**Level Gage and Gage Valve**
**Materials of Construction, Typical**

Drawing: M191980
Date: 16-May-2019
Revision: 10
Revision Date: 18-Jul-2022

inferno MANUFACTURING CORPORATION

# Level Gage and Gage Valve
# Materials of Construction, Typical

*see additional notes on last page of this document*


Date: 16-May-2019
Revision: 10
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**MOC-1 standard: Carbon Steel… NACE wetted… MDMT -20°F**
***suitable for Sour Process***

*Model Number examples*: *R100-27 AAN **AABCAA***; *FT15; FT25*

| Item | Wetted Part | Material | Condition | Raw Mat'l Form | Specification qualifications shown in footnotes | Traceability MTR's available |
|---|---|---|---|---|---|---|
| Gage chamber [a] | yes | carbon steel | quench & tempered; hardness < 22 HRC | square bar | ASTM A105 & ASTM A961 [b] or A420 WPL6 & A960 [d] | **Yes** |
| Cover flange | no | carbon steel | normalized | casting | ASTM A216 Gr WCC | |
| Bolt | no | alloy steel | quench & tempered | fabricated | ASTM A193 Gr B7 | |
| Nut | no | carbon steel | quench & tempered | fabricated | ASTM A194 Gr 2H | |
| Glass [c] | yes | borosilicate glass | tempered (thermally toughened) | molded | DIN 7081 | |
| Seal gasket | yes | flexible graphite with SS insert (Garlock Graph-Lock® 3125 SS) | | | | |
| Cushion gasket | no | synthetic fiber with NBR binder (Klingersil® C4401) | | | | |
| Valve Body | yes | carbon steel | normalized | forging | ASTM A105 | **Yes** |
| Bonnet | no | CF3 (T304L SS) | solution annealed; hardness < 22 HRC | casting | ASTM A351 | |
| Trim | yes | T316 SS | solution annealed; hardness < 22 HRC | bar | ASTM A479 | |
| Vessel and/or Gage connector | T1 yes | carbon steel | normalized or quench & tempered | forging | ASTM A105 | **Yes** |
| | T2 yes | carbon steel | normalized | bar | ASTM A420 WPL6 [d] | |
| Union nut | no | carbon steel | stress relieved | cold forging | ASTM A105 | |
| Bonnet nut | no | carbon steel | stress relieved | cold forging | ASTM A105 | |
| Stem Packing | yes | TFE | operating to 500°F | | | |
| Union Seal | yes | Viton O-Ring (std) | range: -15°F to 400°F | | | |
| Connecting nipple | yes | carbon steel | per Standard | seamless pipe | ASTM A106 Gr B | **Yes** |

*Footnotes*

[a] Q & T condition has been used continuously since 2019 for MOC-1. In case of delays in receipt of raw material we may substitute with same chemistry material but in cold drawn & stress relieved condition per SA/A 696.

[b] meets chemical and mechanical requirements of ASTM A105. Exception: gage chamber is of square cross section not "cylindical" see ASTM A961-16 Para. 6.1.1

[c] Maxos®

[d] "Partial compliance" qualification per S58 -Special Fittings of ASME/ASTM A/960, except markings…. Meets all chemical & mechanical requirements of ASTM A420 WPL6

**MOC-2: Carbon Steel... NACE Wetted & Non-Wetted… MDMT -20°F**
***suitable for Sour Process, Sour Atmosphere ….B7M requires 20% de-rating***

