

September 28, 2024

TSSA
345 Carlingview Drive
Toronto, ON M9W 6N9

Dear Cecylia Garbacz,

Re: Reciprocal CRN Registration in Manitoba

As indicated by the Regulatory Reconciliation and Cooperation Table and the Reconciliation Agreement for the Canadian Registration Number (CRN) for Pressure Equipment, the design reviews conducted and accepted by the Canadian province or territory, or their delegated safety authority, will be mutually recognized in the Province of Manitoba. If a registration is conditionally based on compliance with the notes set by the original issuing Jurisdiction, such compliance shall be applied the same to this Province.

Your submission has been registered, as follows:

File Number:	74-R4397
CRN:	0C25329.54
Scope:	Attachment B-Scope of CRN Registration for Swagelok Processes Pressure Regulators- July 2, 2024
Manufacturer:	SWAGELOK
Expiry Date:	4 July 2034

Along with this letter is the invoice for registration.

In addition, every Pressure Vessel, Boiler, and Heat Exchanger shall be stamped with the registration number and as required by CSA Code B51, a Manufacturer's Data Report (MDR) must be forwarded to this office immediately at the time a unit is shipped to Manitoba. Send your MDR to gasupport@gov.mb.ca. In your subject line, indicate "*Manufacturer's Data Report-CRN No.*" A fee shall be billed to the Manufacturer to process data reports in accordance with the Steam and Pressure Plants Regulation section 17.1.

Please contact gasupport@gov.mb.ca for any questions or concerns.

Inspection and Technical Services

Labour and Immigration
508 – 401 York Avenue, Winnipeg, MB R3C 0P8
T (204) 945-3373 | F (204) 948-2089

1.0 SCOPE

The Swagelok Process Pressure Regulators (SGRS, SGRD, SHRS, SHRD, SGBS, SGBD, SHBS, SGRA, and SGBA Series) comply with the requirements of ASME B31.1-2020 "Power Piping" as an unlisted component per Section 104.7.2 and ASME B31.3-2022 "Process Piping" as an unlisted component per Section 304.7.2.

Compliance is supported by:

- Material properties and allowable stress values from ASME B31.3 Table 1A, ASME B31.3 Table 1B and industry standards.
- Design calculations consistent with the design criteria of ASME B31.3 Section 304.7.2 for minimum wall thickness and ANSI B1.1 Appendix B for thread strength.
- Burst testing to meet the Minimum Required Burst Pressure including Adjustment Factors per ASME B31.1 and ASME B31.3 under laboratory test conditions.

2.0 PRODUCT DESCRIPTION AND RATINGS

The process regulator line of products is highly configurable, as such this design file will review sections of the regulator by feature. Descriptions used in the document relate to the catalogue series and size, where the first 4 characters describe the "Series" of the regulator, and the next 2 digits describe the nominal connection "size" in 16th of an inch. The terms "series" and "size" will be used subsequently in the document.

