



## Weld Pad Pressure Ratings (PSI) — Depend on Method of Attachment, see Drawing A191953

Rev Date: 11/07/19  
 By: ABO

### Double Fillet or Bevel Fillet

### Table I

Pad Material		SA516-70 (Group 1.1)				T304 Stainless Steel (Group 2.1)				T316 Stainless Steel (Group 2.2)			
Cover Material (1)		SA516-70				SA516-70 or T304 SS or T316 SS				SA516-70 or T316 SS			
Bolting Material: ASTM A354 or A193 Grade		354 BD (special)	B7 B8 Cl2	B8M Cl 2	B7M	354 BD (special)	B7 B8 Cl2	B8M Cl 2	B7M	354 BD (special)	B7 B8 Cl2	B8M Cl 2	B7M
Size	Temp.												
	100°F	1480	1360	1200	1090	1440	1360	1200	1090	1440	1360	1200	1090
RWA-11....	200°F	1360	1360	1200	1090	1200	1200	1200	1090	1240	1240	1200	1090
RWA-49	300°F	1310	1310	1200	1090	1075	1075	1075	1075	1120	1120	1120	1090
(Glass Sizes 1-9; Sections 1 & up )	400°F	1265	1265	1200	1090	995	995	995	995	1025	1025	1025	1025
	500°F	1205	1205	1200	1090	930	930	930	930	955	955	955	955
	536°F (2)	1180	1180	1180	1090	915	915	915	915	935	935	935	935
	572°F (3)	1155	1155	1155	1090	900	900	900	900	915	915	915	915
Restrictions Apply	600°F (4)	144	144	144	144	144	144	144	144	144	144	144	144

(1) Cover materials such as ASME SA-36 and ASTM A108, AISI 1018 are not included

(2) DIN 7081 and CRN maximum temperature: 536°F (280°C)

(3) Glass manufacturer's limit for continuous non-corrosive service: 572°F (300°C)

(4) DIN 7081 allows high temperature applications above 300°C with pressure limit of 10 bar maximum

Note - Pressures generally follow Class 600 except for values highlighted which show limits imposed by the bolting material

### Single Outside Fillet Only - Pressure Penalty Applies

### Table II

Pad Material		SA516-70 (Group 1.1)	T304 Stainless Steel (Group 2.1)	T316 Stainless Steel (Group 2.2)
Cover Material (1)		Any listed material	Any listed material	Any listed material
Bolting Material: ASTM A354 or A193 Grade		Any Bolting Grade	Any Bolting Grade	Any Bolting Grade
Size	Temp.			
	100°F	500	500	500
RWA-11....	200°F	450	450	450
RWA-49	300°F	400	400	400
(Glass Sizes 1-9; Sections 1 & up )	400°F	350	350	350
	500°F	300	300	300
	536°F (2)	282	282	282
	572°F (3)	264	264	264
Restrictions Apply	600°F (4)	144	144	144

(1) Cover materials such as ASME SA-36 and ASTM A108, AISI 1018 are not included

(2) DIN 7081 and CRN maximum temperature: 536°F (280°C)

(3) Glass manufacturer's limit for continuous non-corrosive service: 572°F (300°C)

(4) DIN 7081 allows high temperature applications above 300°C with pressure limit of 10 bar maximum

**SCOPE:** Pressure ratings apply to the following models and configurations-

- A. Inferno model RWA series with "2 Hole and Channel" view style, not "Full Slot" (see Note 12 for an explanation of the weld pad model numbering system)
- B. Shell sizes 3" through 12" pipe
- C. All welds must conform to the sizing stated in ASME B31.3 Fig. 328.5.2B
- D. Pipe thickness must meet design code requirements
- E. Tempered borosilicate glass only, reflex or transparent style
- F. Pad, cover and bolt materials are limited to the options shown in Tables I and II

**Caution:** Vessel design using shell diameter not listed in scope, or with inadequate wall thickness, may cause excessive deflection in the shell even though Code requirements may be met. These deflections can be transferred to the welding pad and to the glass and lead to possible glass breakage.

**CRN:** Inferno model RWA series is registered in Canada under CRN 0F21233.5C. Scope of CRN is limited by material choices found in Tables and by above Scope section, Points A - F. In addition-

- Welding of gage to vessel must comply with UW-16.1. End user shall be informed that the attachment of gage to vessel is not part of the CRN; method of attachment shall be registered as part of vessel design registration.
- CRN is limited to 536°F (280°C)
- CRN expiration date: 21-Mar-2029

**Notes:**

1. Pressure ratings are based on Finite Element Analysis performed in 2019. Limiting factors

are base metal Group No. as shown in Table I and bolting material.