*Model Number examples*: *R100-27 AAN **AABCCA***; *FT15-ATM; FT25-ATM*

| Item | | Wetted Part | Material | Condition | Raw Mat'l Form | Specification qualifications shown in footnotes | Traceability MTR's available |
|---|---|---|---|---|---|---|---|
| Gage chamber [a] | | yes | carbon steel | quench & tempered; hardness < 22 HRC | square bar | ASTM A105 & ASTM A961 [b] or A420 WPL6 & A960 [d] | **Yes** |
| Cover flange | | no | carbon steel | normalized | casting | ASTM A216 Gr WCC | |
| Bolt | | no | alloy steel | quench & tempered | fabricated | ASTM A193 Gr B7M | |
| Nut | | no | carbon steel | quench & tempered | fabricated | ASTM A194 Gr 2HM | |
| Glass [c] | | yes | borosilicate glass | tempered (thermally toughened) | molded | DIN 7081 | |
| Seal gasket | | yes | flexible graphite with SS insert (Garlock Graph-Lock® 3125 SS) | | | | |
| Cushion gasket | | no | synthetic fiber with NBR binder (Klingersil® C4401) | | | | |
| Valve Body | | yes | carbon steel | normalized; hardness < 22 HRC | forging | ASTM A105 | **Yes** |
| Bonnet | | no | CF3 (T304L SS) | solution annealed; hardness < 22 HRC | casting | ASTM A351 | |
| Trim | | yes | T316 SS | solution annealed; hardness < 22 HRC | bar | ASTM A479 | |
| Vessel and/or Gage connector | T1 | yes | carbon steel | normalized or quench & tempered | forging | ASTM A105 | **Yes** |
| | T2 | yes | carbon steel | normalized | bar | ASTM A420 WPL6 [d] | |
| Union nut | | no | carbon steel | stress relieved, 1100°F min. | cold forging | ASTM A105 | |
| Bonnet nut | | no | carbon steel | stress relieved, 1100°F min. | cold forging | ASTM A105 | |
| Stem Packing | | yes | TFE | operating to 500°F | | | |
| Union Seal | | yes | Viton O-Ring (std) | range: -15°F to 400°F | | | |
| Connecting nipple | | yes | carbon steel | per Standard | seamless pipe | ASTM A106 Gr B | **Yes** |

*Footnotes*

[a] Q & T condition has been used continuously since 2019 for MOC-1. In case of delays in receipt of raw material we may substitute with same chemistry material but in cold drawn & stress relieved condition per SA/A 696.

[b] meets chemical and mechanical requirements of ASTM A105. Exception: gage chamber is of square cross section not "cylindical" see ASTM A961-16 Para. 6.1.1

[c] Maxos®

[d] "Partial compliance" qualification per S58 -Special Fittings of ASME/ASTM A/960, except markings…. Meets all chemical & mechanical requirements of ASTM A420 WPL6

## MOC-3: Low Temp -50°F Carbon Steel... NACE wetted… MDMT -50°F

***suitable for Sour Process***

*Model Number examples*: *R100-27 AAN **XXBCAA***; *FT15-LT; FT25-LT*

| Item | | Wetted Part | Material | Condition | Raw Mat'l Form | Specification (qualifications shown in footnotes) | Traceability (MTR's available) |
|---|---|---|---|---|---|---|---|
| Gage chamber [a] | | yes | carbon steel | quench & tempered; hardness < 22 HRC | square bar | ASTM A420 WPL6 [d] | **Yes** |
| Cover flange | | no | CF8M (T316 SS) or carbon steel | solution annealed<br>normalized | casting | ASTM A351<br>ASTM A352 Gr LCC | |
| Bolt | | no | alloy steel | quench & tempered | fabricated | ASTM A193 Gr B7 | |
| Nut | | no | carbon steel | quench & tempered | fabricated | ASTM A194 Gr 2H | |
| Glass [c] | | yes | borosilicate glass | tempered (thermally toughened) | molded | DIN 7081 | |
| Seal gasket | | yes | flexible graphite with SS insert (Garlock Graph-Lock® 3125 SS) | | | | |
| Cushion gasket | | no | synthetic fiber with NBR binder (Klingersil® C4401) | | | | |
| Valve Body | | yes | carbon steel | quench & tempered; hardness < 22 HRC | forging | ASTM A350 LF2 | **Yes** |
| Bonnet | | no | CF3 (T304L SS) | solution annealed; hardness < 22 HRC | casting | ASTM A351 | |
| Trim | | yes | T316 SS | solution annealed; hardness < 22 HRC | bar | ASTM A479 | |
| Vessel and/or Gage connector | T1 | yes | carbon steel | normalized or quench & tempered | forging | ASTM A350 LF2 | **Yes** |
| | T2 | yes | carbon steel | normalized with Charpy test @ -50°F | bar | ASTM A420 WPL6 [d] | |
| Union nut | | no | CF3M (T316L SS) | solution annealed | casting | ASTM A351 | |
| Bonnet nut | | no | CF3M (T316L SS) | solution annealed | casting | ASTM A351 | |
| Stem Packing | | yes | TFE | operating to 500°F | | | |
| Union Seal | | yes | low temp Viton O-Ring (std) | range: -50°F to 400°F | | | |
| Connecting nipple | | yes | stainless steel; low temp carbon steel | per Standard | seamless pipe | ASTM A312 (SS)<br>ASTM A333 (CS) | **Yes** |

