

## KUNKLE MODELS 91/218/228 LIQUID RELIEF VALVES

### SAFETY AND RELIEF PRODUCTS

Cast iron liquid relief valves with bronze trim including models UL and FM approved for fire pump installations

#### MODEL 228



#### FEATURES

- Bolted bonnet allows easy inspection and servicing without removal from system.
- Quality cast iron body and bonnet.
- Insert and disc available in bronze or stainless steel 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.
- ANSI B16.1 rated 250# inlet and 125# outlet flanged connections as standard.
- Optional epoxy-coated internal body and bonnet for corrosive environments (to 125°F [52°C]).

#### GENERAL APPLICATION

Liquid relief valves suitable for overpressure relief, pressure regulation and protection of pumps, tanks, lines and hydraulic systems. Models 218, 228 are UL 1478 listed and FM approved for fire pump service.

#### TECHNICAL DATA

|                                    |                                      |
|------------------------------------|--------------------------------------|
| Connections:                       | 1½" to 4" FNPT<br>1½" to 6" flanged  |
| Temperature range <sup>[1]</sup> : | -20° to 406°F<br>(-29° to 208°C)     |
| Pressure ranges <sup>[1]</sup> :   |                                      |
| Model 91:                          | 5 to 400 psig<br>(0.34 to 27.6 barg) |
| Models 218, 228:                   | 60 to 200 psig<br>(4.1 to 13.8 barg) |

#### NOTE

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

# KUNKLE MODELS 91/218/228 LIQUID RELIEF VALVES

## SAFETY AND RELIEF PRODUCTS

### MODEL OVERVIEW

**Model 91:** bronze trim with pressure-tight cap. Suitable for maximum back pressure of 60 psig (4.1 barg)<sup>[1]</sup>.

**Model 218:** bronze trim, UL and FM approved for fire pump installations. Special design offers minimum set pressure of 60 psig. Easily adjustable with handwheel to 200 psig (13.8 barg) (175 psig (12.1 barg) 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 (4.1 barg)<sup>[1]</sup>. Supplied with handwheel.

### NOTE

- 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.

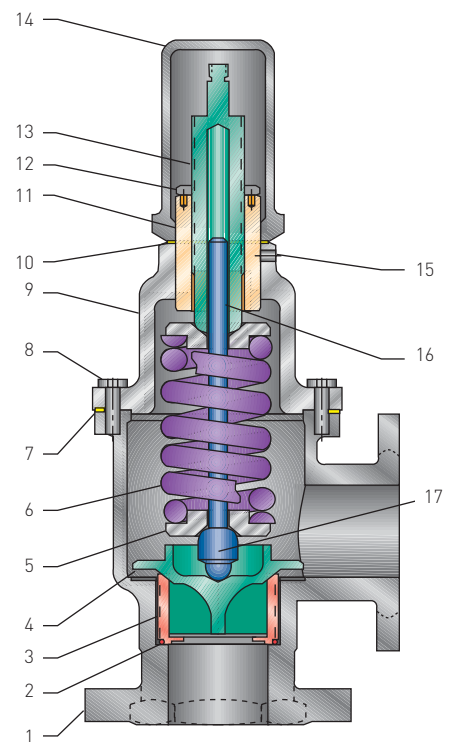
### PARTS AND MATERIALS - MODEL 91<sup>[3, 6]</sup> - NON-CODE, LIQUID RELIEF VALVE