Product Series & Size	Material	Maximum Rated Pressure					
		At ambient temperature			At maximum temperature		
		Inlet	Outlet	Dome	Inlet	Outlet	Dome
SGRS08	316	6000psi @100°F	6000psi @100°F	N/A	1450psi @356°F	1450psi @356°F	N/A
SGRS12	316	6000psi @100°F	6000psi @100°F	N/A	1450psi @356°F	1450psi @356°F	N/A
SGRS16	316	6000psi @100°F	6000psi @100°F	N/A	1450psi @356°F	1450psi @356°F	N/A
SGRS24	316	6000psi @100°F	6000psi @100°F	N/A	1450psi @356°F	1450psi @356°F	N/A
SGBS08	316	6000psi @100°F	6000psi @100°F	N/A	1450psi @356°F	1450psi @356°F	N/A
SGBS12	316	6000psi @100°F	6000psi @100°F	N/A	1450psi @356°F	1450psi @356°F	N/A
SGBS16	316	6000psi @100°F	6000psi @100°F	N/A	1450psi @356°F	1450psi @356°F	N/A
SGBS24	316	6000psi @100°F	6000psi @100°F	N/A	1450psi @356°F	1450psi @356°F	N/A
SGRD08	316	6000psi @100°F	6000psi @100°F	6000psi @100°F	1450psi @356°F	1450psi @356°F	1450psi @356°F
SGRD12	316	6000psi @100°F	6000psi @100°F	6000psi @100°F	1450psi @356°F	1450psi @356°F	1450psi @356°F
SGRD16	316	6000psi @100°F	6000psi @100°F	6000psi @100°F	1450psi @356°F	1450psi @356°F	1450psi @356°F
SGRD24	316	6000psi @100°F	6000psi @100°F	6000psi @100°F	1450psi @356°F	1450psi @356°F	1450psi @356°F
SGRA08	316	6000psi @100°F	6000psi @100°F	250psi @100°F	1450psi @356°F	1450psi @356°F	188psi @356°F
SGRA12	316	6000psi @100°F	6000psi @100°F	250psi @100°F	1450psi @356°F	1450psi @356°F	188psi @356°F
SHRS08	316	250psi @100°F	250psi @100°F	N/A	188psi @356°F	188psi @356°F	N/A
SHRS12	316	250psi @100°F	250psi @100°F	N/A	188psi @356°F	188psi @356°F	N/A
SHRS16	316	250psi @100°F	250psi @100°F	N/A	188psi @356°F	188psi @356°F	N/A
SHRS24	316	250psi @100°F	250psi @100°F	N/A	188psi @356°F	188psi @356°F	N/A
SHRD08	316	250psi @100°F	250psi @100°F	250psi @100°F	188psi @356°F	188psi @356°F	188psi @356°F
SHRD12	316	250psi @100°F	250psi @100°F	250psi @100°F	188psi @356°F	188psi @356°F	188psi @356°F
SHRD16	316	250psi @100°F	250psi @100°F	250psi @100°F	188psi @356°F	188psi @356°F	188psi @356°F
SHRD24	316	250psi @100°F	250psi @100°F	250psi @100°F	188psi @356°F	188psi @356°F	188psi @356°F
SGBD08	316	6000psi @100°F	6000psi @100°F	6000psi @100°F	1450psi @356°F	1450psi @356°F	1450psi @356°F
SGBD12	316	6000psi @100°F	6000psi @100°F	6000psi @100°F	1450psi @356°F	1450psi @356°F	1450psi @356°F
SGBD16	316	6000psi @100°F	6000psi @100°F	6000psi @100°F	1450psi @356°F	1450psi @356°F	1450psi @356°F
SGBD24	316	6000psi @100°F	6000psi @100°F	6000psi @100°F	1450psi @356°F	1450psi @356°F	1450psi @356°F
SGBA08	316	6000psi @100°F	6000psi @100°F	250psi @100°F	1450psi @356°F	1450psi @356°F	188psi @356°F
SGBA12	316	6000psi @100°F	6000psi @100°F	250psi @100°F	1450psi @356°F	1450psi @356°F	188psi @356°F
SHBS08	316	250psi @100°F	250psi @100°F	N/A	188psi @356°F	188psi @356°F	N/A
SHBS12	316	250psi @100°F	250psi @100°F	N/A	188psi @356°F	188psi @356°F	N/A
SHBS16	316	250psi @100°F	250psi @100°F	N/A	188psi @356°F	188psi @356°F	N/A
SHBS24	316	250psi @100°F	250psi @100°F	N/A	188psi @356°F	188psi @356°F	N/A

Series "SGRS"

General service, pressure reducing, spring loaded. These units can be offered with a diaphragm or piston sensing mechanism dependant on the downstream pressure.

Series "SGRD" (sizes up to and including 24)

General service, pressure reducing, dome loaded. These units are loaded externally with pressure via the dome port.