*Footnotes*

[a] Q & T condition has been used continuously since 2019 for MOC-1. In case of delays in receipt of raw material we may substitute with same chemistry material but in cold drawn & stress relieved condition per SA/A 696.

[c] Maxos®

[d] "Partial compliance" qualification per S58 -Special Fittings of ASME/ASTM A/960, except markings…. Meets all chemical & mechanical requirements of ASTM A420 WPL6

| **MOC-4: LG = SS/CS… GV = SS/CS… NACE wetted… MDMT -20°F**<br>***suitable for Sour Process*** | *Model Number examples* | *R100-27 AAN **EABCAA***<br>*FT15-SS/CS; FT25-SS/CS* |
|---|---|---|

| Item | Wetted Part | Material / Grade | Condition | Raw Mat'l Form | Specification qualifications shown in footnotes | Traceability MTR's available |
|---|---|---|---|---|---|---|
| Gage chamber | yes | T316 | annealed & cold drawn; hardness < 22 HRC | square bar | ASTM A479 | **Yes** |
| Cover flange | no | carbon steel | normalized | casting | ASTM A216 Gr WCC | |
| Bolt | no | alloy steel | quench & tempered | fabricated | ASTM A193 Gr B7 | |
| Nut | no | carbon steel | quench & tempered | fabricated | ASTM A194 Gr 2H | |
| Glass [c] | yes | borosilicate glass | tempered (thermally toughened) | molded | DIN 7081 | |
| Seal gasket | yes | flexible graphite with SS insert (Garlock Graph-Lock® 3125 SS) | | sheet | | |
| Cushion gasket | no | synthetic fiber with NBR binder (Klingersil® C4401) | | sheet | | |
| Valve body | yes | F316L | solution annealed; hardness < 22 HRC | forging | ASTM A182 | **Yes** |
| Bonnet | no | CF3 (T304L) | solution annealed; hardness < 22 HRC | casting | ASTM A351 | |
| Trim | yes | T316 SS | solution annealed; hardness < 22 HRC | bar | ASTM A479 | |
| Vessel and/or Gage connector | yes | T316L | solution annealed; hardness < 22 HRC | bar | ASTM A479 | **Yes** |
| Union nut | no | carbon steel | stress relieved, 1100°F min. | cold forging | ASTM A105 | |
| Bonnet nut | no | carbon steel | stress relieved, 1100°F min. | cold forging | ASTM A105 | |
| Stem Packing | yes | TFE | operating to 500°F | | | |
| Union Seal | yes | TFE (std) | range: -250°F to 450°F | | | |
| Connecting nipple | yes | T316 | solution annealed | seamless pipe | ASTM A312 | **Yes** |

*Footnotes*

[c] Maxos®

| **MOC-5: LG = SS/CS… GV = SS/SS… NACE wetted... MDMT -20°F**<br>***suitable for Sour Process*** | *Model Number examples* | *R100-27 AAN **EABCAA***<br>*FT15-SS; FT25-SS* |
|---|---|---|