| No.                    | Part name                         | Materials                                   |
|------------------------|-----------------------------------|---------------------------------------------|
| 1                      | Body                              | Iron, A126 class A or B                     |
| 2                      | O-ring                            | NBR <sup>[9]</sup>                          |
| 3                      | Insert                            | <sup>[1]</sup>                              |
| 4                      | Disc                              | <sup>[1]</sup>                              |
| 5                      | Spring step                       | <sup>[2]</sup>                              |
| 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 <sup>[7]</sup>      | Compression screw bushing         | Iron, A536 80-55-06                         |
| 12                     | Jam nut                           | <sup>[4]</sup>                              |
| 13                     | Compression screw                 | <sup>[4]</sup>                              |
| 14                     | Cap <sup>[5]</sup>                | Iron, A126 class A or B                     |
| 15                     | Socket set screw                  | Steel, commercial                           |
| 16                     | Stem                              | <sup>[2]</sup>                              |
| 17                     | Stem end                          | <sup>[8]</sup>                              |
| <b>Items not shown</b> |                                   |                                             |
|                        | Handwheel <sup>[5]</sup>          | Iron, A126 class A or B                     |
|                        | Handwheel jam nut <sup>[5]</sup>  | Steel plated, commercial                    |

### NOTES

- 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. or brass, B16.
- 6 bolts required for 3" and 4" sizes, and 8 bolts required for 6" size.
- Material brass, B16 or bronze, B584 casting.
- Handwheel option available, delete cap (item 14) and gasket (item 10).
- Flanges per ANSI B16.1. 250# inlet flange standard and 125# inlet flange optional. Outlet flange 125#.
- Only used in orifices K through P.
- Material SST or brass, B16.
- For variation 22 O-ring material is Viton®.

MODEL 91



# KUNKLE MODELS 91/218/228 LIQUID RELIEF VALVES

## SAFETY AND RELIEF PRODUCTS

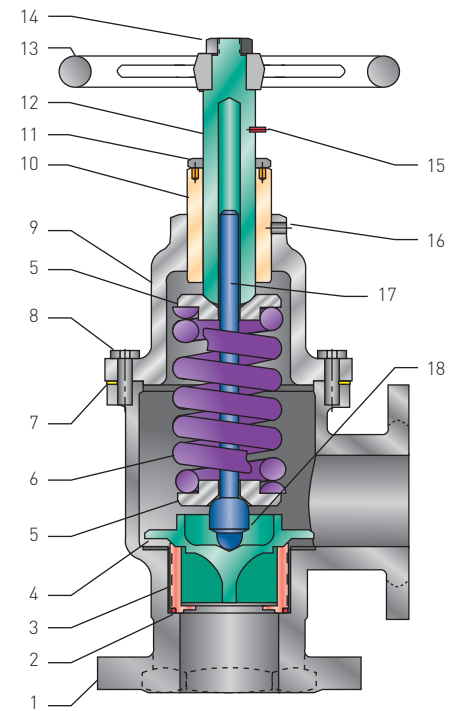
### PARTS AND MATERIALS - MODELS 218 AND 228 - NON-CODE

| No.                   | Part name                                       | Materials                                   |
|-----------------------|-------------------------------------------------|---------------------------------------------|
| 1                     | Body <sup>[1]</sup>                             | Iron, A126 class A or B                     |
| 2                     | O-ring                                          | NBR                                         |
| 3                     | Insert                                          | <sup>[2]</sup>                              |
| 4                     | Disc                                            | <sup>[2]</sup>                              |
| 5                     | Spring step                                     | <sup>[3]</sup>                              |
| 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                               | <sup>[5]</sup>                              |
| 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                                            | <sup>[3]</sup>                              |
|                       | Compression screw locknut wrench <sup>[6]</sup> | Steel, A366                                 |
|                       | Installation instruction <sup>[6]</sup>         | Paper, commercial Gr.                       |
| 18                    | Stem end                                        | <sup>[3]</sup>                              |
| <b>Model 228 only</b> |                                                 |                                             |
| 18                    | Cap <sup>[7]</sup>                              | Iron, A126 class A or B                     |
| 19                    | Cap gasket <sup>[7]</sup>                       | Gasket, klinger silicone C-4400             |