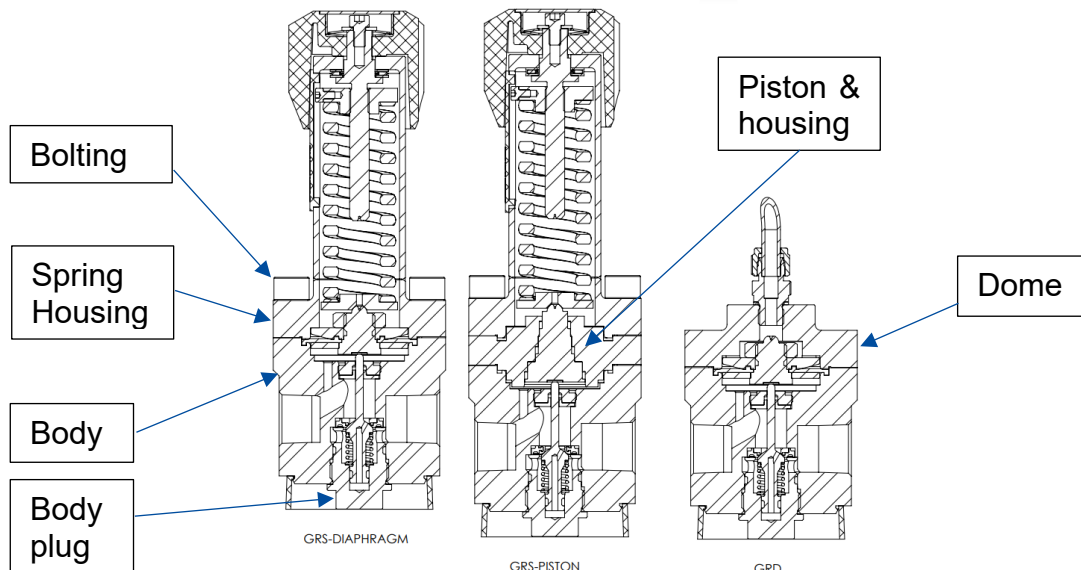


Figure 1 SGRS & SGRD General, Pressure Reducing,

Series "SHRS"

High sensitivity, pressure reducing, spring loaded. These units are offered with a diaphragm sensing mechanism.

Series "SHRD"

High sensitivity, pressure reducing, dome loaded. These units are loaded externally with pressure via the dome port.

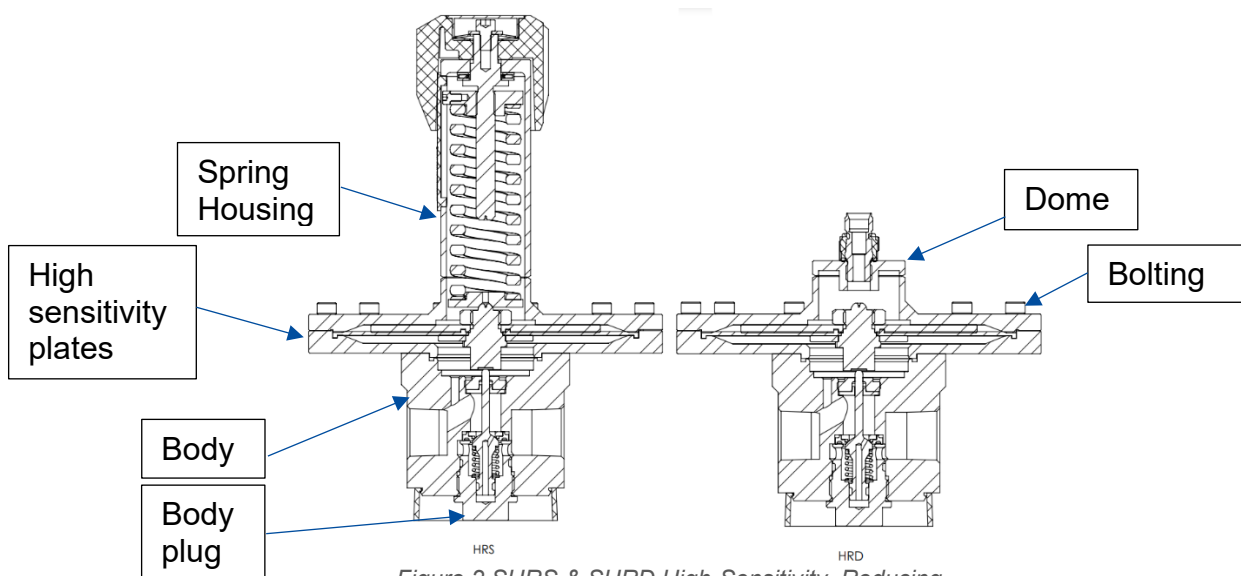


Figure 2 SHRS & SHRD High-Sensitivity, Reducing

Series "SGBS"

General service, back pressure, spring loaded. These units can be offered with a diaphragm or piston sensing mechanism dependant on the upstream pressure.