| Item | Wetted Part | Material / Grade | Condition | Raw Mat'l Form | Specification qualifications shown in footnotes | Traceability MTR's available |
|---|---|---|---|---|---|---|
| Gage chamber | yes | T316 | annealed & cold drawn; hardness < 22 HRC | square bar | ASTM A479 | **Yes** |
| Cover flange | no | carbon steel | normalized | casting | ASTM A216 Gr WCC | |
| Bolt | no | alloy steel | quench & tempered | fabricated | ASTM A193 Gr B7 | |
| Nut | no | carbon steel | quench & tempered | fabricated | ASTM A194 Gr 2H | |
| Glass [c] | yes | borosilicate glass | tempered (thermally toughened) | molded | DIN 7081 | |
| Seal gasket | yes | flexible graphite with SS insert (Garlock Graph-Lock® 3125 SS) | | sheet | | |
| Cushion gasket | no | synthetic fiber with NBR binder (Klingersil® C4401) | | sheet | | |
| Valve body | yes | F316L | solution annealed; hardness < 22 HRC | forging | ASTM A182 | **Yes** |
| Bonnet | no | CF3 (T304L) | solution annealed; hardness < 22 HRC | casting | ASTM A351 | |
| Trim | yes | T316 SS | solution annealed; hardness < 22 HRC | bar | ASTM A479 | |
| Vessel and/or Gage connector | yes | T316L | solution annealed; hardness < 22 HRC | bar | ASTM A479 | **Yes** |
| Union nut | no | Gr CF8M (T316) | solution annealed | casting | ASTM A351 | |
| Bonnet nut | no | Gr CF8M (T316) | solution annealed | casting | ASTM A351 | |
| Stem Packing | yes | TFE | operating to 500°F | | | |
| Union Seal | yes | TFE (std) | range: -250°F to 450°F | | | |
| Connecting nipple | yes | T316 | solution annealed | seamless pipe | ASTM A312 | **Yes** |

*Footnotes*

[c] Maxos®

| **MOC-6: All Stainless Steel... NACE wetted... MDMT -320°F**<br>***suitable for Sour Process... B8M Cl2 requires 15% de-rating*** | *Model Number examples* | *R100-27 AAN **EEBCEA***<br>*FT15-SS; FT25-SS* |
|---|---|---|

| Item | Wetted Part | Material / Grade | Condition | Raw Mat'l Form | Specification qualifications shown in footnotes | Traceability MTR's available |
|---|---|---|---|---|---|---|
| Gage chamber | yes | T316 | annealed & cold drawn; hardness < 22 HRC | square bar | ASTM A479 | **Yes** |
| Cover flange | no | CF3M (T316L) | solution annealed | casting | ASTM A351 | |
| Bolt | no | T316 | mechanically strengthened (strain hardened) | fabricated | ASTM A193 Gr B8M Cl 2 | |
| Nut | no | T316 | per Standard | fabricated | ASTM A194 Gr 8M | |
| Glass [c] | yes | borosilicate glass | tempered (thermally toughened) | molded | DIN 7081 | |
| Seal gasket | yes | flexible graphite with SS insert (Garlock Graph-Lock® 3125 SS) | | sheet | | |
| Cushion gasket | no | synthetic fiber with NBR binder (Klingersil® C4401) | | sheet | | |
| Valve body | yes | F316L | solution annealed; hardness < 22 HRC | forging | ASTM A182 | **Yes** |
| Bonnet | no | CF3 (T304L) | solution annealed; hardness < 22 HRC | casting | ASTM A351 | |
| Trim | yes | T316 SS | solution annealed; hardness < 22 HRC | bar | ASTM A479 | |
| Vessel and/or Gage connector | yes | T316L | solution annealed; hardness < 22 HRC | bar | ASTM A479 | **Yes** |
| Union nut | no | Gr CF8M (T316) | solution annealed | casting | ASTM A351 | |
| Bonnet nut | no | Gr CF8M (T316) | solution annealed | casting | ASTM A351 | |
| Stem Packing | yes | TFE | operating to 500°F | | | |
| Union Seal | yes | TFE (std) | range: -250°F to 450°F | | | |
| Connecting nipple | yes | T316 | solution annealed | seamless pipe | ASTM A312 | **Yes** |