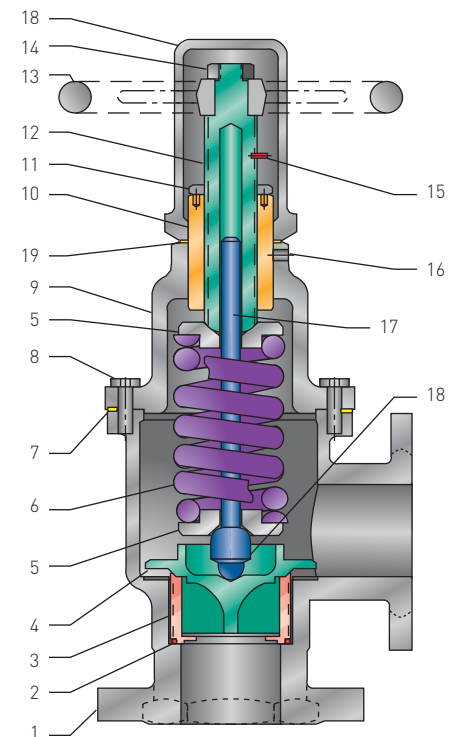
### NOTES

- 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) and Handwheel locknut (item 14) shipped unassembled (Models 218 and 228). A wrench is included to install the Handwheel locknut.

MODEL 218



MODEL 228



# KUNKLE MODELS 91/218/228 LIQUID RELIEF VALVES

## SAFETY AND RELIEF PRODUCTS

### SPECIFICATIONS - MODEL 91<sup>[1]</sup>

| Model number | Valve size (in) | Connections ANSI standard |         | Valve dimensions (in) |    |     | Min/max set pressure (psig) | Approx. weight (lb) |
|--------------|-----------------|---------------------------|---------|-----------------------|----|-----|-----------------------------|---------------------|
|              |                 | Inlet                     | Outlet  | A                     | B  | C   |                             |                     |
| 091A-G       | 1½ x 1½         | FNPT                      | FNPT    | 4¾                    | 4¼ | 11⅞ | 5/400                       | 27                  |
| 091H-G       | 1½ x 1½         | 125# FL                   | 125# FL | 4¾                    | 4¼ | 11¼ | 5/175                       | 36                  |
| 091K-G       | 1½ x 1½         | 250# FL                   | 125# FL | 5                     | 4¾ | 11¼ | 5/400                       | 36                  |
| 091A-H       | 2 x 2           | FNPT                      | FNPT    | 4⅞                    | 4⅞ | 12¾ | 5/400                       | 35                  |
| 091H-H       | 2 x 2           | 125# FL                   | 125# FL | 4¾                    | 4⅞ | 12¾ | 5/175                       | 47                  |
| 091K-H       | 2 x 2           | 250# FL                   | 125# FL | 5                     | 4⅞ | 12¾ | 5/400                       | 47                  |
| 091A-J       | 2½ x 2½         | FNPT                      | FNPT    | 4½                    | 4½ | 14¼ | 5/400                       | 48                  |
| 091H-J       | 2½ x 2½         | 125# FL                   | 125# FL | 5¼                    | 4¾ | 14¼ | 5/175                       | 65                  |
| 091K-J       | 2½ x 2½         | 250# FL                   | 125# FL | 5¼                    | 4¾ | 14¼ | 5/400                       | 65                  |
| 091A-K       | 3 x 3           | FNPT                      | FNPT    | 5⅞                    | 5⅞ | 21  | 5/400                       | 81                  |
| 091H-K       | 3 x 3           | 125# FL                   | 125# FL | 5⅞                    | 5⅞ | 21¾ | 5/175                       | 98                  |
| 091K-K       | 3 x 3           | 250# FL                   | 125# FL | 6¼                    | 5⅞ | 21¾ | 5/400                       | 98                  |
| 091A-M       | 4 x 4           | FNPT                      | FNPT    | 6⅞                    | 6½ | 26  | 5/400                       | 132                 |
| 091H-M       | 4 x 4           | 125# FL                   | 125# FL | 6⅞                    | 6½ | 26  | 5/175                       | 170                 |
| 091K-M       | 4 x 4           | 250# FL                   | 125# FL | 6⅞                    | 6½ | 26  | 5/400                       | 170                 |
| 091H-P       | 6 x 6           | 125# FL                   | 125# FL | 9¾                    | 8½ | 31  | 5/175                       | 340                 |
| 091K-P       | 6 x 6           | 250# FL                   | 125# FL | 9¾                    | 8½ | 31  | 5/300                       | 340                 |