Series "SGBD"

General service, back pressure, dome loaded. These units are loaded externally with pressure via the dome port.

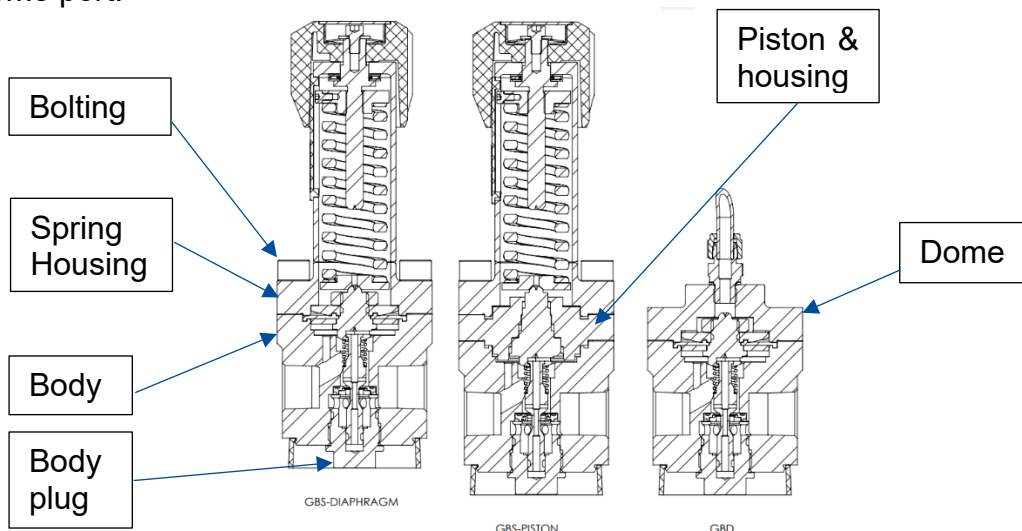


Figure 3 SGBS & SGBD, General, Back pressure

Series "SHBS"

High sensitivity, back pressure, spring loaded. These units are offered with a diaphragm sensing mechanism.

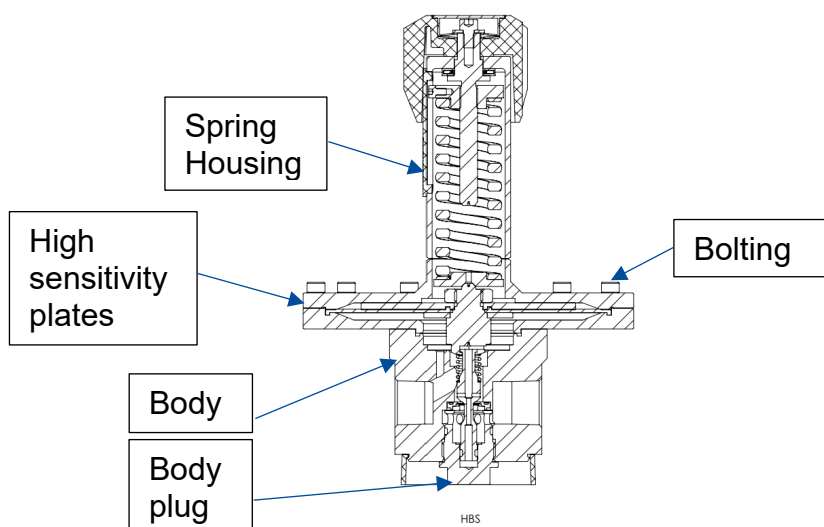


Figure 4 SHBS High sensitivity, Back pressure

Series "SGRA"

General service, pressure reducing, ratio loaded. These units are loaded externally with pressure via the dome port.

Series "SGBA"

General service, pressure reducing, ratio loaded. These units are loaded externally with pressure via the dome port.