*Footnotes*

[c] Maxos®

## MOC-7: Carbon Steel…. Non-NACE gage valves… MDMT -20°F

***Model 15A valve workings are susceptible to corrosion by H2O, CO2 & trace H2S. MOC-1 is recommended for crude.***

*Model Number examples*: *R100-27 AAN **AABCAA***; *15A Non-NACE trim*

| Item | | Wetted Part | Material | Condition | Raw Mat'l Form | Specification qualifications shown in footnotes | Traceability MTR's available |
|---|---|---|---|---|---|---|---|
| Gage chamber [a] | | yes | carbon steel | quench & tempered; hardness < 22 HRC | square bar | ASTM A105 & ASTM A961 [b] or A420 WPL6 & A960 [d] | **Yes** |
| Cover flange | | no | carbon steel | normalized | casting | ASTM A216 Gr WCC | |
| Bolt | | no | alloy steel | quench & tempered | fabricated | ASTM A193 Gr B7 | |
| Nut | | no | carbon steel | quench & tempered | fabricated | ASTM A194 Gr 2H | |
| Glass [c] | | yes | borosilicate glass | tempered (thermally toughened) | molded | DIN 7081 | |
| Seal gasket | | yes | flexible graphite with SS insert (Garlock Graph-Lock® 3125 SS) | | | | |
| Cushion gasket | | no | synthetic fiber with NBR binder (Klingersil® C4401) | | | | |
| Valve Body | | yes | carbon steel | normalized | forging | ASTM A105 | **Yes** |
| Trim | | yes | T410 SS (non-NACE) | annealed | bar | ASTM A479 | |
| Vessel and/or Gage connector | T1 | yes | carbon steel | normalized | bar | ASTM A420 WPL6 [d] | **Yes** |
| | T2 | yes | carbon steel | normalized or quench & tempered | forging | ASTM A105 | |
| Union nut | | no | carbon steel | stress relieved | cold forging | ASTM A105 | |
| Bonnet nut | | no | carbon steel | stress relieved | cold forging | ASTM A105 | |
| Stem Packing | | yes | TFE | operating to 500°F | | | |
| Union Seal | | yes | Viton O-Ring (std) | range: -15°F to 400°F | | | |
| Connecting nipple | | yes | carbon steel | per Standard | seamless pipe | ASTM A106 Gr B | **Yes** |

*Footnotes*

[a] Q & T condition has been used continuously since 2019 for MOC-1. In case of delays in receipt of raw material we may substitute with same chemistry material but in cold drawn & stress relieved condition per SA/A 696.

[b] meets chemical and mechanical requirements of ASTM A105. Exception: gage chamber is of square cross section not "cylindical" see ASTM A961-16 Para. 6.1.1

[c] Maxos®

[d] "Partial compliance" qualification per S58 -Special Fittings of ASME/ASTM A/960, except markings…. Meets all chemical & mechanical requirements of ASTM A420 WPL6

## MOC-8: Carbon Steel… *NACE wetted… MDMT -20°F

***15A "conventional" style gage valves were not designed for sour service. Although trim conforms to NACE, workings are susceptible to corrosion by H2O, CO2 & trace H2S. For crude use MOC-1, Free Turn ® valves***

*Model Number examples*: *R100-27 AAN **AABCAA** 15A*

| Item | | Wetted Part | Material | Condition | Raw Mat'l Form | Specification qualifications shown in footnotes | Traceability MTR's available |
|---|---|---|---|---|---|---|---|
| Gage chamber [a] | | yes | carbon steel | quench & tempered; hardness < 22 HRC | square bar | ASTM A105 & ASTM A961 [b] or A420 WPL6 & A960 [d] | **Yes** |
| Cover flange | | no | carbon steel | normalized | casting | ASTM A216 Gr WCC | |
| Bolt | | no | alloy steel | quench & tempered | fabricated | ASTM A193 Gr B7 | |
| Nut | | no | carbon steel | quench & tempered | fabricated | ASTM A194 Gr 2H | |
| Glass [c] | | yes | borosilicate glass | tempered (thermally toughened) | molded | DIN 7081 | |
| Seal gasket | | yes | flexible graphite with SS insert (Garlock Graph-Lock® 3125 SS) | | | | |
| Cushion gasket | | no | synthetic fiber with NBR binder (Klingersil® C4401) | | | | |
| Valve Body | | yes | carbon steel | normalized | forging | ASTM A105 | **Yes** |
| Trim | | yes | T410 SS (per NACE) | HT per Table A.23 of NACE MR01-73-3 Part 3 | bar | ASTM A479 | |
| Vessel and/or Gage connector | T1 | yes | carbon steel | normalized | bar | ASTM A420 WPL6 [d] | **Yes** |
| | T2 | yes | carbon steel | normalized or quench & tempered | forging | ASTM A105 | |
| Union nut | | no | carbon steel | stress relieved | cold forging | ASTM A105 | |
| Bonnet nut | | no | carbon steel | stress relieved | cold forging | ASTM A105 | |
| Stem Packing | | yes | TFE | operating to 500°F | | | |
| Union Seal | | yes | Viton O-Ring (std) | range: -15°F to 400°F | | | |
| Connecting nipple | | yes | carbon steel | per Standard | seamless pipe | ASTM A106 Gr B | **Yes** |

