Disc and Stem (Model 218K-P only)  
03 - Epoxy coated body and bonnet internal surfaces (all Models except Model 218K-P)  
04 - Epoxy coated body and bonnet internal surfaces (Model 218K-P only)

### Design Revision

Indicates non-interchangeable revision.  
Current Design at Revision "A".

### Valve Service

M - Liquid

### Spring Material

C - Aluminum Coated, ASTM A231 Steel (G, H, J inlet sizes only)  
S - Aluminum Coated, ASTM A229 Steel (K, M, P inlet sizes only)

### Set Pressure

0005 - 5 psig  
0400 - 400 psig



VALVES & CONTROLS

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