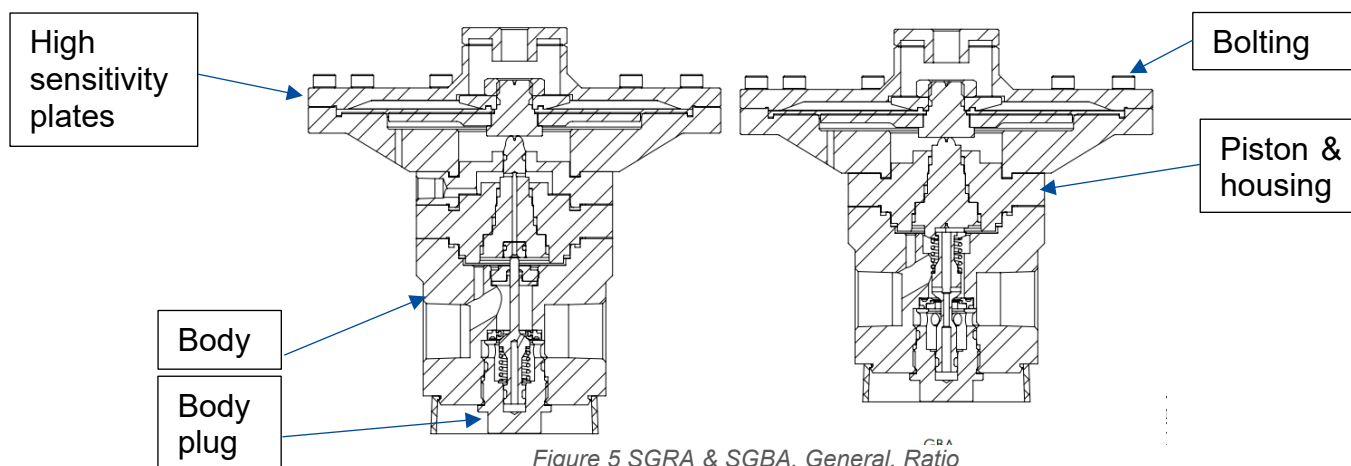


Figure 5 SGRA & SGBA, General, Ratio

3.0 MATERIALS

The materials of construction for pressure-containing components of the Swagelok Process Pressure Regulators (SGRS, SGRD, SGBS, SGBD, SHRS, SHBS, SHRD, SGRA, and SGBA Series) are listed in the table below. These are the only materials used for the pressure-retaining components. The table below gives the maximum allowable stress values. The source of these values is provided in the table.

Component	Material Type & Form	Material Standard & grade	ASME B31.1 or ASME B31.3 code listing	Allowable Stress Source	Tensile Strength	
					Max Allowable Stress at 0 to 100°F	Max Allowable Stress at rated temperature
Body	Stainless Steel 316L Annealed Bar	ASTM A479 316	listed	ASME B31.1 Table A-3 (1)	20000 psi	14872 psi
Spring Housing						
Bolt	Stainless Steel 304 carbide solution treated, and strain hardened	ASTM A193-B8-C2	listed	ASME B31.1 Table A-10 & ASME SEC II PART D Table 3 (2)	25000 psi	25000 psi

Table 1 Materials

(1) MDMT -425°F as listed in ASME B31.3 Table A1

(2) MDMT -325°F as listed in ASME B31.3 Table A2

4.0 BURST TESTING

The modularity of the Process Regulator design lends itself to a test matrix approach, ensuring that each critical component has been tested without the need for many expensive tests. The table below shows the 6 main components of the product (as labelled in section 2), and how each planned test covers the various sizes of product.

The tests in this table account for the pressure containing components used in the smallest and largest sizes of each regulator series (SGRS, SGRD, SHRS, SHRD, SGBS, SGBD, SHBS, SGRA, and SGBA Series).

For example, burst test ordering number SGRS16 demonstrates that all size 16 bodies can withstand 413bar, and that both the size 16 & 24 spring housings & bolting can withstand 413bar as they share the same spring housings and bolts.