*Footnotes*

[a] Q & T condition has been used continuously since 2019 for MOC-1. In case of delays in receipt of raw material we may substitute with same chemistry material but in cold drawn & stress relieved condition per SA/A 696.

[b] meets chemical and mechanical requirements of ASTM A105. Exception: gage chamber is of square cross section not "cylindical" see ASTM A961-16 Para. 6.1.1

[c] Maxos®

[d] "Partial compliance" qualification per S58 -Special Fittings of ASME/ASTM A/960, except markings…. Meets all chemical & mechanical requirements of ASTM A420 WPL6

**Notes:**

**1. Cold Ambient conditions**

* LG's holding water subject to freezing weather must be insulated or heat traced to prevent ice formation from damaging seal gaskets. WARNING- freezing water can extrude seals and require re-building. Consider draining standing water from level gage during freezing weather.

**2. Cold Process applications**

* Non-Frost extensions recommended for cold process; use final letter "F" to indicate this option. Also note possible interference with valve handwheel in Fig 4-1 position if connecting pipe nipple is 2" or less in OAL. For more info see A212162
* Extended valve stem available to provide clearance for insulation under handwheel. Designate model number as FT15-LS (example)

**3. Gage Glass**

Inferno uses Maxos® brand glass. This glass is melted and pressed at factory of Auer Lighting GmbH in Germany. Factory quality control includes mechanical testing (destructive test by sampling) to insure conformance to worldwide quality standard DIN 7081.
Beware of non-conforming Counterfeit glass. For example, see letter Dec. 11, 2018

**4. High Temperature limitations**

* R100, T100, T200 catalog cut sheets show non-steam pressure ratings to 572°F. Inferno's previous publications showing 600°F limit was based on satisfactory history & consistent with other published industry ratings. Our glass supplier, Maxos®, recommends 572°F (300°C) maximum upper limit for operation.

It is to be noted that temperature experienced by the glass pane, installed in the Level Gage does not normally translate to the same temperature as the fluid of the vessel itself. The glass panes in the LG are remote from the fluid in vessel to the extent of the connecting piping where cooling by ambient air may occur. Generally there is no warming flow through the LG because of the static operating nature. Exceptions are during blow-down when vessel operating fluid may flow through the LG.

Maxos® reports their gage glass conforms and exceeds the standard DIN 7081 limit of 536°F. Maxos® recommends that the glass may be used at full pressure ratings up to 572°F without loss of strength. In addition, the glass used in Level Gages may be used in non-steam applications up to 600°F, such as thermal transfer (hot oil) systems, provided that operating pressure is limited to 145 PSI (10 bar), as provided by the "Explanatory Notes" in the DIN Standard.

**5. Thermal Shock**

* During cooling or warming, the rate of temperature change should not exceed 73˚F (23˚C) per minute, otherwise excessive thermal stresses can cause glass breakage.

**6. Steam Service Applications**

* Boilers (fired vessels) fall under special ASME rules. Consult factory for appropriate configurations meeting PG60 and Appendix A-18.

* In steam service, R100 is rated to 250 WSP; T100/T200 with protective mica shield is rated to 450 WSP. T100/T200 without mica protection is rated same as reflex, to 250 WSP. Exposure of unprotected glass to hot water in excess of these limits causes chemical and structural breakdown to the glass, and consequent loss of strength, leading to leaks and eventual glass breakage.