2. Table I ratings require a Double Fillet or a full penetration Bevel Fillet per ASME VIII-1 UW-16.1 as shown in Inferno Drawing A191953. Fillet weld size must be determined according to design pressure and appropriate code of construction.
3. Table II ratings are limited to 500 PSI maximum when attachment is by outside fillet weld only. FEA analysis shows that without an inside fillet around the two holes of the 2 Hole & Channel design, a prying action results, increasing the stress in the fillet weld area.
4. Pressure ratings are not stamped on name plate.
5. Materials other than listed - such as ASME SA-36 or ASTM A108, AISI 1018 - are not covered by the pressure rating tables or by the CRN.
6. Consult "Design Information" Bulletin M101498 Rev 2.1 before relying on the pressure ratings. Flatness of glass seating surface must be maintained in order for the pressure ratings to be valid. Pressure ratings assume that seating surface in the welding pad remains flat within .001" to .005" when vessel is operated under pressure. Limit on out-of-flatness is calculated by consideration of maximum allowable bending strength of the glass.

Caution:

- Distortion from welding can easily exceed flatness limits. Post-weld machining of glass seating surface may be required.
  - Vessel bulging caused by internal pressure will create deflections in the welding pad that contribute to out-of-flatness condition.
7. Current revision shows two different maximum continuous operating temperatures: 536°F (280°C) per DIN 7081, or 572°F (300°C) as allowed by glass supplier. Recent versions of the Pressure Rating table had allowed up to 600°F for "non-continuous" service, based on acceptable historical experience.
  8. Low Temperature use... Glass is borosilicate type with low coefficient of expansion and therefore resistant to fracture from thermal shock. However thermal shock conditions should be avoided. The maker of the glass advises that rate of temperature change should not exceed 23°C per minute (73°F per minute), during cooling or warming. Attention mechanical seal manufacturers and end users: If seal pot sight glasses are subject to rapid cooling or heating then alternate sight glass designs should be considered that include automatic safety ball check shut-offs to limit flow and leakage in case of glass failure.  
  
Glass may be slowly cooled to liquid nitrogen temperature of -196°C (-320°F). Glass is already a brittle material at ambient temperatures and does not become any more brittle at low temperatures. For low

temperature applications be sure to design with heat treated steels or stainless steels suitable for low temperature service.

Inferno standard weld pad assembly materials are good to -20°F. For service to -50°F standard A193 B7 bolting with A194 2H nuts may be used. Cover flanges are required to be ASME SA-516 Gr 70 with Charpy test at -50°F or stainless steel. For service below -50°F stainless steel bolting and covers are required.

9. Weld pad gages are not intended for steam service. Steam and hot water at elevated temperature cause a chemical erosion to borosilicate glass. Service temperature above 470°F (243°C) is not permitted under DIN 7081 for unprotected reflex glass. The consequences of glass breakage in steam service with consequent flash of water and energy release is too great to justify, according to the manufacturer. Do not design this product for steam use other than periodic low-pressure cleaning.
10. Weld pad gages are subject to damage in freezing weather if water is present. Do not allow temperature of standing water to become so low as to permit freezing. Ice formation causes high pressure which can extrude gasket seal and/or break glass.
11. Soft rubber gaskets (ex. Viton, Nitrile, EPDM, Neoprene) require pressure de-rating to 150 PSI, also temperature de-rating.

12. Pressure ratings and CRN apply to weld pads with 2 Hole & Channel construction only; not Full Slot. RWA model numbers with format RWA-xx HxxxxxxR are 2 Hole & Channel. Model number format RWA-xx FxxxxxxR are Full Slot.
  
13. History of pressure de-ratings: Revisions 11 - 13 use "m" and "y" values for nonmetallic fiber seal gasket material as found in ASME Appendix 2: "These values are suggested only and are not mandatory... The primary proof that the values are adequate is the hydrostatic test". Current revision makes use of FEA technique rather than manual calculations, primarily because the rectangular shape is not directly addressed by the Code. FEA has found areas of high stress at the weld attachment location on the welding pad and in the weld fillet. It was discovered that without an inside fillet around the two holes of the 2 Hole & Channel design, a prying action results, causing higher stress. For these reasons current revision contains a general de-rating and a requirement for a double fillet weld.

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