Burst test		Product covered					
Ordering Number	Working Pressure (WP) Rating psig (bar)	Body & Body plug	Piston & Piston plate	Spring housing	Dome	High sensitivity plates	Bolting
SGRD08	6000 (413)	All size 08 & 12			General service size 08 & 12		General service size 08 & 12
SGRD24	6000 (413)	All size 24			General service size 16 & 24		General service size 16 & 24
SGRS08	6000 (413)	All size 08 & 12	General service size 08 & 12	General service size 08 & 12			General service size 08 & 12
SGRS16	6000 (413)	All size 16	General service size 16 & 24	General service size 16 & 24			General service size 16 & 24
SHRS08	250 (17.2)			High Sensitivity size 08, 12, 16 & 24		High Sensitivity size 08 & 12	High Sensitivity size 08 & 12
SHRD16	250 (17.2)				High Sensitivity size 08, 12, 16 & 24	High Sensitivity size 16 & 24	High Sensitivity size 16 & 24

4.1. TEST RESULTS

A number of burst tests were conducted to validate the above's calculations compliance to ASME B31.1 & B31.3 and documented in CTR-10821

Ordering Number	Working Pressure (WP) Rating psig (bar)	4 x WP psig (bar)	Material Factor	Target Pressure Including Adjustment Factors psig (bar)	Pass/Fail
SGRD08	6000 (413)	24000 (1655)	1.108	26592 (1833)	Pass
SGRD24	6000 (413)	24000 (1655)	1.108	26592 (1833)	Pass
SGRS08	6000 (413)	24000 (1655)	1.118	26832 (1850)	Pass
SGRS16	6000 (413)	24000 (1655)	1.147	27528 (1898)	Pass
SHRS08	250 (17.2)	1000 (68.9)	1.118	1118 (77)	Pass
SHRD16	250 (17.2)	1000 (68.9)	1.147	1147 (79)	Pass

4.2. UNLISTED COMPONENT QUALIFICATION

The Swagelok Process Pressure Regulators (SGRS, SGRD, SHRS, SHRD, SGBS, SGBD, SHBS, SGRA, and SGBA Series) are qualified in accordance with ASME B31.1 2022 "Power Piping" as an unlisted component per Section 104.7.2 and ASME B31.3 2022 "Process Piping" as an unlisted component per Section 304.7.2. Burst testing was conducted per ASME BPVC Code Section I, A-22 (Ref. 2.10) and ASME Code Section VIII, Division 1, UG-101. For results, see Product Test Report CTR-10821.

4.3. PRESSURE RATINGS AT RATED TEMPERATURE

Using the allowable stress values from section 3 above, a pressure rating for the valves was calculated at the temperature. In the table below, these calculated values are compared to the valve's actual pressure ratings at the temperature rating published in the product catalogue. In all cases, the valves are de-rated at temperature more than what the allowable stress values from the code require.

Product Series	Material	Maximum working Pressure rating @ -49 to 100°F	Maximum Rated Temperature	At Maximum Rated Temperature	
				Calculated Maximum Pressure based on Allowable Stress	Actual Maximum Working Pressure at Temperature Rating
SG	316 SS	6000psi	356°F	4680psi	1450psi
SH	316 SS	250psi	356°F	194psi	188psi

5.0 END CONNECTIONS

The NPT pipe fittings are covered by registration number OA12577.5C. The BSP end connections conform to ISO/EN 10226. The ASME flanges are covered by registration number 0A0395.3C.

Swagelok Process Regulators are supplied with a variety of end connections, including female NPT and ASME Flange connections. The geometries of these end connections are identical to the geometry qualified under separate Swagelok Fitting (Category A) CRN's.

The ratings of the end connections are accounted for in the product rating so if the end connection pressure rating is less than the regulator pressure rating, the product would be rated to the lesser value.

The following table indicates the Swagelok Fitting CRN numbers that correspond to end connections that may be used with Swagelok Process Regulators:

End Connection	CRN
316 SS Swagelok Tube Fitting	0A21025.5C
316 SS Flange Adapters	0A17712.2C

6.0 MARKING

The Swagelok Process Series Pressure Regulators (SGRS, SGRD, SHRS, SHRD, SGBS, SGBD, SHBS, SGRA, and SGBA) are marked on the exterior of the body with the following information: manufacturer's name (Swagelok), order number, and part number including material designator as noted in MSS SP-25.

7.0 CONCLUSIONS

The summary provided above supports compliance of the Swagelok Process Pressure Regulators (SGRS, SGRD, SHRS, SHRD, SGBS, SGBD, SHBS, SGRA, and SGBA Series) with the requirements of ASME B31.1-2020 "Power Piping" as an unlisted component per Section 104.7.2 and ASME B31.3-2022 "Process Piping" as an unlisted component per Section 304.7.2.

Product Engineer: G.H. Stephenson

Date: September 16, 2024