**7. Standard Factory Finish (carbon steel parts):**

| Component | Standard Finish | Alternate Finish |
|---|---|---|
| Gage chamber | zinc electroplate- gold, green or black | Spray paint for fast turn-arounds and gage sizes longer than 96" |
| Cover flange | powder paint- red | |
| Cap Screw | zinc electroplate | |
| U-Bolt | mechanical zink plate | |
| Nut | zinc electroplate | |
| Valve Body | 2 part epoxy- grey | |
| Vessel and/or Gage connector | 2 part epoxy- grey | phosphatize only, or spray paint |
| Union nut | 2 part epoxy- grey | |
| Bonnet nut | 2 part epoxy- grey | |
| Handwheel | 2 part epoxy or powder: red, yellow, blue and grey according to material | |

| 8. OPTIONAL MATERIALS | Wetted Part | Material | Temperature Range |
|---|---|---|---|
| LG Seal | yes | Gylon 3504 Blue, 3500 Fawn, 3510 Off-White | to 500°F |
| LG Shield | yes | Mica | to 457°F (450 WSP) |
| LG Bolting Accessory | no | Belleville Washer, 17-7 PH SS | to 457°F (450 WSP) |
| Valve Stem Packing | yes | Grafoil | to 572°F (limited by glass) |
| Valve Union Seal, Alternate | yes | TFE | -250°F to 450°F |
| | | Low Temp Viton, use for sour service | -50°F to 400°F |
| | | HSN Highly Saturated Nitrile (HNBR) | -55°F to 300°F |
| | | Low Temp Nitrile | -65°F to 250°F |
| | | Aflas | +25°F to 450°F |
| | | Kalrez (Hi Temp) | Depends on compound |

| 9. ACCESSORIES/OPTIONS | Wetted Part | Item | Application |
|---|---|---|---|
| LG Cleaning Brush | no | Nylon bristle x 40" handle | Large diameter fits thru 1/2" S160 and larger |
| LG Non-Frost Extension | no | Clear Acrylic Plastic & SS mounting hardware | Low process temperature |
| LG Insulation Jacket | no | Low ambient temperature, or low process temp | Low ambient temperature, or low process temp |
| LG Illuminator | no | LED type | |
| LG Scale | no | English or Metric | Aluminum, Stainless, Plastic Hi Vis. Yellow |
| LG Vertical Rising Ball | yes | safety ball check per ASME BPVC PG60 | Integral in gage chamber or separate pipe nipple for steam boiler service, or "nuisance" checking |
| GV: Extra Long Valve Stem | yes | T316 SS, TFE coated threads | To accommodate insulation, or to avoid interference with plastic non-frost extension |
| GV: Spherical Union | yes | includes O-ring seal | Close Hook-Up or "Tee Combo" assemby |
| GV: Upgrade | no | change CS nut to T316 | |
| GV: Flanged Vessel Conn | yes | threaded or welded w PWHT (CS) | |
| LG—GV Combo: | yes | assembly on vessel centers at Inferno factory | End Connected S80 standard; S160 optional Close Hook-Up: S160 |
| LG—GV Combo: | yes | full port ball valve at vent/drain | 2000#, 3000# |
| LG—GV Combo: | yes | pipe plugs installed at open ports | Normally supplied open unless directed |
| LG—GV Combo: | no | gage support | Heavy gage assembly: Welded bracket or no-weld bottom support |

**10. History of Revisions**

| Revision # | Date | Main changes |
|---|---|---|
| 7 | 11/20/2019 | Clarified union nut and bonnet nut alternates for Group 4 |
| 8 | 5/24/2021 | Renamed material "Groups" to MOC numbers; Re-ordered; Added two new MOC's for special case Model 15A |
| 9 | 1/12/2022 | On page 10, corrected max temp for LT Viton (should be 400°F, not 450°F); Added table of contents |
| 10 | 7/17/2022 | For steel construction, if surface hardness of quench & tempered raw material exceeds 187 BHN, then we will certify gage chamber material to ASTM A420 Grade WPL6 *instead* of A105 |