### SPECIFICATIONS - MODELS 218 AND 228<sup>[1]</sup>

| Model number          | Valve size (in) | Connections ANSI standard |         | Valve dimensions (in) |    |         |         | Min/max set pressure (psig) | Approx. weight (lb) |
|-----------------------|-----------------|---------------------------|---------|-----------------------|----|---------|---------|-----------------------------|---------------------|
|                       |                 | Inlet                     | Outlet  | A                     | B  | C (218) | C (228) |                             |                     |
| 2*8A-K <sup>[2]</sup> | 3 x 3           | FNPT                      | FNPT    | 6⅞                    | 5⅞ | 20⅞     | 21⅞     | 60/200                      | 85                  |
| 2*8H-K <sup>[2]</sup> | 3 x 3           | 125# FL                   | 125# FL | 6⅞                    | 5⅞ | 20⅞     | 21⅞     | 60/175                      | 110                 |
| 2*8K-K <sup>[2]</sup> | 3 x 3           | 250# FL                   | 125# FL | 6⅞                    | 5⅞ | 20⅞     | 21⅞     | 60/200                      | 110                 |
| 2*8A-M <sup>[2]</sup> | 4 x 4           | FNPT                      | FNPT    | 6⅞                    | 6½ | 25      | 26      | 60/200                      | 143                 |
| 2*8H-M <sup>[2]</sup> | 4 x 4           | 125# FL                   | 125# FL | 6⅞                    | 6½ | 25      | 26      | 60/175                      | 185                 |
| 2*8K-M <sup>[2]</sup> | 4 x 4           | 250# FL                   | 125# FL | 6⅞                    | 6½ | 25      | 26      | 60/200                      | 185                 |
| 2*8H-P <sup>[2]</sup> | 6 x 6           | 125# FL                   | 125# FL | 9¾                    | 8½ | 30      | 31      | 60/175                      | 350                 |
| 2*8K-P <sup>[2]</sup> | 6 x 6           | 250# FL                   | 125# FL | 9¾                    | 8½ | 30      | 31      | 60/200                      | 350                 |

Dimensions are for reference only.

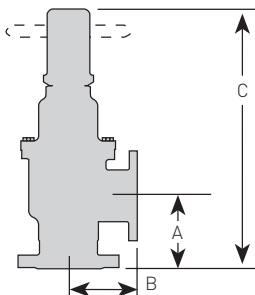
**FL** Flange

**FNPT** Female NPT

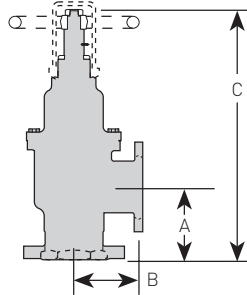
### NOTES

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 MODELS 91/218/228 LIQUID RELIEF VALVES

## SAFETY AND RELIEF PRODUCTS

### CAPACITIES - NON-CODE LIQUID - 25% ACCUMULATION (GPM) - MODEL 91 ONLY

| Set pressure<br>(psig) | Inlet size |     |     |      |      |      |
|------------------------|------------|-----|-----|------|------|------|
|                        | 1½"        | 2"  | 2½" | 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 | —    |

### 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<br>Size (in) | Certified capacities <sup>[1]</sup><br>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.

# KUNKLE MODELS 91/218/228 LIQUID RELIEF VALVES

## SAFETY AND RELIEF PRODUCTS

### SELECTION GUIDE

|                                                                                                   |            |          |          |          |           |          |          |          |             |
|---------------------------------------------------------------------------------------------------|------------|----------|----------|----------|-----------|----------|----------|----------|-------------|
| <b>Example:</b>                                                                                   | <b>091</b> | <b>K</b> | <b>-</b> | <b>M</b> | <b>01</b> | <b>A</b> | <b>M</b> | <b>S</b> | <b>0400</b> |
| <b>Model</b>                                                                                      |            |          |          |          |           |          |          |          |             |
| <b>091</b>                                                                                        |            |          |          |          |           |          |          |          |             |
| <b>218</b>                                                                                        |            |          |          |          |           |          |          |          |             |
| <b>228</b>                                                                                        |            |          |          |          |           |          |          |          |             |
| <b>Connection type</b>                                                                            |            |          |          |          |           |          |          |          |             |
| <b>A</b> Female x female NPT                                                                      |            |          |          |          |           |          |          |          |             |
| <b>H</b> 125# flange x 125# flange                                                                |            |          |          |          |           |          |          |          |             |
| <b>K</b> 250# flange x 125# flange                                                                |            |          |          |          |           |          |          |          |             |
| <b>Connection size</b>                                                                            |            |          |          |          |           |          |          |          |             |
| <b>G</b> 1½" inlet x 1½" outlet                                                                   |            |          |          |          |           |          |          |          |             |
| <b>H</b> 2" inlet x 2" outlet                                                                     |            |          |          |          |           |          |          |          |             |
| <b>J</b> 2½" inlet x 2½" outlet                                                                   |            |          |          |          |           |          |          |          |             |
| <b>K</b> 3" inlet x 3" outlet                                                                     |            |          |          |          |           |          |          |          |             |
| <b>M</b> 4" inlet x 4" outlet                                                                     |            |          |          |          |           |          |          |          |             |
| <b>P</b> 6" inlet x 6" outlet                                                                     |            |          |          |          |           |          |          |          |             |
| <b>Variation</b>                                                                                  |            |          |          |          |           |          |          |          |             |
| <b>01</b> Catalog standard                                                                        |            |          |          |          |           |          |          |          |             |
| <b>02</b> SS seat and disc (all models except Model 218K-P)                                       |            |          |          |          |           |          |          |          |             |
| <b>03</b> Model 91 w/handwheel (K, M and P inlet only)                                            |            |          |          |          |           |          |          |          |             |
| <b>03</b> SS seat and disc (Model 218K-P only)                                                    |            |          |          |          |           |          |          |          |             |
| <b>03</b> Models 218 and 228 epoxy coated body and bonnet internal surfaces (except Model 218K-P) |            |          |          |          |           |          |          |          |             |
| <b>04</b> Model 218K-P epoxy coated body and bonnet internal surfaces                             |            |          |          |          |           |          |          |          |             |
| <b>05</b> Model 91 epoxy coated body and bonnet internal surfaces                                 |            |          |          |          |           |          |          |          |             |
| <b>06</b> SS seat and disc with epoxy coated body and bonnet internal surfaces                    |            |          |          |          |           |          |          |          |             |
| <b>22</b> Model 91 SS seat and disc with Viton® O-ring seal                                       |            |          |          |          |           |          |          |          |             |
| <b>Design revision</b>                                                                            |            |          |          |          |           |          |          |          |             |
| Indicates non-interchangeable revision                                                            |            |          |          |          |           |          |          |          |             |
| Current design at revision 'A'                                                                    |            |          |          |          |           |          |          |          |             |
| <b>Valve service</b>                                                                              |            |          |          |          |           |          |          |          |             |
| <b>M</b> Liquid                                                                                   |            |          |          |          |           |          |          |          |             |
| <b>Spring material</b>                                                                            |            |          |          |          |           |          |          |          |             |
| <b>C</b> Aluminum coated, ASTM A231 steel (G, H, J inlet sizes only)                              |            |          |          |          |           |          |          |          |             |
| <b>S</b> Aluminum coated, ASTM A229 steel (K, M, P inlet sizes only)                              |            |          |          |          |           |          |          |          |             |
| <b>Set pressure</b>                                                                               |            |          |          |          |           |          |          |          |             |
| <b>0005</b> 5 psig                                                                                |            |          |          |          |           |          |          |          |             |
| <b>0400</b> 400 psig                                                                              |            |          |          |          |           |          |          |          |             |

### NOTE

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